Spanish agriculture: the long Siesta, 1765–1965 is the first major study in English of Spanish agrarian history. James Simpson examines how traditional agriculture responded to population growth and the integration of commodity markets, emphasising both Spain's regional variations and its context in Europe. Simpson argues that decisive changes in farming techniques only occurred at the start of this century, leading to rising labour productivity and the start of the rural exodus. Development was interrupted in the 1930s and 1940s, only resuming in the 1950s. He rejects arguments that slow growth can be explained by poor resources or inefficient farmers. Indeed, farmers were quick to change when they had market opportunities (as was the case with olive oil, oranges and rice). By contrast, change was slower in those areas such as cereals where traditional technologies remained profitable. Simpson concludes that there were strict limits on absorbing labour in Spain's dry lands, and labour was retained in agriculture because of government policies.

Cambridge Studies in Modern Economic History 2

Spanish agriculture: the long Siesta, 1765–1965

Cambridge Studies in Modern Economic History

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Spanish agriculture: the long Siesta, 1765–1965

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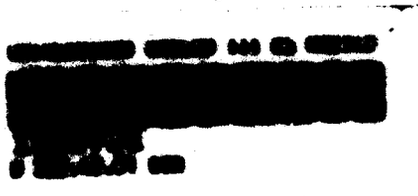

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To my mother, and the memory of my father

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Note on the regional division of Spain

Geographers and historians have long struggled to divide Spain satisfactorily into regions which correspond to such diverse variables as rainfall, crop mix, land distribution or cultural and linguistic background. I have chosen four major regions, three of which are further subdivided into subregions, essentially on the basis of crop mix (Map 1). The provinces that make up those regions and subregions are shown in Map 2 and listed below.

1. NORTH: Coruña, Guipúzcoa, Lugo, Orense, Asturias, Pontevedra, Santander and Vizcaya

Subregions: Galicia (Coruña, Lugo, Orense and Pontevedra) and Biscay (Guipúzcoa, Asturias, Santander and Vizcaya).

2. INTERIOR: Alava, Albacete, Avila, Badajoz, Burgos, Cáceres, Ciudad Real, Cuenca, Guadalajara, Huesca, León, Lleida, Madrid, Navarra, Palencia, Rioja, Salamanca, Segovia, Soria, Teruel, Toledo, Valladolid, Zamora and Zaragoza.

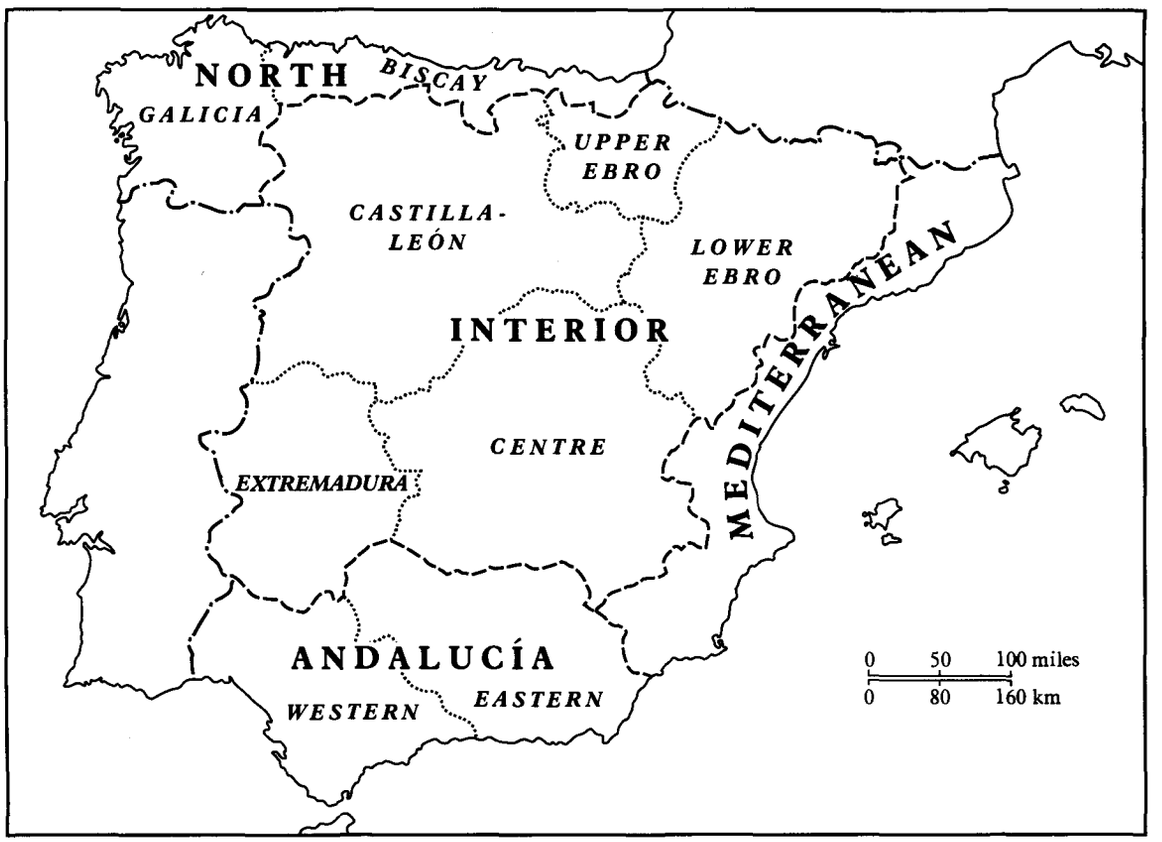
Subregions: Castilla-León (Avila, Burgos, León, Palencia, Salamanca, Segovia, Soria, Valladolid and Zamora); Extremadura (Badajoz and Cáceres); Centre (Albacete, Ciudad Real, Cuenca, Guadalajara, Madrid and Toledo); Upper Ebro (Alava, Burgos and Navarra) and Lower Ebro (Huesca, Lleida, Teruel and Zaragoza).

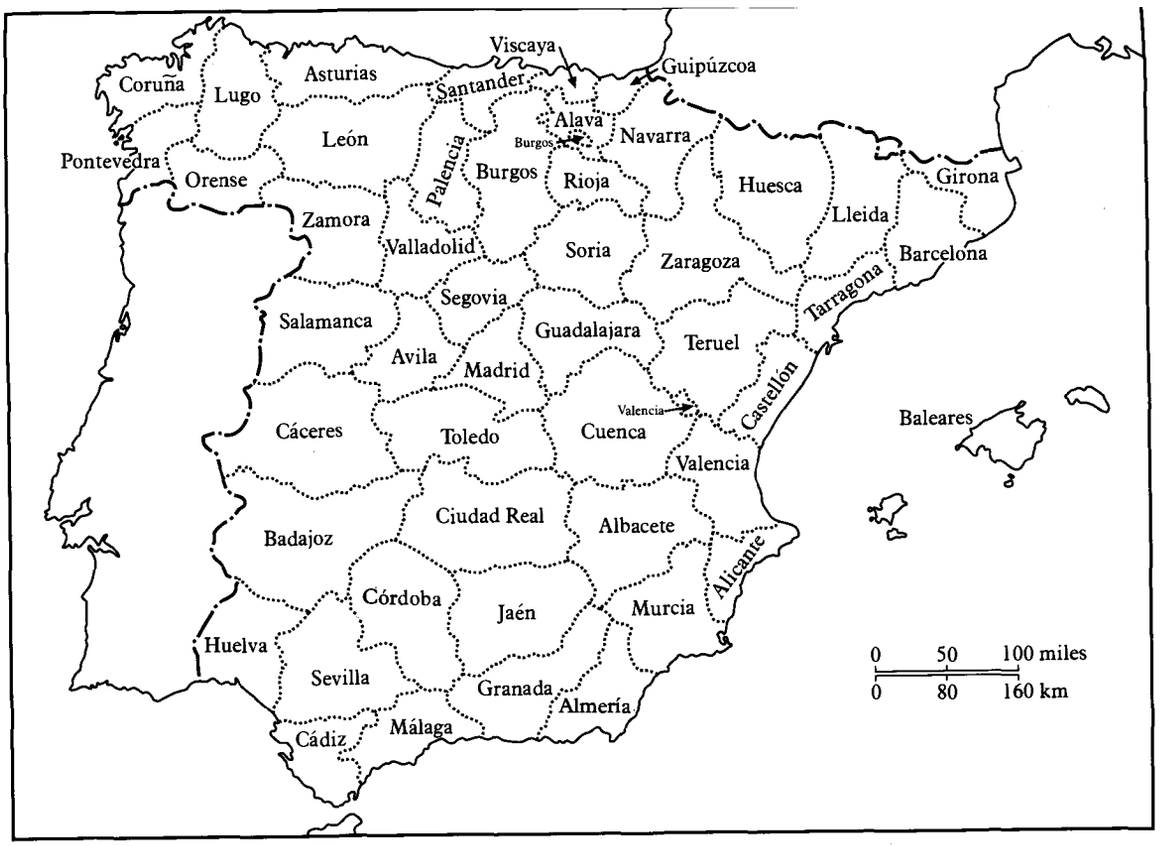
3. MEDITERRANEAN: Alicante, Barcelona, Baleares, Castellón, Girona, Murcia, Tarragona and Valencia.

4. ANDALUCIA: Almería, Cádiz, Córdoba, Granada, Huelva, Jaén, Málaga and Sevilla.

Subregions: Eastern Andalucía (Almería, Córdoba, Granada and Jaén); Western Andalucía (Cádiz, Huelva, Málaga and Sevilla).

Except in estimates of national output and productivity, the Canary Islands have been excluded from this book.





Map 2 Provinces of Spain

Abbreviations and conventions

Abbreviations

AEA	Anuario de Estadística Agraria
AEPA	Anuario Estadístico de las Producciones Agrícolas
BATEM	Boletín de Agricultura Técnica y Económica
CNCA	Confederación Nacional Católico Agraria
DGAIC	Dirección General de Agricultura, Industria y Comercio
EPAPM	El Progreso Agrícola y Pecuario
GAMFM	Gaceta Agrícola del Ministerio de Fomento
GEHR	Grupo de Estudios de Historia Rural
IBRD/FAO	International Bank for Reconstruction and Development/Food and Agricultural Organisation
IIA	International Institute of Agriculture
INE	Instituto Nacional de Estadística
JCA	Junta Consultíva Agronómica
OECD	Organization for Economic Cooperation and Development
OES	United Kingdom Overseas European Survey
USDA	United States Department of Agriculture

Symbols used in tables

n.d. no data (not available)
n.a. not applicable
.. negligible

Spans of years

Because of harvest fluctuations, it is often preferable to refer to an average of a number of years rather than to a single year. A solidus (/) indicates that an average of the years in the span has been used: for example, the 1850/4 wheat price. By contrast, a span marked with an en rule (–) simply refers to the period between the two dates.

Introduction

> One point emerges very clearly from the diversity of experience of the developing countries: rapid growth in agriculture and in GDP go together. Where the pursuit of industrialization – the favored targets of planners in the 1950s and 1960s – has been successful, agricultural progress has not been sacrificed. Success in agriculture strengthens and helps sustain the momentum of the whole economy.[1]

> . . . there are no basic reasons why the agricultural sector of any country cannot contribute substantially to economic growth. True, agriculture using only traditional factors cannot do it, but modernized agriculture is capable of making a large contribution. . . . Once there are investment opportunities and efficient incentives, farmers will turn sand to gold.[2]

In their seminal article of 1961, Johnson and Mellor outlined five areas where agriculture could contribute to economic development, namely by increasing food supply in pace with domestic demand, obtaining foreign exchange through exports, transferring labour to 'manufacturing' and 'other expanding sectors of the economy', making a net contribution to the capital required for overhead and industrial investment and finally, providing a market for consumer goods for the emerging industrial sector.[3] With Kuznets, the development process is viewed as one of structural transformation, where agriculture's share of GDP and of the active labour force declines. However, structural transformation in itself depended on improving agriculture's performance, and in all cases of successful economic development, labour productivity in agriculture has needed to increase significantly. This can be illustrated by three very different historical cases, those of England, the United States and Japan.

For many historians, the role of agriculture is considered crucial in the success of the Industrial Revolution in England, even if the timing

[1] World Bank (1982, p. 4).
[2] Schultz (1964, p. 5).
[3] Johnson and Mellor (1961, pp. 571–81).

of the changes is highly controversial. In particular, labour flowed out of domestic agriculture to such an extent that by 1840 only 28.6 per cent of male labour was employed in the sector. The changes normally associated with the agrarian revolution in England, namely new crops, more intensive rotations and more efficient agrarian institutions (enclosures and an efficient tenurial system) produced a growth in total factor-productivity in the sector which, according to one author, 'at times exceeded that of manufacturing and the rest of the economy – most notably during 1800–31'. As a result, by 1840 there was no productivity gap between agriculture and the rest of the economy.[4]

In the United States, the role of agriculture in the development process was somewhat different. Employment in the sector did not peak in absolute terms until 1907, when it still accounted for 35 per cent of the active population.[5] However as the urban population of America grew from 10 million in 1870 to 42 million in 1913, farmers not only proved capable of feeding them, but also contributed about half of all the nation's exports.[6] Furthermore, agriculture created important backward and forward linkages with the rest of the economy (agricultural machinery, fertilisers and meat-packing, flour milling, tobacco processing). These changes are reflected in labour productivity in agriculture, which grew by between 0.5 and 0.7 per cent a year over the nineteenth century, with the second half of the century witnessing an annual growth of between 0.8 and 1.2 per cent.[7]

Japan has traditionally been seen as the classic example of agriculture contributing to economic development through the transfer of savings, taxes and labour. Indeed, in their pioneering article, Johnson and Mellor referred to Japan as 'probably the clearest example of a country where agriculture contributed significantly to the financing of development'.[8] Rising output and a stagnant workforce led to an average per capita growth in labour productivity of 1.8 per cent between 1880 and 1935.[9] However, Franks has argued that the process of structural transformation and resource transfer was more complex, and less strictly unidirectional than is usually portrayed.[10] As in the United States, growing

[4] Crafts (1985, p. 115 and table 3.4). For criticism of Crafts' estimates and conclusions, see especially Mokyr (1989, pp. 305–12) and Allen (1992, chapter 13; 1994, pp. 119–22).
[5] US Bureau of the Census (1975, DC Series D1–10).
[6] Ibid, (Series A57–72).
[7] Weiss (1993, tables 2 and 3).
[8] Johnson and Mellor (1961, pp. 577–8)
[9] Hayami (1975, p. 30).
[10] Franks (1992, p. 103).

agricultural output became increasingly dependent on industrially produced inputs and urban demand. Furthermore, in the case of Japan, rural households frequently turned to manufacturing employment during periods of low demand in agriculture. Farmers therefore were 'responding to, and themselves affecting, changes in market conditions for labour and goods, in available technology, and in the institutional organisation of industry and commerce'.[11]

The problem facing developing economies is not, therefore, one of simply transferring resources from agriculture to other sectors, but also one of raising agricultural output and productivity. If this was achieved to a greater or lesser extent in the three countries discussed above, the story in many of the more backward European countries, not to mention those of the Third World, is that agricultural output often struggled to grow faster than population growth until well into the twentieth century. Furthermore, farmers rarely adopted immediately the new technologies made available to them by industrialisation, labour did not leave the countryside for the cities or emigrate in sufficient numbers to reduce the farming populations, and agriculture performed few of the functions outlined by Johnston and Mellor. Spain is a case in point. Nadal, in his classic study of Spain's failure to industrialise prior to 1913, noted that low agricultural productivity resulted in costly food and weak domestic markets for manufactured goods. Industry was starved of capital as the wealthy diverted their capital to the purchase of land, and if a cheap and abundant workforce existed in the cities, this was not in itself sufficient for industrialisation.[12] Another leading Spanish historian, Tortella, has written of the 'serious retardation of Spanish agriculture, especially until around 1900', being reflected in its low productivity.[13] He argues that the agricultural sector was weak in its demand for consumer goods, achieved only modest transfers of labour and capital to the urban sector and, in particular, failed as a market for industrial inputs.[14]

If a number of historians have recently questioned whether labour productivity in Spanish agriculture was actually as low as suggested in the works of such authors as Nadal or Tortella, and if the industrial sector itself has also been partly blamed for the country's slow development, few would question the fact that Spanish agriculture's contribution was weak over most of the two centuries between 1765 and

[11] Ibid. (p. 111).
[12] Nadal (1984, pp. 82–6).
[13] Tortella (1987, p. 42).
[14] Tortella concludes that 'agricultural stagnation explains to a large extent the relative retardation of the Spanish economy during the period under study [1830–1930]' (1987, pp. 55–9).

1965.[15] However, this book is not about 'backward' peasants who allocated resources inefficiently and failed to respond to market opportunities. Rather, it is about the difficulties in raising labour productivity faster in traditional agriculture. The book starts in 1765 when Spain's growing population, as elsewhere in Europe, was beginning to put pressure on resources to an extent which had not been experienced since the sixteenth century. Significantly, it is also the year when the *tasa*, or maximum price at which wheat could be sold, was abolished in Castilla. The books ends with the situation in the mid-1960s – a time when traditional agriculture was beginning to change rapidly, producing a significant growth in both labour productivity and transfers of resources to other sectors of the economy. I argue that although natural resources were not especially favourable for agriculture in Spain, this is not enough in itself to explain the slow growth of the sector. Also to blame were government policies, the weakness of urban demand for farm products and in attracting agricultural labour, the difficulties in achieving export-led growth, and the technical restrictions to both improving yields in dry-farming and introducing more labour-intensive crops.

The book is divided into five parts. In the first part (chapters 1 and 2), I present new estimates of agricultural output and productivity. These challenge the findings of some recent research which sees Spain's agricultural sector as having changed significantly from the mid-nineteenth century. Instead, I argue that although population pressure and institutional reforms had stimulated changes in the nation's agriculture, until the turn of the twentieth century agricultural output grew little faster than population growth. In the early twentieth century, the speed of change quickened and labour productivity increased, but most of these gains were subsequently lost in the 1930s and 1940s. Only from the mid-1950s was the process of modernisation of traditional agriculture renewed, leading to a rapid growth in productivity and major structural changes in the Spanish economy.

The second chapter shows the considerable diversity in Spanish agriculture implying that no single factor can adequately explain the slow growth of the sector. Four major regions are established, with labour productivity being higher in the North and Mediterranean than in the Interior and Andalucía. Agriculture in the North was based on very small farms, with adequate rainfall permitting labour-intensive systems of mixed husbandry. Although the population was adequately fed, the

[15] For more optimistic visions of agricultural productivity, see GEHR (1983a) and Prados de la Escosura (1988, ch. 3).

low level of integration in product markets produced low disposable incomes. By contrast, irrigation helped the Mediterranean farmers specialise in high-value fruits, nuts and vegetables for urban and international markets. Both Andalucía and the Interior, which accounted for four-fifths of the nation's agricultural area, suffered from summer droughts. In Andalucía agriculture was dominated by large estates and extensive farming systems based on cereals and olives, whilst in the Interior farms were small with a very high dependence on dry-farming and cereals. The problems facing Spanish farmers were therefore very different, and the speed of change in traditional agriculture would vary significantly according to the region.

In Part II, the mechanics by which traditional agriculture was able to raise output until the late nineteenth century are discussed (chapters 3 and 4). Given Spain's initial low population density, outward movements in the demand curve caused by population growth from the second half of the eighteenth century were met by extending the area cultivated and using existing technology, rather than introducing more intensive cropping methods. The process was aided by changes in property rights, which both strengthened individual ownership through the abolition of institutions such as the Mesta, tithes and entail, and extended it through the sale of large areas of land to individuals – land that had belonged to the church and municipalities. Finally, commodity markets were also liberalised which, together with transport improvements, led to greater market integration and in turn, to an increase in farm specialisation.

The extension of the area cultivated and improvements in market integration between 1700 and 1900 allowed farmers not only to feed a population which virtually doubled in size, but also to meet the increasing international demand for products such as wine and olive oil. Yet there were also major limitations to agriculture's performance. There was, for example, little evidence of improvements in land or labour productivity. The large sale of church and municipal property, whilst far from reinforcing the structure of an independent peasantry such as existed in France, also failed to break fully the links that many had with the land, which might have speeded up rural outmigration, a process which in England had been stimulated by the Enclosures. The small improvements in living standards over the period were caused by events mainly outside agriculture, in transportation and the manufacturing sector.

By the late nineteenth century Europe's farmers were enjoying an increasing supply of new inputs, including chemical fertilisers, labour-

saving harvest machinery and improved irrigation technologies. Part III shows that the likely response by farmers to these new opportunities depended on market opportunities for the different crops and on factor prices. The fact that traditional farming methods often proved the most profitable implied that productivity growth would remain slow prior to the 1936–9 Civil War.

In northern Europe, artificial fertilisers removed the need to keep high densities of livestock to improve soil fertility. However, chapter 5 shows that the experience in Spain, as in other regions of the world where dry-farming was practised, was that existing cereal strains responded poorly to artificial fertilisers, and marginal physical returns to more intensive tillage were therefore low. Instead, farmers used fertilisers to bring into cultivation more land, and yields stagnated until improved seed strains were introduced on a large scale in the 1960s. By contrast, on irrigated land, crops were much more responsive to fertilisers, and Spanish farmers proved to be some of Europe's pioneers in their use.

About four-fifths of Spain's agricultural land suffered from seasonal droughts and low crop yields at the turn of the twentieth century. By contrast, the relatively high labour productivity in parts of the Mediterranean owed much to a combination of a warm climate, irrigation systems, artificial fertilisers and abundant labour which permitted the production of high value crops. The obvious contrast between Spain's *secano* (dry lands) and its irrigated market gardens and orchards was not lost on contemporaries, and many believed irrigation was the answer to the country's low productivity in agriculture. Chapter 6 shows, however, that the commercial success of new irrigation projects depended not only on the construction of reservoirs and canals, but also on the development of water management systems and the introduction of a wide range of complementary inputs, including new crops, scientifically selected and produced seeds, and artificial fertilisers. The chapter shows that, in spite of its potential, the contribution of irrigation-fed agriculture remained small before the 1936–9 Civil War.

Low cereal yields and the limited area irrigated implied that improved labour productivity in dry-farming areas could best be achieved through mechanisation. Chapter 7 shows that the diffusion of labour-saving machinery in Spanish cereals was slow, not so much on account of farmers' ignorance of the new equipment, but rather because, as 'rational' farmers, they were reluctant to mechanise at a time when they had a cheap labour supply, the price of draught energy was high, and the links between the agricultural and industrial sectors were still weak. By contrast, where new mechanical technologies offered real advantages to producers, such as in olive oil processing, the diffusion of new techniques was rapid.

Part III argues, therefore, that farmers were responsive to changes in factor prices and new production opportunities when these proved profitable. Part IV links this notion of 'rational' farmers with Spain's low agricultural productivity and poverty on the eve of the 1936–9 Civil War by looking in greater detail at commodity markets, and the demands for institutional change. Chapter 8 argues that not only were Spanish diets poor in calories, but the consumption of meat and dairy products was significantly below the European norm. This was partly caused by weak urban demand – the relatively slow growth of cities in Spain reduced their ability to stimulate agricultural specialisation. However, demand was not the only problem for, whilst northern European farmers reacted to falling international prices of cereals in the late nineteenth century by shifting resources into livestock products, this was not a realistic option in most of Spain because of summer drought. By contrast, in the North – a region where natural resources were ideal for livestock production – the small scale of many herds and the weak integration of markets limited specialisation. In general, labour was slow to leave agriculture prior to the twentieth century, and this can be explained by the capacity of agriculture to absorb the growing rural population. Only with the reorganisation of Spanish viticulture after phylloxera, and with growing urban wages, would labourers begin to leave agriculture in significant numbers.

Although by the late nineteenth century Spain was uncompetitive in the production of cereals and livestock produce, conditions on large areas of the *secano* were ideal for vines and olives. In chapter 9 I argue that a number of barriers existed to export-led growth in these commodities. International markets were limited to areas of production, or those with large numbers of Mediterranean immigrants. Producers of both crops suffered from product adulteration and cheap substitutes. These limits to demand have to be contrasted with supply which was more elastic, given the abundant supplies of suitable land, cheap labour and low entry costs for producers, both in Spain and elsewhere in the Mediterranean. Already by the turn of the twentieth century, international wine markets were suffering from overproduction. If the situation was better for olive oil producers, the limitations of the international market were clearly present by the late 1920s. Consequently, the incentive to shift resources out of cereals and into vines and olives was limited during the first half of the twentieth century.

Given the low productivity of much of Spain's dry lands and the limited possibilities for changing the crop mix, chapter 10 looks at the role

of government in helping farmers and influencing production decisions in the half century prior to the Civil War. With cereals, government policy was directed towards tariff and price intervention – policies which benefited the larger farmers but which led to high consumer prices and did not significantly improve the incomes of many small producers. Cooperatives, which might have helped the smaller farmer, were not encouraged, in marked contrast to countries such as France where the family farm was politically much more powerful. Therefore, whilst discouraging rural outmigration and appearing to encourage the family farm, successive governments did little to improve the lot of those who chose to remain. Finally, I argue that the ill-fated agrarian reform of the 1930s, which aimed at dividing up large estates, would have provided only a temporary solution to low rural incomes and would not have improved labour productivity.

With technical change leading to modest productivity gains, wider economic growth and development was also taking place within Spain during the first three decades of the twentieth century. However, the limits to productivity growth in agriculture were clearly visible. If farmers were efficient in their allocation of resources, labour productivity remained low over large areas of the country, and consumers faced some of Europe's highest food prices – and some of Europe's poorest diets.

The limited changes in agriculture from the early twentieth century were halted and then reversed during the 1930s and 1940s. The widespread shortages of commercial fertilisers and machinery in Spain after the 1936–9 Civil War resulted in many farmers reverting to traditional techniques. However, from the mid-1950s, agriculture began to change beyond all recognition. Part V looks at these changing fortunes and, in particular, considers how the three key bottlenecks to increased agricultural output – legacies of the earlier period – were eventually overcome. First, the rural exodus to the cities and northern Europe created labour shortages in the countryside, leading to an increase in real wages, and was a stimulus to mechanisation. Furthermore, for cereal farmers the backlog of technology that had built up by the early 1950s was such that its subsequent introduction protected farm profits and at the same time permitted the government to reduce the real price of wheat. Second, major international changes in poultry and pig-farming technologies allowed a rapid growth in domestic output and a doubling of per capita meat consumption between 1955 and 1965. Improvements in breeding and feeding led to higher beef yields, which partly offset the limits imposed by summer droughts and the small production units of the North. Finally, the growing attractions of hydro-electric power, together with improvements in construction technologies, greatly

increased the supply of water for Spain's irrigation needs. As a result, whilst labour productivity increased by about a third between 1900 and 1950, it tripled between 1950 and 1970. Although Spanish agriculture was still poor in comparison with other western European nations, its Siesta had ended.

Part I

The relative backwardness of Spanish agriculture

1 Spanish agriculture: the long view

The majority of countries today still devote a significant proportion of their resources to feeding, clothing and housing their population. However, historically, as Eric Jones has recently reminded us, living standards have varied significantly over time and space in pre-industrial societies.[1] What determined these fluctuations is complicated, but two factors stand out: the ability of a society to produce surplus food, and the rate of population growth. Malthus believed that population growth depended on 'preceding changes in agricultural productivity which, in their turn, are explained as the result of extraneous factors, such as the fortuitous factor of technical invention and imitation'.[2] Boserup turned the argument on its head, suggesting that a larger population would stimulate the search for new systems of production which would increase output.[3] For example, it is hard to imagine the diffusion of the heavy plough from the tenth century without the accompanying demographic pressure to extend the area cultivated on the potentially fertile but heavy soils of northwest Europe. Yet population growth has clearly not always led to technological or organisational change. The beneficial effects of the diffusion of the new ploughs were largely exhausted by the late thirteenth century – and the continued demographic pressure severely depressed living standards for the bulk of Europe's inhabitants. Likewise, in the sixteenth century, population growth failed to induce sufficient changes in production techniques to offset diminishing returns to labour, which meant that if agricultural output grew, it did not grow as fast as population.

The relation between changing levels of output per hectare, and output per worker is shown in Figure 1.1.[4] The level of output per

[1] Jones (1988).
[2] Boserup (1965, p. 11).
[3] The question of whether an abundant population was the cause of improvements in production systems, or was the result of them, was considered by the Spanish priest, Generés, in 1793. See Martín Rodríguez (1984, p. 178).
[4] This section is based heavily on Timmer (1988) See also UN and FAO (1954) and Hayami and Ruttan (1985).

worker is crucial. Increased labour productivity allows economic specialisation and a growing urban sector, whereas this cannot be assured by increasing yields only. Figure 1.1 plots agricultural output and output per worker on a log scale, with the 45° line tracing out constant ratios of land per worker. If welfare improvements are considered as an increase in output per worker, three possibilities are shown, all of which involve a movement to the right (cases a, b and c). In one case (d), no change takes place. Finally, (e) and (f) show falling output per worker. Although these six examples of agricultural change are not exhaustive, they still cover most possibilities and provide a convenient reference for this book.

In their search to simplify the agricultural transformation in Europe since the sixteenth or seventeenth century, historians and economists have identified a series of stages through which agriculture moved.[5] In the initial stage, not only was agricultural productivity so low that it often required at least two-thirds of all workers to feed a country's population and supply its industries with raw materials (wood, wool, linen, silk, etc.), but governments had frequently to intervene to protect the small number of urban consumers from food shortages. The Agricultural Revolution in Holland and England from around the seventeenth century showed the possibilities of increasing yields through better integration of livestock and arable. This book starts just as the transmission of these ideas gathers pace throughout Europe. The Second Agricultural Revolution has been dated from the middle of the nineteenth century. It permitted the substitution of inputs produced traditionally on the family farm with those produced by industries (labour-saving machinery, artificial fertilisers, pesticides, irrigation pumps, etc.). These innovations not only raised further productivity growth, but also slowly released labour to other sectors of the economy. From the 1950s a third revolution became increasingly apparent – the application of laboratory science to agriculture. The impact of developments such as high-yield crop strains, artificial insemination and pest controls would in time assume revolutionary importance because they permitted not simply a rapid growth in yields but, by the 1960s, the first signs of agricultural overproduction in Europe.

A major theme of this book is that Spain, and in a wider geographical context, the Mediterranean region as a whole, experienced different problems in increasing its agricultural productivity compared with

[5] The separation of European agriculture into various stages is frequent in the literature. See for example, Bairoch (1989), Jones and Woolf (1969) and Thompson (1968).

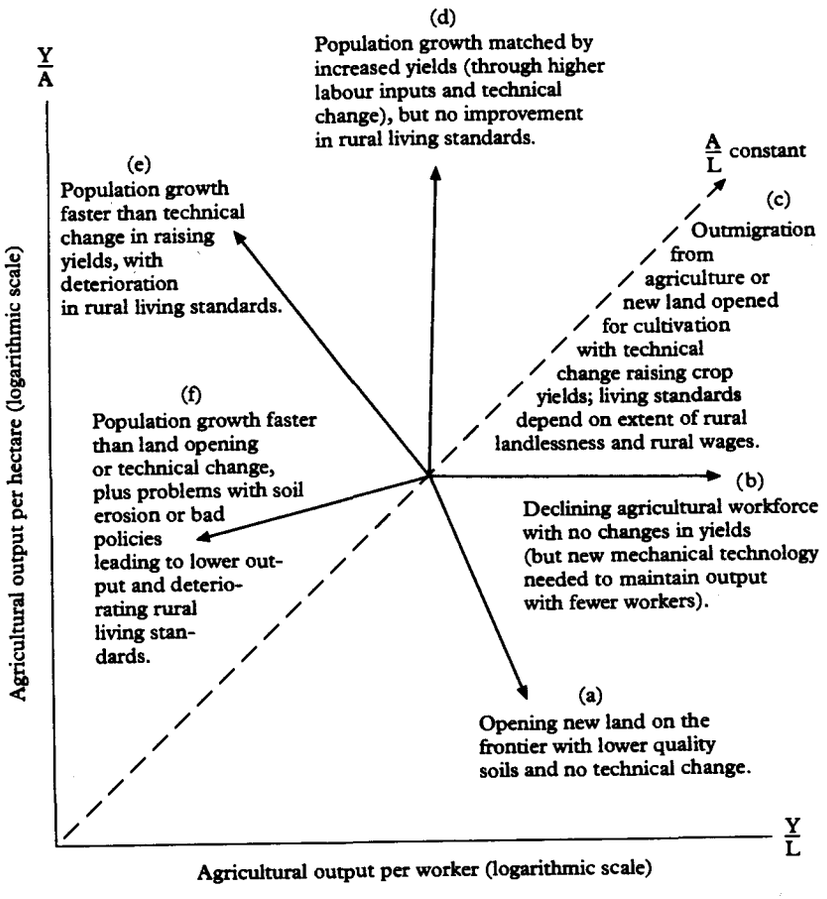


Figure 1.1 Possibilities for agricultural change
Source: Timmer (1988, p. 304)

the countries of northern Europe, during both the first and second Agricultural Revolutions. Both the chronology and pace of agricultural change in Spain was different; I argue that labour productivity in agriculture probably fell slightly in the period 1765–1820, stagnated over the nineteenth century and, although it started increasing significantly from the early twentieth century, it then suffered a major reversal during much of the 1930s and 1940s. The renewed growth from the 1950s therefore marks the true end of traditional agriculture in Spain.

Table 1.1. *Changes in European population, 1760–1960*

	Population (millions)			Annual change (%)	
	c. 1750	*c.* 1850	*c.* 1950	1760–1860	1860–1960
North[a]	17.6	42.9	89.9	0.89	0.74
Central[b]	44.3	73.3	126.6	0.50	0.54
Mediterranean[c]	24.2	43.0	83.6	0.58	0.67
Total	86.1	159.2	300.1	0.61	0.64
Spain	9.0	15.2	28.0	0.53	0.61

[a] Belgium, Denmark, Finland, Netherlands, Norway, United Kingdom and Sweden.
[b] France, Germany and Switzerland.
[c] Italy, Portugal and Spain.

Sources: Anderson (1988, table 1); Mitchell (1992, pp. 3–8).

The Malthusian trap threatens? Spanish agriculture, 1765–1820

Just as the political, economic and social problems associated with the crisis of the seventeenth century affected European countries very differently, so the demographic recovery of the following century would also turn out to be uneven in its nature. By the mid-eighteenth century it was well under way in most parts of Europe, and over the following two centuries the population increased at rates never previously recorded. Between 1750 and 1950 Spain's population grew at an annual cumulative rate of 0.57 per cent against 0.63 per cent for Europe as a whole. As is shown in Table 1.1, Europe's population grew fastest in the countries of the North, but even in Spain this demographic surge was historically unprecedented, being twice the rate that the country had experienced in the period 1530–1760. [6] However, at no time was Spain's agriculture faced by the kind of population growth that took place in England between 1770 and and 1869, when the population increased by three and a half times – an annual growth rate of 1.2 per cent – or in Ireland, where it reached 1.6 per cent between 1780 and 1821.[7] In Spain, the population grew fastest over the two decades between 1910 and 1930, when it reached an annual growth rate of 0.8 per cent.

The implication of this demographic explosion for European agriculture during the late eighteenth century was significant because, not only

[6] Taking population in 1530 as 4.698 million and 1768 as 9.023 million, the growth is an annual 0.28 per cent (Nadal, 1984, cuadro 9).
[7] Wrigley and Schofield (1989, pp. 534–5) and Ó Gráda (1989, p. 13).

were most people born in the countryside, they would also have to be employed there. The Malthusian spectre of rapid population growth leading to falling living standards (or Ricardo's diminishing returns) weighed heavily in many people's minds. Yet the nineteenth century saw a number of western European countries experience a significant growth in population, rising living standards, and a decline in the relative importance of agriculture.

One major step in avoiding the Malthusian threat is usually considered to be the Agricultural Revolution of northwest Europe.[8] This saw such innovations as the planting of forage crops in the fallow, especially legumes and turnips, and the introduction of convertible husbandry using commercially-produced grass seeds. Both allowed a much greater density of livestock and its better integration with arable cultivation. These changes helped improve the nitrogen content of soils, producing in turn higher cereal yields. The success was by no means limited to England. The diffusion of one or more of the techniques involved in raising the nitrogen level of soils had allowed, according to one historian, wheat yields in 'Ireland, northeastern France, Holland, and probably western Germany and Belgium' to be similar to those achieved in England around 1800.[9] At an assumed yield of 1.58 tons a hectare (22.5 bushels an acre), these northern regions enjoyed levels almost twice those that Spain would experience a century later. When allowance for the much greater quantity of unsown fallow that was needed in Spain is also taken into the comparison, then northern Europe was producing about three times as much wheat per hectare as Spain, and a century earlier.[10]

This startling contrast in yields is the single most important difference in traditional agriculture between Spain (or the Mediterranean in general) and northwest Europe. It was not caused by the ignorance of Spanish farmers of the new methods, but by the difficulties in introducing intensive farming rotations to a country with low rainfall and

[8] The exact timing and the impact of these new cultivation methods remain highly controversial, as suggested by some of the contributors to the recent volume by Campbell and Overton (1991). Improved yields were also perhaps caused by greater market integration in the late seventeenth century (Kaussmaul, 1990, especially ch. 5).
[9] Allen (1988, p. 117). See also Allen and Ó Gráda (1988, pp. 93–116).
[10] Even if 1.58 tons/hectare is considered too optimistic for northern Europe in 1800, this level was certainly reached a few decades later. Spanish wheat yields were 0.88 tons/hectare in 1903/12, and for every hectare of cereals and legumes sown, Spanish farmers needed 0.78 hectares of unsown fallow (GEHR, 1991, pp. 1182–5). If fallow is taken as 12.5 per cent of sown area in the north, then yields are approximately three times greater. Yields and fallow refer to England and Wales (Holderness, 1989, pp. 133 and 138). For northern Europe, see footnote 9 above. If crop mix is considered, the situation was more favourable to Spain, as almost half the cereals grown were wheat.

Table 1.2. *Share of the workforce engaged in agriculture, 1800 to 1920/30*

	1800	1850	1900/10	1920/30
United Kingdom	36	22	9	6
Netherlands	n.d.	44	28	22
Germany	n.d.	55	28	23
Belgium	n.d.	48	32	23
France	55	52	42	35
Italy	n.d.	n.d.	61	55
Spain	**65**	**64**	**65**	**51**

Sources: Grantham (1991, table 13.1), Mitchell (1992), Pérez Moreda (1985, cuadro 2.9) and Zamagni (1987, p. 57).

without irrigation.[11] I will explore the nature of technical change in dry-farming later in the book. Meanwhile, the low summer rainfall implied that the First Agricultural Revolution would not be feasible over most of Spain.[12]

The achievement of obtaining higher yields in northern Europe cannot by itself explain the escape from the Malthusian trap, as population growth could have led to both rising crop yields and diminishing returns to labour. The striking feature of English agriculture by 1800 in comparison with other northern European countries was that it combined high output per unit of land with high labour productivity.[13]

Calculating labour productivity in agriculture for late eighteenth and nineteenth century economies accurately poses considerable problems, both methodological and archival. One very rough proxy of a country's economic success is the relative importance of agriculture as a source of employment. This measures not just agriculture's ability to produce a surplus, but also the ability of the economy to channel the surplus to the towns. Although the classification of the labour force is not without its own problems in pre-industrial economies, Spain trailed behind other western countries in the reallocation of labour from the 1800s to 1900s (table 1.2).

The period *c.* 1765 to *c.* 1820 was a difficult one throughout Europe, and it seems likely that in most countries, including Britian, agricultural

[11] See, for example, García Sanz (1974).
[12] Intensive cultivation in Spain was possible in the comparatively small area of the North (see chapters 2 and 3).
[13] Amongst others, see Allen (1991, p. 240; 1992, p. 211), Campbell and Overton (1991, p. 5), Clark (1987; 1991a), O'Brien and Keyder (1978, ch. 5), and Wrigley (1987, ch. 5).

output was outpaced by population growth.[14] Provisioning policies and property rights of the *anciens régimes* were increasingly questioned, but in many countries the price of change turned out to be high, and came in the wake of revolution, dynastic upheavals and warfare. In Spain, rising population, declining real wages (as early as the 1720s in Castilla la Nueva), frequent complaints of 'land hunger', war and high levels of mortality, all suggest that agricultural output per person and living standards fell between 1765 and approximately 1820.[15] Why was agriculture unable to respond more effectively to this rising demand?

Two possibilities existed for improving domestic food supplies: either output per hectare had to be increased, or the area cultivated extended.[16] Reference to the difficulties in adopting improved farming techniques of northwest Europe has already been made, and if the most significant development in the period was the introduction of the potato, this was still relatively rare before 1820. Yet even at the turn of the nineteenth century, when conditions were perhaps at their worst, few contemporaries doubted the potential of Spain to feed a growing population. The historical legacy of the 'crisis' of the seventeenth century was one of underpopulation, and the general belief was that sufficient land existed to support a greater population. With the growing poverty in the second half of the eighteenth century, some thinkers of the Spanish Enlightenment began drawing a distinction between total population and active population. Thus, in 1779 Ward suggested that Spain was overpopulated, not because of population density (still only 20 inhabitants per square kilometre) but because he believed 2 or 3 million people lacked employment.[17] Although these writers looked to industry to absorb labour, they also became concerned with the large quantities of underutilised land in agriculture itself.

The greatest potential for increasing output in Spain therefore came from extending the area cultivated. As discussed in chapter 3, this often depended on institutions of the *Ancien Régime* making available more land for cultivation. There was a reluctance to do so, and it took the revolutionary wars at the end of the eighteenth and beginning of the

[14] For Britain, see Crafts (1985, p. 40). Mokyr has recently written that 'before the mid-1840s at the very earliest, the living standards of the masses in western Europe were *on average* practically unaffected by the Industrial Revolution' (1991, p. 190: emphasis in the original).
[15] For the problems of this period, see Nadal (1984, pp. 127–38), Pérez Moreda (1980), Reher (1990a, p. 77), Reher and Ballesteros (1993, p. 124) and Ringrose (1983).
[16] Imports of food were minimal in this period.
[17] Martín Rodríguez (1984, esp. pp. 159, 170–3).

nineteenth centuries to provide the opportunities for changes in property rights, which in turn allowed an extension to the area cultivated.

The Malthusian trap averted, 1820–1910

By the 1820s agricultural output in large areas of Spain, and elsewhere in Europe, was growing once more.[18] In Spain, growth was almost continuous throughout the rest of the century, interspersed by periodic harvest failures, the impact of which diminished as the century progressed. Given that per capita output probably fell over the second half of the eighteenth century, the long-term changes in the nineteenth century seem more optimistic. But the deficiencies of the data on agricultural output before about 1900 imply that we have to limit our discussion to whether the long-term growth in agricultural output was faster, or slower, than population growth. No attempt can be made to identify short-term fluctuations.

Given the scarcity of data, and the questionable quality of much of that which does exist, the performance of nineteenth-century Spanish agriculture is best approached by looking at the end of the century, and then working backwards.[19] A good point of departure is a recent comparative study of O'Brien and Prados de la Escosura, which allows a comparison between five European countries prior to the First World War using purchasing power parities. Their estimates suggest that male labour productivity in Spain was only 32 per cent of levels in the United Kingdom, 33 per cent of those in Germany, 37 per cent of those in France and 68 per cent of those in Italy.[20] With respect to value added per hectare of agricultural land, the gap with these countries was just as large, and even worse in the case of Italy.[21]

The evident backwardness of Spanish agriculture at the turn of the twentieth century has led Gabriel Tortella to suggest that output per capita could not have been significantly lower in the early-nineteenth

[18] For Spain see *Guía mercantil de España* of 1829, cited in Kondo (1990, p. 25) and Anes (1970b, pp. 261–2).

[19] For a discussion of the limitations of nineteenth-century sources for Spanish agriculture, see Tortella (1985, pp. 73–82), Prados de la Escosura, (1988, ch. 3), Simpson (1989a, pp. 355–62) and GEHR (1991, pp. 17–93). For alternative estimates, see the appendix to this book.

[20] O'Brien and Prados de la Escosura (1992, table 1). Final output and UK prices used. Their Spanish data are based on Simpson (1995a). The difference is significantly reduced if all workers are considered, the implication being that the contribution of female labour was greater in countries such as France, Germany and Italy, than in Spain. However, the Spanish census figures seem to seriously under-record female labour in agriculture.

[21] Output per hectare in Spain was 32 per cent of that in Germany, 33 per cent of that in Italy, 37 per cent of that in France and 54 per cent of that in the UK (O'Brien and Prados de la Escosura, 1992, table 4).

century, and therefore agricultural productivity growth over the century must have been small.[22] To examine Tortella's hypothesis, I have calculated a food balance sheet for the period 1897–1901 when official agricultural production statistics for the first time appear to be reasonably reliable.[23] This shows consumption of roughly 2,100 calories per person/day, which converts to just over 2,700 calories per equivalent male unit. This figure cannot have been substantially lower for any significant length of time during the nineteenth century for three reasons. First, contemporary opinion at the start of our period suggests that a figure of roughly 2,100 calories should be seen as a *minimum* rather than a maximum. The *Censo de Frutos* of 1799 gives a per capita figure for wheat and rye consumption equivalent to 1,725 calories, against an intake of only 1,131 calories for these cereals in 1900.[24] Second, the fact that most of the active population was employed in manual tasks implies that a figure of 2,100 calories would have been necessary to provide the minimum energy requirements. Even at this level it seems likely that approximately 60 per cent of the active labour force would have been incapable of doing more than the equivalent of an average of five hours ploughing each day.[25] Finally, harvest fluctuations from that level would easily depress subsistence to crisis levels, and these rarely occurred after 1820. By contrast, mortality was 30 per 1,000, both in the 1860s and the 1890s, suggesting again little improvement in diets.[26]

The food balance sheet, together with my new estimates for agricultural output after 1900 (see below), can help to establish the 'limits to growth' over the nineteenth century. In total, over half of agricultural output (that is, total production less seed and animal feed) in 1900 was made up of cereals and legumes (of which three-quarters was wheat and rye), wine and olive oil, and this increases to 80 per cent if livestock products are also included (table 1.3). A further 8 per cent comprised 'new crops', which had very little importance in 1800. Thus a good indication of overall change during the century can be obtained if we can estimate trends in output for wheat, wine, olive oil and livestock.

In the second column of table 1.3 ('coefficients of conversion'), changes in the relative importance of per capita output of different farm products over the century have been made. For example, in the case of

[22] Tortella (1985, p. 68).

[23] Simpson (1989a). See also the appendix at the end of this book.

[24] Ibid. (pp. 366–9). The *Censo de Frutos y Manufacturas* was an attempt to measure output in the late eighteenth century. Its reliability has been questioned by historians, especially Fontana (1967).

[25] See appendix, pp. 284–7. Based on Fogel (1991).

[26] Calculated from Nadal (1984, cuadro 23). For information on heights, see the appendix.

Table 1.3. *An estimate of nineteenth-century output*[a]

	1900[b]	Coefficient of conversion	1800[c]	1800[d]
Cereals and legumes	1,068	×1.2	1,282	739
Wine	435	×0.8	348	201
Olive oil	270	×0.75	203	117
Livestock	891	×1.1	980	565
New crops[e]	277	×0.05	14	8
Other crops[f]	367	×0.5	184	106
Total	3,308		3,011	1,736

[a] Estimates are net of recycled products.
[b] In millions of pesetas, 1909/13.
[c] As note *b*, but using population of 1900.
[d] As note *b*, but using population of 1800.
[e] Oranges, almonds, sugar beet and potatoes.
[f] Mainly fruit, vegetables and industrial products.

cereals and legumes, it is suggested that *per capita* production was 20 per cent greater in 1800 than in 1900, whilst wine production would be 25 per cent higher in 1900. As population rose by 74 per cent (an annual increase of 0.55 per cent), the implication is that *total* cereal and legume production rose by only 45 per cent and wine by 116 per cent. I now show how these coefficients have been obtained.

Annual per capita consumption of cereals and legumes in 1900 was 154 kilograms, or some 1,180 calories, of which Spain was about 93 per cent self-sufficient.[27] In addition, the potato, a crop of very little importance in 1800, provided a further 170 calories per person per day in 1900. As cereal imports were minimal in the early 1800s, per capita output of cereal and legumes at this time would have had to be 20 per cent greater to maintain the 1900 figure of 1,350 calories obtained from cereals, legumes and potatoes. Given the low total calorie intake for 1900, and the population's high dependence on these basic foods, a lower figure for 1800 seems unlikely.

Wine and olive oil appear, by contrast, to have grown faster than population. Garrabou and Sanz, using the *Censo de Frutos* as a starting point, suggest annual rates of increase of 1.3 and 1.4 per cent respectively.[28] This seems excessive, perhaps in part because the *Censo de Frutos* is less reliable for these crops than for cereals.[29] Furthermore, rates of

[27] Simpson (1989a, apéndice 1). We only consider those cereal–legumes for human consumption, by far the most important part of final agricultural output.
[28] Garrabou and Sanz (1985, p. 130).
[29] Ibid. (p. 129).

growth for wine have been calculated using the exceptional harvest years of 1887/9. If it is based on the period 1891/1900 instead, the increase is reduced to an annual 1.0 per cent.[30] As a result, I suggest that per capita wine output was some 20 per cent and olive oil 25 per cent lower in 1800 than in 1900, so giving annual growth rates of 0.78 and 0.84 respectively.

Livestock estimates present the greatest problems. The most reliable census figures – those of 1750, 1865, 1917 and 1929 – show stagnant herd sizes, implying a significant fall in per capita consumption. This dismal performance can be explained by two factors. In the first instance, there was a need for a more intensive usage of land which, given existing technology and per capita incomes, favoured arable rather than livestock husbandry. Second, the extension of arable required an increase in the number of work animals. Thus, although there was little difference in the total weight of the national herd between the census of 1750 and that of 1917, there were important changes in composition which led to an increase in work animals, and a decline in those animals whose primary economic purpose was the production of industrial raw materials (wool, hides) or food (meat and milk).[31] Thus whilst the number of mules almost tripled between the two dates, the national population of sheep fell by a third, and goats by a half. Cattle, which were regarded as much as work animals as producers of meat and milk, declined by a seventh, being substituted by the more efficient mule. Better breeding and product specialisation could, in theory, have maintained or even increased the output of wool, milk and meat in the face of falling numbers, but there is little evidence for more than just isolated changes. However, to bias this argument against the hypothesis of Tortella, namely little or no growth in output per person during the nineteenth century, I assume per capita output of livestock produce was similar in 1800 as I have estimated elsewhere for 1865, implying a per capita decline over the century of almost a third.[32]

Finally, 'new' crops, which comprise potatoes, oranges, almonds and sugar beet, have been taken to represent 5 per cent of output of their 1900 figure in 1800, and 'other' crops some 50 per cent.[33]

If the per capita consumption of calories seems unlikely to have grown significantly over the nineteenth century, the increases in annual real

[30] Garrabou and Sanz argue that production in 1891/1900 was increasingly affected by phylloxera (1985, p. 130). In fact, falling prices also led to a reduction in the intensity of cultivation. By contrast, the 1887/9 harvests were unusually large.
[31] On this point see Garrabou and Sanz (1985, p. 121).
[32] Simpson (1995a, table 1).
[33] The composition of 'other' crops changed over the century, with chestnuts, silk, flax and hemp being amongst those that declined in importance. The figure of 50 per cent is probably on the low side, thereby increasing slightly our estimated growth rates.

GDP per head identified by Carreras and Prados de la Escosura, of 1.1 per cent and 1.0 per cent respectively between 1850 and 1913, appear to have done little to stimulate the demand for foods such as milk, meat or fruit.[34] According to the food balance sheet for 1900, the average annual per capita consumption of meat was just 13 kilograms, milk 24 litres, sugar 4.6 kilograms, coffee 0.4 kilograms and cheese 0.7 kilograms.[35] The Spanish economy saw some significant changes during the nineteenth century, but dietary improvements were not one of them, with the important exception of the elimination of major shortages associated with harvest failures.[36]

The result of these conjectures is that production in 1800 was 1,736 million pesetas (in prices of 1909/13), implying an annual growth rate during the century of 0.65 per cent, against a population increase of 0.55 per cent. This increase has assumed that there were no changes in relative prices. The available price information, especially for the first half of the nineteenth century, is highly localised and needs to be used with care. However, a recent estimate suggests that changes in the relative prices of agricultural produce during the nineteenth century were small, and should not affect the estimates of agricultural output or labour productivity.[37] Finally, given that agriculture employed approximately two-thirds of the active workforce in both 1800 and 1900, labour productivity in the sector was probably stagnant.[38] If this was the case, the positive growth rates achieved in countries such as France, Britain or the United States suggest that the labour productivity gap between these other countries and Spain increased over the nineteenth century.[39]

Given this rather pessimistic picture, the achievements of the sector are worth repeating. A population, which between 1760 and 1900 increased from about 9 million to 18.6 million, was successfully fed with only small quantities of imports. Indeed, exports of agricultural produce made an important and growing contribution to the country's capacity to import and stimulated the development of a food processing industrial sector. Stagnant per capita consumption of foodstuffs need not be inconsistent with wider growth of the economy if, (i), a greater proportion was commercialised and (ii), a greater value added was achieved by food processing industries. This appears to have taken place. Spain

[34] Calculated from Carreras (1989c, pp. 556–7) and Prados de la Escosura (1995, table D.5).
[35] Meat refers to lean meat (including poultry) and offal. Simpson (1989a, cuadro 5).
[36] See chapter 8.
[37] Prados de la Escosura (1988, pp. 121–3).
[38] For active population, see Pérez Moreda (1985, p. 56).
[39] For France and Great Britain, see Prados de la Escosura (1988, cuadro 3.9) and for the United States, Weiss (1993, table 2).

had only 34 cities of more than 10,000 inhabitants in 1800, three less than in 1600. This figure had reached 174 by 1890, and the number of inhabitants in these cities had grown from 1.17 million to 4.71 million, an annual growth rate of 1.56 per cent.[40] Therefore the stagnant growth of agricultural productivity noted in Spain during the nineteenth century could, in theory, be perfectly compatible with modest economic development, as productivity improvements in transport and food processing industries permitted a widening of the market and urban development.[41]

The difficulties in estimating agricultural output in a country such as nineteenth-century Spain are immense, and it is worth remembering the fragile nature of the evidence. To highlight just one point, a recent reinterpretation of employment figures in the United States in the nineteenth century has revised considerably our knowledge of the rate of growth in agricultural output per worker in the United States.[42] Employment data, as we shall see, are even more questionable in the case of Spain. Yet my claim of stagnant labour productivity during the nineteenth century appears compatible with what we know about the country's agriculture and agricultural technology. Whilst it is true that some farmers introduced important changes in farming practices before 1900, as will become apparent in this book, a significant gap is apparent between best practice techniques and their general diffusion throughout the sector.

The slow demise of traditional agriculture, 1910–1965

During the first thirty years of the twentieth century, a greater body of statistical material makes it easier to determine the general trends in Spanish output, and most historians have suggested that not only did agricultural output grow, but that land and labour productivity also increased significantly. The most important study is that of *Grupo de Estudios de Historia Rural* (hereafter GEHR), which gives an annual increase in output of 1.4 per cent between 1900 and 1931, against a growth in population of 0.77 per cent.[43] This figure however, is not without its own deficiencies. First, it refers to gross output rather than being net of intermediate outputs, such as seed corn or animal forage.

[40] De Vries (1984, tables 3.1, 3.2 and 3.8). See chapter 8 on difficulties in using these figures as evidence of intersectoral transfers of labour.
[41] For a discussion on the reconciliation of a slow-changing agricultural sector with wider economic development, see Lévy-Leboyer and Bourguignon (1990, pp. 32–4), Prados de la Escosura (1989), Simpson (1989b) and Nadal and Sudrià (1993, p. 204).
[42] Weiss (1993).
[43] GEHR (1983a, p. 229).

Table 1.4. *Growth in productivity, 1891/5 to 1929/33*

	Labour productivity				Land productivity		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1891/5	3,299[a]	4,033	818	109	23,934[a]	138	109
1897/1901	3,308	4,392	753	100	25,898	127	100
1909/13	3,710	4,680	793	105	26,832	138	109
1929/33	4,741	3,827	1,239	165	28,567	166	131

(1) Net output at 1910 prices, millions of pesetas.
(2) Number of male agricultural workers ('000s) in the censuses of 1887, 1900, 1910 and 1930.
(3) Output per male worker (pesetas).
(4) Index of labour productivity, 1897/1901=100.
(5) Agricultural land (thousands of hectares).
(6) Output per hectare (pesetas).
(7) Index of land productivity, 1897/1901=100.

[a] Assumes vegetables, fruit and raw materials represented 20% of output, and the area 7.5% of all cropped land.

Source: See Simpson (1995a, pp. 181–6).

Second, constant prices have been obtained by using a price index for the economy as a whole, rather than calculating constant prices for each individual product, and finally the contribution of livestock is probably overestimated. Elsewhere I have tried to correct these shortcomings, and have calculated that during the first three decades of the twentieth century output grew by 1.13 per cent annually, significant in itself, but less than the figure given by GEHR.[44]

Table 1.4, which is based on these new estimates, shows that output increased from 3,308 million pesetas in 1897/1901 to 4,741 million pesetas in 1929/33, in constant prices, an annual increase of 1.13 per cent. Perhaps surprisingly, the relative importance of traditional Mediterranean crops, cereal and legumes, vines and olives, declined only slowly. From 53.6 per cent of output in 1897/1901, they were still responsible for some 48.9 per cent just over thirty years later. 'Other crops', which include such products as potatoes, oranges and sugar beet,

[44] See Simpson (1995a). The main cause of this discrepancy is the recovery from the so-called 'Great Depression' at the end of the nineteenth century. GEHR accepted the increase in output from 1891 in official statistics as being genuine, but Simpson argues that they reflect a greater statistical sophistication on the part of the compilers (GEHR, 1983a, p. 190, and 1991, pp. 44 and 59–62; Simpson, 1989a, pp. 359–61).

remained at roughly a fifth, whilst livestock products increased to just over 30 per cent.[45]

To a major extent, Spanish farmers obtained greater output by increasing the area sown (75.9 per cent), which not only involved bringing new land under the plough, but also a reduction in unsown fallow, which fell from 44.5 per cent of the cereal rotation in 1897/1901, to 41 per cent in 1929/33. This greater intensity of cultivation was obtained, partly at least, through the greater use of fertilisers and better farm equipment. The remaining 24.1 per cent is accounted for by other factors, such as better farming methods, or switching to more valuable crops.

As in most countries in this period, statistical shortcomings relating to the measurement of the active population make it difficult to identify changes in labour productivity. One problem is caused by the fact that each person is classified as employed in only a single economic activity, when a major feature of less developed economies is the low level of labour specialisation. A second problem is the underestimation of female labour in agriculture which, for example, represented only 7 per cent of those actively employed in the 1930 census. A final problem is the question of underemployment and surplus labour, as agricultural workers were more fully occupied in some regions or years than in others. Family labour tended to work more hours than wage labour. In theory, therefore, efficiency in agriculture should be measured by output per hour worked, rather than output per worker year. None of these measurement problems are unique to Spain, and here we shall follow convention by including only male workers, which have been assumed, for the sake of comparison, fully employed throughout the year (table 1.4).[46]

The results shown in table 1.4 suggest that the small decline in both land and labour productivity between 1891/5 and 1897/1901 would be even larger if, as GEHR suggest, the published figures of the early 1890s are correct. The cause of the decline can be explained by the growing area of unproductive vines due to disease (phylloxera), together with a small fall in livestock production. Some, although not all, of this decline is reversed between 1897/1901 and 1909/13. The overall picture of the period 1891/5 and 1909/13, therefore, is stagnation in both land and

[45] If intermediate products are included, the distribution is:

1897/01	traditional crops	60.7%	1929/33	55.6%
	other crops	18.8%		22.4%
	livestock	20.5%		21.9%

Source: Simpson, (1995a, appendix 1c). Rough pasture and forestry have been excluded.

[46] For a discussion of measuring labour productivity in European agriculture, see O'Brien and Toniolo (1991, pp. 396–400).

labour output. Between 1909/13 and 1929/33 there is growth in both land and labour productivity, with the latter increasing almost twice as fast as the former. However, caution has to be given to interpreting the timing of this growth, as the 1910 census perhaps overstates the numbers in agriculture in contrast to the underestimation in the 1930 census.[47] While there seems no doubt that a significant upswing in labour productivity occurred from 1909/13, it is possible that it is exaggerated in table 1.4 and the movement started slightly earlier, perhaps from the turn of the century.

The interwar period saw the beginning of the transformation of traditional agriculture in Spain. Greater integration of the national economy permitted farmers to purchase a growing quantity of industrial inputs and at the same time release labour to other sectors. According to one recent study, agriculture's share of GDP (including forestry and fishing) declined from 35.0 per cent in 1909/13 to 28.6 per cent in 1929/33. At the same time, its share of the active labour force fell from 66 per cent to 46 per cent.[48] Agricultural labour productivity rose more rapidly than it did in the economy as a whole.[49]

This rapid change of traditional agriculture in Spain was halted, and then reversed, by the 1936–9 Civil War. If the war disrupted agricultural output by diverting resources away from the sector to other users and destroying capital equipment, the damage wrought was a good deal less than many countries suffered during the Second World War. However, more than a decade after the Civil War had finished, the Spanish economy had still not recovered its pre-war output levels, and the poor performance of the agricultural sector was reflected in widespread hardship and the return of hunger during the 1940s. Real GDP per head, which reached a pre-Civil War high in 1929, was only surpassed in 1954. Agriculture's contribution to GDP in 1949/51 was still 30.6 per cent, virtually the same as it had been in 1929/33, whilst the sector employed 47.6 per cent of the labour force in 1950 compared with 45.5 per cent in 1930.[50]

During the 1950s the Spanish economy showed a remarkable transformation. It grew by an annual 3.9 per cent, and between 1961 and 1973 GNP increased by an average annual rate of 7.5 per cent, second

[47] Simpson (1995a, pp. 185–6).
[48] For sectoral contribution to GDP, see Prados de la Escosura (1995, table C.7). For active population, see Nicolau (1989, p. 79).
[49] This also happened in the cases of the United Kingdom, France, the United States and Australia (Timmer, 1988, p. 285).
[50] For real GDP per head and sectoral contribution to GDP, see Prados de la Escosura (1995, tables C.7 and D.5). For active population, see Nicolau (1989, p. 79). Diets were also similar to those at the turn of the century, as shown in chapter 11.

Table 1.5. *Growth in productivity, 1929/33 to 1969/71*

	Labour productivity				Land productivity		
	(1)	(2)	(3)	(4)	(5)[a]	(6)	(7)
1929/33	4,741	3,827	1,239	100	28,567	166	100
1949/51	4,504	4,936	912	74	27,000[b]	167	101
1959/61	5,449	4,115	1,324	107	27,325	199	120
1969/71	6,640	2,646	2,509	203	27,500	242	146

(1) Net output at constant prices, millions of pesetas.
(2) Number of male agricultural workers ('000s) in the 1930, 1950, 1960 and 1970 censuses.
(3) Output per male worker (pesetas).
(4) Index of labour productivity, 1929/33=100.
(5) Agricultural land (thousands of hectares).
(6) Output per hectare (pesetas).
(7) Index of land productivity, 1929/33=100.

[a] Pasture has been estimated at 5.5 million hectares for 1950, 1960 and 1970.
[b] Estimate.

Sources: Output: 1929/33, Simpson (1995a); 1949/51, 1959/61 and 1969/71 calculated using growth rates from Prados de la Escosura (1995, tables A.4 and D.4); labour: Nicolau (1989, p. 78); agricultural land: Simpson (1995a), AEA (1980, p. 27).

only to Japan amongst OECD countries.[51] The contribution of agriculture to this growth was essential, providing savings, labour and basic foods at falling real prices to the rest of the economy. This time labour productivity grew roughly at the rate of the rest of the economy, with agriculture's contribution to GDP falling from 30.5 per cent in 1949/51 to 16.5 per cent in 1964/66, and the labour force falling from 47.6 to 27.6 per cent.[52] The number of agricultural workers fell from 5.3 million in 1950 to 4.7 million by 1960. A decade later the figure had dropped to only 3.0 million.

As had been the case in the interwar period, labour productivity grew much faster than land output, with output per hectare growing by 1.9 per cent and output per male worker by 5.2 per cent between 1949/51 and 1969/71 (table 1.5).

The difference between traditional and modern agriculture is that crop and livestock production in the former tends to be more diversified, allowing farmers to achieve high levels of self-sufficiency in consumption, and be independent of the market for energy (family labour and

[51] Harrison (1985, p. 144).
[52] Prados de la Escosura (1995; table C.7); Nicolau (1989, p. 79) and AEA (*año 1980*, pp. 16 and 606).

Table 1.6. *The modernisation of Spanish agriculture*

	1909/13	1929/33	1950/4	1960/4	1970/4
Total production	146.0	138.2	136.4	142.6	129.9
Intermediate products	−46.0	−38.2	−36.4	−42.6	−29.9
Final output	100.0	100.0	100.0	100.0	100.0
Inputs purchased outside the sector[a]	n.d.	n.d.	−9.9	−17.2	−29.1
Gross value added	n.d.	n.d.	90.1	82.8	70.9

[a] Inputs purchased outside the sector include forestry for the years 1950/4, 1960/4 and 1970/4.

Sources: Simpson (1995a, appendix 1a and 1c), AEA (1975, p. 609) and OECD (1969, p. 206).

home-reared animals), agricultural tools and fertilisers. Estimates for the early years can be regarded as only approximate, but table 1.6 indicates some of the changes that took place. The high level of intermediate products is a reflection on the country's attempts to be self-sufficient in the supply of animal feedstuffs. The significant decline between 1960/4 and 1970/4 reflects the decision to allow an increase in imports of animal feedstuffs, together with a rapid growth in the purchase of fuel, machinery and fertilisers by farmers.

The transformation of traditional agriculture was not complete in Spain in 1965, but by this date significant progress had been made. Yet the labour productivity gap which was noted between Spain and other western nations on the eve of the First World War had not been closed. Indeed, with respect to output per male worker, the gap in the seven countries was larger in 1970 than it had been in 1930, or indeed in 1890 (table 1.7). In the periods 1910–30 and 1950–70 the gap grew smaller in all cases, bar that of Germany (1950–70). In other words, the international performance of Spanish agriculture worsened in the periods 1890–1910 and 1930–50.

Output per hectare showed less severe fluctuations than output per male worker. However, in 1960 output per hectare in Spain was still less than half of that found in five of the seven countries. Of course, different resource endowments in countries implies different farming methods, and Spanish output per hectare was respectable in comparison with the United States. Yet of greater importance, because of its welfare implications, was labour productivity, and here American farmers produced ten times more than their Spanish counterparts.

Conclusion

One of the major characteristics of Spanish agriculture prior to the First World War was the growth in output. However, although sufficient to feed a growing population, it was not fast enough to cause any significant improvements in labour productivity, diets or life expectancy. The causes of low labour productivity could have been bad farming practices, poor land endowments, climate, demand constraints or, as O'Brien and Keyder have noted, it may be as much a 'reflection of lower rates of structural change and internal migration than inefficient farming *per se*'.[53] I shall discuss these points later in the book.

From about 1910 agricultural output began to grow, with labour leaving the sector in significant numbers. Unfortunately, the process of migration received a serious setback during the 1930s and 1940s, and only from the mid-1950s would it be renewed with any vigour. The result is that whilst labour productivity grew by 1.9 per cent between 1909/11 and 1929/31, and 3.8 per cent between 1949/51 and 1959/61, the growth over the longer period 1909/11 and 1959/61 was a more modest 1.1 per cent.[54] The interwar period therefore proved a false start to the ending of Spain's agricultural Siesta.

Finally, the international comparison shown in table 1.7 indicates that even though Spain was a 'late-comer' compared with northern Europe, this provided few advantages. O'Brien and Prados de la Escosura have recently argued that just as European agriculture has shown no indication of any long-term tendency to converge towards US standards of labour productivity during the twentieth century, the gap between the Mediterranean and northwestern Europe has also remained.[55] The major problem facing Spanish farmers was that approximately 80 per cent of the land surface suffered from irregular rainfall, especially in the summer. As we shall see in this book, on the one hand there were strict limits to the possibilities of technological transfer from northern to southern agriculture, a restriction that had been present since the First Agricultural Revolution.[56] On the other hand, the advances in scientific-based dry farming were only just beginning to appear in the 1950s. The comparison here with northern Europe is not to show the failure of technological transfer, but rather the cost

[53] O'Brien and Keyder (1978, pp. 108–9).
[54] Male labour only. Calculated from Prados de la Escosura (1995, table D.4) and Nicolau (1989, p. 78).
[55] O'Brien and Prados de la Escosura (1992, pp. 530 and 534).
[56] On this point see Cipolla (1976), Galassi (1986) and Tortella (1992, pp. 63–4).

Table 1.7. *Spain's productivity gap with Western Europe and the United States, 1890–1980*

	Netherlands	Denmark	France	Germany	Italy	UK	US
A. *Output per male worker*[a]							
1890	43	46	53	43	84	38	30
1910	35	22	39	27	71	32	24
1930	43	24	44	38	91	39	27
1950	23	15	27	28	68	19	10
1960	21	19	30	25	68	23	10
1970	31	21	34	26	71	27	13
1980	35	33	46	39	98	41	15
B. *Output per hectare*[a]							
1890	30	41	45	39	40	58	166
1910	23	27	40	27	34	55	157
1930	22	23	40	28	34	61	149
1950	15	20	41	26	34	46	110
1960	15	23	47	28	35	57	139
1970	15	27	46	28	38	59	164
1980	13	37	55	36	46	70	184

[a] Figures refer to Spanish productivity as a percentage of the country shown. Purchasing-power parities have been used.

Source: Calculated from O'Brien and Prados de la Escosura (1992a, table 6).

to the national economy of Spanish farmers not developing alternatives, or to the rest of the economy in not absorbing greater numbers of agricultural workers earlier.

2 Unlocking the puzzle of stagnation: regional variations

Contemporaries provided a number of explanations for the poor performance of Spanish agriculture described in chapter 1, with unfavourable topography, poor soils, inclement climate and an 'inefficient' property distribution being the most frequently cited.[1] This chapter is divided into three sections. In the first, I examine some of the consequences of resource endowments. In particular, the presence of summer drought over much of the Peninsula meant that dry-farming methods were used, and livestock densities were low. In the second section, I look at land distribution and tenurial systems and identify major differences within the country. Finally, I explore what regional variations can tell us about the problem of backwardness. To do this, I have divided the country into four agricultural areas (see pp. xvii–xix): the North (Galicia, Asturias, Santander and the two maritime provinces of the Basque Country, Guipúzcoa and Vizcaya); the Mediterranean coastal areas (Cataluña minus Lleida, the Baleares, the País Valenciano and Murcia); Andalucía (the eight provinces), and the rest which I call the Interior.[2] It is argued that three factors explain the different regional performances: the predominance of low value, extensive cereal and legume rotations using excessive quantities of labour; the relatively small areas of high value crops such as fruit trees, sugar beet, market gardening, which maximised land output; and, finally, the small scale of intensive dairy and meat production. I conclude that neither poor resource endowments, nor property rights, are enough by themselves to explain the slow productivity growth of the sector, but rather they were just constraining factors to more complex problems, which will become apparent in the book.

[1] Other popular complaints included government tariff policy, taxes, education, and an expensive and inadequate transport system.

[2] Regions are based on provinces, the usual unit used by government agencies.

How limiting were resource endowments to agricultural progress?

In his widely read book, *Los males de la patria* (first published in 1890), Lucas Mallada claimed that topography, climate and soils were especially unfavourable to Spain. Mallada classified the country into four areas, with 10 per cent of the surface being rock and totally unproductive; 35 per cent having very low productivity owing to high altitude, lack of water or poor soils; 45 per cent being moderately productive; and finally only 10 per cent that 'leads us to suppose that we have been born in a privileged country'.[3]

Mallada's criticism has often been repeated over the past century as an excuse for the low productivity in Spanish agriculture. Yet a prosperous agriculture is the result not so much of favourable soil fertility or climate, but rather a function of the intensity in which labour, capital and technology is applied, and the nature of society's demands on the soil. At various periods in Spain's history, some areas of the country appear to have enjoyed favourable conditions for agriculture. Under the Romans, Spain was famous for its wheat, wines, and olive oil. Later, the Muslims perfected and extended the country's irrigation systems, and their intensive agriculture not only fed large urban populations but also provided the raw material for the important silk industry. While Andalucía and the Mediterranean benefited from the introduction of a wide variety of new crops, Spain's empty and turbulent Interior proved ideal for the merino sheep, and the region was for centuries one of Europe's most important suppliers of high quality wool.

The argument that poor resource endowments alone were to blame for the slow growth in agricultural output does not therefore appear especially convincing for the period prior to 1765. Mallada's diagnosis of poor resource endowments, rather than reflecting a permanent condition of Spanish agriculture, suggests instead a slowness in adjusting crop mix and production techniques so as to benefit from the country's changing comparative advantage in international markets.[4] I shall return to this point at various times during the book. However, the nature of Spain's topography, climate and soils clearly did influence the type of agricultural systems used, a subject we shall now consider.

[3] Mallada (1890:1969, p. 30).
[4] Indeed Mallada believed that the farmer's situation had worsened over the fifty years prior to his writing in 1890 (ibid., p. 87).

Nineteenth-century travellers remarked at length on the major regional contrasts in Spanish agriculture caused by differences in relief, climate and soil. First and foremost was the question of topography, and according to one visitor, Richard Ford, who knew the country as well as anybody:[5]

> the geological construction of Spain is very peculiar, and unlike that of most other countries; it is almost one mountain or agglomeration of mountains, as those of our countrymen who are speculating in Spanish railroads are just beginning to discover. The interior rises on every side from the sea, and the central portions are higher than any other table-lands in Europe, ranging on an average from two to three thousand feet above the level of the sea, while from this elevated plain chains of mountains rise again to a still greater height.

After Switzerland, Spain is Europe's highest country, with 18.4 per cent of the land mass above 1,000 metres, and only 11.4 per cent found between 0 and 200 metres, the optimal height for agricultural purposes.[6] Climatically, the country divides into two broad areas, with the north and northwest receiving between 30 and 45 inches (760–1140 millimetres) of rain annually and, except in the mountains, enjoying relatively mild temperatures. Over large areas of the rest of the country, rainfall is often under 20 inches (less than 500 millimetres), although of greater importance for agriculture is the seasonal distribution, with the summer months experiencing long droughts. Drought, combined with the high temperatures, severely limits the choice of crops, and has made intensive cultivation impossible except where irrigation can be practised. Outside the North, extremes of winter temperatures are marked by the limits for olive cultivation, which is roughly south of a horizontal line going through Madrid, together with north-eastern Spain (especially the Ebro valley). Finally, except along the Mediterranean coast, the risk of frosts limits crop choice.

If not the sole factor, climatic factors and especially summer droughts have played a major role in determining crop mix, livestock densities and farming systems. As table 2.1 shows, Spanish agriculture in 1910 was very different from that of northwest Europe. First, the relative importance of arable was much greater in the Mediterranean countries, a factor which, until very recently, was reflected in the extremely low per capita meat consumption. Second, fruit, nuts, wine and olive oil were much more prominent in the Mediterranean than in the North.[7] Lastly, cereals were especially important in Spain.

[5] Ford (1846:1970, p. 17).
[6] Cabo (1986, p. 303).
[7] Spain was suffering from the heavy damage being wrought on its vineyards by the disease phylloxera in this period.

Table 2.1. *Structure of output*[a] *in different European countries, c. 1910 (per cent)*

	France	Germany	Italy	Spain	United Kingdom
Cereals, legumes and hay	23.0	18.9	22.2	34.7	15.0
Vegetables and raw materials	8.2	12.8	13.0	15.2	9.6
Fruit, nuts, olives and wine	24.4	2.7	36.0	19.8	2.4
Animal produce	44.4	65.3	28.3	30.2	71.9
Other	0.0	0.3	0.0	0.1	1.1
Total	100.0	100.0	99.5	100.0	100.0

[a] As a percentage of total agricultural output.

Source: O'Brien and Prados de la Escosura (1992a, table 3).

Specialisation in cereals and legumes need not by itself imply inefficiency if the country had a comparative advantage in their production. However, this was not so in Spain. Most cereals in Spain were grown under conditions of dry farming, so much so that one agronomist noted that if Spanish farmers had written about their own farming techniques, the world would have used the word *secano*, instead of dry-farming.[8] Dry-farming can be defined as growing crops under semi-arid conditions where moisture is deficient and which require special cultivation methods.[9] In the case of Spain, special cultivation methods were required in almost all non-irrigated areas outside the North, about four-fifths of the country's land mass. Dry-farming cereals had three main characteristics: the need for winter rather than spring planting; a period of fallow of one or two years after each crop to 'conserve' moisture; and the need to carefully maintain the depth of tillage, especially in the spring, to avoid moisture loss. The unsown land provided sparse pasture for livestock, which in turn produced virtually the only fertiliser that the soil would receive. Wheat yields during the whole of the period 1765–1965 failed to reach more than a ton per hectare except in years of exceptional harvests. If these yields were not so very different from those achieved by the major wheat exporting countries – the United States,

[8] Cascón (1911, reproduced in 1934, pp. 53–4 and cited in GEHR, 1983b). National statistics divide production into irrigation land (*regadío*) and non-irrigated (*secano*). In this book, all references to *secano* refer to semi-arid farming techniques, and therefore exclude the North where sufficient rainfall made these techniques unnecessary.

[9] Shaw (1911, p. 3).

Canada and Australia – farmers in these countries enjoyed significant economies of scale in production. In Spain, farmers looked for tariff protection and cereals were consequently relatively expensive (see chapter 8). By contrast, Spain benefited from suitable climatic and soil conditions for the production of wine, olive oil, fruit and nuts, allowing the country to compete in international markets.

Summer droughts also resulted in poor quality animals and low livestock densities. The large areas of empty and initially turbulent lands in central Spain led to the founding of the Mesta in 1273, an institution which North and Thomas, among others, have identified as a major cause of Spanish agricultural backwardness.[10] The Mesta was a transhumant organisation, allowing sheep to graze the winter pastures of Extremadura and the Sierra Morena, and the summer pastures of the foothills of the Cantabrian mountains and other upland areas of the northern Interior.[11] By using two different geographical regions, separated by three or four hundred miles, relatively large numbers of sheep could be kept. This has led one recent study to stress the positive value of the institution, namely its ability to achieve efficient property rights for grazing.[12] The establishment of *cañadas* (designated sheep walks) kept the animals away from crops, and special courts existed to deal with the problems caused by stray animals. Furthermore, and in contrast to what North and Thomas believe, sufficient land existed to make the Mesta compatible with arable farming until the late eighteenth century.[13] By then, as chapter 3 argues, under the influence of population growth the Mesta's usefulness began to be widely questioned, and it quickly lost its powers, eventually disappearing in 1836. If the role of the Mesta in Spanish agriculture needs to be re-examined in a much more favourable light, it still needs to be stressed that transhumant sheep farming was totally incompatible with mixed husbandry. Neither summer nor winter pastures were sown, leading to a physical separation between arable and livestock husbandry. Everywhere outside the North, farmers found it almost impossible to maintain high livestock densities for mixed farming on unirrigated soils, and this lack of grazing helps to explain why, by the twentieth century, mules were the principal work animals over much of Spain's *secano* (maps 3 and 4).[14] As we shall see,

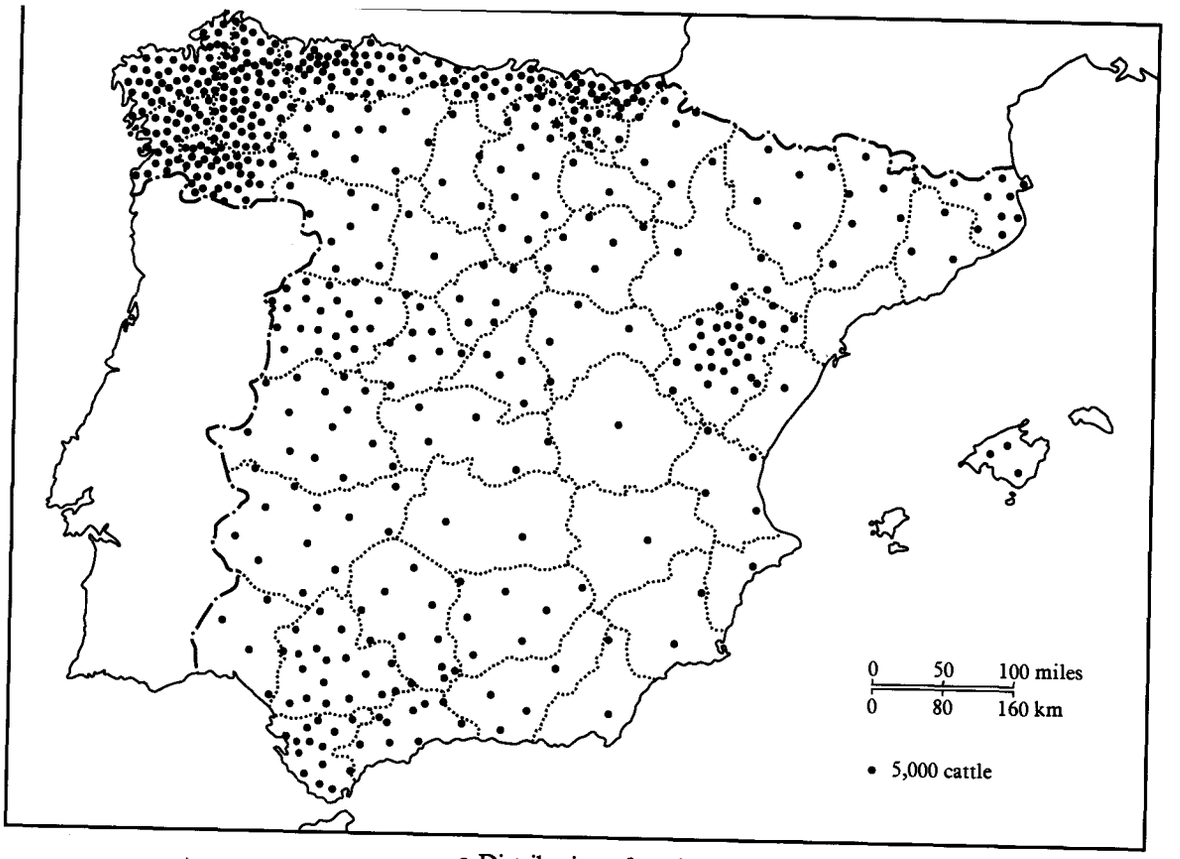
[10] North and Thomas (1973, pp. 4–7 and 128–30).

[11] The classic work on the Mesta is that of Julius Klein (1920).

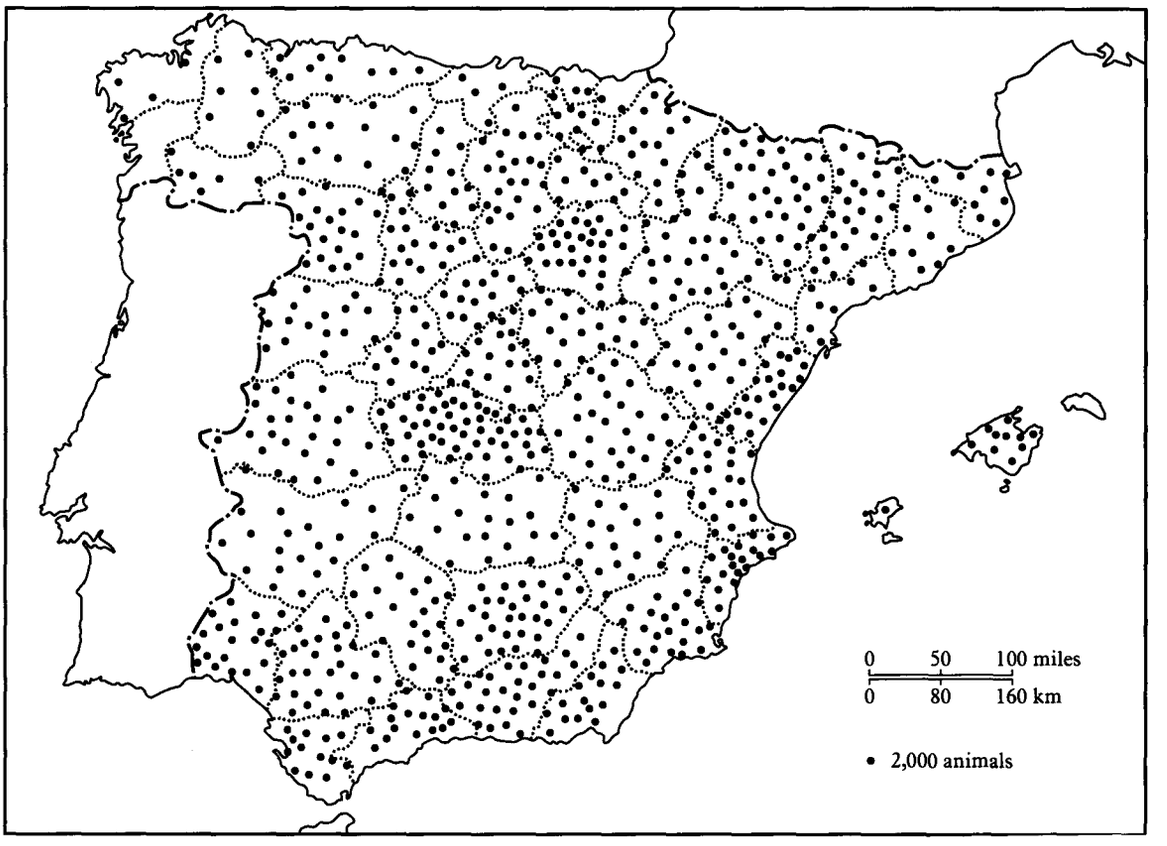
[12] Nugent and Sanchez (1989).

[13] Conflicts also occurred in the late fifteenth and early sixteenth centuries.

[14] The regional distribution of cattle was less pronounced at the start of the period. For the slow decline of cattle in plough teams from the seventeenth century, see Anes (1984, pp. 6–9), Llopis (1986, pp. 33–4), Simpson (1987, pp. 281–3), Vassberg (1984, pp. 158–63) and Zapata (1986, p. 713).



3 Distribution of cattle
Source: Naval Intelligence Division, vol. 3, p. 249. Figures represent an average year before the Civil War.



4 Distribution of mules and asses
Source: Naval Intelligence Division, vol. 3, p. 252. Figures represent an average year before the Civil War.

only with the provision of cheap substitutes such as mineral fertilisers (to maintain soil fertility), the internal combustion engine (energy), and the technology for intensive meat production (especially poultry and swine, which turned consumers from occasional to frequent meat eaters), was Spanish agriculture gradually freed from this constraining factor.

The low livestock density also had another important, although less obvious consequence: it contributed to the relatively high rural underemployment. The seasonal nature of much of arable farming implied that idle time was common with most crops.[15] To some extent this could be overcome by a careful planning of the crop mix, or by short-term seasonal migrations to other agricultural or industrial areas. However, in large areas outside the North and those not favoured by irrigation, the tendency was for farm labourers to suffer long periods of involuntary idleness, with Andalucía in particular having large numbers of underemployed day labourers.

Land ownership and tenurial systems

Contemporaries and, more recently, historians have emphasised not only the poverty of Spain's natural resources as a limitation to agricultural progress, but also a supposed sub-optimal distribution of property. According to Malefakis, land ownership in Spain had two major characteristics:[16]

a the predominance of either very large or small holdings, with an absence of holdings large enough to maintain comfortably, but not excessively, a peasant family, and
b a marked regional difference in the distribution of the two extremes: small holdings being found in the north and centre of the country, and large farms in the south [see map 8].

Malefakis defines small as below 10 hectares and large as above 100, a division that he admits has limitations without knowledge of land quality or cropping systems. Despite this problem, Malefakis reinforced what contemporaries had generally believed, that the pocket handkerchief plots of Galicia, the fragmented farms of Castilla-León, and the undercapitalised *latifundios* of large areas of Andalucía, Extremadura and La Mancha, all created institutional barriers to the modernisation of the sector.

[15] It has been suggested that output per worker in England in 1851 was 80 per cent greater with animal husbandry than with arable (Clark, 1991, pp. 230–1).
[16] Malefakis (1970, p. 15).

Table 2.2. *Distribution of land by size of holding, 1930*[a]

	Size of holdings (hectares)		
	<10	10–99	100+
Number of holdings (%)	99.1	0.8	0.1
% of total land area	46.5	24.9	28.6
% of taxable income	60.2	21.5	18.3

[a] The data include totals for the North that were only available in 1959.

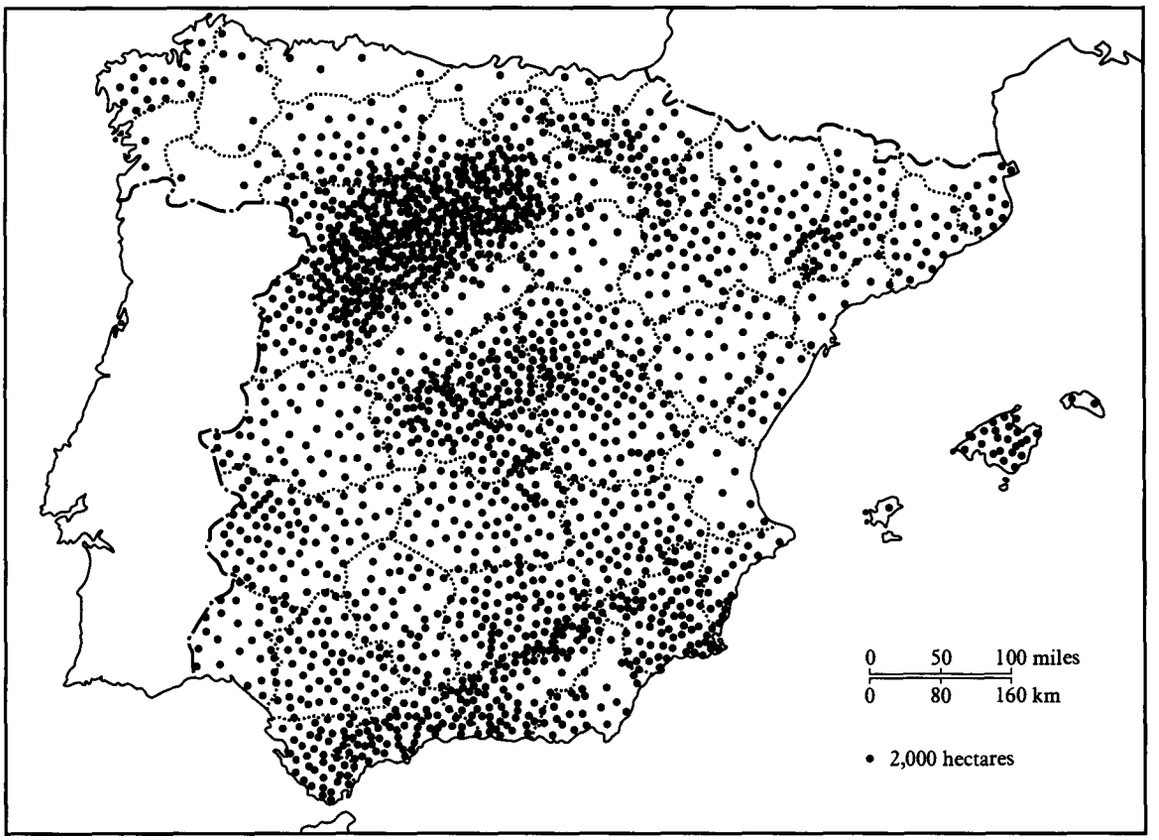
Source: Malefakis (1970, tables 1 and 2).

Prior to the 1936–9 Civil War, when the potential economies of scale for large farms were more limited, contemporaries defended the *latifundios* on grounds of necessity given the unfavourable climatic conditions. However, the division of Spain into areas of high and low rainfall produces a map which does not correspond sufficiently accurately with that of land ownership when divided into areas of small-holdings and large estates. As Malefakis writes:[17]

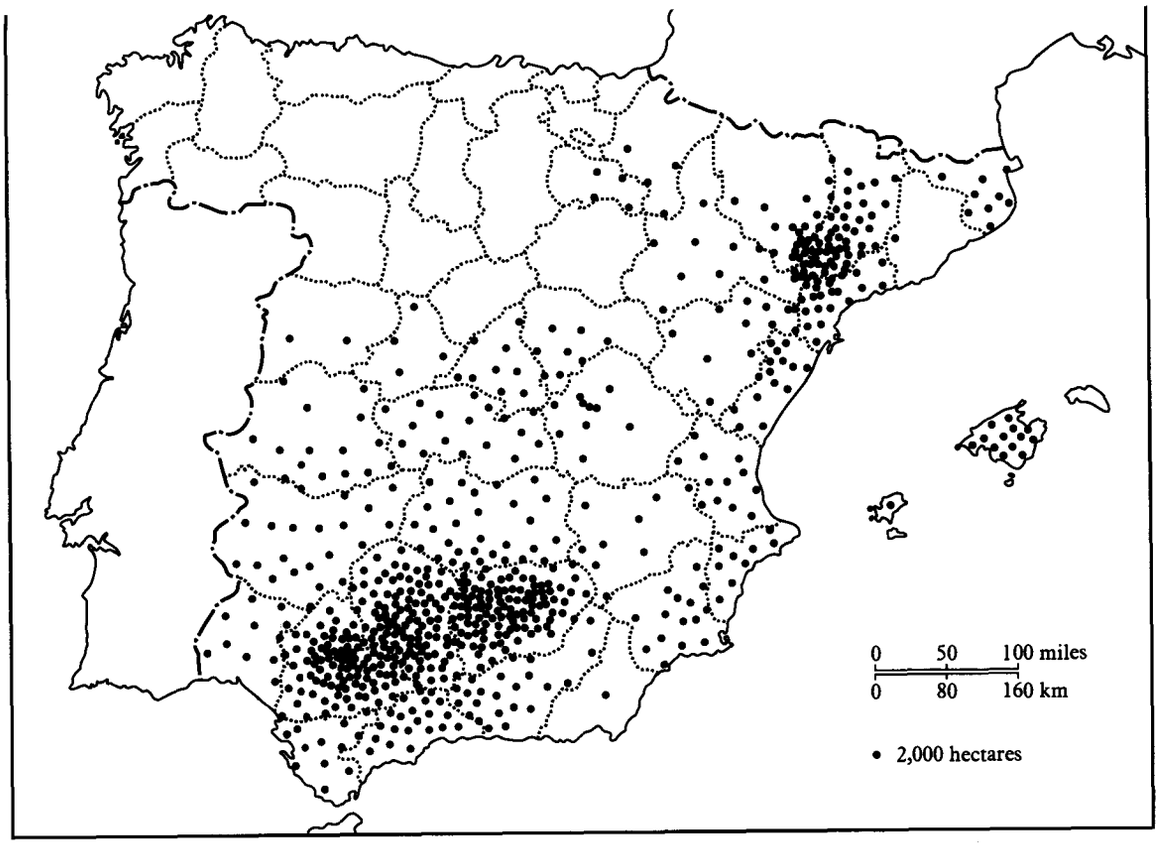
> The most exaggerated forms of minifundios are indeed found in rainy Spain, where agricultural conditions are relatively favorable. It is also true that the latifundios are located entirely within arid Spain. However the latifundio regions account for considerably less than half of arid Spain; in more than half, small holdings, not large estates have somehow managed to survive as the predominant form of property. Rainy Spain, which constitutes less than one-fifth of the national surface, corresponds to only the Atlantic and Pyrenean provinces of . . . 'Northern' Spain . . . The Catalonian and Aragonese provinces of 'Northern' Spain and the whole of 'Central' Spain fall within the arid four-fifths of the nation. The predominance of small property in the Levante and Murcia may perhaps be attributed to the extensive irrigation systems that have long existed there. No such explanation will suffice for much of Catalonia, most of Aragon, and the whole of that immense region known as Old and New Castile which lies upon the great central plateau of Spain, the Meseta.

The contrast between the level of aridity and size of agricultural holdings illustrates the incompatibility of a simple division between these variables (maps 8 and 9).[18] Yet this fact need not in itself condemn the *latifundios* as many farms found in regions of low rainfall were clearly too small by the late nineteenth century. Indeed, and as this book will

[17] Ibid. (pp. 35–6).
[18] Taking the average annual rainfall and dividing it by the annual temperature gives a more realistic indicator of the effects of precipitation than simply the level of rainfall, but it still ignores seasonal distribution and changes in variables from one year to the next.



5 Distribution of wheat production
Source: Naval Intelligence Division, vol. 3, p. 205. Figures represent an average year before the Civil War.



6 Distribution of olive groves
Source: Naval Intelligence Division, vol. 3, p. 219. Figures represent an average year before the Civil War.

show, the failure to consolidate holdings and increase farm size in the Interior was itself a major cause of the country's low productivity during the twentieth century.

However, it was the *latifundios* in southern Spain, and especially Andalucía, which caused the main 'agrarian problem' prior to the Civil War. Owners of the *latifundios* were often absentee, and the property leased in large units and on short leases, to a relatively small tenant class. Cultivation was then carried out by *jornaleros*, temporary workers, whose numbers tended to exceed demand except during the harvest. The traditional view of the *latifundio* is that, given the low yields and large areas of fallow found in cultivation, they were inefficient.[19] This opinion has, however, been challenged in recent years and it is now generally regarded that the owners, if not profit maximisers, at least used production methods appropriate to an economy with large supplies of land and labour. Nevertheless, the social consequence of *latifundios* was a large body of impoverished landless labourers who worked the estates, usually on short-term temporary contracts.[20] The poverty and banditry in the early nineteenth century took a more political direction by the end of the century with the growth of rural anarchism, making the region one of the most unsettled in Europe. The existence of large agrotowns, in contrast to a relatively empty countryside, gave the region a cultural identity which made emigration rare, despite the severe underemployment and poverty, and the political will of the *pueblo* was only broken with the events of the 1936–9 Civil War and its aftermath.

The problem of small holdings was most acute in the North, and in particular in Galicia, in the extreme northwest. In Galicia it was not just the minute and fragmented ownership but, until the twentieth century, also the frequent division of ownership of the *dominium utile* and *directum*. One example, not atypical, was a 'field' found in Mera (La Coruña) which measured 32 square metres and on which three people

[19] Cultivation tended to be either biennial, *año y vez*, or *al tercio*, which involved planting a cereal crop one year, and leaving the soil fallow for the following two years. In the immediate vicinity of towns or large farms (*cortijos*), a more intensive form of this triennial rotation was frequent, cultivating part of the land with a fodder crop in the second year (barley, oats or *escaña*), and part with vetches in the third. This land would receive a disproportionate amount of the limited manure available.

[20] The economic plight of the Andalucian day worker was often extreme. Brenan wrote in 1943 that 'they lived in a state of chronic hunger and the deaths from malnutrition . . . were particularly numerous' (1974, p. 120). Quevedo y García Lomas noted that 'the Andalucian day worker has the most irregular work of all Spaniards, the worst daily wages of all agricultural labourers in Europe, and is the worker most devoid of supplementary resources to his day's wage of all workers in this world . . .' (1904, p. 55).

owned indefinite property rights: one had the use of the land, another the chestnut tree to be found on it, and a third, received as rent six eggs annually, being paid alternately by the farmer who worked the land and by the 'owner' of the chestnut tree.[21] If the Council of Castile's decision in 1763 effectively protected indefinitely the tenants (*foristas*) from eviction, it was not until 1926 that they were given the legal right to purchase full property rights to the land.[22] This was important because if the *foristas*' right to cultivate the land had been secured at a relatively early date, overall rents tended to be driven up by the practice of sub-leasing. By contrast, further east in the Basque Country, the *caserías*, owners of the *dominium utile* corresponding to the land, house, rights to commons, and sometimes even work animals, could only sell or leave their property on the condition that it was not divided. Farm sizes tended to be larger and, as rents were modest, property often remained with the tenant and their heirs indefinitely, and the subdivision which so plagued Galicia was generally absent.[23]

Given sufficient rainfall and the limited area of arable, farmers in the North responded to growing population pressure in part by emigrating, and in part by changing crop rotations to maximise output per hectare. Although geographically suited to livestock farming, many farmers suffered from a shortage of sufficient capital and from the significant diseconomies involved in the *minifundias*. Therefore, although livestock produce accounted for about half the agricultural output, herd size in 1865 was only 3.1 animals per owner in Galicia, and between 4 and 4.5 animals in the rest of the North.[24]

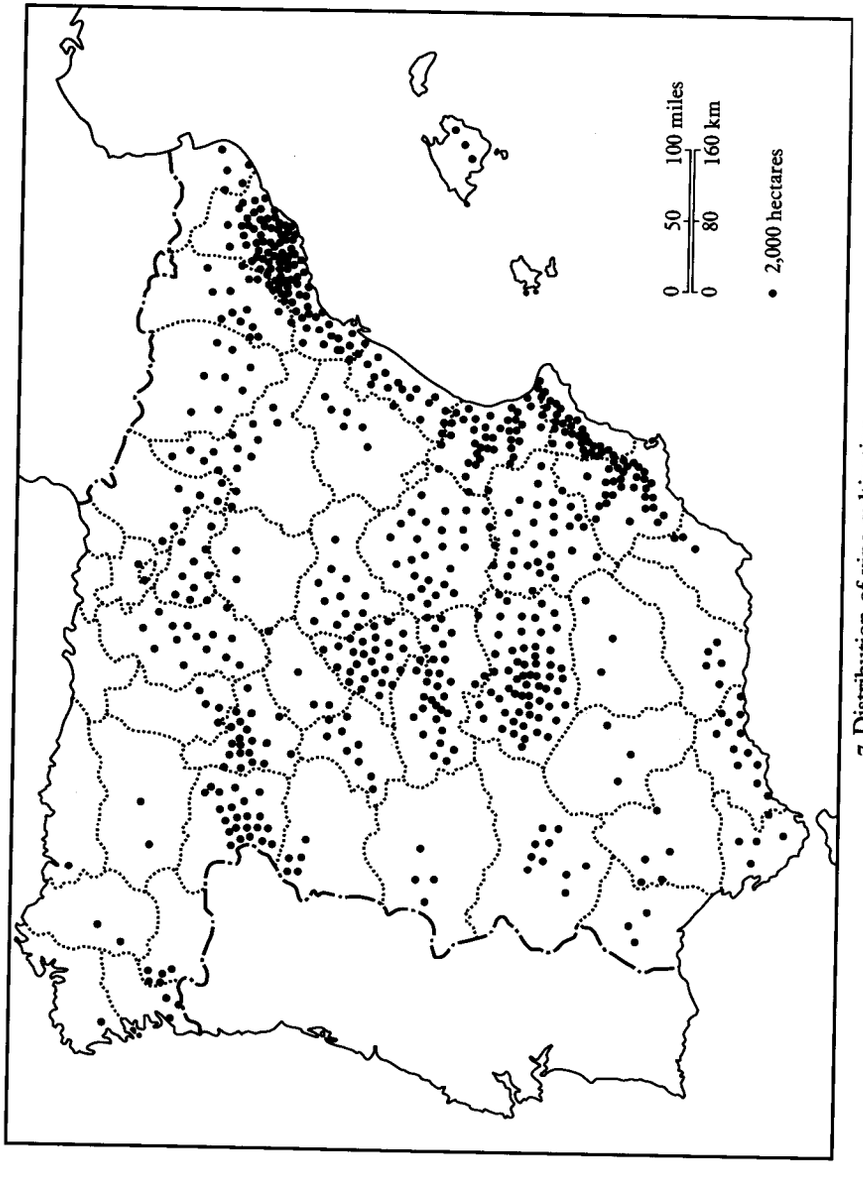
As can be seen in map 8, the Interior contained major contrasts in farm size. Whilst in the south and west (Centre, Extremadura and the province of Salamanca), large estates or *latifundios* existed, elsewhere smaller properties tended to predominate. In the area of *latifundios*, conditions were not dissimilar to those found in Andalucía. However, in the area of small farms, a major feature was the large number of tenant farmers. Leases were often for only two or three years, with restrictions

[21] Ministerio de Agricultura, Industria, Comercio y Obras Públicas (1904, p. 27).

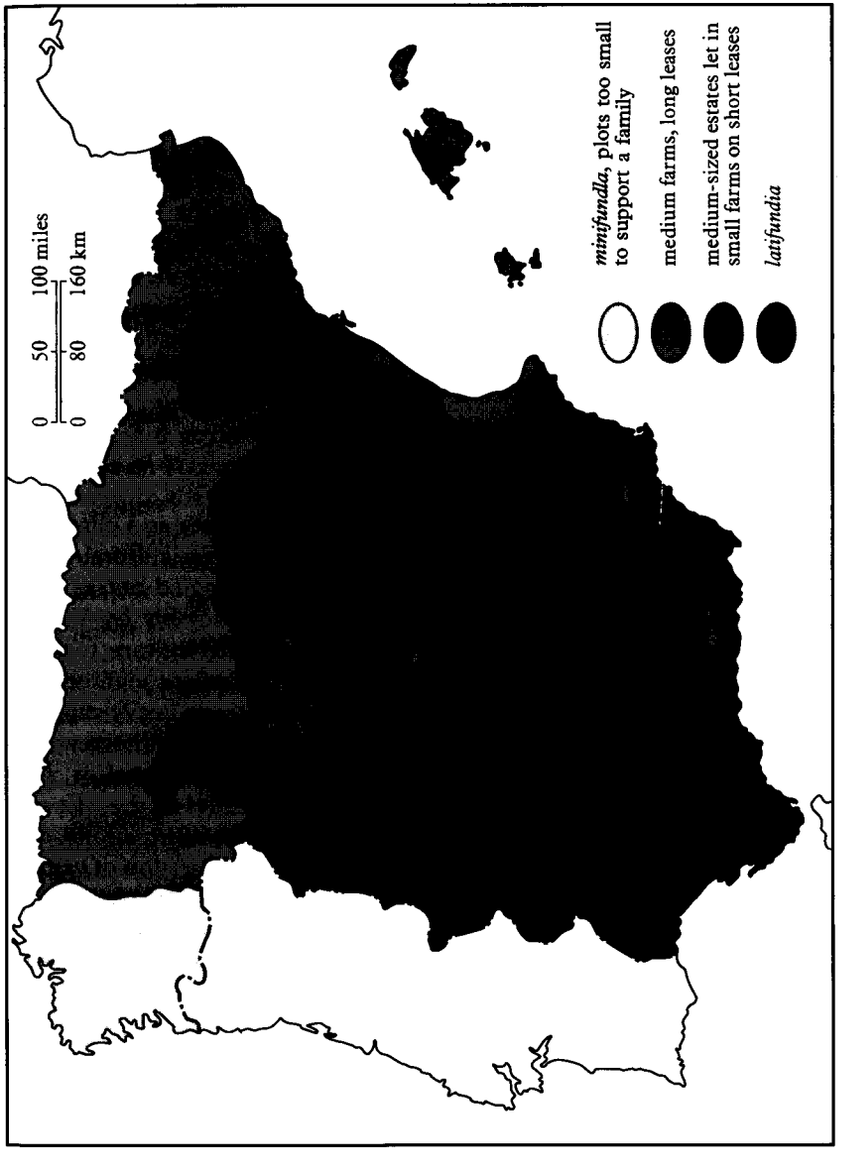
[22] However, chapter 3 will show that from the late nineteenth century many agreements between the different owners of the land were reached privately.

[23] In 1766, the average farm in Guipúzcoa was between 3.8 and 5.5 hectares, but in Galicia, usually well below 3 hectares (Fernández de Pinedo, 1974, p. 164; Saavedra and Villares, 1985, p. 454). By 1930 there was one male worker for every 2.7 hectares in Galicia, compared with 3.1 hectares in Guipúzcoa and 4.4 hectares in Vizcaya.

[24] Output refers to 1929/33 (Simpson, 1995a). Herd size, cited in Domínguez Martín, 1990, p. 191. Capital shortages were partly overcome by the use of contracts similar to those of sharecropping (*la admetería* in the Basque country, *la aparcería* in Santander, *la comuña* in Asturias and *la parceiría* in Galicia), where animals were provided by middlemen, and raised by smallholders (ibid., pp. 192–3).



7 Distribution of vine cultivation
Source: Naval Intelligence Division, vol. 3, p. 222. Figures represent an average [illegible]



8 Distribution of holdings
Source: Brenan (1974, pp. 334).

on crop mix and with tenants having no legal rights to indemnification for improvements.[25]

A major characteristic of the Mediterranean area was also the small scale of much of the farming.[26] Given the favourable conditions for labour-intensive crops – vines, fruit trees, market gardening – a large amount of land was cultivated directly by the owner, with recourse to labour markets only at periods of peak demand. However, much land was also leased, either through sharecropping arrangements, or by similar contracts which protected landowners' investments in trees, irrigation and soil fertility.[27] If the liberal land reforms of the 1830s set in motion a period of land concentration in the irrigated areas of Valencia and Murcia, this would be subsequently slowly reversed from the 1880s, including the major orange-growing region of Alzira.[28] Larger farms were to be found away from the Mediterranean coast, especially where the major crop was cereals, and here farming conditions were similar to those found in the Interior.

Regional output and productivity

The presence of a variety of farming systems, crop mixes and climatic conditions produced noticeable regional differences in agricultural performance. Historically, the Mediterranean has been singled out as the most dynamic of Spain's agricultural regions, most notably by Vilar, who emphasised the major contribution of Catalan agriculture to the industrialisation of the region during the second half of the eighteenth century.[29] More recently, the diversification and relatively heavy capital investment in agriculture and related industries from the late-nineteenth century have been noted in Valencia.[30] By contrast, institutional or climatic factors are usually cited as restricting opportunities in the rest of the country. Table 2.3 does not necessarily refute these affirmations, as what is of importance for economic development is the question of value added in the sector, the level of exports, and forward and backward linkages with the rest of the economy. However, table 2.3 does suggest that if agriculture was more dynamic in the Mediterranean than elsewhere, its influence on the national economy would be limited because of its relatively small size. At the beginning of the Second Republic the

[25] Robledo (1984, chapter 3) and Hermida Revillas (1988, chapter 1).
[26] See especially Ruiz Torres (1985, p. 195), Pérez Picazo (1991) and the contributors to Garrabou (1992).
[27] Calatayud (1992, pp. 236–9).
[28] Millán and Calatayud (1992) and *Grupo de Historia Agraria de Murcia* (1992).
[29] Vilar (1962, pp. 78).
[30] Garrabou (1985), Palafox (1985), Piqueras (1985) and Nadal (1990, pp. 296–314).

Mediterranean contributed little more than 20 per cent of national output, not so very different from regions usually considered as 'backward', such as Andalucía or the North.[31] Table 2.3 shows that between them, the Interior and Andalucía accounted for four-fifths of agricultural land, but output per hectare was only one-third, and labour productivity three-quarters that of the North and the Mediterranean in 1929/33. We shall now proceed to consider the causes of regional differences in both land and labour output in more detail.

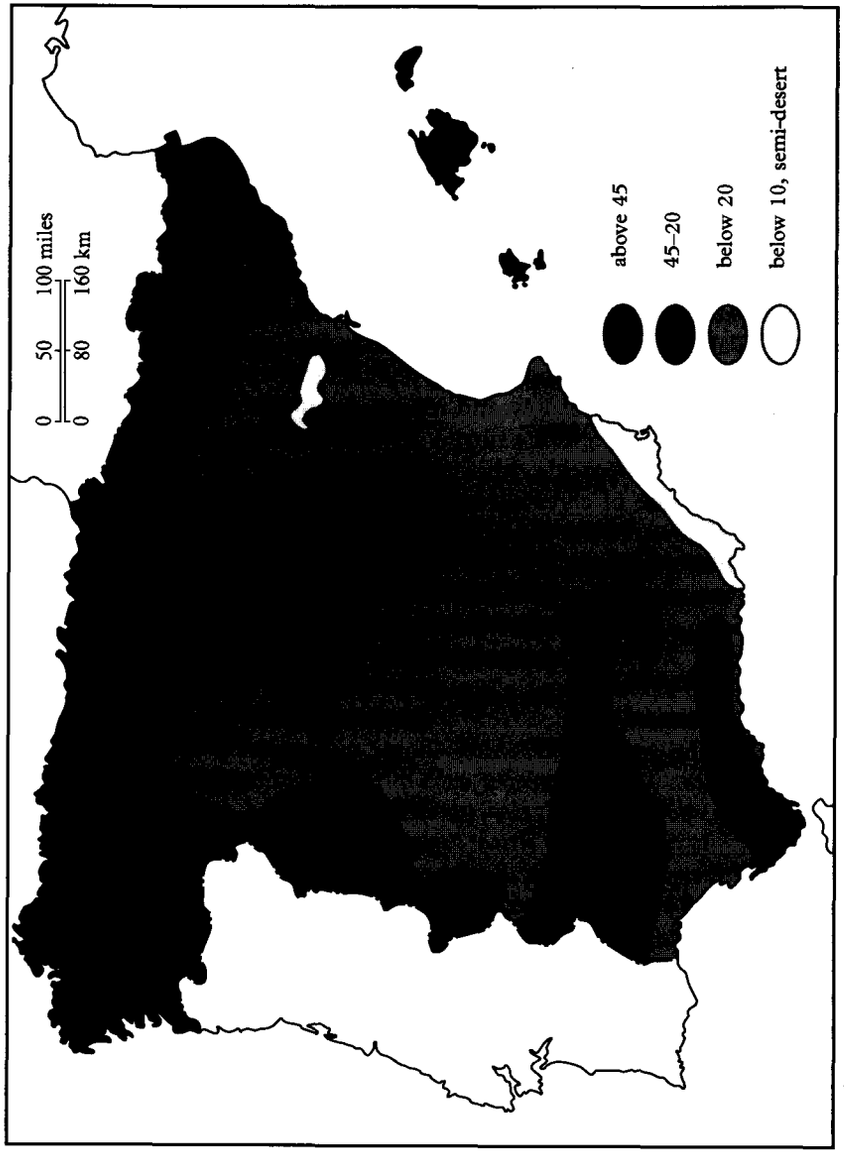
Output per hectare

If land quality was highly varied in Spain, the intensity of rotations and crop mix was determined essentially by the presence or not of summer droughts. Table 2.4 shows that final output in the Interior and Andalucía was achieved mainly from cereals, legumes, olives and vines, crops typically found in areas of low and irregular rainfall. Any comparative advantage that these regions enjoyed in the production of these crops was not on account of yields, which were little above the national average and, in the case of cereals, required extensive rotations.

By contrast, output per hectare was much higher in the North and Mediterranean, which can be explained by the more favourable conditions for intensive livestock husbandry (North) and intensive crops, especially fruit, nuts, vegetables (Mediterranean 'other crops', in table 2.4). Intensive livestock husbandry was difficult outside the North because of high pasture and fodder costs, caused by summer droughts. The Mediterranean benefited from irrigation which permitted specialist fruit farming and market gardening. These two regions, which in 1929/33 between them had only 18 per cent of the nation's agricultural land, produced 55 per cent of the national output of fruit, nuts and vegetables.[32]

A second factor was farm size, with contemporaries frequently noting the high output per hectare on small, family-run enterprises in contrast to the large estates which used wage labour. The limited area of good land (whether irrigated in the Mediterranean, or arable in the North), together with population growth, led to high rents, leaving farmers little alternative but to cultivate intensively their small plots. High rental obli-

[31] Using political rather than agricultural regions gives us the following results. Cataluña (Barcelona, Girona, Lleida and Tarragona) produced 8.7 per cent of net output, labour productivity was 2,439 pesetas per male worker, and output per hectare was 605 pesetas. The País Valenciano (Alicante, Castellón and Valencia) produced 10.9 per cent, labour productivity was 2,987 pesetas, and output per hectare was 905 pesetas.
[32] The Canary Islands were responsible for another 7 per cent, leaving only 38 per cent for the Interior and Andalucía.



9 Index of aridity

Note: The index of aridity is obtained by dividing the rainfall in millimetres by the average temperature

Table 2.3. *Regional output and productivity, 1929/33*

	% of agricultural area	% of national output	Output per hectare (pesetas)	Output per male worker (pesetas)
North	7.3	18.5	809	2,750
Interior	62.6	42.1	216	2,326
Andalucía	19.1	17.1	288	1,630
Mediterranean	11.0	22.3	650	2,688
Spain	100.0	100.0	327[a]	2,315[a]

[a] Includes the Canary Islands.

Source: See Simpson (1995a, Appendix 2).

Table 2.4. *Composition of regional agriculture, 1929/33 (per cent)*

	Cereals	Vines and olives	Other crops	Livestock	Hectares/ male worker
North	16.8	2.6	26.7	53.9	3.4
Interior	41.0	13.2	23.7	22.2	10.8
Andalucía	28.4	27.5	23.6	20.5	5.7
Mediterranean	15.5	17.3	48.5	18.7	4.1
Spain[a]	28.0	14.3	31.0	26.7	7.1

[a] The Canary Islands are included in total.

Source: Simpson (1995a, table 6).

gations reduced farm profits, affecting investment and personal consumption. However, table 2.4 suggests that intensive cultivation was also a means of reducing risk. The complexity of rotations in the North and on the irrigated lands in the Mediterranean allowed farmers to benefit both from a wider variety of products, and also higher and more stable yields. Furthermore, in the coastal areas where external demand had allowed specialisation in viticulture from the seventeenth century, traditional technologies benefited smaller units of production, rather than penalised them.

The impact of economies of scale is more difficult to assess in the Interior and Andalucía. In general, agricultural production in these two regions was much more similar than between the North and Mediterranean. However, whilst Andalucía was a region of large estates, in the Interior small holdings were common.[33] Little difference in production

[33] The regions of La Mancha and Extremadura in the Interior were exceptions to this.

methods existed between the small and large farms, and technical change in dry farming made only a minimal contribution to increasing yields prior to the Civil War. Where technology did lead to yield improvements, for example with the introduction of more specialised breeds of cattle, phylloxera-resistant vines, or improved rice and orange strains, the benefits were often reaped by small farmers, but usually in the North and Mediterranean.[34]

Labour productivity

If the difference in labour productivity between regions was less pronounced than output per hectare, then it is also much harder to explain. Whilst Spain's North is usually regarded as one of Europe's more 'backward' regions, recent studies have suggested that the Mediterranean was a 'leader'.[35] The results in table 2.3 need more detailed comments.

First, the relatively high figure for the North can partly be explained because of the distortions caused by including only male labour, and assuming that the men worked the same hours as in other regions. They clearly did not. The North was a region where female labour played a major role in farming, substituting for males who had migrated in search of cash incomes for long periods. If we assume that the female labour force was equivalent to two-thirds of the male in the North, and to a third elsewhere, then labour productivity in the North falls to 82 per cent of that of the Mediterranean, 95 per cent of the Interior, but still a third greater than in Andalucía. However, this line of reasoning is dangerous, not just because of the nature of our assumptions, but because it fails to solve one very important problem, namely that of living standards. Labour productivity cannot be taken as a direct indicator of per capita income because it does not include the farmer's operating costs, taxes, or rental obligations. However, Northern farmers provided most inputs themselves, they were unlikely to have paid significantly more taxes than elsewhere, and were also increasingly becoming full owners of their land.[36] Perhaps even more important, farmers in the North appear to have benefited from both high labour productivity in agriculture and cash incomes earned from seasonal

[34] In the North and Mediterranean, it was often the larger farmers who were responsible for the initial changes. See Calatayud (1986), Garrabou and Pujol (1988) and Puente Fernández (1992).

[35] In particular, Garrabou (1985, p. 122).

[36] However, the small, highly divided nature of holdings, together with the region's lack of alternative employment opportunities, probably pushed land prices above those elsewhere. Information is not available to assess how important this was to farm profitability.

migration (not to mention emigrants' remittances). Instead of being one of the country's poorest regions, the North might thus appear to be one of the richest. Contemporary observations make this argument unconvincing, so we have to look elsewhere.

The answer to the problem would seem to lie with prices and markets. The North was a region of small farms and poor communications, both locally and with the rest of the country. If labour was integrated into national and international labour markets from an early date, this was not so with product markets. As late as the mid-1960s, farmers still produced a third of net output for home consumption.[37] A significant part of output was therefore not only not marketed, but not traded at all, a fact which is obviously ignored in the official statistics, where a market price is given to all production whether sold or not. Low levels of market integration for agricultural produce severely restricted economic growth, as surplus agricultural production could not easily be converted into an easy form of stored wealth.[38] Market-orientated livestock production might have overcome this limitation, and was also compatible with the region's natural endowments, but the small scale of most farms made the risks of specialisation considerable, and most farmers had neither the necessary finance nor access to capital markets.

The difficulties in selling farm produce in the North can be illustrated by farmers' diets in Guipúzcoa at the end of the nineteenth century. This consisted of chestnuts, beans, a type of cake made from maize called *tálua* and, in particular, milk from their cows. Meat was very rare. Only if the farm was near a town might some milk be sold, but hardly any butter was produced, and the little that was, was consumed once more by the farmer.[39] This was the province which in 1909/13 had by far the highest labour productivity in Spain, and had some 45 per cent of its active labour force employed in the sector.

Just as it would be wrong to forget that in some areas of the North efficient markets for agricultural commodities were operating by the 1936–9 Civil War, so it would be equally wrong to assume that all farmers in the Mediterranean were totally market orientated. However, a major difference between the two regions was that of opportunities: in the coastal Mediterranean a rapidly growing urban population and dynamic external markets encouraged high labour and capital inputs to

[37] If recycled items are included, farm consumption was a fifth. Only approximately two-fifths of total output was sold to non-farm consumers (INE, 1964 [cited in Leal *et al.*, 1975, p. 100]).

[38] Mokyr (1985) makes this point for Ireland as one explanation of how a comparatively well-fed population could suffer a loss of a million people in the Great Famine of 1845–50.

[39] Dirección General de Agricultura, Industria y Comercio, Madrid, 1892, I, p. 448.

Table 2.5. *Agriculture and urbanisation in Spain, 1887 and 1930*[a]

	Male employment in agriculture, % of total		% of population living in towns of 10,000+	
	1887	1930	1887	1930
North	77.8	48.6	10.3	21.1
Interior	76.2	53.2	16.6	29.3
Andalucía	70.1	58.8	41.5	52.9
Mediterranean	62.8	38.8	42.5	54.0
Spain	72.3	49.7	26.0	38.3

[a] The Canary Islands are not included.

Sources: 1887 and 1930 Population Censuses; Luna (1988, cuadro 1).

produce specialised agricultural products, whilst in the North there was, a 'Boserupian concentration on basic food crops in response to localized population pressures'.[40] The relatively small share of national output which I have estimated for the Mediterranean in 1929/33 hides the fact that a much higher share enter commercial circuits, leading to a significantly greater value in transport and food processing industries.[41] It was also the region which competed most in international markets with such products as spirits (*aguardiente*), almonds, citrus fruit, onions, raisins, rice, new potatoes, silk and wine.

The Mediterranean was not just integrated into commodity markets, but also into national labour markets. By 1930 some 54 per cent of the region's population lived in urban centres with more than 10,000 inhabitants, and agriculture employed less than 40 per cent of the active labour force. Labour was highly mobile, with the industrial centres of Valencia and especially Barcelona being the main foci of attraction. Therefore, despite some of the country's highest rural wages, the region was the one where the agricultural sector was least important (Table 2.5).

In the case of Andalucía, low labour output can be explained by a combination of three factors: low output per hectare, low land to labour ratios and the lack of mechanisation. Large units of production coupled with low crop yields need not have led to low labour productivity if they

[40] The quote is from Grantham (1989, p. 50), who makes a similar distinction for northern France to explain regional differences in agricultural income per hectare.

[41] Nadal (1990, pp. 296–314), Martínez Carrión (1989, pp. 619–49), Palafox (1985, pp. 319–43), Pérez Picazo (1990, pp. 315–41) and Simpson (1992a, pp. 131–7).

had been associated with mechanisation (see chapter 7). However, as table 2.4 shows, the amount of land per male worker in Andalucía was only 39 per cent more than in the Mediterranean, even though these figures include uncultivated land found within the rotation. In total contrast to the North, and especially Galicia, it would seem that whereas farmers in Andalucía were integrated into commodity markets at a relatively early date, this was not the case with labour.[42] Despite low wages and a short working year, the region was the only one which saw a growth in the number of farm workers during the first third of the twentieth century. If few would doubt the profitability of large farms in southern Spain during this period, the slowness of mechanisation and of labour to leave the land had important implications for the overall efficiency of the economy. Despite the high level of urbanisation, 52.9 per cent compared with a national figure of 38.3 per cent in 1930, outside the provincial capitals there was virtually no industry other than food processing and, as shops relied upon poor agricultural workers' spending capabilities, their numbers and contents were limited.[43] Furthermore, the intersectorial linkages in olive oil production, the region's most important product, were limited.

The final region, the Interior, contained three-fifths of the nation's agricultural land and two-fifths of farm workers on the eve of the Civil War. Output per hectare was two-thirds of the national average and labour productivity similar to the national average. Although the Interior encompasses a region with great contrasts, an underlying characteristic was the specialisation in low yield, cereal and legume rotations. In 1929/33 some 41 per cent of output was from cereal and legumes, with only 22 per cent of output derived from livestock products, and 24 per cent from fruit, vegetables and industrial products, products which had contributed to the high output per hectare in the North and Mediterranean respectively. It was the specialisation on extensive cereals, together with extensive viticulture in La Mancha and ranching in Extremadura, which limited labour productivity because, although each worker enjoyed three times more land than those in the North (two-and-a-half times more than those in the Mediterranean and twice as much as in Andalucia), yields were significantly below those of the first two regions. Despite

[42] For commodity markets, see Bernal (1988) and Herr (1989).

[43] Brenan describing in 1943 towns such as Osuna (population 16,000), Morón (19,000) and Carmona (22,000) in the province of Sevilla, noted 'the first impression is one of decay and stagnation. A few wretched shops selling only the bare necessities of life: one or two petty industries – soap making, weaving of esparto mats, potteries, oil-distilleries that between them employ some couple of hundred men . . .' (1960, p. 118).

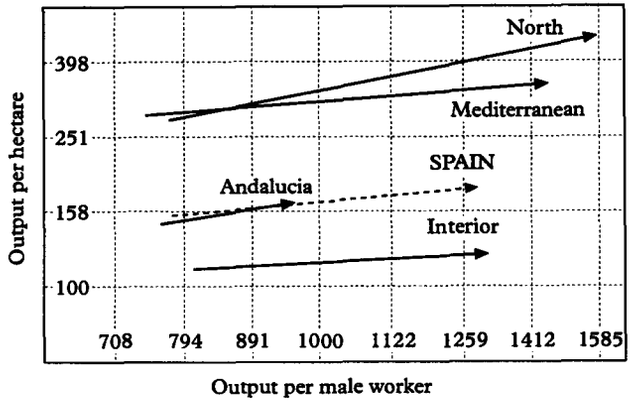


Figure 2.1 Regional changes in agrarian productivity 1909/13 to 1929/33 (in semi-log scale, constant pesetas 1909/13)
Source: Simpson (1995a, pp. 206–7 and 212–3).

losing some 17 per cent of its labour force between 1900 and 1930, this would not be enough to close the gap with either the North or the Mediterranean.

Conclusion

This chapter has shown the importance of natural endowments in determining crop choice. Crop mix, together with the distribution of property has a significant influence on the level of output per hectare and labour productivity. Figure 2.1 shows graphically the changes in land and labour output in the four regions between 1909/13 and 1929/33. This period, as noted in chapter 1, was when labour productivity for the first time increased significantly after 1765. At one extreme was the Interior, which saw an important growth in labour productivity, but scarcely any change in output per hectare. As we shall see, this occurred on account of a declining workforce, stagnant yields, mechanisation and an extension in the area cultivated (a mixture of possibilities 'a' and 'b' in figure 1.1). Andalucía saw a much smaller growth in labour productivity, but output per hectare increased by slightly more. These two regions, which between them accounted for 60 per cent of output and covered 80 per cent of the agricultural land in 1929/33, were essentially regions of *secano*. By contrast, both the North and the Mediterranean combined larger increases in land output and labour productivity

(possibility 'c' in figure 1.1). These were regions of small farms and intensively cultivated crops.

Important as natural endowments and property distribution were, it would be wrong to conclude that they were the only cause of low productivity in Spanish agriculture. They were not, and parts III and IV will examine in detail the ways in which farmers might have overcome the barriers imposed by these factors, and why they failed to do so. First, however, we must examine how agriculture was able to increase its output to feed the nation's growing population from the mid-eighteenth century to the late nineteeth century.

Part II

Traditional technologies and market opportunities, 1765–1880

3 Agricultural growth and stagnant technology

> . . . Spanish agriculture is still the agriculture of the fifteenth century: an agriculture which plants one year and leaves fallow the next because of the lack of mineral fertilisers; of litanies sung because of the lack of irrigation; of pack animals because of the lack of local roads; an agriculture of scratch ploughs, of illiterate labourers, of money at 12 per cent, of the iniquitous sales tax (the *consumos*), of miserable harvests of five or six grains for each one sown, of the hungry farmer . . . a slave to a mortgage and his patron (*cacique*). (Costa, 1911e, p. 122)

Prior to the 1880s, agricultural imports were negligible except in years of major harvest failures. Even at the turn of the twentieth century, when imports were temporarily much more important, Spain was still 94 per cent self-sufficient in wheat, 87 per cent in maize and 100 per cent in potatoes, wine and olive oil.[1] Consequently, the population increase of some 10 million between 1712/17 and 1900 was fed essentially on domestically produced food. In this chapter and the next, I examine how traditional agriculture was able to increase output with few changes in land and labour productivity.

In the first part of this chapter I argue that cereal production was increased by extending the area cultivated, rather than improving yields. In the long term this was only possible because of a combination of institutional reforms and the presence of large areas of under-utilised land. As figure 1.1 showed, if technology remains unchanged, labour productivity could only remain constant if the land to labour ratio and land quality did not deteriorate. Chapter 4 argues that the tendency towards diminishing returns in the second half of the nineteenth century was offset, at least partly, by two processes: improved market integration which allowed for greater specialisation, and favourable trends in commodity prices, which helped to compensate the negative impact of stagnant or even falling physical yields. By the late nineteenth century this model of growth would be threatened by both technical limitations to

[1] Except for potatoes (1902), these figures refer to 1897/1902 (Simpson, 1989a, p. 382).

extending the area cultivated, and falling international cereal prices. The problem would be resolved through domestic price increases (tariffs on imports and a depreciating peseta), and the use of artificial fertilisers to maintain soil fertility (see chapters 5 and 10).

The second part shows how traditional technologies were also ideally suited for farmers to meet increasing demand for the country's leading export commodity prior to the First World War, namely wine. Large areas of suitable land and surplus labour were brought into use to take advantage of upturns in demand, and poor product quality was unimportant given the widespread use of blending. Once again, in the absence of labour-saving technologies, the tendency towards diminishing returns to labour were offset by improving commodity prices and the greater employment opportunities in viticulture compared with cereals for family labour. However, like cereals, but for differing reasons, this favourable situation would be threatened at the end of the nineteenth century.

In the final part of the chapter, I look at the region of Galicia in the North. Here the area of arable could not easily be extended to accommodate the increase in population, but climatic and soil conditions permitted the introduction of new crops (maize and potatoes) into traditional subsistence rotations. A major restriction to increased output was property rights, which were not clearly defined for much of the period. Although it had been determined as long ago as 1763 that most farmers could not be evicted from the land they worked, it was not until 1926 that they had the legal right to become full owners. Finally, the small scale of most farms and the difficulties in marketing produce, led to incomes remaining extremely low.

Cereal production under conditions of elastic supplies of labour and land

The two factors which determined the size of the agricultural labour force in nineteenth-century Spain were the rate of population growth and the fact that agriculture was a residual employer, implying that the amount of labour in the sector was determined not so much by its own labour requirements, but rather by the demand for work in other sectors of the economy, or the possibilities and attractions of emigration. From the limited information that exists, it would seem that the active population in agriculture grew at the same pace as total population during the nineteenth century (chapter 1). As most cereals were for domestic consumption, and Spain's crop mix changed little during the century, it can therefore be argued that labour supply for cereal producers grew

roughly in line with demand. As a result, the incentive to introduce labour-saving technologies would be strictly limited, with farmers continuing to use almost exclusively scratch ploughs rather than mouldboards, together with labour-intensive harvesting and threshing technologies until the turn of the twentieth century (see chapter 7).

The question of land supply, however, was more complicated. One of the major concerns of seventeenth-century writers such as Caxa de Leruela, Martínez de Mata and Moncada, was the question of Spain's, and especially Castilla's, underpopulation. From a population density of 15 persons per square kilometre in 1712/17 (about a third of that of France), Spain still had only twenty-four persons per square kilometre in 1833.[2] Travellers wrote at length on the absence of habitation in many areas of Spain and the large quantities of uncultivated land which might be made good by the plough. Thus in Andalucía in the early 1830s, the 'depopulated wastes' were 'of vast extent', and in Extremadura the land was 'abandoned to sheep-walks, or left as uninhabited wastes overgrown with cistus; yet the finest wheat might be raised here in inexhaustible quantities'.[3] Even in Valencia, one of the most densely populated regions of the country, significant areas of uncultivated land remained, especially away from the coastal region.[4]

In Spain, like Germany, there was never any native 'Malthusianism' and the low population density implied that a greater intensity of cultivation was often not only unnecessary or uneconomical, but impossible given the shortage of labour.[5] From the 1760s population growth began to change the relative price of land and labour. The response of individual farmers would depend on local market conditions, resource endowments, and the legal access they had to the uncultivated land. In general, Boserup's observations about demographic pressure and land use appear appropriate for eighteenth- and nineteenth-century Spain: rather than simply increasing the area cultivated, population growth led to a more intensive use of the soil, with arable farming gaining at the expense of pastoral, and rotations shortening. In this respect, crucial to the farmer's ability to increase production would be changes to property rights.

If Spain at the end of the eighteenth century had extensive areas of uncultivated land, various institutions, which had often existed for centuries, severely restricted access to most farmers. Despite regional

[2] The population in 1712/17 is here taken as 7.5 million (Pérez Moreda, 1984, cuadro 1), and the area of Spain as 504,678 km^2.

[3] Ford (1966, 1, p. 226, and 2, p. 771).

[4] Cavanilles (1795–7, especially 1, pp. 66 and 78). For a general view, see Caballero (1864, p. 2).

[5] Schumpeter (1954, p. 252). The North, as shown by the case of Galicia below, differed from the rest of Spain.

differences in property ownership and tenurial systems, a number of generalisations can be made. First, less than half the nation's land in the eighteenth century could be sold if the owner desired, because much of it belonged to the church, municipalities, or was held by the nobility in entail. Second, legal ownership was often divided between those who had indefinite rights to receive a 'rent' from the land, and those who had the right to cultivate the soil (*dominium directum* and *dominium utile*). Third, large areas of lands were communal to all villagers, either permanently (commons, usually pasture or woodland), or temporarily (e.g. grazing rights for the village flocks on the stubble of all lands). Fourth, seigneurial jurisdiction and rights still remained important in some regions. Finally, a number of institutions held important privileges, most notably the church with respect to tithes, and the Mesta in pasturing rights.[6]

Restricted access to land for much of the population implied that it would be the institutions, essentially the nobility, church and municipalities, which would determine the flexibility of agriculture to absorb population growth. The traditional welfare mechanism that helped offset diminishing returns to labour as population grew was the supply of uncultivated municipal land. In theory, however, national law stated that prior permission from the Crown was necessary for the ploughing up of pasture. This was because the Mesta, the transhumant sheep owners' organisation, enjoyed the privilege given by the Crown to pasture on all land which was traditionally unsown, in exchange for taxes.[7] Both enclosing property and changing pasture to cultivation were thus illegal. Disputes between arable and sheep farming were not new in Spain, but the generally favourable market conditions for both wool and grain in the second half of the eighteenth century made them assume much greater significance. Whilst the numbers of transhumant sheep more than doubled between 1708 and 1780, the cost of pasture increased by only a third, significantly less than either the price of wool or wheat. According to one historian, 'it would be difficult to find in the Mesta's history such a long period of prosperity'.[8] During the Peninsular War, however, many of the larger flocks were devastated, and after a brief Indian summer in the early nineteenth century, wool production declined and the Mesta became a less attractive source of revenue for the Crown. Its abolition in 1836 did not mark the end of transhumant sheep farming, but it removed the privileges that had helped keep the system profitable, and it allowed landlords and farmers to switch from pasture to arable if they so desired. As a result of the Mesta's abolition, the number of transhumant sheep requiring winter pastures fell from 4.5 million in 1796 to 1.9 million in 1865, and the population of Extremadura would grow faster than the national average in the 150 years prior to the Civil War.

Despite the power of the Mesta, farmers resorted to various methods to extend the area sown in the eighteenth century. First, the Crown on occasion granted permission to municipalities to plough up some of their pastures for grain.[9] Second, although national law might restrict the ploughing of traditionally unsown land, each locality was governed by its own rules which, on occasions, contradicted those of the state,

[6] The best short survey of institutional rights and privileges is García Sanz (1985a). For Castilla, see Vassberg (1984).

[7] Sánchez Salazar (1988, p. 24). The Decreto of 1748 re-emphasised the prohibition against ploughing up *dehesas* and common pasture, and ordered the return to pasture of all land that had been converted to crops during the previous twenty years (ibid., p. 5).

[8] Llopis (1982, p. 12). The *tasa máxima* of 1731 fixed the cost of pasture at six *reales de vellón* per animal in Extremadura, and five reales in Castilla la Nueva and Andalucía, but table 3.1 suggests that in reality they tended to rise. The *derecho de posesión* gave flock owners indefinite use of pasture, unless the landlord wished to use it himself, grazing at least a similar number of animals (García Sanz, 1978, pp. 287–8).

Table 3.1. *Eighteenth-century pasture and commodity price indices*

	Pasture costs		Commodity prices		Total number of sheep[a] (millions)
	Winter	Summer	'fine' wool	Wheat	
	(A)	(A)	(A)	(B)	
1709/17[b]	100	100	100	100	2.1
1741/70[c]	109	110	131	130	3.4
1771/83	135	135	186	158	5.0

(A) Guadalupe monastery.
(B) Fábrica de la Iglesia de Villacastín (Segovia).
[a] Sheep numbers refer to transhumant flocks. The figures refer to the years 1708, 1746 and 1765, and 1780, respectively.
[b] Comprises data for the periods 1709/10 and 1714/17.
[c] Comprises data for the periods 1740/50 and 1765/7.

Sources: Llopis (1982, Appendix 1.2, 1.5 and 1.6); for sheep numbers, García Sanz (1985b, p. 24).

[9] Between 1700 and 1800 there were 959 petitions by municipalities (more, if individual ones are included), of which 579 were granted, 353 remained pending and 27 were refused. Andalucía accounted for 25 per cent of all petitions, Extremadura 21 per cent, Castilla la Nueva 31 per cent and Castilla la Vieja and León 19 per cent. The rest of the country accounted for only 4 per cent (Sánchez Salazar, 1988, p. 66). The number of petitions tended to be greatest in those areas where the Mesta had most interest in maintaining pasture rights, and consequently was less tolerant of illegal cultivation.

and permitted controlled cultivation of communal lands.[10] Finally, the authorities often turned a blind eye to the illegal ploughing up of pastures, especially if the local notables did not have grazing interests, or were themselves involved in the encroachment. Indeed, government attempted to solve the problem of rising land values, rents and commodity prices in the eighteenth century by achieving a more equitable use of the municipal land already under cultivation, and reducing the power of larger farmers over the distribution of rented municipal lands (*propios*).[11] By contrast, the *Real Decreto* of 1793, applicable only in Extremadura, attempted for the first time to increase cereal output by allowing farmers to plough up their own pasture lands, and represented an important defeat for the Mesta.[12]

This extension of cultivation was often temporary, both because of the desire of the municipalities not to lose legal control of the land, and because land quality would not support continuous cropping. In many areas, some form of bush-fallow (*rozas*) was practised, with the undergrowth being cleared by burning and a cereal crop sown for a year or two, before being abandoned again for as many years as was necessary to allow the land to recover its fertility. Caxa de Leruela noted in 1631 that this form of cultivation had two major advantages: it required less work than normal short-fallow cultivation, and the ashes acted, in the absence of manure, as a fertiliser.[13] Therefore, low levels of population density using bush-fallow were not incompatible with relatively high labour productivity, when measured by hourly labour requirements to obtain a fixed unit of output. The importance of shifting cultivation compared with short-fallow rotations at the start of our period is difficult to quantify, although it seems to have been practised to a greater or lesser extent in most regions.

By the end of the eighteenth century, the success of these legal and illegal mechanisms to absorb population growth appears to have been stretched to the limit. Whereas in Extremadura and Andalucía 'land hunger' appeared against a background of undercultivation, low population density and restricted access to land, elsewhere diminishing returns to labour were apparent. For example, in Aragón, large areas of land had been given over to the plough during the century so leading to a reduction

[10] Sánchez Salazar (1988, p. 46). For a description of local organisation and the 'web of use-rights' in one village in Castilla, see Behar (1991, part 4).

[11] Government legislation occurred in 1738, 1766, 1768 and 1770 (Sánchez Salazar, 1988, pp. 42 and 144–53). See also Llopis (1983, pp. 140–1).

[12] Sánchez Salazar (1988, p. 154).

[13] Caxa de Leruela, (1975, p. 79), Boserup (1965, pp. 24 and 33) and Herr (1989, p. 375). Herr notes that, in the mid-eighteenth century, yields using this form of cultivation in Baños (province of Jaén) were 'higher than any other land in the town'.

in the area of pasture and the capacity of the region to support livestock, resulting in less manure, declining yields and food shortages.[14] In Castilla, a similar situation existed, and Larruga wrote of Palencia at the end of the eighteenth century 'that they sow all the land most years without resting them and even so, the production is not sufficient to compensate the tenant for his efforts after satisfying the heavy burden of the rent'.[15]

While the government between 1765 and 1796 had struggled to find a way of encouraging farmers to produce more food, from 1796 its overriding priority would be to obtain sufficient money to pursue the War and maintain the monarchy.[16] There followed between 1798 and 1808 the first sale of church properties, which netted some 1,653 million reales for the Treasury and accounted for approximately one-sixth of the church's wealth.[17] However, the breaking of new land before 1808 was of minor importance compared with the 'avalanche' following the invasion of the French army, with farmers failing 'to respect sheep walks (*cañadas*), foot paths, or even private property'.[18] Bankruptcy led numerous municipalities to sell properties, while elsewhere the landless occupied land illegally, part of a wider movement of civil disobedience, which also included the non-payment of tithes and seigneurial rights.[19]

The magnitude of these changes in property ownership cannot be quantified, but whereas by the late 1780s Spain had difficulties feeding a population of 10.4 million, by the early 1820s the country had enough wheat to export small quantities, even though its population had increased by 12.5 per cent to 11.7 million.[20]

The 'Liberal' land reforms of the nineteenth century were wide reaching, and included the disbanding of the Mesta (1836), the abolition of entail of estates of the nobility (1836–41), the ending of the tithe (1841), and the sale of approximately 10 million hectares of church and municipal land, or 20 per cent of the national area between 1836 and 1900.[21]

[14] Asso (1798, pp. 176–9), cited in Sánchez Salazar (1988, pp. 192–3). See also Pérez Sarrión (1989). High cereal prices between about 1780 and 1817 were to be found in most parts of Europe, and they explain in good part the general pessimism of economists such as Malthus and Ricardo.

[15] Larruga (1794, Tomo XXXII), p. 235, cited in Yun Casalilla (1987, p. 614).

[16] Herr (1989, p. 98).

[17] Ibid. (pp. 122 and 133).

[18] Llopis (1983, pp. 143–4). Sheep walks were regarded as communal property.

[19] Fontana (1985, p. 224), García Sanz (1985a, pp. 24–7), Torre (1990) and Sánchez Salazar (1990). Because the tithe was usually 10 per cent of *total* cereal output, its non-payment implied an increase in *net* income to the farmer of considerably more.

[20] Population census figures of 1787 and 1821 (Pérez Moreda, 1985, p. 26).

[21] Simón Segura (1973, p. 282). García Sanz estimates 25 per cent if sales outside the period chosen by Simón Segura are included (1985a, p. 30), and Herr (1989, p. 718) estimates about 30 per cent, 'measured by the value of its annual product at time of sale'.

With one or two notable exceptions, these reforms were successful in establishing private ownership with full legal property rights over the land, and limited most owners' interests to either direct cultivation or rent.[22] Although much has been written on the mechanism of land sales, the economic consequences of disentailment have received virtually no attention. Two general observations, however, have been noted. First, the sale of large quantities of land took place against a background of rising rents and land prices; and second, that farming techniques and agricultural productivity would change little, if at all. These points would appear to be related.

Herr has observed that periods of major legislation permitting land sales, namely the late eighteenth century, 1836–7 (Mendizábal's sale of church lands) and 1855 (Madoz's sale of municipal lands) coincided with high wheat prices.[23] Likewise the limited information on rents, the two series from Andalucía and Ciudad Rodrigo (Salamanca), both indicate that rents had recovered their 1774–90 levels by the mid-nineteenth century. In Andalucía between 1850 and 1866, rents increased to 'giddy' new highs on account of demographic pressure, together with other factors such as the re-establishment of commercial contacts with Latin America.[24] It was similar in Ciudad Rodrigo where, having fallen to 83 per cent of their 1774 level in 1824, rents proceeded to increase to 91 per cent in 1840 and 194 per cent by the 1870s.[25] Therefore, the sale of large tracts of land in the nineteenth century occurred when rents and wheat prices (see chapter 4) were rising strongly, after the post–Napoleonic War depression.

It is normally supposed that the sale of the church land gave little possibility of increasing agricultural output as most of it was already in production.[26] By contrast, the sale of municipal land permitted an

[22] Two major exceptions were Galicia, where the owners of the *dominium utile* often remained distinct from those of the *dominium directum*, and the *rabassa morta* sharecropping contracts in Cataluña, which led to major problems for the regional government (*Generalitat*) during the 1931–6 Second Republic. Both are discussed below.

[23] 'Historical writing has explained the Spanish legislation of 1836 and 1855 as the product of the current political situation, which on both occasions temporarily put the Progresista party, committed to *desamortización*, into power. It is hard to escape the conclusion, however, that the international grain market was partly responsible for the attractiveness of these laws at these dates. In the United States the distribution of public lands and in Spain the legislation creating them and putting them up for auction were both responding to developments affecting all the Western world.' (Herr, 1989, pp. 736–7).

[24] Bernal (1978, pp. 128–30).

[25] Robledo (1984, cuadro 24).

[26] Rueda (1986, p. 151). A distinction must be made between these lands, and the sale of property held in entail by charitable institutions and other religious endowments between 1798 and 1808. Of these, Bruna wrote in 1784: 'There is nothing more common in Andalucía than untilled scrubby lands and unkept vineyards of abandoned capellanías. When one sees a field in this condition in the countryside, one naturally remarks that it must belong to a capellanía' (cited in Herr, 1989, p. 91).

extension of the area cultivated, leading to a decline in pastures and livestock and, in some areas, a fall in yields. As Sánchez-Albornoz has noted:[27]

> Cereal production increased notably, but through an extension of the area sown and not thanks to an increase in yields. Lands of diminishing production potential were brought into cultivation without recourse to more advanced technology. The employment of more labour in these activities produced an increase in the size of the rural population. Land or labour productivity fell, making once more the living standards of the average Spaniard more precarious and consequently more vulnerable to natural calamities.

From the 1870s, some of the major wheat provinces of the Interior began to note both a limit to the area of cultivation and perhaps falling yields.[28] It seems highly likely, although difficult to show, that a combination of growing farm debt caused by heavy land purchases, encouraged by rising cereal prices, was the cause. Much of the new land put into permanent cultivation in the 1860s and 1870s had in fact been cultivated occasionally in earlier times, or had been wooded common land. Eager to recover their initial capital investments, farmers cut down large areas of forest and shortened rotations. Given the traditional technologies for maintaining soil fertility and the increase in cereal prices until the early 1880s, the result was diminishing returns to labour and perhaps also falling yields. Stagnating prices during the 1880s halted or even temporarily released marginal land from the plough. The relief was shortlived as a combination of tariff protection and chemical fertilisers permitted about another million hectares of wheat to be sown between 1899/1901 and 1930/5 (chapter 5).

On a more positive note, improved transportation and market integration allowed for a more rational distribution of crops and a degree of product specialisation (see chapter 4). It is also possible that with the changes in property rights, farmers cultivated their lands with greater care. However, in the absence of sufficient supplies of manure (livestock numbers were actually declining) or the planting of clover or vetches (difficult under conditions of dry farming), the only protection against soil exhaustion was fallow. This meant leaving the land uncultivated

[27] Sánchez Albornoz (1977, p. 43).

[28] Nineteenth-century information on crop yields is virtually non-existent. Although it is true that isolated figures exist for crops in different townships, this information is of very limited value. What is required are farm-based series with information on length of rotations and changes in factor inputs and prices. See however, Gutiérrez Bringas (1993, pp. 505–38).

once every other year on the better *secano* soils, and up to twenty years on the poorer ones.

Spanish farmers of course acted not so differently from those in countries such as the United States, where yields in the 1920s were little above those of the early nineteenth century, although in this case the potential land supply was significantly greater than Spain's.[29] In periods of history when international freight rates were high, and internal transportation difficult, this was a perfectly rational response. However, by the end of the nineteenth century neither of these two factors were valid any longer, and traditional agricultural practices could only continue with the help of artificially high prices obtained by tariffs and a depreciating peseta.

Viticulture and traditional agriculture

If contemporaries believed that Spain suffered from unfavourable resource endowments for cereal farming, they thought otherwise in the case of vines. Cyrus Redding, in his major book on wines published in the middle of the nineteenth century, noted that:

> southward of France geographically, Spain should from its happier climate as a wine-growing country, precede it in the excellence of its vines, . . . if France comes before Spain in its wines, it is because science has led the way to excellence there, and enabled the French to obtain, by delicacy of management, by art and by labour, that which nature had well-nigh accorded to Spain without such appliances.[30]

Certainly most wine production in Spain was primitive, but the country's comparative advantage lay not so much in quality, as quantity. Large areas of the country were suitable for vines – land which had only a marginal use for other forms of agriculture. According to Le Roy Ladurie, the 'classic response of Mediterranean agriculture to a rise in population' was to 'plant trees or vines on old or new assarts, thereby increasing the returns from agriculture by more intensive forms of land utilization'.[31] Vines in Spain were rarely irrigated and summer drought meant that intercropping was generally impossible except with immature plants. If viticulture required greater quantities of labour than cereals, seasonal demand was less pronounced, which made the crop, as Le Roy Ladurie noted, popular with smallholders. An indicator of the greater output per hectare is shown in table 3.2, where vines produced 119 per cent more per hectare than wheat in the period 1897/

[29] Grigg (1992, p. 40). One area where the United States did differ from Spain was in the considerable rise in labour productivity during the nineteenth century.
[30] Redding, quoted in Read (1975, p. 36).
[31] Le Roy Ladurie (1976, pp. 56–7).

Table 3.2. *Area and value of output of different crops, 1897/1901*

	Gross output/hectare sown (pesetas)	Area sown ('0000s hectares)
Wheat	134[a]	3,733
Barley	107[a]	1,376
Maize	295	465
All cereals (ex. rice)	120[a]	6,781
Vines	293	1,429
Olives	186	1,197
Oranges[b]	1,214	42
Almonds[b]	610	41
Potatoes[b]	819	243
Sugar beet[b]	1,095	21
Rice	1,882	34

[a] Figures for wheat and barley have been divided by two to take into account one year's fallow.
[b] Oranges, almonds, potatoes and sugar beet are for 1902.

Source: Simpson (1995a, Appendix 1a and 1b).

1901. This figure should be taken as a minimum, as in numerous provinces wine output was lower on account of disease (phylloxera), and low commodity prices reduced labour inputs from what they had been a decade or so earlier.

The amount of labour required in traditional viticulture to clear and prepare the land before planting depended not only on the nature of the terrain, but also the price of wine. By the late nineteenth century, market conditions increasingly played an important role in determining labour inputs, as the provincial agronomist noted in Valencia.[32]

> In prosperous years, such as occurred in the five years from 1880 to 1885, the cultivation of the vine advanced in intensity from year to year, the plantations being made with great care after deep ploughings, the digging of spacious holes for the shoots, and abundant manuring. Today (1889), circumstances have unfortunately changed for agriculture generally, and those cares and ploughings, while still taking place with some regularity, are not able to reach such a degree of perfection on account of lack of resources.

Annual cultivation was also labour intensive with hand tools, rather than ploughs, being used almost everywhere except in La Mancha in the mid-nineteenth century.[33] A combination of irregular spacing, difficult terrain, and fragmented small-holdings hindered the use of

[32] Dirección General de Agricultura, Industria y Comercio, 1891a, p. xv.
[33] Hidalgo Tablada (1870, p. 272).

animals in other areas. Pruning and harvesting were naturally both labour intensive. With respect to wine making, the soft skin of the grape made the extraction of the must a relatively simple task, being done by treading the grapes in 'almost all provinces'.[34] The containers used for fermenting the wine reflected closely local resources, but wood was rarely used. Finally, wines were frequently strengthened by the addition of alcohol, both to reduce the fiscal impact of domestic sales taxes and transport costs (see chapter 4) and to extend the product's life. It also served to disguise the poor conditions under which it had been made.[35]

The heavy labour requirements both in the initial planting of vines, and in their subsequent exploitation, encouraged small units of production, using family labour. In Cataluña, landowners had responded to the growth in demand for spirits and wine in the seventeenth and eighteenth centuries by the use of sharecropping arrangements – *la rabassa morta* – which had originally given peasants almost unlimited use of the land, thereby offsetting both the high cost of land clearing and the particularly labour-intensive nature of local wine production. Although changes took place in the nature of the *rabassa morta* during the nineteenth and twentieth centuries, it would remain a long-term sharecropping contract.[36] As contemporaries noted, the advantage of these contracts was that vines were cultivated on lands where they otherwise would not have been if wage labour had been used.[37] Outside Cataluña, sharecropping also appears to have been fairly common in viticulture in Zaragoza, Huesca and Navarra.[38] Nearly everywhere, however, vines were worked by landowners or sharecroppers. Land was rarely leased because of the greater labour requirements in contrast to cereals, and because tenants would have had little interest in conserving the capital value of the vineyard.[39] It would be the response of these smallholders, using periods of underemployment to extend the area,

[34] Elías de Molins (1904, p. 102). The use of mechanical crushers before the turn of the twentieth century was rare; two major sources, the *Exposición Vinícola Nacional* (1878–9) and *Ministerio de Fomento* (1886) barely mentioned them. Their appearance can be linked to the decline in wine prices and the increase in wages during the early twentieth century.

[35] For example, almost all wine produced in Ciudad Real was strengthened, whether for local consumption or for export (Ministerio de Fomento, 1886, p. 81).

[36] See especially Giralt i Raventos (1965), Balcells (1980), Colomé i Ferrer (1990).

[37] EPAPM (1904, no. 414, p. 711).

[38] See Espejo (1900, pp. 196, 216 and 223); Laguna (1903, p. 108). In particular, there seems to have been a correlation between falling wine prices and the growing use of sharecropping contracts in viticulture; see Espejo (1900 p. 196) for Zaragoza, and Simpson (1985b, pp. 180–1) and Zapata (1986, p. 283) for sherry in the 1880s.

[39] For a theoretical approach to the question of sharecropping, monitoring costs and moral hazard, see Galassi's work on Tuscany, especially that of 1992.

which accounted for the significant growth in output and commercialisation of wine from the 1870s (see chapter 4). For example, in Zaragoza, landless labourers planted vines on scrub land (*monte*) and the high prices provided the income to allow them to acquire small plots of irrigated land in the valley. It would not last long, as falling wine prices from the late 1880s were met by either reducing variable inputs (labour) to a minimum (ploughing but not hoeing, pruning and harvesting), or by abandoning cultivation completely and using the land for pasture.[40] However, in general, supply had a tendency to be 'irreversible', as farmers were reluctant to uproot plants to reduce output in periods of low prices.[41]

Given the large areas in Spain suitable for viticulture, the labour-intensive nature of production, and the difficulties in transportation, it is hardly surprising that the very great majority of wines were of poor quality, and that most villages kept them for their own consumption, with the small quantities exported being produced near the coast. As Ford had noted in the 1840s:[42]

> Local is everything, the Spaniard takes the goods that the gods provide him, just as they come to hand; he drinks the wine that grows in the nearest vineyards, and if there are none, he regales himself with water from the least distant spring.

With the development of rail communication, wines could be transported greater distances. However, the great wine 'boom' of the 1870s and 1880s saw few changes in production techniques. Where possible, farmers extended the area of vines on previously worthless scrub, or at the expense of marginal cereals, such as noted above in the case of Zaragoza. When this was not possible, farmers worked the soil to take maximum advantage of the limited quantity of moisture. Product adulteration was also another method to raise short-term output.

In conclusion, growing commercial opportunities allowed traditional viticulture to respond by extending the area cultivated using few technical changes. These methods were sufficient given the high commodity prices until the late 1880s, and the lack of product differentiation within both domestic and French demand for wine. With time, disease (phylloxera, which by 1909 had already destroyed over a million

[40] Rivera y Casanova (1897, pp. 93–4).

[41] This makes estimating changes in wine productivity very difficult. Apart from the problems in determining changes in product quality over time, output was essentially a function of the age of the plant, climate variations and labour inputs. As the latter responded to short-term changes in product prices, they hide longer term changes.

[42] Ford (1970, p. 159).

hectares of Spain's vines), low wine prices and rising wage costs, led to a complete reorganisation of production, as will be discussed in chapter 9.[43]

New crops and delayed institutional change: the case of Galicia

The experience of Galicia, together with other areas in the North, was different from that of the rest of the country for two reasons. First, the possibilities of extending the area cultivated were much less than elsewhere and second, climate and soils permitted the introduction of new crops and an intensification of rotations in response to population pressure. Despite these differences, technology again went unchanged and if the growth in labour inputs increased production, it was at the expense of a decline in output per unit of labour.[44] In this section I consider in detail the changes in Galicia, before extending the general conclusions to other areas of the North.

By the eighteenth century, perhaps 80 or 90 per cent of the cultivated area in Galicia was held under an emphyteusis contract, the *foro*, which gave the *dominium utile* to the peasantry, and left the *dominium directum* in the hands of others, especially the church.[45] As the 1763 *Real Provisión* failed to establish whether the owners of the *dominio directum* had the right to evict their tenants, this effectively gave the tenants indefinite use of the land. Given the limited area of arable land available, the pressures of a growing population led from an early date to the shortening of rotations, with maize being introduced by the end of the seventeenth century. Output was also increased by greater use being made of scrub land, both as a source for organic fertilisers, and for slash-and-burn cultivation.[46] During the period covered by this book, the major innovation was the potato.

The potato was virtually ignored by farmers until the late eighteenth century, and even then its diffusion in Spain, as in other European countries, would be slow. As potatoes in Spain produced the equivalent of 6.48 million calories for each hectare sown (some 3.75 million more

[43] Phylloxera first appeared in Spain in the early 1870s, but made little headway before the late 1880s. See especially Carnero i Arbat (1980, chapter 3).

[44] For comments on agricultural technology in Galicia at the end of the nineteenth century, see Dopico (1983) and Barreiro Gil (1983).

[45] Saavedra and Villares (1985, p. 467).

[46] For example, in eighteenth-century Galicia, slash and burn cultivation provided up to 50 per cent of winter cereals in some villages, as well as providing fertilisers and pasture for livestock (Saavedra and Villares, 1985, p. 455; García Fernández, 1975, pp. 128–30).

than could be achieved with wheat cultivation), the reluctance of farmers to grow the plant is often regarded as a missed opportunity to improve diets.[47] In the words of one European historian:[48]

> Perhaps nothing better illustrates the conservatism and suspicion of the peasants, and the injuries that they inflicted upon themselves by their obduracy and ignorance, than their long resistance to planting and eating potatoes.

A number of reasons can explain this resistance, namely the crop's novelty, institutional restrictions and technical factors, including the need to change existing crop rotations, the adaptation of seeds to local conditions, and problems of storage. Only the first of these can perhaps be associated with peasants' 'conservatism'. Just as Blum noted for central and eastern Europe, the acceptance of the potato by Spanish farmers was usually associated with hunger, which 'swept away the peasants' scorn for the vegetable'.[49] In Galicia the area sown was extended after the famine of 1768–9,[50] but it would be the food shortages which accompanied the French invasion and Peninsular War that popularised its use.[51]

The question of seed selection appears crucial in some areas to the speed of diffusion. In neighbouring Asturias, the introduction of the potato within the main rotations (*terrazgo*) failed, because the initially good yields quickly declined, and the potatoes acquired a bad taste. This problem was not present on the upper lands, and it was here that the crop was mainly cultivated. In the 1850s – a period of bad cereal harvests – it was discovered that potato seed from the uplands gave good results on the *terrazgo*, and it was reintroduced. However seed problems continued until the end of the century.[52]

[47] Based on a net potato yield of 9.26 tons (Ministerio de Agricultura, Industria, Comercio y Obras Públicas, 1902), with seed requirements estimated at 2 per cent, and 700 calories producd per kilogram. By contrast, the net wheat yield was 0.67 tons for 1897/1901 (Sotilla, 1911), with seed corn estimated at 16 per cent of harvest, the flour coefficient 0.75 per cent, and 3,420 calories produced per kilogram of flour. For each hectare of sown wheat some 1.73 million calories were available. Doyle in 1784 suggested that the potato supported more than four times as many people as wheat, without the risks associated with wheat such as inclement weather or locusts (cited in Meijide Pardo, 1984, p. 12).

[48] Blum (1978, p. 272).

[49] Ibid. (p. 273).

[50] Lucas Labrada (1971, p. 27).

[51] Meijide Pardo (1984, pp. 16–17). The same was true elsewhere in the North. For the Basque Country, Bilbao and Fernández de Pinedo (1984, p. 166) suggest that contact with potato-eating French troops encouraged the plant's use amongst the local population.

[52] González Llana, (1889, cited in García Fernández, 1988, pp. 112–18). As the potato was finally introduced successfully on the *terrazgo* during a period of famine, it is not clear to what extent the delay had been caused by difficulties associated with the seed,

Population grew in Galicia from 1.3 to 1.8 million between 1752 and 1860, and there is a significant correlation between zones of greatest demographic growth and those where the potato first appeared and achieved its greatest intensity.[53] The lack of commercialisation of the potato can be explained by its low calorific content to weight ratio. Its price was rarely quoted with other agricultural products during the first half of the century. Indirectly however, the potato allowed peasant farmers to sell other products which they had previously devoted to their subsistence, especially cereals. As a result Galicia, which in the late eighteenth century had imported cereals, was exporting them by the 1820s despite a larger population.[54]

The final question was that of property rights. Being a new crop, the potato was exempt from tithe payments and the ecclesiastical authorities complained that farmers dedicated substantial resources to it for this reason alone. However, by the nineteenth century the effective opposition of the church appears to have been limited. By contrast, the *foro* contracts did not pose a restriction, so that the potato (like maize in the seventeenth and eighteenth centuries) was regarded as being compatible with the existing institutions.

In contrast to other areas of Spain, the nature of land ownership in Galicia implied that nineteenth-century changes in property rights released relatively little land for cultivation. Furthermore, the sale of ecclesiastical lands failed to join the *dominium utile* and *directum* in the hands of one owner but rather consisted of the 'transfer of rentiers rights and not of land'.[55] Given the limits of marginal land in the mid-nineteenth century, increased output was achieved by changes in crop mix and rotations, and not through improved property rights. The region therefore differed from the rest of Spain.

Yet property rights are generally considered as having restricted growth, and from the 1840s there was increasing criticism of the *foro* contracts. In particular, the *foro* was seen as both causing the further subdivision of property (and consequently making it extremely difficult to consolidate holdings at a later date) as well as leaving farms without

and to what extent other factors, such as consumer preference for other products, delayed its diffusion. For Galicia, see Rodríguez Galdo and Dopico (1981, p. 61).

[53] Rodríguez Galdo and Dopico (1981, p. 38).

[54] *Junta de Comercio*, La Coruña in 1833, cited in ibid. (p. 58).

[55] Villares (1982, p. 145). The State failed to sell virtually any municipal land as in Galicia it was the villagers and not the municipality who owned the property (ibid., pp. 157–8). More recently, Quintana Garrido (1990, pp. 148–51) has suggested that Villares perhaps underestimated some of the changes in property rights in nineteenth-century Galicia.

working capital.[56] Therefore, although the *foro* institution proved flexible enough to allow both the introduction of new crops and the shortening of rotations, it failed, or indeed perpetuated, the subsistence nature of Galician agriculture. It was also a major factor in leaving the region with a staggering 15 million holdings in 1959.[57]

Attempts to reform the tenure system met with opposition from rentiers, many of whom were urban dwellers and had bought their 'property' during the sale of ecclesiastical lands. The lawyer Linares Rivas argued in the 1860s that alternative investments to the *foro*, such as commerce, would have led to quick ruin given the rentiers' lack of experience and difficulty of obtaining it in Galicia, 'where we do not breathe the same air as in modern towns'.[58] As a result, the 1873 legislation, which ended the institution, lasted less than six months.

However, the growing integration of the Galician economy within the national and international would signal the institution's slow demise. From the eighteenth century in Galicia, it was common for household economies to receive an important cash contribution from migrant workers, with as many as 90,000 workers (equivalent to 38 per cent of the active population) making an annual exodus each spring.[59] From the 1830s and 1840s, emigration to South America became increasingly common, in part because of the decline in local rural industries and the inability to increase agricultural output more quickly without diminishing returns, but also because of the introduction of cheaper and quicker international transportation. Between 1860 and 1900 net emigration from Galicia was equivalent to 20 per cent of the region's total population in 1860, less than half the number in Ireland (46 per cent), but considerably more than the Italian figure (12 per cent).[60] As with the earlier migrations, a major part of this emigration was male and temporary, with the emigrant attempting to obtain a source of outside

[56] Recent research has suggested that between 1750 and 1880 the importance of the foral rentals was in fact declining (although more than compensated by the peasants' growing obligations to the State), and property had become no more fragmented over the period. The redemption of the *foros* from the 1890s further intensified the subdivison (Villares, 1982).

[57] Of these, 23.3 million were of less than half a hectare, and only 0.1 million had more than 10 hectares (García-Badell, 1960, cited in Malefakis, 1970, p. 18).

[58] Cited in Villares (1982, p. 278).

[59] The main destinations were the cereal harvests of the two Castillas, Andalucía and Portugal (Laborde, cited in Domínguez Martín, 1992, p. 155). This was not so different from Ireland in the early nineteenth century, where 'like the potato and cottage industry, it [seasonal migration] accommodated population pressure on the land' (Ó Gráda, 1989, p. 15).

[60] Carmona Badía (1990, esp. pp. 32–4). Nationally the figure was considerably less, as discussed in chapter 10.

capital that would protect and strengthen his hold on his small farm.[61]

In common with other regions of Europe with abundant pastures and situated at a distance from urban markets, the North specialised in livestock production. As early as 1802 it was noted that the sale of animals provided an important cash income for farmers (see chapter 8). From the 1860s the region began to supply England and later Portugal, with the number of animals sold each year reaching a peak of 40,000 in the 1880s before declining in the 1890s. However, this decline was more than compensated for by the growth of sales within Spain, with the numbers despatched by rail increasing from an annual average of 90,000 head in 1907/10 to about 200,000 in 1926/30.[62] By the Second Republic, the equivalent of about one-fifth of Galicia's cattle was moved out of the region annually.

Armed with growing sums of cash from livestock sales and emigrants' remittances, the peasants from the 1890s started buying out their landlords. Peasant organisation, rent strikes and occasional violence also took place, so that the *Real-Decreto* of 1926 permitting the redemption of the *foros* by the farmer merely signalled the State's recognition of what had already become a reality in the Galician countryside. However, despite these changes, the region remained extremely poor. In 1910, when some 78 per cent of the active male labour force was employed in agriculture, it was noted:[63]

> Scarcity of manual labour, the employment of heavy primitive agricultural implements, and the absence of scientific methods account for the poor returns for the hard labour of the industrious peasants, who work from dawn to night to scratch a bare living from the soil.
>
> Women and little children appear to perform nearly the whole of the hard labour of ploughing and harvesting, and only in the neighbourhood of the towns are good results obtained from market gardening, which is the favourite occupation of the scanty male population.

Despite a diversified diet, the region's farmers suffered from a shortage of good land, *minifundios*, working capital and, as noted in the previous chapter, weak market integration.

Conclusion

In this chapter it has been argued that an extension of the area cultivated was sufficient to feed the extra 10 million inhabitants that were added to the country's population over the eighteenth and nineteenth centuries. In the same way, the growth of the country's agricultural exports would be successfully achieved by increasing the use of factor inputs rather than technical change.[64] The key to unlocking the potential of these lands was institutional reform which allowed farmers access to the land and gave them more clearly defined property rights. Only in the North, where the area of potential land suited to both short fallow rotations and intensive annual cropping was severely limited, did attempts take place to increase crop yields.[65] However, as elsewhere, the introduction of labour-saving technologies was of little importance, and the tendency for unit labour output to fall could only be offset by increases in commodity prices. I shall consider this process in the following chapter.

Where abundant, under-utilised resources existed, as in Spain, it was unnatural to expect farmers to be interested in raising labour or land productivity by introducing new production techniques. Therefore, for farmers and rentiers alike, the most profitable agricultural investments would remain the extension in size of their land holdings.

[61] Villares (1982, p. 400).
[62] Ibid. (p. 377).
[63] British Parliamentary Papers, 1910, no. 4625, pp. 7–8.

[64] One exception was sherry, discussed in the following chapter.
[65] Increased crop yields were also attempted in the few areas of irrigation (see chapter 6).

4 Agricultural specialisation and the growth of markets

In the mid-eighteenth century, the low purchasing power of much of the population placed it at risk from harvest failure. A slow and costly transport system, inefficient transmission of market-place information, and government interference with the market mechanism all implied that short-term local shortages were difficult to overcome and that local prices of basic foodstuffs might double or more in a short space of time. To protect themselves from adverse price movements, farmers dedicated a significant part of their resources to growing basic food crops, regardless of the suitability of their land for such production. By contrast, the more integrated markets to be found by the end of the nineteenth century not only permitted farmers greater security of supplies, but also allowed them the possibility of specialising in those crops most suited to local climatic and soil conditions, especially those that factor and product prices showed were most profitable.

In the first section I argue that Spain's transport system improved significantly over the century prior to the railways although, in comparison with France, the country was to continue to suffer severely from an inadequate road network and an almost total lack of inland water communications. Greater market integration, however, was not just a question of public works; it also implied a complete overhaul of the *Ancien Régime*'s concept of the market. In particular, official policy changed from one of trying to protect the consumer by fixing maximum prices to one of letting them be determined by the market, with recourse to external supplies in years of significant harvest failures.

Improvements in transport technologies, the decline in freight rates, and the liberalisation of market operations had two important consequences. For wheat consumers the greater stability in supplies, rather than a fall in commodity prices, became the major feature. By contrast, for producers, cheaper freight allowed them to raise prices and extend the area cultivated on marginal lands. The supposedly 'irrational' ploughing up of 'marginal' lands was the farmers' response to a strong

upward movement in farm prices. Only in the 1880s and 1890s, when falling international prices threatened to make domestic cereals unprofitable on the marginal soils, would the process be temporarily halted. Thereafter, as chapter 10 will show, the price of wheat, and through it the area cultivated, was determined by government tariffs and price policies.

Finally, I examine the impact of changes in international demand for wine on domestic production. In each of three different examples – Cataluña (wine spirits in the late eighteenth and early nineteenth centuries), Jerez de la Frontera (sherry in the mid-nineteenth century) and bulk table wines (1870s–1890s) – producers were quick to spot commercial opportunities to extend the area cultivated to meet the growth in demand. The chapter's conclusion is that the cause of agriculture's low productivity was not that producers failed to respond to commercial opportunities. By the late nineteenth century, both national and international markets were having a major impact on farming decisions in most corners of the country. Rather, low productivity was caused by the traditional farming systems that prevailed due to the extensive areas of undercultivated land existing at the start of the period (chapter 3) and the relatively cheap supply of harvest labour (chapter 7).

Physical and institutional restrictions to trade

The pre-rail transport system in Spain was costly and inefficient.[1] In part, this was caused by problems common to most pre-industrial European countries, namely the relatively high capital requirements of road building owing to the deficiencies of the national exchequer, low population densities (and therefore relatively high per capita costs of public works programs) and the high cost of animal energy (mules, oxen). These were compounded by two features peculiar to Spain: its virtual lack of navigable rivers and canals (much the cheapest method of traditional transport in pre-industrial economies), and the decision to locate its capital some 350 kilometres (220 miles) from the nearest major port, Valencia.[2] As with other European countries, attempts to overcome these restrictions can be dated from the mid-eighteenth century.

In the mid-eighteenth century, Spain had less than 10,000 kilometres (6,000 miles) of unpaved roads suitable for wheeled traffic, making

[1] See especially Ringrose (1970) and Gómez Mendoza (1982).

[2] Only the lower reaches of the Guadalquivir and Ebro rivers were navigable, but many others provided physical obstacles which required bridging, and at times they were prone to severe flooding.

Table 4.1. *Length of paved roads and railways, 1750–1908 (km)*

	Roads	Railways
1749	0	0
1779	400	0
1800	2,000	0
1834	4,000	0
1855	10,323	440
1868	19,815	5,269
1884	23,368	8,165
1890	28,621	9,083
1908	41,466	11,362

Sources: Roads (1747–1868): Madrazo (1984, pp. 163–79), Frax Rosales and Matilla Quiza (1988, p. 209); railways: Cordero y Menéndez (1978, Apéndice 11-2, pp. 324–5).

transport slow, irregular and expensive.[3] Following the French example, the Spanish government started a road building programme in 1749 which served first and foremost in centralising the communication needs of the state, linking the capital by paved roads to six of the country's ports.[4] It took 85 years to finish these six roads, but then, in the space of 30 years, the construction of paved roads in Spain almost quadrupled to nearly 20,000 kilometres (12,500 miles) by 1868 (table 4.1). Thus in the century prior to the railways, Spain's transport system changed from being based essentially on pack animals (usually mules) to one using carts.[5] Yet in spite of these improvements, France, a country of similar size, enjoyed a road network eight times larger than Spain's, together with over 11,000 kilometres (7,000 miles) of navigable water by the mid-nineteenth century.[6]

[3] In Spain, as elsewhere, the condition of roads depended not only on their construction, but also on the amount of traffic that they were required to carry. This led to the best roads being found in the sparsely populated regions of La Mancha, and the worst roads in the most commercially active region of the country, Cataluña (Fontana, 1975, pp. 29–30).

[4] In 1700 Spain's road network was decentralised, with no single point of the country serving as a central hub of communications; but, by 1800, Madrid had firmly established itself as the centre, with three-quarters of the 2,000 kilometres of paved roads built by this later date corresponding to these six arteries.

[5] Fontana (1986 p. 86). Improved organisation of transport services (relay teams) and carriages (stagecoaches) also helped reduce the journey-time for passengers. For example, the journey from Irún to Cádiz via Madrid, which had taken 24 days in 1776, took only seven days in 1850 (Madrazo, 1984, p. 548).

[6] Gómez Mendoza (1982 p. 24).

Table 4.2. *Estimated costs of commercial transport,[a] 1872 and 1912*

	1872	1912
Rail		
cost[b]	0.02	0.02
charge	0.09	0.07
Coastal shipping	0.04	0.04
Canals	0.14	n.d.
Roads	0.82	0.88

[a] Prices in pesetas per ton-kilometre.

[b] The cost price of railways is that estimated by the *Norte* and *MZA* to transfer products (coal) for their own use (*Tarifa de servicio*).

Source: Gómez Mendoza (1982, tables 3.2 and 3.3, and pp. 77–8).

Although greater investment in road improvements increased the efficiency of Spain's transport services in the century prior to the railways, the impact on transport costs would be limited. In the pre-railway age, draught animals were the main source of energy in transportation, and for professional carters between a third and a half of total costs was absorbed by animal feed.[7] Therefore carting costs depended considerably on agriculture's ability not just to improve livestock breeds, but also to provide a cheap source of animal feed, neither of which were achieved until well after the advent of both the railways and the internal combustion engine.

It has been calculated that by 1878 the railways, which effectively replaced an animal-based energy source with a mineral-based one, saved the equivalent of 0.5 million mules and oxen, and about 1.12 million hectares of barley to feed them.[8] As Wrigley has noted, rail transport not only permitted the movement of far heavier loads, and at a significantly greater speed, but also had the capacity to increase output without any demands on the domestic agricultural system.[9] Unit transport costs fell, permitting a widening of the market, growth in urbanisation, and an increase in agricultural

[7] Refers to 1878 and is based on two mules led by one man (53 per cent), one cart pulled by two mules (50 per cent), and one cart pulled by two oxen (38 per cent) (calculated from ibid. (cuadro 3.5 and 3.6)).

[8] Ibid. (p. 97). The model used assumes that all goods that were transported by rail were moved by the next most efficient system of transport.

[9] Wrigley (1988, pp. 27–30).

specialisation.[10] The greater efficiency of railways is highlighted in table 4.2, but the lack of competition to them in much of Spain prior to the internal combustion engine implied that complaints by farmers on the tariffs that they charged was especially bitter. In May 1880, for example, Costa noted that it was cheaper for wheat to be brought from California to Barcelona or Bilbao, than it was from Palencia or Arévalo, two major centres of production in the Interior, to Barcelona.[11] Although Spain's domestic rail tariffs would fall, the above situation appears not to have changed significantly on the eve of the First World War.[12] From the time of the Great War, however, the question of transport costs for cereal producers was only part of the much wider question of government intervention in domestic markets, as will be shown in chapter 10.

Physical relief, transport technology, and levels of investment in infrastructure were not the only restrictions on the development of the national market in the pre-industrial era. There was, as today, often a conflict of interest between the farmer and consumer, and it was the government which determined the legal framework in which the rules of supply and demand would operate. In addition, government bodies at both national and local levels often intervened to tax agricultural commodities to raise revenue. It was natural, therefore, that both producer and consumer should look to the government for protection in times of difficulties, and the government in turn should be concerned about the impact on an important source of its revenue by exogenous changes in the market. It is also not surprising that almost all agrarian reformers of the period should have characterised government intervention in the market as either insufficient to protect farmers or as harmful to trade. Here I describe the gradual freeing of the internal market for cereals from trade restrictions during the eighteenth and nineteenth centuries, leaving to part 4 their reappearance in the twentieth century.

Until the sixteenth century, the limited size of most inland cities in Spain meant that their grain demands seldom exceeded the supply from their hinterland – the rural areas where the city had special rights and

[10] The rate of rail construction in Spain was slow in comparison with other countries, with only 440 kilometres completed in 1855, compared with 1,207 kilometres in Italy, 5,037 in France and 11,744 in the United Kingdom (Mitchell, 1992 pp. 655–6).

[11] Costa (1911a, p. 124). Complaints of high rail tariffs at this time were by no means limited to Spain; for France, see Moulin (1991, p. 91).

[12] *Cámara de Industria de Madrid*, 1912, p. 40. Tariffs for wheat and flour fell from 0.094 pesetas/ton/kilometre in 1878 to 0.064 pesetas in 1905 according to Gómez Mendoza, cited in Garrabou and Sanz (1985, p. 52). See also Gómez Mendoza (1989, pp. 47–51).

privileges to the agricultural surplus.[13] Everywhere cities tried to control supply and demand by reducing to a minimum the possibilities of speculative profit. Three legal instruments were used. First, the use of the *tasa*, or maximum price at which wheat could be sold.[14] Second, an attempt was made to control grain merchants by eliminating the possibility of short-term speculation by forbidding the purchase of grain for storage and later resale. Prices could be raised between the point of production and consumption by a margin only sufficient to cover transport costs. There was no room, therefore, for the grain merchant who might buy when prices were low, and sell when high. By contrast, direct contact between the small farmer and domestic consumer in the official markets was encouraged.

Finally, these legal controls of the market were supplemented by public granaries, the *pósitos*. These were originally designed to form a buffer stock, buying and storing grain at times of surplus, selling at times of scarcity, in an attempt to influence price, a situation not dissimilar to a central bank today trying to 'defend' a national currency.[15] The major difficulty facing the *pósito* was that of balancing its books. Without knowing the full size of the harvest, the town had to buy sufficiently to restock or replace old grain. Freed from its public duty, the *pósito* might have made large profits, but its social duty to stabilise the market often implied large losses which had to be borne, in one form or another, by the municipality.[16]

By the 1750s, the disadvantage of a system which relied upon municipal or, in the case of Madrid, national finances, to be used to balance supply with demand, was becoming all too apparent.[17] A renewed growth in population and a run of poor harvests encouraged new

[13] As Madrid's population grew from approximately 109,000 in 1700 to 190,000 in 1800, and reached 246,000 by 1850, its food demands naturally increased at roughly the same rate. Coastal cities were less at risk because of the greater possibility of obtaining imports in years of shortage.

[14] The first general *tasa* was introduced in the Crown of Castilla in 1502. When the underlying price level was depressed, the *tasa* was rarely used, but when grain prices started moving upwards, such as between 1740 and 1760, it became a controversial policy instrument. When it was operative, holders of stocks were forced to sell at the fixed price.

[15] The comparison is not exact. An important difference was that the market policy of the *pósito* was often determined by the municipal officers, often themselves important producers, leading to a conflict of interests. I owe this point to Enrique Llopis. See also Caballero (1864, pp. 132–3) and Reher (1990a, p. 158).

[16] Castro (1987, pp. 106–7).

[17] For example, the imports from Naples and Sicily to supply the Madrid *pósito* in 1753 and 1754 cost the national exchequer 6 million reales, and the *pósito* had debts outstanding of 4.4 million reales owed to the *Cinco Gremios Mayores* (ibid., p. 118).

thoughts concerning the role of the market. Two ideas in particular were borrowed from those developed by the physiocrats and others in France. First, the need to encourage farmers to increase production began to be seen as the best way of securing adequate food supplies, rather than trying to shelter the urban consumer from the consequences of harvest failure. Farmers, it was argued, would respond to higher prices by producing more.[18] Second, there was the need to free the market from all legal restrictions. Campomanes, a leading member of the Spanish Enlightenment and a politician, argued that artificially low prices restricted production, and the strong fluctuations in grain prices dislocated the national economy. Grain merchants would, he argued, match supply with demand, and food would circulate freely, costing the state nothing.[19]

In 1765, the *tasa* was officially abolished, although it would take at least half a century for a free grain trade to be fully accepted and operative in the whole country.[20] The reasons are various. First, it took time for a sufficient number of grain merchants with established granaries to appear, which would enable the quick and effective movement of supplies to alleviate local shortages. Without enough merchants, the government rightly feared that supplies would simply be held in the hands of a few, who would effectively enjoy an oligopolist position.[21] Second, for a market system to work efficiently, sufficient information on prices and stocks would be required for consumers to act rationally. As is well documented in many European countries, this information was usually unavailable, and rumour and 'fear' acted instead. Finally, falling transportation costs would be needed to extend the market for grain producers, and reduce the impact of local harvest failures.

It is probably only in the decade following the Peninsular War that conditions permitted a relatively free movement of cereals within the country. The advantages for farmers would be significant, as one example will show. López y Peñalver noted that in Palencia after the 1806 harvest, wheat was so plentiful that it could only be fed to the pigs. He argued that a succession of good harvests were accompanied not just by low prices, but also by high labour costs. This in turn encouraged a

[18] The Real Provisión of 1735 had anticipated this change by giving the *pósito* the responsibility of guaranteeing farmers loans of seed corn until the following harvest. Administrative restructuring in 1751 strengthened further this emphasis on production rather than just consumption, and the number of *pósitos* run by municipalities (but centrally controlled) reached 5,225 in 1773. See Anes (1969, pp. 73–94).

[19] Campomanes (1764, cited in Castro, 1987, pp. 126–7).

[20] Larraz (1935, p. 19) suggests that only after 1834 was unrestricted internal trade finally achieved.

[21] See especially Anes (1970a), Yun Casalilla (1989 and 1990) and Llopis (1989).

reduction in the area sown, thereby worsening the situation when the inevitable poor harvest came.[22] The example of Palencia is important, because it was to be one of the leading provinces in the growth of internal and colonial trade in wheat from the 1820s.[23]

Restrictions to trade were further improved with the abolition of internal tolls (*pontazgos* and *portazgos*) and of the last internal customs barrier with the Basque Country in 1841. However the *consumo*, a sales tax levied on the entry of goods into cities and municipalities (which raised prices thereby affecting consumer demand), remained operational in one form or another throughout much of the period. Rates varied according to product, place and period, but the produce worst affected was wine. Again one example will suffice. In the early 1920s the major cities (for example, Madrid, Barcelona and Valencia) taxed wine by at least 10 pesetas a hectolitre which, when added to the depressed price of that period of 15 to 18 pesetas, implied a tax rate of between 36 and 40 per cent. To reduce the effective rate of taxation to a minimum, producers strengthened wines with alcohol to the maximum permitted, and then watered it down once duty had been paid.[24]

Nineteenth-century market integration: the case of wheat

If in the 1770s Adam Smith could write that 'the prices of bread and butchers' meat are generally the same, or very roughly the same throughout the greater part of the United Kingdom',[25] this was not the case in Spain, nor in much of continental Europe. In the pre-railway era, prices were lower in Spain's main wheat growing area, the Interior, than in the coastal provinces, although the latter's ability to import in years of harvest failure resulted in greater price stability.[26] To take an extreme example, the May price for wheat in Medina de Ríoseco (Valladolid) in 1804 was some 348 per cent higher than it had been

[22] López y Peñalver (1812, pp. 3 and 8).

[23] Sanz and Garrabou (1985, pp. 15–67), Yun Casalilla (1991, pp. 47–76), Hoyo Aparicio (1991, ch. 3) and Kondo (1990, pp. 83–6 and 130–43).

[24] Confederación Nacional de Viticultores (1925, pp. 11–19).

[25] Smith ([1776], 1970, p. 177). Schofield has noted for England that the 'demographic record . . . points to an increasing integration of market networks over the seventeenth and early eighteenth century' and 'in the case of wheat, regional prices were moving in a way that suggests the emergence of a national market by the 1690s' (Schofield, 1983, p. 91). In France, it has been suggested that a single market was achieved only in 1863, with the extension of the railways (Renouard, 1960, pp. 42–4, cited in Price, 1983, pp. 309–10). For wheat prices in the Spanish Interior in the eighteenth century, see Escrivá and Llopis (1987).

[26] Anes (1969, pp. 45–70).

Table 4.3. *Fluctuations in wheat prices during the nineteenth century (per cent)*

	Centres of production		Centres of consumption	
	Valladolid	Zaragoza	Barcelona	Valencia
1820/9	100	100	100	100
1875/84	207	137	106	88

Source: Calculated from Garrabou and Sanz (1985, Apéndice 1).

during the previous eleven years, and some 264 per cent higher than it was in Barcelona in the same year.[27] The increase in domestic production and improved efficiency of the market from the 1820s, slowly reduced these regional extremes. However, they were still present during the railway age, as illustrated by the harvest shortage of 1867–8, when in June 1868, wheat prices were lower in Barcelona, a centre of consumption, than they were in Valladolid, a centre of production.[28] The convergence of wheat prices during the nineteenth century was accompanied by three related changes: an upward trend in producer prices, a decline in the importance of local supply-and-demand curves in determining farm-gate prices, and changes in the nature of the subsistence crisis.

Despite occasional significant local fluctuations, the price differences between areas of production and areas of consumption declined as the century progressed. Yet, as can be seen in table 4.3, while prices in Barcelona and Valencia (centres of consumption) changed little between 1820 and 1880, those in Valladolid and Zaragoza (centres of production) increased by 107 and 37 per cent respectively. It would appear that falling transport and transaction costs did not lead to cheaper wheat for consumers, but rather allowed a greater level of product specialisation for farmers, and a steady extension of the area cultivated on increasingly marginal soils, as noted in chapter 3.[29] Higher product prices helped offset the negative impact of diminishing returns to labour.

With a greater integration of national markets, prices were no longer determined by movements in the local supply-and-demand curves. Traditionally, a poor harvest was compensated in part by a sharp rise in prices, whereas a good harvest led to a fall.[30] Although this did not imply complete stability in farmers' incomes, it caused a different set of problems to those of a fully integrated market, where the shortages caused by a poor harvest could be alleviated by supplies coming from outside. This situation was further complicated by the growing integration of international markets, especially because from the early 1880s world prices were below those in Spain. From this period the determining factors in Spain's internal wheat prices were import tariffs and the value of the peseta, and then, from the First World War, increasingly government-fixed prices. With this last measure, policy had effectively returned to that of the *Ancien Régime* (chapter 10).

Consumers benefited from the greater integration of the market, not so much through lower prices, but rather by a greater stability in supplies, leading to a decline in the intensity and frequency of 'subsistence crisis'. At the end of the eighteenth century Spain had seemed incapable of feeding its population, yet appears to have had little difficulty in feeding a much larger one from the 1820s. Indeed, imports of wheat were only permitted after years of harvest failure, in 1825, 1835, 1847, 1856 and 1867.[31] It was not to last, and in the words of one prominent historian:

> The second half of the nineteenth century suffered once again from the old imbalance between men and resources. The recurrence of food crises – in 1857, 1868, 1879, 1887 and 1898 – supplies, in my opinion, the clearest proof of the nation's incapacity to provide even for its most pressing needs.[32]

However, as I have argued elsewhere, food crises need imply neither inefficiencies in agriculture nor in transportation, but rather in government policies.[33] Unless Spain had a comparative advantage in producing wheat, and could export competitively on world markets, it would be rational to expect some of its domestic requirements to be produced outside the country, especially in years of poor harvests. Thus the fact that Spain imported increasing amounts of wheat from the 1880s, which by 1900/9 was equivalent to the output from 318,000 hectares, should not be seen as a failure so much as the consequence of domestic resources being switched into the production of more valuable export crops, especially wine and olive oil.

[27] Fontana, (1975, pp. 25–7).
[28] Sánchez Albornoz (1977, ch. 3). For regional wheat prices in the late nineteenth century, see GEHR (1980).
[29] Events in Spain were therefore similar to what happened internationally. As Harley has written, 'although the price of wheat has fallen during the period of frontier (1850–1913), the movement of the frontier occurred as the local price rose' (Harley, 1980, p. 232).
[30] See Wrigley (1987, esp. pp. 102–8).
[31] Sánchez Albornoz (1963). Not only was Spain self-sufficent in wheat, but there was a small surplus until the 1880s to export to the country's remaining colonies.
[32] Nadal (1973, p. 537).
[33] Simpson (1989a, pp. 370–2).

If markets became increasingly efficient during the nineteenth century, especially after the creation of the basic rail infrastructure, the renewal of subsistence crises from the middle of the century can be seen in part as the result of government trade policy in delaying vital imports.[34] In Andalucía, where hunger would continue the longest, the lack of 'entitlement rights' to food after the sale of common lands would seem to be a further contributing factor, especially for the landless.[35]

Nineteenth-century wine exports

By 1880/4, the vine accounted for 45 per cent of all Spanish exports, before it started a long decline.[36] Low entry costs and extensive areas of suitable land for its cultivation were offset by its perishability (most Spanish wines in their natural state frequently became undrinkable within a few months of production) and by the bulky nature of the product. These problems were overcome by the simple expedient of adding more alcohol to the wine, or distilling it into spirits. With respect to the fruit, conservation was achieved by drying the grapes (producing raisins), although refrigeration at the end of the nineteenth century would allow the export of fresh fruit. For the export market in the pre-railway era, transport costs for wine were kept to a minimum by locating production centres close to the coast. As we saw in the previous chapter, the intensive nature of viticulture made it well suited to the small family farms of the Mediterranean area, and the lack of capital often associated with peasant farming was alleviated in the pre-phylloxera period by the fact that factor inputs tended to be almost entirely labour. The advent of the railways lifted the geographic restrictions on production and resulted in a rapid expansion of cultivation in central Spain.

Wine exports can be divided into two broad types: 'luxury', and 'bulk' or 'table' wines.[37] Luxury wines differed in a number of important ways. First, considerably greater care was taken at all stages of production, and higher capital outlays were required to mature the wine. The result was that quality wines might be sold at prices up to ten times higher

[34] Sánchez Albornoz (1977) has noted how political errors delayed imports and exasperated the difficulties of the 1857 and 1868 shortages (pp. 30–2, 46–52 and 85). It is of interest that the 'crisis' in 1898 took place when a tariff of 3.9 pesetas/hectolitre, equivalent to 16 per cent of the national wheat price, was in force (calculated from GEHR, 1980, cuadro 14).

[35] For the 'entitlement' theory, see Sen (1982, esp. pp. 1–8).

[36] Prados de la Escosura (1982, p. 41). See table 9.1 for the contribution of the vine to Spanish exports over the period.

[37] Most national trade statistics do not attempt to differentiate between the two, although sometimes they distinguish between alcohol content, a factor which may, or may not, be relevant in determining quality.

than normal ones.[38] Second, for the consumer, Spanish luxury wines were rarely drunk with meals, and therefore tended to compete not with table wines but rather with other aperitifs and with whisky, brandy or, later, champagne. Finally, production was strictly limited to a few small areas on account of soil quality and climate. Therefore, for the very great majority of wine producers, the luxury wine market was not an option. In terms of value, however, the export of Spanish luxury wines was at least as important as that of bulk wines during the first half of the nineteenth century (see table 9.1 below). Given its predominance among luxury wines, my comments will be limited to sherry.[39]

Sherry was produced in Jerez de la Frontera (Cádiz) for the export market, with the bulk of it going to the United Kingdom.[40] In the first half of the nineteenth century, the British market had shown a strong preference for wines which were heavy and strong, with port, madeira, malaga and sherry being especially popular. Around the middle of the century, however, there was a drift away from these towards lighter, drier wines, often consumed as an aperitif or with meals.[41] This change in fashion is impossible to quantify, but it did not go unnoticed by contemporaries. Denman, writing in 1876, noted that the:[42]

> general public taste has so manifestly altered that the wine trade is being revolutionised. The strong old Sherries and Ports of the past are gradually being supplemented by lighter qualities, which our fathers would scarcely have recognised as wines. Instead of strong draughts derived from added alcohol, and cloying sweetness from added saccharum, persons are looking for wine flavour, bouquet and cleanness upon the palate.

In Jerez, the change in fashion brought with it a response through changes in the manufacturing process and nature of the end product. At the beginning of the nineteenth century, the principal method of

[38] Price differences are based on sherry (British Parliamentary Papers, Cadiz, 1865, liii, p. 657).

[39] Others included Malmsey produced in the Canary Islands and Sitges (Barcelona), and Málaga or 'Mountain'.

[40] It was noted in 1846 that 'The people at large in Spain are scarcely acquainted with the taste of Sherry wine, beyond the immediate vicinity in which it is made; and more of it is swallowed at Gibraltar at the messes, than either in Madrid, Toledo or Salamanca. Sherry is a foreign wine, and made and drunk by foreigners; nor do the generality of Spaniards like its strong flavour, and still less its high price, although some now affect its use because, from its great vogue in England, it argues civilisation to adopt it', Ford (1970, p. 177).

[41] Drummond and Wilbraham (1958, p. 337) suggest that the custom of taking an aperitif before dinner appears to have been introduced in England in the early nineteenth century, although they do not specifically mention sherry.

[42] Denman (1876, p. 3).

making sherry was by the *añada* system. This involved the laying down of wine year by year, sometimes vineyard by vineyard, and its sale according to its year of production. Before despatch, or sometimes during the making, a certain amount of wine spirit was added. An alternative method, the *solera* system, became more important after the Napoleonic Wars. By the middle of the century it had become the predominant form of sherry making,[43] and can be directly linked to the growth in *fino* exports to the United Kingdom. The fino was a completely different sherry, and catered for the change in tastes in the British market noted above. Wines were initially stored by the year, as in the *añada* system but, after a number of years, they entered the *solera* which most suited their characteristics.[44] The *solera* consisted of casks of similar wines, each at a different stage of development. The length of the *solera*, together with the number of casks at each stage, varied according to the scale of production and quality of wine required. When a quantity of wine was drawn from the end cask with the most mature wine, it would be replaced in equal quantity by a slightly younger one, in the next cask. The process would then be repeated all along the *solera*, so that as mature sherry was removed from one end, new wine would be entering from the other. Surprisingly, this does not reduce the quality of the wine, because if it is not done in excessive quantities, the younger wine will, within a few months, take on the characteristics of the original wine.[45]

The development of the *solera* system was important for two reasons. First, a homogenous product could be constantly marketed, facilitating the selling of wine by brand names.[46] Two butts of wine produced by the *añada* system in Jerez could differ significantly despite having come from the same vineyard, having been pressed together, and subsequently stored side by side.[47] The second reason for the development of the *solera* was the increased demand for *finos*, as already mentioned. Although excellent *finos* could be produced by storing wine, say for ten years, this involved a considerable outlay of capital. The *solera* system produced an equally acceptable drink after only a few years, cutting

[43] Parada y Barreto (1868, p. 129). Vizetelly found some sherry still being made by the *añada* system, although it had largely been succeeded by the *solera* (Vizetelly 1876, p. 33).

[44] Parada y Barreto (1868, p. 129) and Vizetelly (1876, p. 105) both give four years.

[45] Jeffs (1970, p. 193).

[46] The legislation in Britain in 1861 was especially important as this allowed the sale of wines by people other than publicans, hoteliers or wine merchants, and the British public began to buy sherry under recognised labels (e.g. 'Tio Pepe'), rather than on the advice of their wine merchants.

[47] Jeffs (1970, p. 191).

costs, and increasing the commercial power of the shippers at the expense of the wine maturers.

Demand for Spanish sherry grew rapidly in the middle of the century, with total exports increasing from 125,000 hectolitres in 1855/9 to 282,000 in 1870/4.[48] Of greater significance to producers, prices rose from 40 pesetas a hectolitre in 1851/4 to 132 in 1862/4.[49] Given the time it took to bring plants into production, and the time required to mature the wine, supply from Jerez in the short term was relatively inelastic. As a result, increasing demand for sherry was met by adulteration, using wines from neighbouring Montilla (Córdoba), Moguer, Manzanilla, Niebla, and Bollulos del Condado (Huelva) and Aljarafe (Sevilla).[50] Adulteration was not a monopoly of the Jerez's sherry shippers, however. Because of the lack of product definition, 'sherry' started to be imported into the United Kingdom from countries such as South Africa and Australia. However, the product which did most harm came from Hamburg, which was based on poor wines with potato spirits and saccharine added.[51]

Product adulteration, health concerns with respect to both the genuine product and its imitations, and excessive prices for unadulterated wine severely damaged the sherry trade.[52] The increased customs duty in 1866, allegedly designed to protect the British consumer from fortified wines, reduced demand further.[53] Although exports did not fall off until 1874, and production reached its maximum in the 1880s, this was of no consolation to those producers who aimed at a quality product, as prices peaked in 1863 and then fell significantly (table 4.4).[54]

Given the relatively small area of sherry production in Jerez (around 8,000 hectares in the late nineteenth century), the contribution of

[48] González Gordon (1972, pp. 203–8).

[49] González Gordon (cited in Zapata, 1986, p. 1208). Wine prices refer to must produced on the region's best soil (*albariza*).

[50] Simpson (1985a, p. 309) and López Estudillo (1992, pp. 60–2).

[51] *Medical Times and Gazette*, cited in Tovey (1880).

[52] In 1873, *The Times* carried a letter from a Dr Thudichum which drew attention to the supposed health hazards of the drink on account of the use of gypsum in the crushing of grapes, and sulphur in the fumigation of casks. It started a debate which did not end until a detailed report appeared twenty years later in *The Lancet* which cleared the drink (Jeffs, 1970, pp. 95–8). One wine specialist wrote in the 1860s that 'sherry has long been a favourite wine, but the quantity of bad quality now shipped and sold under its name has already injured its reputation, while high prices of any that is good or old offers an opportunity of another kind' (Shaw, 1863, pp. 142–3).

[53] Although alcohol content in sherry was high, in general it was an unfortified wine.

[54] For producers' responses in the face of falling prices, and the lack of diversification of the local economy of Jerez de la Frontera, see Simpson (1985b, pp. 183–4 and 188–9).

Table 4.4. *Changes in prosperity for sherry producers, 1860–89*

	Annual production ('000 hectolitres)	Price of must[a] (pesetas per hectolitre)	Output (millions pesetas)	Value of output index
1860/4	136[b]	108.0	14.72	100
1865/9	137[c]	68.3	9.34	63
1870/4	n.d.	57.5	n.d.	n.d.
1875/9	180[d]	41.4	7.46	51
1880/4	171	n.d.	n.d.	n.d.
1885/9	215	n.d.	n.d.	n.d.

[a] Prices refer to must produced on *albarizas* soils (i.e. high quality sherries).
[b] Excludes 1861.
[c] Only years 1865–7.
[d] Only years 1876 and 1879.

It has been assumed that the proportion of 'quality' wine to 'normal' remained constant over the period; if the proportion of 'normal' wine increased (as seems likely), the decline in output value would be even greater. If prices are used only for those years when figures for production are available, then the 'value of output index' falls from 100 in 1860/4, to 63 in 1865/9, and to 48 in 1875/9. Production in 1870/4 was probably about 170,000 hectolitres, and the price of must in 1880/9 roughly similar to 1875/9.

Sources: Simpson (1985b, Apéndice A) and González Gordon cited in Zapata (1986, p. 1208).

exports to national production would inevitably remain limited.[55] However, the experience of the 'sherry' boom of the 1860s highlights a more general characteristic of the nation's agriculture, namely the difficulties in introducing quality controls on producers to maintain consumer confidence. The *denominación de origen* was only established in 1933, but even then major difficulties remained in enforcing it.[56]

If sherry was the best known of Spain's wines, its relative importance in terms of volume was insignificant as Spain produced overwhelmingly cheap, bulk wines. The success of foreign trade in stimulating output of bulk wines would depend on the response to the market of numerous small producers, as noted in the previous chapter.[57] That this occurred can be seen in two major wine 'booms'.

[55] For area of vines in the nineteenth century, see especially López Estudillo (1992, pp. 50–2). By 1932–4 the whole province of Cádiz produced less than 2 per cent of Spain's must (by value).
[56] A second question was the protection of the name 'sherry' itself in international markets from other users. Legal action was started in the 1920s, and has only been recently resolved (González Gordon, 1972, pp. 41–52).
[57] The *Confederación Nacional de Viticultores* suggested, no doubt with exaggeration, that almost 4 million people lived from the vine (1925, p. 7).

The first example is the expansion of production and specialisation in Catalan agriculture in the eighteenth century, which helped provide a strong domestic market for the incipient cotton industry. Central to this growth was a viticulture based on small producers and involving the export of spirits rather than wine to South America and Europe. Spirit production was dispersed amongst the vineyards as the type of stills used, *olles* and *fassines*, were cheap in construction and required a minimum of skill to operate.[58] The frequently poor quality of the wine was therefore not a problem. The decline in prosperity of spirit production can be dated to the interruption of commerce during the Napoleonic Wars and as a result of the independence of Latin America, with both spirit and wine prices falling faster after 1817 than those for wheat or olive oil.[59] The second 'golden age' was national in scope, and occurred with the rapid increase in wine exports from the early 1870s to France where phylloxera had severely diminished harvests (see table 4.5). Phylloxera had been first noted in Europe in 1863, and although the disease spread relatively slowly, virtually all vines in time suffered to some extent.[60] The only effective cure was the replanting of vineyards with American disease-resistant root stock, which would then be grafted onto European stock. The impact of the disease in France can be measured by wine production in the period 1876/90 being only 61 per cent of what it had been in 1861/75. Replanting allowed it to recover to 97 per cent by 1901/10.[61] The increased demand for wine from France brought a rapid response from Spanish producers and, as the expansion of viticulture was mainly on land previously devoted to either rough pasture or low yield cereals, output per hectare increased.[62]

If vine growers responded to rising prices in the 1870s and most of the 1880s by increasing output, so too did wine merchants. The French market required a wine with an alcoholic strength of up to 15° for mixing with their own domestic production.[63] Although Spanish wines were naturally stronger than French on account of the climate, most were strengthened with spirits before being exported. This suited wine producers because in the absence of strengthening, most wines would have become undrinkable within a short period of time and could not have

[58] Vilar (1978, p. 278) and Martínez Shaw (1985, p. 75).
[59] Torras Elias (1976) and Fontana (1978, p. 185).
[60] The use of sulfocarbonates and flooding were expensive, and only temporarily halted the disease. The timing of phylloxera's outbreak can be linked to the shortening in travel time between Europe and America, allowing the louse to survive the journey (Ordish, 1972, pp. 5 and 19–23).
[61] Calculated from Mitchell (1992, pp. 313–4).
[62] Assuming a wine yield of 16 hectolitres/hectare, in the period 1886–90, France was taking production equivalent to some 436,250 hectares from Spain.
[63] French import duties during the 1880s were 2 francs on all wines up to 15°, and therefore there was a financial incentive to strengthen it to that level.

Table 4.5. *Exports of Spanish bulk wines, 1861–1925*

	Total exports[a]	Exports to France[a]	Exports to other countries[a]	Exports to France (%)	Spanish wine price[b]	Index of exports by value[c]
1861/5	88.7	9.9	78.8	11	23.2	100
1866/70	111.5	13.0	98.5	12	19.4	105
1871/5	160.6	30.8	129.8	19	20.2	158
1876/80	302.4	180.1	122.2	60	26.0	382
1881/5	682.7	547.9	134.8	80	35.5	1,178
1886/90	825.6	698.0	127.6	85	26.0	1,043
1891/5	636.4	444.5	191.9	70	16.5	510
1896/1900	534.6	372.0	162.6	70	19.3	501
1901/5	208.4	143.3	65.1	69	20.7	210
1906/10	140.1	42.7	97.4	30	15.8	108
1911/15	269.9	141.8	128.1	53	27.4	359
1916/20	445.5	275.7	169.8	62	30.4	658
1921/5	278.6	166.2	112.4	60	23.2	314

[a] Exports in millions of litres.
[b] Wine price (pesetas per 120 litres) in San Pere de Ribes (Barcelona).
[c] Index of exports obtained by multiplying total exports by wine price (1861/5=100).
Sources: Dirección General de Aduanas, and Balcells (1980, pp. 375–9).

been transported. Given the high domestic prices, wine merchants started importing foreign spirits to strengthen Spanish wines, leading to the closing of most domestic distilleries.[64] The result was widespread abuse of 'wines'. To cite just one report from the *Consejo Provincial de Agricultura, Industria y Comercio* in the important wine producing province of Tarragona:[65]

> The commerce of true wines has greatly diminished for some time in this area. Since a considerable quantity of those exported only have a small base of wine, the rest is composed of water, foreign alcohol, colouring materials and tartic, citric and sulphuric acid, the last being harmful to the health.

Wines for domestic consumption were not exempt from this, and perhaps viniculture should be regarded as an integral part of the nation's early chemical industry! According to one source, about a quarter of wines consumed in Spain had been 'manufactured' using foreign alcohol.[66] Not surprisingly, given the nature of some of the products used, 'wine' was considered by many as a health hazard.[67]

In conclusion, there were few changes in wine presses or storing methods before the end of the century. A certain product specialisation did occur: the growth in *fino* sherries, the commercial production of 'champagne' or *cava* by Codorniu from 1872, and the founding of some of Rioja's major bodegas from the 1860s. However, these were exceptions and represented a minute part of Spain's total wine production. By the late nineteenth century the vast amount of Spanish wine sold in both domestic and export markets was traditionally-produced bulk wine.

Conclusion

The removal of legal impediments to trade and the improvement of the transport system allowed greater market integration and a fall in freight costs. More efficient markets in turn allowed farmers to specialise in those crops that were most profitable and suited to local resource endowments. A relatively low elasticity of demand implied that the productivity gains in transport allowed farmers to extend the area cultivated for cereals, helping to offset the diminishing returns to labour in these crops given the generally inappropriate conditions for their cultivation

64 In Alicante, for example, despite a 20 per cent increase in vines during a decade, 40 of the province's 50 stills were out of action, with the remainder hardly working in 1886 (*Crisis agrícola y pecuaria*, no. 307, p. 289; see also vol. 2, p. 335 (Lleida), vol. 3, p. 201 (Palencia) and vol. 3, p. 547 (Rioja)).
65 Ibid., (vol. 3, no. 132, p. 26).
66 Antúnez (1887, p. 16).
67 Simpson (1985a, pp. 112–15).

nationally. In conclusion, it was the development of the market and the farmers' access to land, rather than changes in agricultural technology, which allowed the country to escape the Malthusian consequences of its population doubling between the early seventeenth century and the mid-nineteenth century.

If Spanish wheat farmers were generally willing to extend the area cultivated in the face of rising prices, this also appears true of wine producers. The example of wine spirits from Barcelona, sherry from Jerez, and table wines almost everywhere from the 1870s, shows that growth in demand was met by a wave of new plantings, together with product adulteration. Peasant farming was clearly market orientated in large areas of the country by the late nineteenth century.

Part III

The limits to technical change, 1880–1936

5 Soil fertility and the chemical revolution

In Part II we saw that Spanish farmers had tended to increase their output during the nineteenth century by shifting the frontier of cultivation. If improvements in welfare required higher labour productivity, there were strict limits to how far this could be achieved using traditional production systems, especially in a period of relatively fast population growth. Furthermore, by the late nineteenth century, the threat of cheap foreign cereals in domestic markets, the presence of new vegetable oils in export markets, and the widespread destruction of vineyards through disease (phylloxera) required new ideas and farming practices if farmers were to remain competitive.

In theory, there were two ways in which labour productivity might have been improved: by increasing the area cultivated per worker, or by increasing output per hectare, either through increased crop yields, or by changing the crop mix to higher value products. These two approaches are often illustrated by the historical experience of Japan and the United States between 1880 and 1930. Although both countries enjoyed significant growth rates in output per worker (1.85 and 1.02 per cent a year respectively), the methods of obtaining the increase were very different. In the United States output per hectare grew relatively slowly, but the area of arable per male worker increased from 12 to 21 hectares between 1880 and 1930, an achievement made possible by the introduction of mechanical technology which reduced labour inputs, especially in cereal cultivation.[1] By contrast, in Japan the area of arable per male worker increased from only 0.66 hectares in 1880 to 0.78 hectares in 1930. After unsuccessful attempts at using American farm technology at the end of the nineteenth century, Japanese farmers switched to 'biological yield-raising technology, much of it supported by heavy irrigation investments'.[2] In this and the following chapter I consider the

[1] Hayami and Ruttan (1985, appendix tables B-1 and B-2). See also the comments of Olmstead and Rhode (1993).
[2] Binswanger (1984, p. 7).

possibilities in Spain of raising output per hectare, leaving to chapter 7 the potential for reducing labour inputs.

The close relationship between high animal densities and high crop yields, which was well established in some agricultural regions in the Low Countries and in England by the seventeenth century, was regarded by many Spanish writers as being crucial to the long-term development of the country's agriculture.[3] However, demographic growth, together with the sale of large areas of municipal lands that had previously been kept for pasturing the village herd, encouraged farmers to extend the area of cereal cultivation (especially wheat) rather than attempt to maintain livestock densities and increase fertiliser inputs. As I argued in part II, it was the existence of large areas of underused land and the rising cereal prices which permitted farmers to ignore, at least temporarily, the need to maintain soil fertility. When cereal prices stagnated in the late nineteenth century, it was the low livestock densities which were often regarded as the prime causes of poor crop yields and agricultural backwardness.[4]

The chemical revolution of the second half of the nineteenth century provided an industrial alternative, in the form of artificial fertilisers, to overcome the limitations of poor resource endowments for intensive livestock farming in Spain. Yet farmers' response to this opportunity was slow. Animal manure and other organic material still accounted for four-fifths of all fertilisers in terms of mineral content in 1911, and as much as two-thirds as late as 1933.[5] Although chemical fertilisers were replacing imported guano in the paddy fields and orange groves of Valencia as early as the 1880s, most arable land in Spain rarely benefited from their use. I argue that the small usage of chemical fertilisers in much of dry-farming agriculture can be attributed to both the relatively small quantities required before the marginal physical product was reached, and the high costs associated with employing fertilisers. The real potential of chemical fertilisers was in intensive agriculture, which in Spain usually implied a demand for other complementary inputs such as irrigation and new crops.

[3] See for example Jovellanos (1986, p. 185).

[4] Costa argued that it was the '... ill-fated divorce between arable and livestock which had been the principal cause that has brought about the crisis in national output', (Costa, 1911c, p. 267). Likewise Rodrigáñez noted that 'perhaps the principal cause of our backwardness is the abnormal relationship between livestock and arable, which impoverishes the nation's agriculture' (Rodrigáñez, 1977, p. 281).

[5] In 1911, 79 per cent and, in 1933, 67 per cent. The 1919 government survey suggests that animal manure accounted for approximately 94 per cent of organic manure in use (Gallego, 1986, p. 197 and cuadro 5). For further comments on this survey, see below. However, Grigg (1992, p. 41) has noted that 'until the 1930s farmyard manure provided most of the plant nutrients added to the soil in Western Europe'.

The limitations of organic fertilisers

In traditional agriculture, farmers maintained soil fertility by moderating the frequency of cultivation and by using organic fertilisers, such as animal manure, night soil, or compost made from vegetable material. The use of fallow also limited weed growth and the spread of disease, although its effectiveness could be increased by frequent weeding and destroying by hand either the insects themselves, or the diseased plant.[6] In the Low Countries, northern France, and probably parts of England, the experience of the Middle Ages was that cereal yields increased and fell with the growth and fall in population, whilst labour productivity moved in the opposite direction.[7] This relationship was only broken with the introduction of new husbandry techniques, such as the planting of leguminous crops, turnips, a greater concentration of livestock, and a better integration of livestock and arable (mixed husbandry). Improved yields were achieved through a more efficient tillage, a greater application of fertilisers, and by increases in the soil's nitrogen content.

Dry farming conditions in Spain made impossible a similar scenario to that of the Agricultural Revolution in northern Europe. For one thing, soils could not be worked as intensely because summer drought and low rainfall meant that they could only be cropped about once every two or three years. As late as 1960, fallow still occupied about 40 per cent of rotations.[8] Second, fodder crops require ample supplies of summer rainfall, which favours northern climates where 25 to 35 per cent of rainfall occurs in the summer, but such a requirement makes fodder crops all but impossible outside irrigated areas in much of the Mediterranean.[9] Artificial grasses such as clover and lucerne (alfalfa) present similar difficulties. As a result, northern European livestock densities based on traditional grazing methods (as opposed to being stall-fed) were impossible. However, in Spain, not only were livestock densities low, they probably fell significantly during much of the period, as noted in chapter 1. Furthermore, outside the small number of areas of intensive cultivation, the limited quantities of organic fertilisers available were frequently wasted by the farmers.

The government fertiliser survey of 1919 suggests a close correlation between the use of organic fertilisers and regional livestock densities in

[6] Boserup (1981, pp. 23–4).

[7] See especially Campbell (1991, pp. 144–82) on which this paragraph is based.

[8] AEA (*año 1980*, p. 27). The figure would be higher if only cereals and legumes are included.

[9] Summer rainfall figures refer to regions bordering the North Sea. See Galassi (1986, pp. 93–4).

1917.[10] However, as the 1919 survey includes virtually no organic fertilisers for the provinces of La Coruña, Logroño, Lugo, Orense, Santander, Tarragona and Valencia, I have estimated the *potential supply* of animal manure, by calculating a figure based on the animal populations.[11] In table 5.1, an index of the supply of manure has been obtained by estimating the total live weight of animal stock, and the *potential demand* by the area cultivated with cereals and legumes. Only cereals and legumes have been considered for two reasons. First, these crops, together with the vine and olive, accounted for over 90 per cent of the sown area during this period, but the quantities of manure used with olives and vines was small.[12] Second, although animal manure was used with fruit trees, sugar beet and other industrial crops, the area was relatively small, and by the 1920s chemical fertilisers were often more important (see below).

Table 5.1 suggests that the animal live weight per hectare (my proxy for manure supplies) fell from 228 kilograms per hectare in 1865 to 137 in 1886/91, rising again to 170 in 1917/22 and 199 in 1930/5. Even if the 1891 census (the weakest of the three) is ignored, the trend is of a decline in the long-term supply of organic manure as the area of arable increases, indicating that contemporaries were correct in their comments concerning the shortage of organic fertilisers in agriculture.[13] Only in the North would a system of mixed husbandry appear truly operative. Furthermore, not only was the supply of manure small, it was seldom used to its full potential. To maximise output, animals had to be well fed and kept inside, their bedding changed frequently and the manure kept properly to reduce weight loss and leaching of its mineral content during the rains. One agronomist suggested that the manure per animal obtained and used on the experimental farm in Palencia in 1915 was 90 per cent greater than that used by many local farmers, because of their poor collection and storage methods.[14]

[10] Government estimates for livestock (live weight) in 1917 (Ministerio de Fomento, 1920) and manure used in 1919 (ibid., 1921) show:

	Share of nation's livestock (%)	Animal manure used (%)
North	27	25
Mediterranean	9	13
Interior	47	50
Andalucía	17	12
Spain	100	100

[11] The inclusion of more realistic figures for these provinces would considerably increase the advantage enjoyed by the North.

[12] Furthermore, the almost total absence of the vine and olive in the North implies that their inclusion would widen even further the difference between this region and the other three.

[13] For a discussion of the 1891 livestock census, see Simpson (1995a, pp. 182–3).

[14] Cascón (1934, pp. 325–6). The remarks are likely to have been valid for all dry-farming areas of the country. Animals were frequently kept outside, thus reducing the need for

Table 5.1. *An estimate of the supply of animal manure in cereal cultivation*

A. *Area: cereal/legume rotations (thousands of hectares)*

	1860	1886/90	1922	1930/5
North	795	650	810	657
Mediterranean	1,189	1,241	1,304	1,299
Interior	8,737	9,591	10,573	11,291
Andalucía	2,509	2,867	2,674	2,753
Spain	13,230	14,349	15,361	16,000

B. *Live weight of animals (thousands of tons)*

	1865	1891	1917	1933
North	712	519	701	908
Mediterranean	245	172	245	293
Interior	1,590	1,018	1,225	1,479
Andalucía	469	258	446	502
Spain	3,016	1,967	2,617	3,182

C. *Potential supply of animal manure per hectare* (total live weight[a]/area cultivated in kilograms)

	1865	1886/91	1917/22	1930/5
North	896	798	865	1,403
Mediterranean	206	139	188	226
Interior	182	106	116	131
Andalucía	187	87	167	182
Spain	228	137	170	199

D. *Wheat yields and potential supply of manure, 1909/22*

	Manure index, 1917/22	Soil fertility index[b]
North	508	213
Mediterranean	111	113
Interior	68	87
Andalucía	98	127
Spain	100	100

[a] Live weight coefficients: horses and mules 0.326 tons, donkeys 0.172 tons, cattle 0.371 tons, sheep 0.03 tons, goats 0.034 tons and pigs 0.077 tons.

[b] Wheat yields for 1909/13 (excluding irrigated land) have been divided by the frequency of cultivation of all crops in the cereal and legume rotations in 1922 (calculated from GEHR, 1991 and 1983b, pp. 308–18).

Sources: Area, 1860: *Dirección General de Contribuciones*, 1879 (area cultivated using coefficients of 1886/90); 1890, 1922 and 1930–5: GEHR (1983b, pp. 285–325). Live weight coefficients, Flores de Lemus (cited in GEHR, 1978, p. 150), and national census figures.

Table 5.1 also provides a rough proxy for soil fertility, and indirectly an estimate of the success or failure of farmers to improve soils. This has been calculated by using wheat yields on non-irrigated land for 1909/13 and dividing them by the ratio of sown land to total lands within the rotation, to account for differences in the intensity of cultivation.[15] To establish more clearly the limitations of traditional fertilisers in raising crop yields, we need to examine each of the four regions.

North

In terms of the *potential* supply and demand, table 5.1 shows that the North received about four or five times more animal manure per hectare of cultivated land than the rest of the country. Furthermore, the small-scale and labour-intensive nature of farming in the North, together with the close integration of arable and pastoral activities, resulted in a higher use of animal manure, which is reflected in the index of soil fertility (twice that of the national average).[16]

Yet the intense cultivation of generally poor soils in the region implies that the supply of manure was not enough, and the vegetation from the large areas of uncultivated hillsides played a significant role in maintaining soil fertility by providing bedding for animals and compost.[17] Both the extension of cultivation and the greater intensity of rotations during the nineteenth century resulted in these resources being utilised more efficiently, with the growth of private usage instead of communal.[18] However, although traditional fertilisers produced high yields in the North, such intensive farming based on family labour could only be achieved if farms were small, which in turn implied that the surplus over consumption available for sale was inevitably also small. Furthermore, by the late nineteenth century the supply of organic fertilisers was

manure collection and distribution (assuming that it fell on cultivated land), but reducing the total weight as straw would be absent.

[15] Thus, annual cultivation is divided by 1, bi-annual by 2, etc. Wheat was important everywhere, unlike barley, oats, maize or artifical grasses, which varied considerably according to local conditions.

[16] The collection of manure was not a time-bound operation and could be carried out when the opportunity cost of the farmer's labour was small. Consequently, the small family farms of the North were inclined to maximise the use of the potential supply of manure, as their employment decisions would be regarded as fixed overhead capital cost rather than as a variable cost, unlike the *latifundios* in the South, which relied on wage labour.

[17] In the humid areas of the Basque Country, lime was also used in some areas from the late seventeenth century to treat the heavy acidic soils (Fernández Pinedo, 1974, pp. 216–19).

[18] For Galicia, see Quintana Garrido (1990, p. 153).

becoming increasingly scarce in some areas, implying a significant increase in the time spent in collection.[19]

Interior

The high cost of feed and poor cereal yields on the unirrigated soils in the dry Interior led to much lower animal densities than in the North. Population growth and rising wheat prices from the second half of the eighteenth century stimulated grain production at the expense of pastures, a process further encouraged by institutional reforms which removed legal protection of lands which had traditionally been reserved for animals.[20] As the area under cereals grew, livestock densities fell from 182 kilograms of live animal weight per hectare in 1865, to only 116 in 1917/22, just 68 per cent of the national average.[21]

The failure of the Interior to adapt to population pressure by increasing yields, and thus achieving falling unit costs, is often considered a major characteristic of the nation's agriculture at the turn of the century. The small farms of the Interior appear to have attempted to maximise production at periods of low prices, in direct contrast to the large producers in Andalucía (see below). Finally, low summer rainfall considerably reduced natural vegetation which might have been transformed into compost as in the North. It also implied meagre diets for the livestock, reducing in turn the quantity of manure produced. In conclusion, the introduction of chemical fertilisers in the twentieth century presented, at least in theory, a way of escaping the consequences of diminishing returns.

Mediterranean

The dry cereal lands of the Mediterranean showed characteristics similar to the Interior, namely low livestock densities, small holdings, miserable wheat yields and poor utilisation of manure.[22] However, the comparative advantage of this region was in the production of wine, olive oil and carob trees on the *secano*, and a whole variety of crops on the small, but heavily settled irrigated areas. Whereas olives and vines required little in the way of fertilisers, irrigation implied intensive culti-

[19] Carmona Badía (1990, p. 40) argues that shortage of fertilisers was a limiting factor in Galicia.

[20] Invasions of common lands, the abolition of the Mesta (1836) and the disentailment of common lands from 1855 affected the size of local flocks and herds, (see chapter 3, pp. 64–7).

[21] This was the cereal heartland of Spain, with over two-thirds of the nation's non-irrigated wheat lands in 1905/9 (table 5.5).

[22] For poor utilisation of manure, see Ministerio de Fomento, (1921, Barcelona: p. 361, Tarragona: p. 372, Lleida: p. 380, Girona: p. 394, and Baleares: p. 424).

vation and the consumption of large quantities. The limitations on local agriculture of an inelastic supply of organic materials can be seen in some of the more densely populated areas of Mediterranean coast as early as the eighteenth century. For example, in Burriana (Castellón), Cavanilles writes:

> the multitude of irrigated plots (*huertas*), and the fact that Burriana has no waste land at all except the sea shore, has caused a shortage of manure which is required for the land and to obtain it, they (i.e. the farmers) turn to disastrous methods. One is the excessive frequency by which livestock are allowed to graze where they like, irrespective of the clearly stated fines; another is the robbing of soil from irrigation channels, diminishing thereby the thickness of the banks to the point that they do not have the strength to contain the water, leading to the loss of the major part and prejudicing those of Nules; finally another is to make holes in the roads to carry the soil to their fields.[23]

A later writer of the same province noted how children's education was much shorter in areas of irrigation because of the high opportunity cost of their labour in collecting organic fertilisers.[24] The high cost of manure resulted in the Levante coast being one of the first areas in Europe to introduce guano in 1844.[25] The use of guano therefore both increased the supply of fertilisers and reduced labour demand, permitting a major increase in the area of rice on land previously considered marginal because of lack of manure.[26]

Andalucía

In Andalucía not only was the animal density low, but the utilisation of manure was further reduced by three factors: first, the existence of

[23] Cavanilles (1795–7, I, p. 107).

[24] 'In towns where irrigation predominates, the labourers' children from six years old are already being used to collect rubbish for fertilisers. In areas of *secano*, they do not usually work until they are twelve.' (*Junta de Agricultura de la Provincia de Castellón*, AMA legajo 123, cited in Garrabou, 1985, p. 194.) This was also the situation in Murcia during the early part of the twentieth century (Ministerio de Fomento, 1921, p. 453). See also Caballero (1864, p. 59).

[25] Polo de Bernabé wrote in 1846 that: 'This task (of collecting fertilisers) increases each day because of the growth in cultivation in many villages and, happily, when the need for more fertilisers was thought to have been almost impossible to find, the import of guano into the country has overcome the greatest and most urgent of agriculture's needs; it has led to the enrichment of the inhabitants of some areas, and improved the lot of almost all their farmers', cited in Giralt i Raventós, (1978, p. 76). Apart from the important role in introducing guano into Spain, Polo de Bernabé also introduced the mandarin, leading Giralt to refer to him as a 'gentleman farmer' (ibid., p. 76). Imports of guano into the Levante had reached 20,849 tons by 1862/5 (Porqueras Giménez, cited in Garrabou, 1985, p. 45). See also Mateu Tortosa (1993).

[26] See chapter 6. Polo in 1844 estimated guano as being a third of the price of 'abonos comunes', although transport from the port increased its final price to farmers (Giralt i Raventós, 1978, p. 75).

ranching, which implied a separation between livestock and arable, and the consequent loss of animal manure to the latter;[27] second, the much larger farms were worked mainly by seasonal labour, and it seems likely that farmers viewed the marginal cost of collecting and spreading the manure as being greater than the marginal revenue obtained from the larger harvests;[28] and finally, significant distances were to be found between towns and the outlying fields.[29] However, unlike the Interior, the predominance of large farms implied that in periods of low cereal prices, farmers were more likely to reduce the intensity of cultivation as the marginal cost of labour rose, thus reducing the risks of soil exhaustion. Soil fertility was therefore maintained by extensive cultivation.

Chemical fertilisers – a slow revolution[30]

The use of chemical fertilisers in Spain grew rapidly, increasing from about 50,000 tons in the early 1890s to 1.3 million tons by the early 1930s.[31] Yet as table 5.2 suggests, use of all three major elements (nitrogen, phosphate and potash) remained low by European standards, with only a quarter of the phosphates and nitrogen being applied to the soil compared with what was believed to have been required, and less than a tenth of the potassium required.

However, there were marked differences in the use of chemical fertilisers on the eve of the Civil War (table 5.3). In the North, where the supply of organic fertilisers had been appreciably greater than in the other regions, chemical fertiliser consumption was concentrated in the Basque Country and Santander, with the amounts used in Galicia being minimal (maps 10–12). The Interior was the region where most chemical fertilisers were used, accounting for 666,000 tons, or half the national consumption. Yet given this region's greater area of cultivation, the figures are equivalent to only 63 kilograms of phosphates, 14 kilograms of nitrogen and 2 kilograms of potassium per hectare sown. These figures are not dissimilar to the third region, Andalucía, with again much larger quantities of phosphates being applied to the soil than nitrogen or potassium. Finally, consumption

[27] Ministerio de Fomento (1921, Cádiz: p. 524).

[28] In Sevilla it was suggested that manure was not used because of the availabilty of chemical fertilisers, especially superphosphates. Fertilisers were used here primarily to save labour (ibid., p. 520).

[29] In general, most manure would be concentrated on irrigated land and the relatively small areas of intensive cultivation around towns and farmhouses (e.g. ibid., Jaén: p. 474, Málaga: p. 485, Córdoba: p. 537).

[30] Chemical fertilisers are taken to include all non-organic fertilisers, including mineral fertilisers.

[31] Gallego (1986, pp. 218–19).

Table 5.2. *Actual and potential use of chemical fertilisers,*[a] *1913, 1922 and 1932*

	Phosphates			Potash			Nitrogen		
	1913	1922	1932	1913	1922	1932	1913	1922	1932
Holland	1.99	1.77	1.98	6.74	9.91	5.61	1.18	1.42	1.71
Belgium	0.90	0.91	0.90	1.60	1.48	3.66	1.83	1.03	1.31
Germany	0.58	0.50	0.65	4.87	7.63	7.99	0.65	1.04	1.12
Great Britain	0.97	0.91	0.82	0.43	0.58	2.01	0.64	0.58	0.63
France	0.46	0.51	0.49	0.22	1.49	2.16	0.23	0.20	0.51
Italy	0.35	0.30	0.31	0.06	0.04	0.16	0.11	0.12	0.29
Spain	0.11	0.13	0.20	0.09	0.04	0.08	0.04	0.10	0.28
Greece	..	..	0.04	..	..	0.02	..	..	0.02

[a] A figure of 1.00 implies that 'adequate' quantities were applied per hectare.

Source: Ministerio de Agricultura (1934, p. 172).

Table 5.3. *Consumption of chemical fertilisers in Spain, 1930*[a]

1. *Consumption in 1930 (thousands of tons)*

	Phosphates	Nitrogen	Potassium
North	51	3	1
Interior	534	119	12
Andalucía	176	28	8
Mediterranean	211	154	22
Spain	972	303	44

2. *Consumption in 1930 (% of total)*

	Phosphates	Nitrogen	Potassium
North	5.2	1.0	2.3
Interior	54.9	39.1	29.5
Andalucía	18.1	9.2	18.2
Mediterranean	21.7	50.7	50.0

3. *Consumption in 1930 (kg per hectare sown)*[b]

	Phosphates	Nitrogen	Potassium
North	49	3	1
Interior	63	14	2
Andalucía	53	8	2
Mediterranean	90	66	9
Spain	65	22	4

[a] The Canary Islands have been excluded.

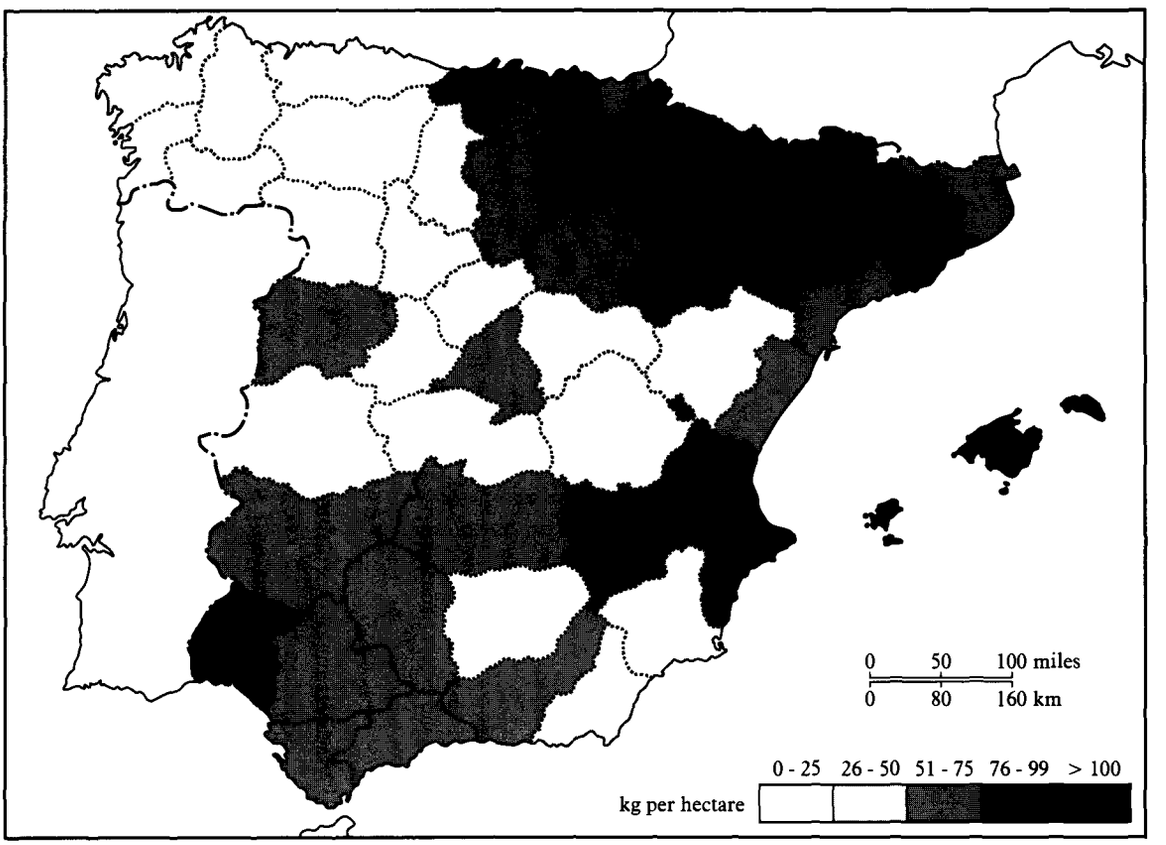
[b] Includes all land except natural pasture and unsown fallow.

Source: AEPA (1930, pp. 290–1 and 302–3).

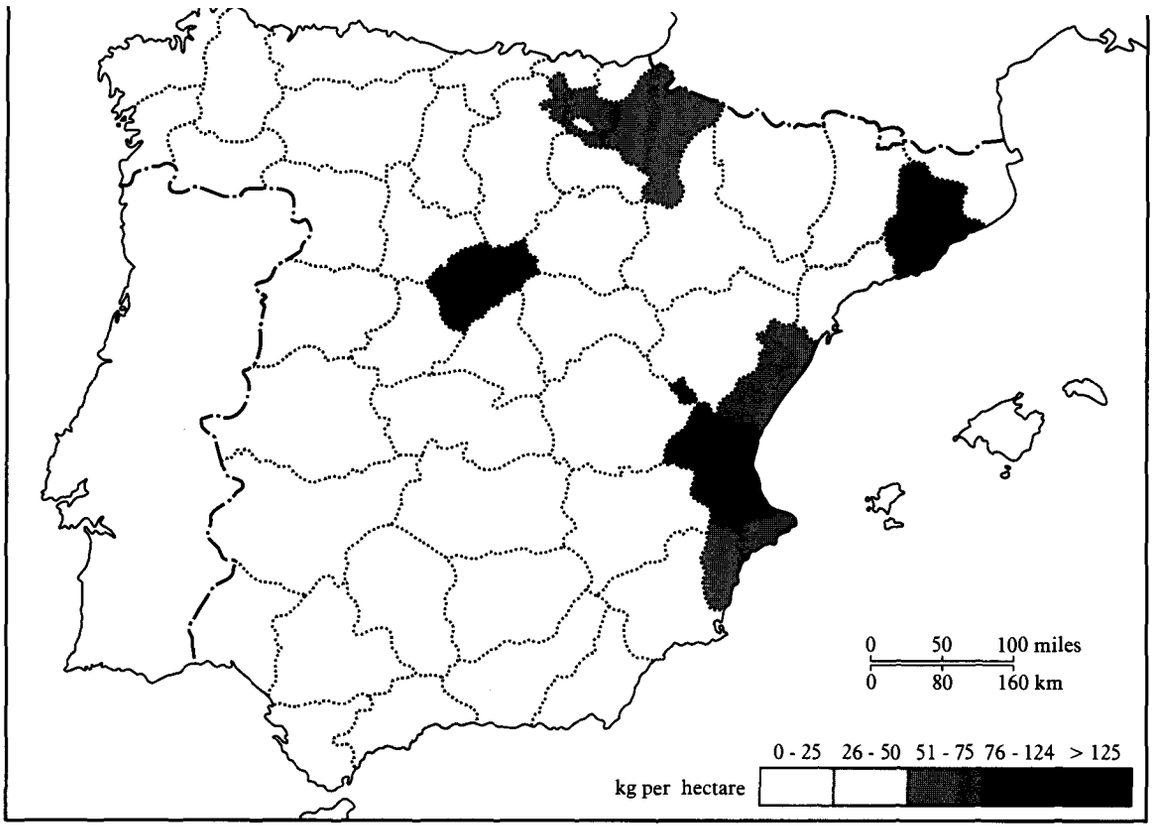
in the Mediterranean accounted for 387,000 tons or 30 per cent of the total, equivalent to 90 kilograms of phosphates per hectare sown, 60 kilograms of nitrogen and 9 kilograms of potassium, appreciably more than that of the other regions. As shown in maps 10a-c, the provinces of Valencia and Barcelona consumed considerably more than elsewhere.[32]

Although the development of chemical fertilisers reduced the supply price of plant nutrients, for their successful use farmers had to learn about the potential of different manufacturers' products in relation to their specific soil conditions, seed varieties and crop mix. In a country where 48 per cent of the inhabitants were illiterate on

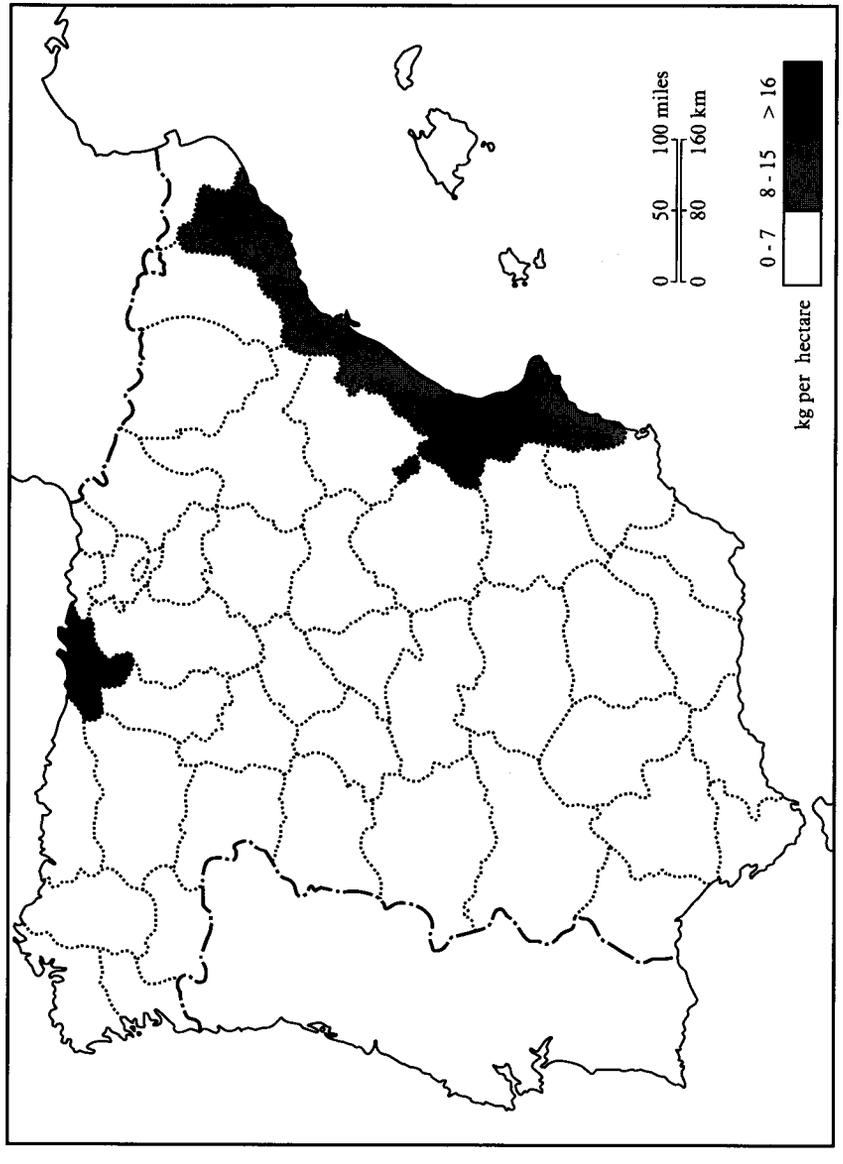
[32] Highest consumption, however, was in the Canary Islands, with 170 kilograms of phosphates, 300 of nitrogen and 120 of potassium.



10 Phosphate fertiliser usage, 1930



11 Nitrogen fertiliser usage, 1930
Source: AEPA, *año 1930*



12 Potash fertiliser usage, 1930

the eve of the First World War, progress would inevitably be slow.[33]

The first serious attempts to introduce chemical fertilisers in Spain appear to have been made in the 1880s in the Mediterranean, especially around Valencia, with the replacing of guano in the paddy fields and orange groves.[34] Chemical fertilisers offered two major advantages compared with organic ones: they had a high mineral content to weight ratio, and they could be adapted to the soil and to the plants' individual requirements. However, rice farmers in Valencia in the 1880s initially found difficulties in achieving a correct balance of fertilisers, with the result that yields remained stagnant or even fell in some areas.[35] Likewise, orange growers also had problems in using the new chemical fertilisers, although once the initial difficulties had been overcome, they contributed significantly to the rapid growth in the area of the crop.[36]

The obtaining of scientific information and its diffusion was the result of both publicly funded experimental stations and private chemical fertiliser interests. In the case of rice, significant research was carried out by the *Estación Arrocera de Sueca* founded in the 1880s. Elsewhere in Spain, the highly esteemed experimental and teaching farm in Zaragoza at the end of the nineteenth century investigated the role of chemical fertilisers on irrigated soils, especially for the growing of sugar beet and red clover.[37] In Granada, Martín Rodríguez notes the rapid growth of sugar beet from the late 1880s, and the inelastic supply of manure made it necessary to use chemical fertilisers, which the 'farmers did not know

[33] Núñez (1992, p. 94).

[34] Imports of guano to the Levante fell from an average of 17,000 tons to a tenth of that figure between 1893/9 and 1906/13; total imports of all fertilisers doubled between the two dates (Garrabou, 1985, p. 46). By the 1880s, rice was a firmly established crop, but oranges were only just beginning to be of commercial importance.

[35] *Crisis Arrocera* (1887, p. 73). One author believed that the exclusive use of guano led eventually to a lack of potash in the soil and falling yields. However, as a producer of chemical fertilisers himself, perhaps this author had reasons to exaggerate the decline in yields. (Utor, no date, but between 1873 and 1887). In the years immediately preceding the First World War, it was believed that the secret to high yields lay in the use of sulfato amonico, but when prices increased, its partial substitution with superphosphates led to 'equally or greater' harvests (Ministerio de Fomento 1921, pp. 430–1). A later writer, however, would doubt the need to use potash as a fertiliser in rice cultivation, given the type of soils in Valencia (Font de Mora, 1939, p. 124).

[36] For the early difficulties in using chemical fertilisers in Valencia, see Arévalo y Baca (1886, pp. 5–6, quoted in Calatayud, 1989a, p. 73).

[37] The *Granja-Instituto* was founded by the royal decree of 14 May 1881, and its first experimental work dates from 1885 and 1886 (Granja-Instituto de Zaragoza, 1906, pp. xxi). The first two directors, Otero and Rodríguez Ayuso published widely the results of the Granja in Spain. By 1900 there were other Granja-Instituto's in operation in Barcelona, La Coruña, Jerez and Valencia, and *Estaciones de Viticultura y Enología* in Ciudad Real, Haro, Palencia and Toro, together with the *Estación Agronómica del Instituto Agrícola de Alfonso XII* in Madrid.

how to use'.[38] As a result, local sugar factories set up a 'parallel business' of producing and marketing fertilisers, using as a base the remains of sugar beet.[39] In all these cases, chemical fertilisers were accompanied by the use of irrigation and high yield crops which, in the case of Granada and Zaragoza, were new to the regions. It was not until 1905, when José Cascón was given the task of establishing an experimental farm in Palencia, that the question of chemical fertilisers and dry farming was given any serious consideration by the authorities.

Research into chemical fertilisers and their use was also carried out by private initiative. Martín Rodríguez's work on sugar beet in Granada shows clearly the role of highly capitalised food processing industries in the provision of technical instruction (and materials) on such matters as fertilisers and seeds, to insure an adequate supply of raw materials of a predetermined quality for the new factories. In 1903, the *Sindicato de potasa de Strassfurt* became operational in Madrid, and six years later claimed to have given free fertilisers and technical advice to more than 2,000 farmers for testing throughout the country, and distributed over 400,000 copies of its pamphlets.[40] Finally, though the list could be considerably extended, Luis Utor, producer of chemical fertilisers and an industrial engineer, wrote one of the first books on the advantages of chemical fertilisers for Spanish farmers.[41]

The uneven regional consumption of chemical fertilisers noted in table 5.3 and maps 10–12 is in part the result of differences in the interaction between manufacturers, distributors, agricultural research centres and farmers. Yet table 5.4 suggests that a major factor determining chemical fertiliser usage was also the distribution and concentration of different crops within the country. 'Intensive' crops covered 13 per cent of the nation's sown area and consumed 34 per cent of phosphates, 57 per cent of nitrogen and 76 per cent of potassium. The Mediterranean, with 18 per cent of the nation's cultivated area, had 77 per cent of the country's market gardening and fruit trees. Therefore, although farmers needed sufficient technical knowledge and supplies of suitably priced fertilisers, the incentive to use them appears to have been greatest in areas of intensive cultivation.

[38] Martín Rodríguez (1982 p. 209).

[39] López-Rubio appears to have been one of the first, and in 1892/3 profits from his fertiliser business were higher than those from sugar beet production. Competition soon grew, until the firm *Carrillo y Compañía* in 1900 obtained control of the local market (Martín Rodríguez, 1982, p. 209). These fertilisers were based on residues from the sugar mills and artifical fertilisers.

[40] EPAPM 7/1/1909.

[41] Utor (no date, but cited in *Crisis Arrocera*, 1887, p. 118).

Table 5.4. *Use of chemical fertilisers by crop type, 1933 (kg per hectare)*[a,b]

	Phosphates	Nitrogen	Potassium
Cereals and legumes	60	16	1
Intensive crops[c]	170	121	26
Vines and olives	18	8	1
Artificial pasture	88	5	0

[a] The Canary Islands have been excluded.

[b] The Ministry's estimate of fertiliser consumption for each crop must be considered as only very approximate.

[c] Includes root and industrial crops, market gardening and fruit trees.

Sources: Calculated from Ministerio de Agricultura (1934, pp. 176–7) and AEPA (1933, pp. 346–7).

To test the hypothesis that an important element of demand was the presence of intensive crops, a regression has been carried out using the relative value of intensive crop production in each province as the dependant variable and the relative value of fertiliser used as the independent variable, for the year 1932. All provinces of 'dry' Spain have been included, but not those of the North or Canary Islands, given their much higher supplies of organic fertilisers. The results give a significant correlation coefficient of 0.85, with an R^2 of 0.72. These results tend to confirm the statement that fertilisers were used mainly with intensive crop cultivation. The delay in the use of chemical fertilisers on the dry cereal land, in contrast to those irrigated in the Interior, was noted by contemporaries.[42]

Yet if most government and private resources were devoted to irrigated crops, artificial fertilisers were also initially considered as the solution to the low yields of the *secano*. In particular, phosphates were seen as a remedy to the soil exhaustion experienced in various parts of Castilla la Vieja and Aragón.[43] The relatively low usage of chemical fertilisers in comparison with northern Europe (table 5.2) and Spain's low cereal yields are often considered as evidence of technological failure. To explain why farmers in Spain's *secano* did not use more chemical fertilisers, we need to consider the potential for technical change in its wider aspects.

In the first instance, although comments on the potential benefits of fertilisers abound in the Spanish farming press, prior to the First World

[42] For example, Ilera writing in EPAPM, 1909, no. 647, p. 606.

[43] Rodríguez Ayuso (1897, reprinted in *Granja-Instituto de Zaragoza*, 1906, p. 439). See also Lapazarán (1918, cited in Pinilla Navarro, 1990, p. 277 for Aragón).

War most refer to experiments that had taken place in northern Europe, especially France, and under conditions very different to those found in Spain's *secano*.[44] One notable exception was that produced under dry-farming conditions of the *Granja-Experimental* in Palencia in 1910, where it was claimed that an extra 255 pesetas per hectare invested in fertilisers and their complements produced a return of 1.7 tons more wheat, or 422 pesetas, in comparison to the return on local farms using traditional methods.[45] However, conditions on the experimental farm appear to have been exceptional, and as late as 1976/80 average wheat yields in this province for *secano* were still only 1.65 tons, or two-thirds of that reportedly achieved on the experimental farm some sixty years earlier. A second factor was enforcement of product quality control, because the opportunity for fraud was especially great with mixed fertilisers. The government decree of 1900 had allowed, on the initiative of the consumers, the right to test the content of fertilisers in the ten existing official laboratories. The 1919 report, however, indicates that this had had only a limited affect, and new legislation in the same year strengthened controls, allowing the initiative to check fertilisers to be extended to official bodies.[46] Only with time did farmers acquire the technical information required for successful use of chemical fertilisers, so that demand was sufficient to allow specialised manufacturers to be able to establish reputable brand names.

A third factor was that of price. Whereas in the major cities of Madrid or Barcelona superphosphates were under 220 pesetas per ton in 1921, in the important wheat producing provinces of Valladolid the price was 252 pesetas, in Zaragoza 283 pesetas, and in Albacete 328 pesetas.[47] Furthermore, most of the demand from cereal farming was found in the Interior, but production of superphosphates took place on the Mediterranean coast.[48] However, over time, changes in the relative price of fertilisers undoubtedly encouraged their greater use. Figure 5.1 shows that, with the exception of the First World War, use of superphosphates became increasingly more profitable in wheat production. The growing

[44] See, for example, Llorente (1899).

[45] Fertilisers and complementaries relate to soil fertility, and include both organic and inorganic fertilisers and their distribution, the use of seed drills and differences in land preparation. As some 300 kilograms of superphosphates and 100 kilograms each of nitrogen and potash were used, these soils must have been more receptive to artificial fertilisers than most. The land also benefited from heavy manuring. The experimental farm also enjoyed greater economies in the harvesting and threshing of the harvest, but these have been excluded from the calculation (Cascón, 1934, pp. 456–7).

[46] *Real Decreto* 1919, article 11. By this date, official government laboratories were in operation in 55 towns (article 25). The level of fraud appears greatest in those provinces outside the main centres of consumption.

[47] *Anuario Estadístico de España* (1921–2, 7, p. 195).

[48] Nadal (1985, p. 100).

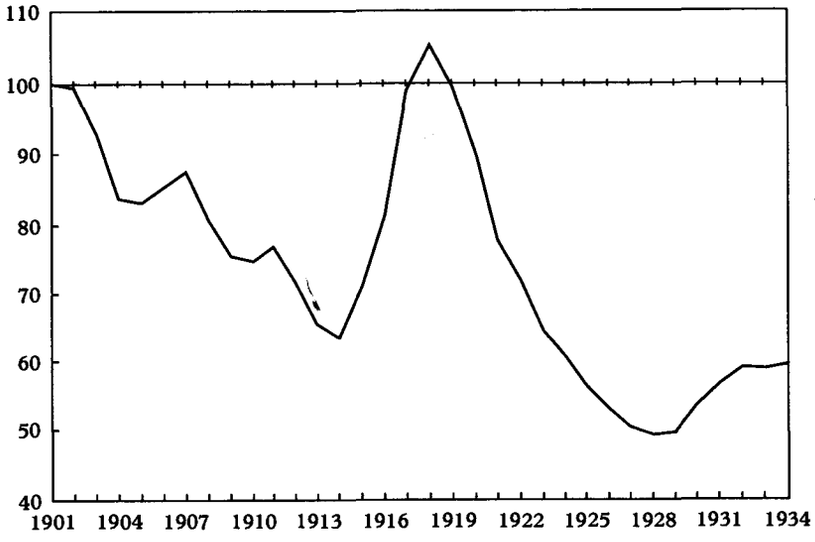


Figure 5.1 Superphosphate price relative to wheat price, 1901–34 (three-year averages used; 1900/2 = 100)
Sources: EPAPM (1928, pp. 254 and 328); París Eguilaz (1943, pp. 35 and 63).

numbers of cooperatives (which obtained fertilisers more cheaply because of bulk purchases, provided the technical expertise to check the quality, and gave instructions to farmers on their use) and the favourable price movements both help to explain the increasing use of superphosphates on Spain's *secano*.

What figure 5.1 does not show, of course, is whether farmers should have increased their fertiliser usage even more. To answer this question, we need to know what the limited quantities of chemical fertilisers used actually achieved. Greater use in cereal farming might produce three possible results. First, rotations and the area cultivated could remain constant but yields increase; second, whilst the area cultivated and yields remain constant, the frequency of sowing (intensity of the rotation) increased; and finally, average yields and frequency of sowing might remain constant, but artificial fertilisers might allow an increasing quantity of previously marginal land to be brought under the plough.

Figure 5.2 shows that wheat yields in Spain during the first thirty years of the twentieth century grew by less than 10 per cent, averaging 0.85 tons on dry land, and 1.75 on irrigated land, with a national average

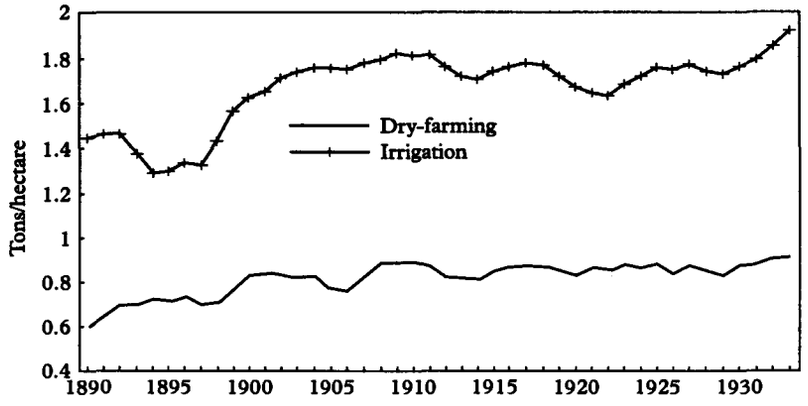


Figure 5.2 Wheat yields, 1890–1933 (five-year averages used)
Source: AEPA (various years)

on all of 0.90.[49] Total production nevertheless increased by a hefty 1.06 million tons, or 33 per cent between 1900/4 and 1931/4, making Spain Europe's fourth largest wheat producer.[50] The figure also suggests, however, that important yield increases occurred at the end of the nineteenth century, and this has led a number of authors to see the period 1886–1936 as a successful period of growth, with both total production and average farm yields increasing.[51] However, whereas total production certainly increased, and cereal farmers *did* change production methods by slowly introducing both chemical fertilisers and new machinery, it is not as clear that wheat yields enjoyed a major increase in the period. In the first place, contemporaries themselves remained sceptical about the accuracy of the early estimates of wheat production.[52] Second, even if cereal yields did grow during the period 1886/90 and 1898/1902, it is possible that this was simply a recovery to levels that had been reached during an earlier period.[53] Finally, in the unlikely event that the yield increase between 1886/90 and 1898/1902 is not simply a statistical illusion, the increase could not have been caused by chemical

[49] Dry-farming accounted for almost 90 per cent of total wheat production.
[50] After France, Italy and Germany (Malenbaum, 1953, pp. 238–9).
[51] See especially GEHR (1983b, pp. 304–6).
[52] For the 1890s, see Arrazola (1896), Sanz (1981) and Simpson (1989a).
[53] The 1886/90 yields were poor because, 'in most provinces, drought and other unfavourable weather, and even plant diseases, have not been favourable to production' (Dirección General de Agricultura, 1891a, 3, p. 594). The yield for 1886/90 of 0.8 tons, however, may be excessive, as in the absence of an area sown, I have used the average for 1891/5.

fertilisers, as only 143,000 tons were available to *all* Spanish farmers by the later period.[54] To avoid these problems of interpretation, this study of the wheat farmers' response to the opportunities presented by chemical fertilisers will be limited to the periods 1905/9 and 1930/4.[55]

Most of the increase in non-irrigated wheat production during the first thirty years of the twentieth century was achieved through extending the area sown, the rest being achieved through improved yields on land already under cultivation. Table 5.5, however, suggests that there were very strong regional contrasts. In the North, a region which accounted for less than 3 per cent of all output, the area sown fell and yields increased, and in the Mediterranean, with between 6 and 7 per cent of output, most of the growth in output was also achieved through better yields. It was in the two major regions of production, Andalucía (about 18 per cent of total) and the Interior (60 per cent), where the contrasts are most apparent. In Andalucía, non-irrigated wheat production grew by some 19 per cent, but the area fell marginally. By contrast, the Interior's wheat production grew by 44 per cent, and the area sown by 37 per cent. In Andalucía the use of chemical fertilisers (and, their complements, especially better ploughs), appears to have led to better yields, whereas in the Interior they tended to be used to extend the area cultivated.[56]

If yield improvements were not the prime cause of the increased output of wheat, it is possible that the greater use of chemical fertilisers was instrumental in the reduction of fallow used in cereal and legume cultivation. The measurement of uncultivated land within the rotation poses significant problems for historians. However, with the exception of Andalucía, it would appear from table 5.5 that there was very little shortening of the period under fallow. Dry-farming in the Interior and the Mediterranean remained essentially biennual. In the case of Andalucía, the estimates of GEHR suggest that the area sown within the rotation grew from 52 per cent in 1903/12 to over 60 per cent of the land by 1930/5, a figure greatly at odds with critics of the region's agricultural

[54] Gallego (1986, p. 218).
[55] Dry-farming wheat yields averaged 0.83 tons in the five-year period 1900/04, and 0.82, 0.82, 0.86, 0.85, 0.87 and 0.90 in the following six periods. This study therefore compares the lowest (0.82 in 1905/9) with the highest (0.90 in 1930/4).
[56] Within these regions there were naturally contrasts. In both eastern and western Andalucía the area sown remained constant, but whereas in the east yields actually fell by 17 per cent, in the west they rose by 61 per cent. This might either be due to a rearrangement of crops, with the strong growth of the olive in the east taking place on previously fertile wheat lands, or due to statistical inaccuracies for the period 1905/9.

Table 5.5. *Dry-farming and wheat production in Spain,*[a] *1905/9 and 1930/4*

		Interior	Andalucía	Mediterranean	North	Spain
Area[b]	1905/9	2,340.6	741.9	296.1	76.5	3,455.2
	1930/4	3,183.0	731.7	296.9	72.3	4,283.9
% growth		+37	−1	0	−5	+24
Output[c]	1905/9	1,927.2	608.4	236.0	94.9	2,866.4
	1930/4	2,765.8	722.0	263.4	103.7	3,854.9
% growth		+44	+19	+12	+9	+34
Yields	1905/9	0.82	0.82	0.80	0.86	0.82
	1930/4	0.87	0.99	0.89	1.43	0.90
% growth		+6	+21	+13	+66	+10
Growth in output, 1905/9–1930/5		838.6	113.6	27.4	8.8	988.5
% of growth caused by growth in area sown		+81	−7	+5	−27	+65
Intensity of cultivation						
% sown, 1903/12		53	52	61	99	56
% sown, 1930/5		56	61	65	98	59
% of national wheat output						
1905/9		59.3	18.7	7.3	2.9	88.1
1930/4		64.3	16.8	6.1	2.4	89.6

[a] The Canary Islands and irrigated land have been excluded.
[b] Thousands of hectares.
[c] Thousands of tons.

Sources: Area and output calculated from AEPA; intensity of rotations, GEHR (1983b).

Table 5.6. *Wheat production in selected countries, 1909/13 and 1925/9*

	Area sown (ha)		Yields (tons per hectare)		Exports (+) and imports (−) as % of national output	
	1909/13	1925/9	1909/13	1925/9	1909/13	1925/9
Spain	100	112	0.92	0.92	−3.4	−3.1
Four exporters[a]	100	140	0.95	0.97	+29.5	+43.9
Three European countries[b]	100	90	1.34	1.47	n.d.	−31.6

[a] Argentina, Australia, Canada and the United States.
[b] France, Germany and Italy.

Sources: IIA *International Yearbooks* (1924–5 and 1933–4).

practices in this period.[57] Although it is clear that rotations did shorten in some areas of Andalucía, especially in the rich lands of the Campiña during the 1920s, very large tracts of land were sown little more than once every three years.[58]

Instead, Spanish farmers used the growing quantity of chemical fertilisers on the *secano* to increase cereal output through an extension of the area sown. Therefore the traditional agricultural supply response of extending the area cultivated, rather than increasing its intensity, remained valid in much of Spain not just until the late nineteenth century, but until the 1960s (table 11.4). In this respect Spain was not alone. The use of new seed and fertiliser technologies to increase the area cultivated, rather than improve yields, can be shown comparing the experience in Spain with four wheat exporting nations (Argentina, Australia, Canada and the United States) with three of Europe's largest producers (France, Germany and Italy) between 1909/13 and 1925/29 (table 5.6).

The experience of Spanish wheat farmers followed that of the exporting countries, with stagnant yields but increases in the area sown, albeit on a significantly more moderate scale. By contrast, Europe's three largest producers reduced the area cultivated by 10 per cent,

[57] In Sevilla, the area sown given by GEHR reached 69 per cent in 1930/5, a figure which not even the most optimistic supporters of its agriculture would have accepted in the debate on the land reform during the Second Republic. In contrast, Pascual Carrión suggested that over 60,000 hectares were still devoted to shifting cultivation, more than 100,000 hectares to *al tercio*, and some 233,740 hectares to *dehesas* in this province in this period (Carrión, 1975, p. 339).

[58] For the Campiña in the 1920s, see Sumpsi (1978).

allowing yields to grow by a similar amount, leaving them some 60 per cent higher than Spain's in 1925/29.[59]

I do not possess sufficiently detailed sources to measure the degree to which cereal farmers were rational in their response to the potential of artificial fertilisers. However, in the couple of decades following the 1936–9 Civil War, two factors became apparent. First, perhaps a sixth of the nation's wheat lands were totally dependent on artificial fertilisers for cultivation by 1936, implying that in their absence – this land would return to rough pasture (see table 11.4 below). This growth in the area of cultivated land helped to improve the land to labour ratios, especially in the Interior, which in turn encouraged mechanisation (chapter 7). Second, although consumption per hectare of artificial fertilisers was small, especially in comparison with northern Europe, so too was the marginal physical product of fertilisers in Spain's *secano*. According to government figures in table 5.2, Spain used only 20 per cent of the phosphates, and 28 per cent of the nitrogen required to be technically efficient. However, a later study of a region in the Interior (the north Meseta) shows that yields were responsive only to a maximum input of 30 kilograms/hectare of nitrogen and phosphates each, suggesting that inputs of phosphates perhaps were not especially low, and nitrogen usage was only about half the technical ideal by the 1930s.[60] Even if the example of the north Meseta cannot be extended to the rest of the country, there can be no doubt that given Spain's climatic conditions and its traditional seed varieties, there was no real possibility of greatly increasing wheat yields using dry-farming techniques. If market prices suggest that more resources should have been used for wheat farming, Spanish wheat farmers appear to have been perfectly rational in extending the area cultivated, just as their contemporaries were doing in the Americas. Whether it was correct for the government to stimulate the input of more resources into wheat through its manipulation of the price mechanism is another question, and one to which we shall return in chapter 10.

Conclusion

This chapter has shown that, although there were significant regional variations, most Spanish farmers used relatively small quantities of both organic and chemical fertilisers prior to the Civil War. In the North, higher and better distribution of rainfall permitted mixed husbandry and

[59] The real gap of course was even larger, given the fact that much of Spain's wheat land was sown only once every two years.

[60] See chapter 11.

advanced systems of compost production to be practised, which helped to reinforce the self-sufficiency of much of its agriculture. On the irrigated land, especially in the Mediterranean, labour-intensive methods of obtaining organic fertilisers were substituted first by the imports of guano, and later by chemical fertilisers. By contrast, the Interior lacked sufficient rainfall for intensive livestock husbandry and had low chemical fertiliser consumption. Consumption of such fertilisers, however, did permit a growth in cereal output through an extension of the area cultivated, with yields remaining stagnant. Finally, in Andalucía, changes in crop mix (with a greater diffusion of olives on marginal cereal lands), and the introduction of chemical fertilisers, allowed some small improvements in cereal yields.

This suggests a major contrast between the relatively heavy consumption of chemical fertilisers in the small areas of dynamic intensive commercial agriculture, and the small quantities of chemical and organic fertilisers used elsewhere.[61] Valencian rice and orange growers, as their admirers noted, had little to learn from foreign technology or methods. The same was perhaps less true of Spanish sugar beet production, but farming methods were significantly more advanced than those of the traditional cereal farmers.[62] However, in these examples, greater fertiliser usage was only one of a number of inter-related changes, and without accompanying changes in other areas, such as the provision of irrigation, introduction of new crops or strains of seeds, or improved marketing systems, the use of chemical fertilisers would have been considerably smaller. By contrast, the relatively low consumption of artificial fertilisers on the large areas of dry cereal farming appears connected to the low level of response of the traditional seed varieties, a problem not solved until the 1960s. This technical bottleneck implied that only three alternatives existed to increasing agricultural productivity on Spain's *secano*: irrigation, mechanisation of labour tasks in cereals, and growth through labour-intensive crops such as the olive and vine which were suitable on these soils. These will be considered in turn in chapters 6, 7 and 9.

[61] The exception was the North where intensive systems of organic fertilisers were used until the end of the period.

[62] One contemporary noted that 'the introduction of this crop has promoted more the use of fertilisers and machinery than all the other crops in Spain together' (EPAPM, 7/2/1909, no. 614, p. 73).

6 Intensive cultivation and irrigation – a solution to low productivity?

The potential advantage to Spanish farmers of a long growing season (hot summers and mild winters), especially on the Mediterranean coast, is limited by summer drought. From the Roman period, if not before, small irrigation schemes using simple technology and surface water had allowed some farmers to overcome this restriction, producing higher yields and a wider variety of crops. These irrigation systems had been greatly extended during the Muslim occupation and new crops (rice, oranges, mulberries, sugar cane and cotton) introduced. The first section of this chapter shows that the general international interest in the construction of major irrigation schemes at the end of the nineteenth and beginning of the twentieth centuries was shared by many Spaniards, and seen by some as the key to solving the nation's agricultural problems. However, significant problems existed in the extension of irrigation farming. In the remainder of the chapter, I compare the success of an area of traditional irrigation, Valencia, with the difficulties in extending the area of irrigation in a relatively new area, that of the Ebro valley.

Although intensive irrigation cultivation had existed for centuries in Valencia, the half century prior to the Civil War saw farmers not only extending the area, but also introducing high-value crops (especially the orange), and changing production methods (fertilisers, selected seeds, machinery, tube-wells, etc.) in response to changes in factor and product markets. By contrast, the extension of irrigation in the Ebro Basin suffered frequently from both insufficient water during summer months, and lack of technical assistance to farmers. This resulted in traditional cereal rotations and olives being grown on irrigated land. It was not until the experimental farming in Zaragoza at the end of the nineteenth century showed the possibilities of sugar beet that new crops began to play a more prominent role. I conclude that although irrigation was essential for improved productivity, water alone was not enough. New inputs – fertilisers, seeds, machinery – were also required, together with crops that could be sold profitably. In this respect the extension of irrigation in Spain, although naturally limited by government budgetary constraints and the technical shortcomings of farmers, perhaps faced a greater short-term barrier in the lack of potential crops and markets.

Table 6.1. *Irrigation systems in Spain, 1916*

	Area (hectares)	% of total
Surface water		
1. Diverted from rivers, streams, canals, etc.	857,090	62.7
2. As above, but raised mechanically	26,913	2.0
3. Diverted from deposits, reservoirs, lakes, etc.	80,690	5.9
Sub-total	964,693	70.6
Groundwater		
4. Springs	239,268	17.5
5. Wells and pumps	98,516	7.2
6. Horizontal shafts	36,664	2.7
7. Artesian wells	27,300	2.0
Sub-total	401,748	29.4
Total	1,336,441	100.0

Source: Ministerio de Fomento (1918, 2, pp. 398–9).

Water resources, irrigation and crop production in Spain

The irrigation technology used in Spain in the 1760s relied mainly on simple channels constructed to divert water from springs, streams or rivers. In a few cases, such as the *Canal Imperial of Aragón*, or the *Acequia Real del Júcar*, ambitious and expensive canals had been constructed, although they were not always used exclusively for irrigation. Elsewhere, such as around Valdepeñas or the Vinaroz-Benicarló plain, *norias* and *senias* were a conspicuous part of the landscape.[1] The most complete statistical breakdown of irrigation systems before the Civil War was that of 1916 (table 6.1), which shows that still over four-fifths of the area irrigated (82.2 per cent) received water by simply diverting surface or spring water (groups 1, 2 and 4, and hereafter referred to as 'traditional irrigation'). Water which had been stored for later use (as in reservoirs, group 3) accounted for less than 6 per cent, and the drawing of groundwater by systems other than springs, only 12 per cent. Unlike, for

[1] Townsend (1791, 2, p. 287) and Cavanilles (1795–7, 1, pp. 36–9).

example, the Nile in Egypt, Spanish rivers had substantially less water in the summer months than the winter, precisely the time of year when irrigation was most in demand.

Along the Mediterranean coast, a number of highly developed surface irrigation schemes had existed for centuries, often involving complex water management systems and intensive crop cultivation. During the nineteenth century, the State attempted to encourage new irrigation schemes by providing financial incentives and creating the framework for local water management by farmers themselves. In particular, the *Ley de Aguas* of 1879 allowed tax concessions on newly irrigated land, permitted expropriation of land when public water with a flow of more than 200 litres per second was used, and established the legal framework for self-governing water boards. The legislation of 1883 for the first time provided state subsidies of up to 50 per cent for all major construction work, and loans of a further 50 per cent, at an annual 3 per cent interest, to irrigation associations for the preparation of land for irrigation purposes. The result was that the 1880s witnessed a construction boom in reservoirs, with eleven finished during the decade, although their size was generally small.[2] However, it was enough to lead two distinguished Italian hydraulic engineers, Zoppi and Torricelli, to note enthusiastically in their report to the Italian Government in 1883 that:[3]

> We are fully persuaded that Spain, from the point of view of the technique of irrigated crops and of the necessary equipment is so far advanced that no other European State can rank with it. The fact which drew our attention and which led us to investigate the causes was the great development of irrigation works in Spain and especially in the costly form of artificial lakes. At a number of points on the peninsula new reservoirs are under construction or projected, and consortia have already been formed for their utilization.

Yet despite the enthusiasm of Torricelli and Zoppi, the new schemes undertaken were usually financial failures and, as table 6.2 shows, construction was slow prior to the First World War. Joaquín Costa, the leading Spanish writer on irrigation policy in the nineteenth century, noted that the high initial investment required in hydraulic projects and the long-term payback implied that only the government was capable of financing the building of reservoirs and canal systems. Costa identified two potential areas of profits from irrigation: the distribution of water, and the added revenue obtained by farmers from their greatly increased production. Private companies could only benefit from the

[2] The two largest were Puentes (irrigation) and Villar (drinking water) (Nadal Reimat, 1981, p. 152).

[3] Cited in Ferrari (1926, pp. 398–9).

former (and smaller of the two), and this had frequently not been sufficient to cover costs, leading to a number of important financial failures in the construction industry.[4] By contrast the State could benefit also from the greatly increased tax revenue which irrigation would bring.[5]

One limitation to irrigation, as is apparent in table 6.2, is that the principal hydraulic schemes of the period 1790–1913 consisted of building canals, not reservoirs. By the late nineteenth century, the provision of distribution channels alone was not sufficient as growing demand for water meant shortages during the periods of maximum demand (i.e. the summer).[6] Although one potential, short-term solution was the better organisation of water usage by farmers, in the long term, reservoir construction was required to store the winter rains. In this respect, the building of major reservoirs in a number of countries (for example, Egypt, India and the United States) offered examples of the potential of the new construction technologies, and Spain sent engineers to report.[7] Although Spain had a long history of construction of small storage dams and barrages, the greater size of dams required to meet demand posed formidable technical and financial problems. In the first instance, dam construction was often required in inaccessible parts of the country at the headstreams of rivers, implying an additional large investment in the provision of suitable infrastructure. A second factor was that Spain, especially in the Mediterranean area, was prone to flooding that could increase normal river flow by a thousand times. This meant that the capacity of the dams had to be much greater than would otherwise be required.[8] Finally, heavy flooding contributed to soil erosion, a problem exacerbated in Spain in the nineteenth century by deforestation, which in turn led to large quantities of sediment building up in the reservoirs. For example, one recent study has shown that whilst topsoil loss in the Loire valley is only 10 tons/km^2 a year, in the Segura valley (Murcia) it

[4] The financial difficulties involved in canal and reservoir construction were numerous, with the most notorious being perhaps the Canal de Urgel. See Llauradó (1884, 2, pp. 410–23) and Zulueta Gomis (no date, pp. 72–110).

[5] Costa, basing his calculations on the experience of the Canal de Urgel, suggested that the potential tax revenue from the Tamarite and Sobrarbe canals would provide between 5 and 6 million pesetas which, at 5 per cent interest, would allow a government expenditure on these projects of at least 100 million, or 500 pesetas per hectare irrigated (Costa, (1911b, p. 234). In table 6.2 it can be seen that the Tamarite (Canal Aragón y Cataluña) in fact cost 593 pesetas per hectare when measured by the area actually irrigated, or 304 pesetas per hectare when the area of potential irrigation is used.

[6] There were similar complaints in the eighteenth century. For example, before being taken over by the Canal Imperial in 1775, the Canal Tauste had problems irrigating during the summer months (Llauradó, 1884, 2, p. 355).

[7] Nicoláu and Puig de la Bellacasa published studies in 1905 and 1908 on irrigation in Egypt and the United States. In return, a large number of foreigners visited Spain.

[8] Houston (1950, p. 61).

Table 6.2. *Principal canals and reservoirs in Spain, 1914*

A. *Canals*

	Date finished	Length (km)	Cost (millions pesetas)	Potential area irrigated (hectares)	Actual area irrigated (hectares)	Cost per hectare irrigated (pesetas)
Imperial de Aragón (2)	1790	96	23.10	28,000	28,000	825
Tauste (2)	1790	45	4.55	9,000	6,700	506
Castilla[a] (1)	1848	227	17.45	n.a.	n.a.	n.a.
Urgel (2)	1861	144	28.08	69,000	60,000	407
Delta derecho de Ebro (2)	1866	29	11.20	12,400	7,500	700
Elsa (1)	1870	42	2.55	13,000	1,500	196
Henares (3)	1870	37	5.65	11,500	8,500	491
Aragón y Cataluña (2)	1910	124	31.94	105,000	53,854	304
Delta izq. de Ebro (2)	1912	27	10.50	12,600	4,000	553

B. *Reservoirs*

	Date finished	Cost (millions pesetas)	Size ('000 m^3)	Irrigation: capacity (hectares) or usage
Villar (3)	1880	2.05	21,900	drinking water
Campofrío (4)	1883	2.04	2,570	industrial
Puentes (5)	1884	3.46	32,360	12,000
Santillana (3)	1908	2.65	45,000	drinking and hydroelectricity
La Peña (2)	nearing completion	6.60	18,000	16,000
Riudecañas (6)	nearing completion	2.84	3,446	1,500
Alfonso XIII (5)	nearing completion	2.21	23,112	improved irrigation
Talave (5)	nearing completion	2.74	19,892	improved irrigation
Buseo (7)	nearing completion	2.28	7,502	10,500

(1) Duero basin; (2) Ebro; (3) Tajo; (4) Guadalquivir; (5) Segura; (6) Tarragona; (7) Júcar.

[a] The Castilla canal was constructed principally for communication purposes.

Source: Based on Bello (1914, pp. 28–31 and 44–53).

reaches 130 tons/km^2.[9] In 1900, Spain had a reservoir capacity of only some 78 million cubic metres, a figure which had increased to 3,620 million by 1940, and had reached 42,201 million in 1980.[10]

The first step towards meeting Costa's demands for more action by the State was the *Plan Nacional de Obras Hidráulicas* of 1902, which attempted a national approach to measuring and planning the country's water assets. In all, 296 new hydraulic constructions, which would have increased the irrigated area by 1,469,922 hectares and provided work for some 250,000 families, were planned. However, according to Lorenzo Pardo, the 1902 Plan was badly conceived as it treated each construction separately, and failed to provide an overall plan of the country's needs.[11] Not only was the Plan badly conceived, it lacked any budgetary work, and was presented to a State which lacked the political will to finance even a small part of it.[12] As a result, the speed of new irrigation projects coming into operation remained slow. From an estimated 1.23 million hectares irrigated in 1904, the area had grown to only 1.5 million by 1932, an annual increase of 0.7 per cent – about the same as the total area cultivated.[13]

By the Second Republic, some 29 per cent of the total value of crops was produced under irrigation, and included products such as oranges, rice and cotton.[14] However, in terms of the area and output, it was the traditional crops, such as cereals, legumes and vegetables which were the predominant irrigated crops (table 6.3). At first sight this appears to be a misallocation of resources, with farmers planting low-value crops (cereals, legumes, etc.) instead of higher value ones (such as oranges). However, this was not often the case, as the area under low-value crops can also be explained by the fact that they were often grown in rotations

[9] Cabo (1986, p. 307).
[10] AEA *año 1980* (p. 10). The minimum size of reservoirs considered is 500m^3.
[11] Ministerio de Obras Públicas (no date, 1, p. 20).
[12] Although it was partly revised in 1909, 1916 and 1919, it was not fully replaced until the 1933 Plan. By that year, only 30 projects had been completed, and a further 17 were under construction (ibid., p. 24). To help coordinate demand for water in a catchment basin, the Government passed two decrees in May 1926, one to permit the establishment of water authorities in the major catchment areas, the second to create the first authority, in the Ebro basin. The decree forced all major water users to join a confederation, a self-governing body which aimed to maximise the use of the water resources. The confederations were given statutory powers to expropriate land, and tax any increase in property values caused by its activities. For government budgetary priorities, see Harrison (1976).
[13] Calculated from Jiménez Blanco (1986a, cuadro 19).
[14] Estimated from AEPA (*año* 1932).

Table 6.3. *Output and yields on irrigated and non-irrigated land, 1932*

	Irrigated lands				
	Area sown (ha)	Value of total output (millions pesetas)	Output (pesetas/ hectare)	Average yields with irrigation (tons)	Average yields without irrigation (tons)
Vegetables[a]	174,186	769	4,415		
Potatoes	137,182	381	2,778	14.81	10.67
Wheat	237,138	249	1,050	1.97	1.05
Oranges	74,638	235	3,151	16.26	n.a.
Sugar beet	72,533	150	2,070	25.60	13.70
Rice	49,670	107	2,150	6.41	n.a.
Barley	123,541	95	765	2.15	1.43
Bananas	5,122	90	17,621	35.20	n.a.
Beans	78,134	90	1,151	1.14	0.46
Maize	95,988	90	936	2.25	1.36
Onions	21,973	76	3,464	26.46	12.22

[a] Includes all the 'huerta'.

Source: AEPA (*año 1932*).

with higher value crops, or that the farmer had no real alternatives given the shortage of irrigation water in summer.[15]

In the absence of labour-saving technologies, the greater demand for labour on irrigated land would lead to diseconomies of scale, and encourage cultivation in small units, raising total labour productivity, but not hourly productivity.[16] However, the provision of irrigation systems would not necessarily encourage market-orientated production, or produce backward and forward linkages to the rest of the economy. The experience of a civilization such as that of medieval China, shows that sophisticated irrigation schemes were quite compatible with traditional technology and a relatively high level of self-sufficiency.[17] High pro-

[15] For the importance of wheat in rotations, see especially Garrabou (1985, pp. 29 and 30).
[16] As Zulueta Gomis asked, 'What owner stops to calculate what his hourly wage is?' The same writer notes that landowners were able to triple rents of irrigated land by subdividing it into small lots (Zulueta Gomis, no date, p. 102).
[17] Jones and Woolf (1969, p. 1). In Murcia, the mulberry tree in the seventeenth century accompanied a self-sufficient, cereal-based agriculture, its sale providing the peasant with the 'liquidity to pay the rent, possible debts and, increasingly, taxes' (Pérez Picazo and Lemeunier, 1987, p. 565).

ductivity could only be achieved therefore with commercial high-value crops, otherwise subsistence agriculture was likely to be practised with high output per unit of land, but with low labour productivity.

The rest of this chapter argues that the relatively slow progress in extending the area irrigated cannot be explained solely in terms of government budgetary priorities or the technical skills of Spanish engineers. Farmers also had to learn to use water efficiently and to grow new crops with different cultivation techniques if the irrigation systems were to be profitable. In the words of Costa:[18]

> the hydraulic policy concerns the nationalization of water and its . . . storage by the State, but it also implies the establishment of technical schools . . . where learning is through practical experience . . . the use of chemical fertilisers, the rotation of cereals with legumes without fallow, whether with irrigation or *secano*, the intensive cultivation of meadows and market-gardens, and the combination of arable with livestock breeding.

The extension of traditional irrigation: the case of Valencia

It was perhaps in Valencia that irrigation-based cultivation techniques and water management schemes were most sophisticated. Many of the important schemes in Valencia were already in existence before 1800, and consisted of directing the water from the main rivers (Turia and Júcar) along canals and channels on the coastal lowlands, before they emptied into the sea. Almost all the hydraulic works had been built and operated privately, using some form of communal water management organisation.[19] To assess the success of Valencian irrigation in increasing productivity, three crops are examined: rice, oranges and mulberry leaves (silk production). It will be argued that the small scale of the irrigation systems and farms meant that it was the farmers themselves who instituted change rather than the State, which limited its activity in the period under discussion to the construction of a small reservoir and two research stations.[20]

[18] Costa (1911d, cited in Fernández Clemente, 1990, p. 73).

[19] Undoubtedly the most famous water management system, which dates from Muslim times, was that of the lower Turia for irrigation of the market gardens around Valencia. The irrigation needs of the seven main canals were determined by the *atandador*. Irrigation rights belonged to the land, and could not be sold or separated from it. An individual's abuse of his rights implied that another farmer went without water. At a weekly meeting, the famous *Tribunal de las Aguas* (Water Tribunal) dispensed judgement on conflicts arising from infringements of water rights. The Tribunal still meets, every Thursday in the doorway of the Cathedral. No appeals against its judgements are accepted, nor are written records kept.

Rice

Between 1796 and 1932 the area of rice in Valencia doubled, with an annual increase of 0.46 per cent.[21] A large part of this expansion took place on land which had previously been marshes or lagoons, areas which were regarded by the government as health risks because of malaria. Of particular importance was the reclamation of lands from the Albufera lagoon, in the *Ribera Baja*, which allowed a further 6,163 hectares of rice to be sown between 1796 and 1920.[22] These reclaimed lands were only suitable for rice and were cultivated in relatively large units using wage labour. They required large quantities of fertilisers to avoid soil exhaustion.

The high prices and significant employment opportunities with rice also encouraged farmers to grow the crop on the *Ribera Alta*, higher land than the *Ribera Baja*, and of better quality.[23] Here rice was grown in rotation with other crops in small units using family labour. As the mainstay of the local diet, its small harvest fluctuations resulted in it becoming an ideal subsistence crop for farmers, permitting them to dedicate the rest of the rotation to more risky commercial crops. Two potential problems faced rice growers: the concern of the government and local authorities over creating large areas of stagnant water near to towns and villages, and the massive amount of water needed for rice cultivation.[24] Although official concern declined as the incidence of malaria was reduced during the nineteenth century – the result of better

[20] The *Plan provisional de obras hidráulicas* of 1902 planned ten reservoirs to be built by the State, but only that of Buseo in 1915 had been completed, although that of María Cristina (1925) had also been built privately (Piqueras, 1985, p. 138).

[21] Calculated from table 6.4. Between 1730 and 1796 the annual rate of growth had been 0.83 per cent (Mateu Tortosa, 1987, p. 50).

[22] Calatayud (1986, p. 452). Writing of the 5,000 hectares recovered between 1863 and 1927, Piqueras notes that 'nothing less' than 6 million tons of infill, carried in small boats was required, 'reminding one of the great works in China' (Piqueras, 1985, p. 134).

[23] The area of rice fell in the *Ribera Baja* from 63 per cent of the provincial total in 1796 to 50 per cent in 1920, against that of the *Ribera Alta*, which increased from 22 to 26 per cent. The other main area was in the immediate vicinity of Valencia (the *Horta*). Calculated from Calatayud (1986, pp. 451–3).

[24] Cavanilles suggested that rice cultivation required six times more water than market gardening (*huerta*) (cited in Calatayud, 1986, p. 463). In reality, as Calatayud suggests, interest in rice cultivation was related to its profitability, and official petitions to extend the area occurred frequently after some natural disaster, making it difficult for authorities to refuse (ibid., pp. 465 and 480).

drainage and manuring techniques – legislation was passed in 1860 and 1861 to limit the extension of cultivation. The strong growth in cultivation during the first half of the nineteenth century created severe problems of water supplies, leading to conflicts between different organisations drawing on the waters of the River Júcar. These were temporarily solved by the 1845 *Ordenanzas*, which created a single administrative unit for both the traditional area irrigated by the *Acequia Real del Júcar* and that of its extension, completed in the late eighteenth century by the Duque de Híjar.[25] Sufficient to meet existing demand, the new water management system was insufficient to allow extensions in irrigation until the reservoir constructions of the twentieth century. Finally, the late nineteenth century saw growing international competition in rice markets, which also discouraged farmers from extending the area of rice much further (table 6.4).

The restrictions on extending the area cultivated led to attempts to increase yields, and contemporaries from the 1880s claimed that the region had the highest rice yields in the world (table 6.5).[26] High yields were achieved not so much from the intensive use of labour, but rather the increasing use of factor markets to obtain fertilisers and seeds. As we saw in the previous chapter, the intensive use of organic fertilisers in the early nineteenth century required large quantities of labour for collection and spreading, and explains the early use of guano in the Valencia area which reduced labour costs. The use of guano had allowed a major increase in the area of rice on land previously considered marginal because of lack of manure, and at the same time total average yields increased between 1800 and 1886.[27] From the mid-nineteenth century, the area grew only slowly but, after farmers overcame the initial difficulties in adapting chemical fertilisers to rice, yields increased strongly (table 6.4).

A second factor to explain the growth in rice yields from the mid-1880s was the increasing knowledge of seed varieties. The harvests of 1884 and 1885 suffered badly on account of flooding, cholera and a plant disease called 'straight head'.[28] At the time, a number of theories

[25] Calatayud (1984, pp. 295–322).

[26] Amongst others, see *Crisis Arrocera* (1887, pp. 56–7); Morote (*c.* 1914) and Font de Mora (1939, p. 117). It should be noted, however, that the area cultivated in Spain was much smaller, being 38,000 hectares in 1909/13, against 32 million in India, 3 million in Japan, 269,000 in the USA, 145,000 in Italy and 109,000 in Egypt.

[27] The majority report of the *Crisis Arrocera* of 1887 believed that yields in the *Ribera Baja* in 1800 were only about 1.4 tons, and the use of guano 'doubled or on occasions tripled' rice yields (p. 31), which would imply that the yields given in table 6.4 for 1770 and 1796 are too high.

[28] *Fallada del arroz* or *cabeza anhiesta*. 'The disease appears on muddy, badly drained soils, with a high content of organic material and is especially prone in periods of excessive rain' Angladette (1969, p. 596). In 1885 the rice varieties badly affected were

Table 6.4. *Rice cultivation in the province of Valencia*

	Area (hectares)	Yield (tons per hectare)	Total production (tons)	Price per ton
1770	14,792	3.0	44,376	n.d.
1796	16,620	2.2	36,564	n.d.
1860	26,169	n.d.	n.d.	n.d.
1881	23,448	3.8	87,930	272
1903/12	28,334	5.8	163,518	236
1922	31,412	6.3	198,382	n.d.
1932	31,106	7.2	223,963	326

Conversions for units used in sources: 1 hectare=12.03 *hanegadas*; 1 *cahíce*=2.01 hectolitres and 1 hectolitre=62.5 kilograms (*Crisis arrocera*, 1887, p. 186; and Sanz Bremón, AMA, legajo, 259).

Sources: For 1770, Mateu Tortosa (1987, pp. 50 and 70–1 (taken as 2 *cahíces*/*hanegada*)); for 1796, Cavanilles (1795–7, 1, p. 177); for 1860, Sanz Bremón (1875:1979, p. 228); for 1881, Sanz Bremón (1881:1979, pp. 255–9); for 1902, Ministerio de Agricultura, Industria, Comercio y Obras Públicas (no date, p. 28); for 1903/12, Ministerio de Fomento, Dirección General de Agricultura, Minas y Montes (1915, p. 217); for 1922, GEHR (1991, pp. 1077 and 1081); and for 1932, AEPA (*año* 1932, pp. 226–7).

Table 6.5. *Rice yields in various producer countries, 1909/13 and 1924/8 (tons per hectare)*

	1909/13	1924/8	Growth (%)
Spain	5.0	6.2	+24
Italy	3.3	4.6	+39
USA	1.8	2.1	+17
India	1.5[a]	1.4	−7
Japan	3.2	3.5	+9
Egypt	2.8	3.1	+11

[a] 1914/18.

Source: FAO (1963, pp. 13–14 and 19–20).

were put forward, including the exhaustion of the soil through improper use of chemical fertilisers and seed failure. Considerable efforts were made to introduce new varieties, especially from Asia and Italy, together with attempts to improve existing strains. In 1924, the first hybrid was

Antellano, *Caruso* and *Llavoreta de Algemesí*; in 1895 *Bomba*; and in 1910 and 1911 *Amonquili* (Carrasco García, 1952, p. 60).

achieved in the *Estación Arrocera de Sueca*, and average yields in Valencia reached 7 tons per hectare by the Civil War.[29]

These changes in chemical and biological technologies were only partly matched by those in the mechanisation of cultivation. From the late nineteenth century, it was widely believed that Valencian rice was uncompetitive on world markets because of high labour costs. Attempts were directed towards reducing labour inputs, and success was significant in some operations, as one writer noted in 1914:[30]

> a few years ago the farmer only used hoes (*azadas*) or the old roman plough painfully pulled by a pair of mules, threshing was done almost exclusively by animals, and only the constant use of artificial fertilisers gave this crop a special air of progress . . . . in little more than twenty years the use of the mouldboard has become widespread, harrowing perfected, and the use of mechanical threshers is becoming more frequent.

Despite these changes, rice remained a labour-intensive crop before the Civil War. One problem to mechanisation was the small size of many of the farms, being usually only about one hectare. This fact, and the damp nature of the soil, made it impractical to harvest by machine.[31] Threshing was easier, with the first all-purpose threshers being adapted for rice, before a local engineering firm started producing machines exclusively for the crop. The small size of some farms was overcome by the use of a rental market for portable machines.[32] Finally, the improvement in tillage machinery required an increased supply of energy to operate them efficiently, and the province of Valencia witnessed large imports of stronger animals from Brittany and Gascony.[33]

To assess the impact of these changes in technology on rice production, table 6.6 brings together a number of different estimates of costs between 1768 and 1933.[34]

[29] Carrasco García (1952, p. 97).
[30] López Guardiola (1914, p. 180).
[31] Ibid. (p. 188). Another problem in introducing harvesters was that the value of grain lost in the operation exceeded the savings achieved by mechanisation (Font de Mora, 1939, p. 139).
[32] These modifications were carried out by Gordillo and Martí, and the first locally-produced machines by the firm, Hijo de Domingo Gómez, in Valencia. By the Civil War, there were almost 200 threshing machines operating in the province (ibid., p. 143).
[33] See R. Janini in his work entitled *El perfeccionamiento de los métodos de cultivo del arroz en la provincia de Valencia como causa del cambio de su población equina*, Valencia, 1914.
[34] A relatively large number of profit and loss accounts exist for rice production after 1860. The 1863 figure has been chosen because it is from the *Ribera Baja* and that of 1878/83 for the reasons given in *Crisis Arrocera* (1887, pp. 19–23); Maylin's estimate of *c.* 1905 has been ignored because of the absence of fertilisers, and Font de Mora (1939) and Carrasco García (1952) because they lie outside our period.

Table 6.6. *Changes in relative costs in rice cultivation (per cent)*

	1768	1863	1878/83	1933
Seedlings	20.5	10.0	6.5	6.8
Fertilisers	18.1	26.0	29.4	12.2
Labour and other costs	41.7	47.4	38.2	53.8
Rent	19.7	16.6	25.9	27.2
Total	100.0	100.0	100.0	100.0

Sources: 1768, for the Valencian *huerta*, Valácarcel (1768, cited in Mateu Tortosa, 1987, p. 72); 1863 and 1878/83 for Sueca (*Ribera Baja*), *Crisis arrocera* (1887, Apéndice 11); and 1933, García Gisbert (1933, pp. 106–7).

Fertiliser costs per unit of output show a steady increase in their share over the century prior to 1883, before falling sharply because of the more efficient chemical fertilisers. The relative cost of seed fell significantly, probably on account of better transportation and more scientific selection. The share of rent, after remaining relatively stable over the first part of the period, increased over the second half and reflects the growing crop yields. Finally, labour and other costs reached their peak in 1933. Within this category are also included work animals and machinery, the use of which increased as the period progressed. However, labour costs appear to have risen both in rice and orange production between 1880 and 1936, and was perhaps the cause of the growth in small holdings on irrigated land from the late nineteenth century in the region of Alzira.[35] Although high wages threatened the capacity of producers to compete in world markets, it did allow a notable increase in local disposable incomes.[36] In conclusion, rice production provides an example of high productivity, achieved by farmers responding to changes in factor and product markets.[37] It also illustrates the complementary nature of inputs, as will also be seen in the case of orange growing.

Oranges

Although the first orange plantation had been noted in 1791, the amount of land given over to oranges grew slowly until the last quarter of the

[35] Calatayud (1989a, cuadro 7).
[36] Wages reached 15 pesetas a day for six hours work for transplanting and harvesting (Font de Mora, 1939, p. 288).
[37] It should be noted that, despite having the world's highest yields, the last decade of the period saw high domestic tariffs and a system of export bounties in operation.

nineteenth century. From then it grew rapidly, with an annual growth rate of 3.8 per cent a year between 1881 and 1932 (see table 6.7). Three explanations are usually given for this rapid growth: the improvement in transportation and the introduction of refrigerated boats, leading to a rapid growth in external demand (see chapter 9), the standardisation of the product, and the improvement of water supplies for irrigation.

The orange was predominantly an export crop, with only 28 per cent of production in the period 1927–31 being sold on the domestic market. According to one writer:[38]

> the lack of uniformity of the fruits was the greatest threat to future demand. It has been the introduction of grafting and the use of varieties initially produced spontaneously that has allowed the birth of the great trade in citrus fruit.

Other problems of standardisation, such as the selling of underripe or frost-damaged fruit, were more difficult to solve, and required government legislation if the sale of poor quality products were not to undermine consumer confidence.[39] The establishment of a number of different varieties, which offered the consumer a choice of fruit (oranges, mandarins, and so on), and which lengthened the season, were paramount to its success.

Table 6.7 shows that whereas the area under cultivation grew rapidly, average yields remained stagnant. Unlike the case of rice, the rapid extension of the area was often initially from inferior soils to better ones, as the orange slowly displaced other crops on traditionally irrigated lands. However, like rice producers, growers had difficulties in adapting the new chemical fertilisers to their soils in the mid-1880s. Once this had been mastered, yields were maintained with heavy inputs of chemical fertilisers.[40]

As noted above, by the mid-nineteenth century there was a shortage of water in the River Júcar to allow an extension of irrigation on new lands, and the presence on existing irrigated land of intensive crop rotations made an immediate switch to oranges risky. However changes in tube-well technology provided an alternative. Madoz in the 1840s had noted the extensive use of *norias* and *senias* along the banks of the River Júcar to draw on groundwater, but it was after the 1880s that growers, using the new industrial technology, developed wells of ever

[38] Font de Mora (1954, p. 11).

[39] The decrees of 1930 and 1935 dealt with the marketing of the fruit. The main unresolved problem in this period was that an apparently mature orange (i.e. of the correct colour) could be bitter. Unlike some fruit, oranges do not ripen naturally after picking.

[40] Arévalo y Baca (1886, pp. 5–6).

Table 6.7. *Orange cultivation in Valencia*

	Area (hectares)	Production (tons)	Yield (tons per hectare)	Price (pesetas per ton)	% of national production
1881	6,200	93,000	15.0	100	58
1902	11,021	198,378	18.0	80	32
1922	20,000	389,000	19.5	n.d.	48
1932	40,518	603,590	14.9	144	52

Sources: Sanz Bremón (1979, pp. 271–4); Ministerio de Agricultura, Industria, Comercio y Obras Públicas (no date, p. 28); GEHR (1991, pp. 1085 and 1089); and AEPA (*año* 1932, pp. 226–7). The last source gives yields per hectare of trees in full production as 20.8 tons, 'young' trees 6.1 tons and mandarins 19.2 tons.

greater depths on unirrigated land of poor quality.[41] As Calatayud has suggested, the technology was not always interchangeable as the deeper tube-wells needed relatively large areas to be profitable, unlike the old norias. This implied that these tube-wells were the work of rich farmers or landowners, although by the twentieth century it was common to find the use of both limited companies and cooperatives of small farmers.[42] Once the crop's profitability had been established, it started to displace other crops on better, already irrigated land.

The sinking of tube-wells was expensive, as was the establishment of orange groves on account of the heavy labour requirements and the delay before the first full harvest.[43] On the larger farms these costs were often offset by leasing or share-cropping arrangements, although for an irrigated crop, the orange was often grown in relatively large units. If crop yields and labour demand per hectare changed little during the

[41] Madoz (1849, vol. 15, p. 323). The first steam pump had been introduced in Carcaixent in 1850. The growing use of tube-wells in the late nineteenth century was noted by Sanz Bremón (1979) and Llauradó (1884). For summaries of these changes see Garrabou (1985, pp. 51–2 and 98–107) and Calatayud (1990).

[42] Calatayud (1990, pp. 207–10). See also López Gómez (1974, p. 197) and Garrabou (1985, p. 106). Maylin (1905, p. 162) notes that the land was of the 'poorest quality' and thus had a low opportunity cost. This was in contrast to the Lower Segura, where the growth of oranges took place on land owned by small market-gardeners (Calatayud, 1989b, p. 100).

[43] Font de Mora (1954, pp. 305–7) notes that *annual* costs were greater than annual income until the seventh year, and that planting costs were only fully absorbed in the twelfth year. Water from tube-wells was relatively expensive (and hence not used for rice cultivation) at 36 pesetas/hectare for each irrigation in 1916. By contrast water from the *Acequia Real del Júcar* was an annual 6–12 pesetas per hectare for *cequiaje* (another 12 pesetas was required in the land of the extension) (*Ministerio de Fomento*, 1918, I, pp. 365–6). See also Palafox (1985, pp. 325–31).

period 1880–1936, the high returns per hectare (table 6.3) encouraged a rapid extension of cultivation.

Silk

In contrast to the Valencian farmers' success in increasing the output of rice and oranges, commercial silk production proved to be a failure. The production of raw silk for weaving involved the breeding of silkworms (sericulture) and the reeling and throwing of the silk from their cocoons – tasks which were ideally suited to small-scale production. Although usually irrigated, the mulberry tree had small water requirements and this fact, together with the low cereal prices in the seventeenth century, had led to a considerable growth in its cultivation.[44] By the mid-eighteenth century, however, Valcárcel noted that farmers were uprooting their mulberry groves for other crops, and leaving just enough trees to mark the extent of their properties, and thereby seriously diminishing output.[45] The mulberry therefore tended to be found within a polyculture, with the farmers using the leaves to feed the silkworms. However, by the beginning of the 1760s the production of raw silk was in decline in the Valencia region. It has been suggested that behind the debate over the health risk associated with rice production, there lay a conflict between the interests of silk producers and the large absentee owners on one hand, and the peasants who wished to cultivate rice on the other.[46] The success of rice farming implied a considerable growth in the use of irrigation, to the consequent detriment of the mulberry which suffered from the excess of water in neighbouring fields.[47] As we have seen, rice had the advantage for small farmers in that it required a large labour force, provided a secure harvest of a basic food, and was more easily sold than silk.[48]

Both the agricultural and industrial branches of silk production were, therefore, in decline in Valencia, even before the outbreak of the disease *pebrina*, in 1854. The risk of disease could be reduced by using microscopes to ensure that the cocoons were not contaminated. This technology was generally not available to growers, who preferred instead to purchase cocoons from abroad, thus greatly increasing costs.[49] By the

[44] In Alzira the mulberry increased from 132 hectares (1,583 *hanegadas*) in 1650, or 11 per cent of the irrigated lands, to 1,164 hectares in 1672, or 65 per cent (Peris Albentosa, 1989, p. 196).
[45] Cited in ibid. (p. 198).
[46] Peris Albentosa (1989, p. 215).
[47] Martínez Catalán (1896, p. 17).
[48] Peris Albentosa (1989, p. 215).
[49] Melgares (1887, p. 14).

late nineteenth century, heavy pruning in Valencia led to reduced yields of mulberry leaves of between 115 and 160 kilograms per tree in the Ribera del Júcar, and between 35 and 70 kilograms in the Huerta of Valencia, compared with 288 to 345 kilograms in other parts of Spain.[50] A second 'failure' on the part of the producers concerned labour organisation. One period of intense work, the feeding of the silkworms, lasted about six weeks, and required significant amounts of family labour. By contrast, in Valencia, the reeling and throwing of the silk was done by outside labour because it coincided with peak demand for labour in other crops.[51] The difficulties of matching the labour requirements of a multi-cropping farming system with the supply of family labour was overcome in Japan in the twentieth century; in Valencia, by contrast, farmers preferred to change their cropping systems.[52]

The failure of the Valencian farmer to overcome these problems can only be explained by the growing attraction of other crops such as rice, citrus fruit and market gardening. In the province of Murcia, and especially in the *huerta* of the provincial capital, significant attempts were made to benefit from the international advances in sericulture, and the mulberry remained important until the 1950s.[53] It is difficult to accept that these initiatives would not have occurred in Valencia if more profitable opportunities had not been available to farmers.

The introduction of new irrigation: the case of the Ebro Basin

The region with the greatest irrigated area in Spain by the Civil War was the Ebro Basin, where flow-irrigation systems diverted water from the River Ebro and its many tributaries along a number of canals (see table 6.8). In general, these canals were built ahead of demand, as the report of the *Junta del Canal Imperial de Aragón* of 1789, La Ripa, suggests:[54]

> It is sad to see the large and fertile lands that still remain uncultivated despite for many years being able to be improved by irrigation ... Of the aforesaid uncultivated lands, some are communal lands belonging to towns, and others belong to private owners.

[50] Martínez Catalán (1896, p. 14).
[51] Peris Albentosa (1989, pp. 54–5).
[52] Nghiep and Hayami (1979). In Japan the period of cocoon culture was traditionally April–June, but was changed to July–September.
[53] The *Estación Sericícola* was created in 1892, although it only really started operating in 1902 (Pérez Picazo and Lemeunier, 1987).
[54] Cited in Fernández Marco (1961, p. 107). The Canal was also constructed for transport.

Table 6.8. *Actual and potential irrigation in the Ebro Basin, 1884 and 1913*

Canals	Potential area for irrigation		% of area irrigated	
	1884	1913	1884	1913
Imperial	26,368	28,000	55	100
Tauste	9,990	9,000	60	74
Urgel	90,000	69,000	58	87
Ebro (right bank)	11,780	12,400	51	60
Aragón y Cataluña	n.a.	105,000	n.a.	51
Ebro (left bank)	n.a.	12,600	n.a.	32

Sources: Llauradó (1884, 2, p. 437) and Bello (1914, pp. 28–9).

Over a century later, a similar situation existed with the Canal de Urgel, one of the largest constructions in Spain. Here, a considerable area that should have benefited from irrigation remained uncultivated; and, on much of the land that was irrigated, farmers continued to grow traditional *secano* crops using extensive rotations with fallow.[55] Therefore, as Llauradó and Otero noted, the need by the end of the nineteenth century was not so much to extend the area under irrigation, but rather improve that already existing, and introduce more intensive systems of production.[56] Undercultivation (or lack of cultivation) was the result of three distinct problems. The first was the seasonality of water supplies, with the risk of summer drought making it impossible for farmers to switch from traditional cereal/legume rotations or olives into more profitable ones. Of the 384,746 hectares of irrigated land in the Ebro Basin in 1904, almost 100,000 hectares suffered from seasonal shortages.[57] Improved water supplies could be obtained by better organisation, and especially by the construction of reservoirs.

The second factor was the question of crop mix. The traditional cereal/legume rotation would only be changed if a more valuable crop was available, which in turn was a question both of market opportunities and a farmer's ability to change production techniques. Outside a few small areas of market gardening in the region, new crops did not appear until the experimental farm in Zaragoza was established. Under the direction of Otero and Rodríguez Ayuso, farmers were encouraged in 1892 to plant red clover, alfalfa, and especially sugar beet.[58] The delay in introducing sugar beet in Spain can be explained in part by market factors (the reliance on colonial supplies, especially Cuban, and the indigenous sugar cane industry), and in part for the need for advanced, costly technology associated with the extraction of the sugar.[59] Sugar beet, as with rice or oranges, required much greater quantities of fertilisers than the traditional cereal legume rotations, and local supplies of manure in Zaragoza were quickly exhausted, encouraging the use of chemical fertilisers. Information on this was provided by the local experimental farm, together with advice on the most suitable seeds and cultivation methods. In contrast to Granada (the other major centre of sugar beet production at this time, where initial advice on cultivation and manufacture came mainly from foreign technicians who were often unacquainted with the complexities of irrigation technologies), the experimental farm in Zaragoza sought to find the best cultivation methods for local conditions.[60] The result was that the sugar yield obtained from the beet was higher than that produced by farmers in Granada, and this allowed the region to capture a greater share of the market.

A farmer's ability to introduce changes in cultivation was limited by his previous experience (normally extensive cereal rotations or viticulture), lack of capital (the result of low productivity in traditional agriculture) and lack of available labour (traditional low population density associated with regions of *secano*). The problem of education was dealt with by the *Granja-Instituto* in Zaragoza, although here, as elsewhere, private institutions (namely sugar beet factories) also played a major role. The abnormally high profits of 1898–9 and 1899–1900 encouraged the widespread adoption of sugar beet and, in order to guarantee supplies, mill owners were willing to provide farmers with the necessary skills, together with seeds and loans, contracting in advance to buy their production. By 1932, the province of Zaragoza

[55] *Ministerio de Agricultura, Industria, Comercio y Obras Públicas* (1904, p. 91).
[56] Llauradó (1884, vol. 2, p. 439) and Otero, (1885, cited in Germán and Forcadell, 1988, p. 89).
[57] Provinces taken as Lleida, Huesca, Navarra, Teruel and Zaragoza. These problems were not unique to this region however, as the Henares Canal (provinces of Guadalajara and Madrid), which was completed in 1863, had the capacity to irrigate some 10,000 hectares of land during most of the year – the exception being precisely the months of drought.

[58] *Ministerio de Agricultura, Industria, Comercio y Obras Públicas* (1904, p. 272).
[59] Sugar was first produced from sugar beet in Granada in 1882, and technology (machinery and technical skills) was brought from France by a local chemist and doctor. After initial difficulties, the technology had been copied by nine others by 1889/90. See the excellent study by Martín Rodríguez (1982, p. 104).
[60] *Granja-Instituto de Zaragoza* (1906, pp. 399–400).

had over 24,000 hectares of sugar beet, with a crop value of nearly 50 million pesetas.[61]

Conclusion

The contrast between the Ebro valley and Valencia provides important insights into the problems relating to irrigation in the pre-Civil War period. The advantages of irrigation to farmers were essentially twofold: the ability to grow crops with higher value-added than those found in dry farming, and the greater potential for reacting positively to changes in commodity prices. Both factors are apparent in Valencia and help to explain why highly intensive agriculture, based on small farms, also enjoyed high labour productivity, as well as creating backward and forward linkages to other sectors. In the Ebro valley the situation was different. A less favourable climate for fruit farming, the often uncertain water supply in summer, and a long tradition of using dry-farming techniques, all meant that adopting irrigation technologies was far from easy. The high infrastructural costs made irrigated cereals or artificial pastures unprofitable although, with the exception of sugar beet, there were few alternatives. In this situation, improved labour productivity depended not so much on the intensive cultivation of small farms, such as was found in Valencia, but rather on the introduction of mechanical labour-saving technology in the production of cereals and sugar beet.[62] Perhaps surprisingly, although the country was already self-sufficient in wheat by the 1930s, the increased production of irrigated cereals seems to have been official policy. Thus the 1933 Plan of the *Ministerio de Obras Públicas* envisaged extending the nation's irrigated lands by some 1,206,670 hectares over a period of twenty-five years, of which almost two-thirds would be devoted to wheat. In reality, the area irrigated grew by only 300,000 hectares, and infrastructural costs dictated the need to grow higher value crops.[63]

Irrigation therefore proved to be no miracle cure for the problem of low productivity. Indeed, three of Spain's more successful irrigation-fed crops, namely rice, sugar beet and oranges (which between

[61] This represented 30 per cent of national production. Other provinces in the Ebro valley, Navarra, Huesca and Teruel accounted for an additional 20 per cent (AEPA, *año 1932*, pp. 110–1).

[62] For Zaragoza, see EPAPM, (1921, p. 81) and for Lleida (Canal de Urgel), see Zulueta Gomis, (no date, p. 85).

[63] A further 271,665 hectares of 'improved' irrigation was planned. The total area irrigated in Spain grew from 1.5 million hectares in 1930 to 1.83 million in 1960, and reached 2.2 million in 1980 (AEA, *año 1980*, pp. 36–7).

them accounted for 200,000 hectares of irrigated land), were all in difficulties before the end of the 1920s. In the case of rice and oranges, yields were the highest in the world. However, Spanish orange exports were just entering a period of major crisis, and the export levels of the early 1930s would not be repeated until the 1950s. The domestic market for rice was saturated by the late 1920s and, to reduce stocks, a system of export bounties was established in 1927.[64] Finally, in order to avoid overproduction and to maintain a high level of government revenues, a trust, the *Sociedad General Azucarera de España* was established as early as 1903 to control output of sugar and, indirectly, the area given over to sugar beet.[65]

Irrigation was slow to appear in Spain, both because of the high cost of the infrastructure and the difficulties in providing technical information to the farmers to change crop systems and market their farm produce. Furthermore, as irrigation techniques affected only about 5 per cent of agricultural land, they could only provide an indirect solution to the specific problems of the *secano*. Here, as we shall now see, improved labour productivity depended on mechanisation.

[64] An internal tax was paid by consumers to finance the exports, or some 25 per cent of production. The scheme was in operation between 1927/30 and 1933/35 (Font de Mora, 1939, pp. 356–65).

[65] See Martín Rodríguez (1982, p. 281).

7 The reluctance to mechanise

In chapters 5 and 6 we saw the difficulties in improving crop yields through the use of chemical fertilisers and irrigation. With dry farming, small quantities of artificial fertilisers allowed an expansion of output through an extension of the area cultivated, but yields stagnated. By contrast, the lack of adequate water supplies, suitable crops and the inexperience of farmers, all contributed to limit the growth of irrigation to a relatively small area of Spain. As non-irrigated land accounted for 71 per cent of gross crop output in 1932, the best chance of increasing labour productivity, as in much of the United States, was through mechanisation.

In the first two sections of this chapter, I look at the cause of the delay in the use of reapers and threshers in the cereal harvest. I argue that even as late as the First World War, cheap labour and relatively expensive draught energy made mechanisation unprofitable in large areas of the country. In the final section the rapid modernisation of the country's olive oil presses from the early 1900s is linked to the international demand for better quality oils. The general conclusion is that farmers were 'rational' in their choice of techniques, adopting only those that promised to be profitable. Cheap and abundant labour, a weak farm machine industry, and high farm prices maintained through tariff protection, all contributed to the slow mechanisation of the *secano*.

Technical choice: the cereal harvest prior to 1900

Gregory Clark has observed that 'farm workers in the northern United States and in Britain in the early nineteenth century were extraordinarily productive and well paid by the standards of Eastern Europe and of medieval England', and that little or none of this can be explained by superior technologies, but rather by higher work intensities.[1] For northern France, George Grantham has shown the potential for improving labour productivity growth in cereal farming, estimating an increase of 177 per cent between 1750 and 1862.[2] By contrast, I argued in chapter that labour productivity remained stagnant in Spain until the turn of the twentieth century, and on the eve of the Civil War it has been estimated that labour productivity was only 58 per cent of that achieved in central and northern Europe.[3] Why did Spanish cereal farmers fail to change, as those in northern France or England appear to have done?

If differences in work effort identified by Clark are hard to explain, Grantham argues that improvements in labour productivity in northern France between 1750 and 1800 (and probably as late as 1840) were almost all attributable to tillage operation, namely the suppression of the fallow and the use of better ploughs and improved plough teams.[4] In Spain, as we have seen, the planting of crops instead of leaving the land fallow was impossible given the nature of dry farming. With respect to ploughs, although there were attempts to introduce new models, the *arado romano* (scratch plough) dominated until the turn of the twentieth century.[5] This delay can be attributed to the fact that the new ploughs worked the soil deeper. When used for spring tillage, this reduced soil moisture and thereby adversely affected yields. Farmers in Spain, therefore, could only use ploughs that had been developed for more humid climates for their autumn ploughing. By contrast, where work animals were concerned, a slow change had been occurring from the seventeenth century which was eventually to affect all of Spain's *secano* – namely, the replacement of oxen and cattle by mules. By 1865, mules were more important than oxen as work animals in the Mediterranean region, the Ebro valley, La Mancha, and a few provinces of Castilla-León, such as Palencia and Burgos. In others, including Burgos, León and Zamora, together with Extremadura and Andalucía, oxen still predominated.[6] However, everywhere the numbers of mules were growing and this change, together with the light weight of most traditional ploughs,

[1] Clark (1987, p. 419).

[2] Grantham (1991, table 13.3). Heavy soils are considered as 60 per cent of the total, and light ones the remainder. The greater part of the productivity increase was achieved during the nineteenth century.

[3] Moore (1945). O'Brien and Prados de la Escosura indicate an even greater productivity gap between Spain and selected central and northern European countries, as noted in table 1.7.

[4] Grantham (1991, p. 35) estimates that three-quarters of labour productivity growth between 1750 and 1800 was attributable to tillage operations, against a quarter for harvest and threshing.

[5] See Moral Ruiz (1979, pp. 43–6) and Simpson (1987, pp. 279–81) for the delay in diffusion of mouldboards in Spain.

[6] Simpson (1987, cuadro 3).

helped offset the apparent decline in the number of work animals per hectare cultivated after 1750.

Between 1862 and 1929, labour productivity in French cereals almost tripled, due mainly to improvements in harvesting and threshing.[7] In these operations there were fewer barriers to a relatively rapid transfer of technology; yet, in general, Spanish farmers failed to mechanise much before the First World War, for reasons which I shall now discuss.

The timing of the wheat harvest was critical because if it was collected too early, the wheat would be green and therefore difficult to separate from the husk and fetch lower prices, whereas a late collection risked the grain being lost on the ground.[8] Traditionally, the wheat harvest was the time of maximum labour demand in the agricultural year, and the labour supply was swollen with large numbers of workers not included in the agricultural census figures. It was the supply elasticities of these part-time labour groups (women, children, industrial workers, migrant labourers, and so on) which determined wages and the profitability of mechanisation. In general, three methods can be distinguished for cutting the standing wheat: the use of the sickle, the scythe, and mechanical reapers.

Although mechanical reapers were being manufactured commercially in the United States by the early 1830s, the industry grew little in that country until the 1850s when rising wheat prices coincided with an increase in the cost of harvest labour.[9] In the southern provinces of Spain, some farmers showed an interest in the use of mechanical reapers during the 1850s and the newspaper *La Agricultura Española* of June 1865 claimed that seventy-six such reapers were already in operation in the province of Sevilla.[10] Interest was not limited to Sevilla, as in the following month seventeen orders for reapers had been received by the manufacturers Parsons (associates of Wood) from the province of Jaén alone.[11] Yet the *Junta Consultiva Agronómica*'s major study of wheat farming in 1886/90 records that only 'eight or ten reaper-binders' existed in Sevilla, and in Jaén none are mentioned.[12] Indeed, it was probably only in Girona (the Ampurdan), Huesca, Navarra, Sevilla, and Zaragoza

[7] The period 1862–92 would see the diffusion of the reaper in France, with the 'triumph' of the binder taking place between 1892 and 1929 (Grantham, 1991, p. 356).

[8] The standing wheat was harvested in Spain between June and the end of August, depending on local climate conditions.

[9] The classic work on the mechanisation of the wheat harvest in the United States is David (1975).

[10] The manufacturers were Garret, Wood, and MacCormick (Heran, 1980, p. 190).

[11] Heran (1980, p. 191). Similar trends appear to have taken place in Valladolid and Albacete at this time. See Garrabou (1990, p. 47).

[12] Dirección General de Agricultura, Industria y Comercio (hereafter DGAIC) (1891a, vol. 3, Sevilla: p. 145 and vol. 2, Jaén: p. 13).

Table 7.1. *Late nineteenth-century wheat harvesting costs (in pesetas)*

	Huesca 1886/90	Sevilla 1864	Zaragoza 1886/90
A) *With sickle (per hectare)*			
1. Using day wages	35.0	n.d.	n.d.
2. Using piece-work	30.0	30.7	43.9
B) *With mechanical reaper*[a]			
Annual no. of days worked	15	30	25
Total fixed capital investment	1,100.0	1,150.0	825.0
Annual costs:			
3. Mules	375.0	285.8	400.0
4. Labour	915.0	1,305.0	1,100.0
5. Maintenance at 10%	110.0	115.0	82.5
6. Interest at 5%	55.0	57.5	41.3
7. Depreciation at 10%	110.0	115.0	82.5
Total annual costs	1,565.0	1,878.3	1,706.3
8. Area reaped (hectares)	90.0	144.0	57.0
9. Cost per hectare	17.4	13.0	29.9
C) *Break-even point*			
1) Fixed annual costs (5+6+7)	275.0	287.5	206.3
2) Variable costs per hectare (3+4/8)	14.3	11.1	26.3
3) Cost by traditional method (A1)	35.0		
4) Cost by traditional method (A2)	30.0	30.7	43.9
Break-even point			
Case A1 (c1/(c3–c2)) in hectares	13.3		
Case A2 (c1/(c4–c2)) in hectares	17.6	14.6	11.8

[a] Models used: Huesca – Wood's reaper with mechanical rake; Sevilla – McCormick-Burgess and Kay; and Zaragoza – Wood.

Sources: For Huesca: DGAIC (1891a, 2, pp. 156–9); for Zaragoza: DGAIC (1891a, 3, pp. 477–80); for Sevilla; *La Agricultura Española*, 23 July 1864, cited in Heran (1980, p. 181).

that the numbers reached double figures.[13] Early interest had quickly faded.

In table 7.1 a cost comparison has been made between collecting the harvest by using traditional methods (the sickle) and by a mechanical

[13] It is difficult to be sure of the number of machines in existence from isolated press comments. For example, one writer in Arjona (Jaén) claimed in 1901 to have owned a reaper for 15 years (although none is mentioned in DGAIC, 1891), and that his was one of twelve working in this one *partido* (Serrano, 1901, p. 177). Huesca with 200 reapers and about 30 binder-reapers, appears to have been the province with the most machines in 1886/90 (DGAIC, 1891a, 2, Huesca: p. 157).

reaper in the provinces of Huesca, Sevilla, and Zaragoza during the late 1880s. An attempt has also been made to establish at what scale of production it would have become profitable to mechanise the harvest operation (i.e. the 'break-even' point or 'threshold' farm size).[14] The method consists in dividing all costs into fixed and variable, and the break-even point can be shown as

$$\text{Break-even} = f/(t-v)$$

where f represents the fixed costs associated with the reaper, t the cost of collecting the harvest by traditional methods, and v the variable cost of using a reaper.

The break-even point, or land area below which it was theoretically more profitable to use hand harvesting with a sickle rather than a mechanical harvester, was between 13.3 and 17.6 hectares in Huesca, 14.6 in Sevilla, and 11.8 in Zaragoza. Although these figures refer to the area sown and not to the area cultivated, it is clear that large areas of central and southern Spain had farms that were of a sufficient size to accommodate reapers. Furthermore, fields in these areas tended to be large and open, and were sufficiently well drained to cause a minimum of additional investment requirements in adapting the landscape to the machinery.[15] However, it would be a mistake to suppose that farmers were inefficient because they were not using the new technology. In the case of Sevilla, if the costs in table 7.1, which refer to 1864, are corrected for 1886/90, then the break-even point becomes 26 hectares where the harvest was collected by hand and labour paid by time, and 50 hectares where collected by hand using piecework. Furthermore, if the reaper worked at a speed of less than 3.5 hectares a day over the thirty days that one assumes it to have been operational, then it would always have been cheaper to reap by hand using piecework. Therefore, the higher harvesting costs using traditional methods in the Ebro valley (Huesca, Navarra, and Zaragoza) encouraged the diffusion of the reaper in these provinces, whereas the supply of a cheap and abundant labour force in Andalucía (Sevilla) restricted its introduction. However, other factors also explain the reaper's slow diffusion.

[14] Figures for reaping and threshing costs in the 1880s are provided by provincial agronomists and quite likely come from direct observations of machinery. However, given the wide range of farming conditions found, not to mention the significant performance differences of individual machines, the statistical exercises here can only provide general conclusions on the degree of profitability. For a discussion of the 'threshold model' and the diffusion of the reaper, see especially David (1975), Olmstead (1975) and Olmstead and Rhode (1995).

[15] These are some of the reasons suggested for the delay in introducing the reaper in the United Kingdom in comparison with the United States (David, 1975, pp. 233–88).

A major concern for farmers was the question of maintenance and repair. Whereas the mid-west of the United States emerged during the 1850s as a 'substantial regional manufacturing sector bound by demand-links reaching backward from commercial agriculture', Spain imported its technology, and there was a general lack of skilled mechanics, especially outside the main cities.[16] In the late 1880s it was noted that only the manufacturers Pinagny of Pamplona and Elizalde y Compañia had tried to produce reapers in Spain, adapting the technology to the needs of the country. By the early twentieth century, however, no domestic manufacturers appear to have been producing reapers.[17] Thus, while the farmer in the American mid-west during the second half of the nineteenth century was able to mechanise knowing that an abundant supply of skilled labour existed and supplies of spare parts were cheaply and quickly available, a delay of two months was reckoned the norm for 'every part' in Spain.[18] The situation was neatly summed up by Costa in 1880:[19]

> it would be against the most rudimentary laws of logic to think that a country could suddenly jump from the mule, the Egyptian plough and threshing boards, to the steam engine, Howar (sic) plough and Ransomes threshing machine. In the United States of America, the iron and coal industries live together intimately with agriculture, but in Spain we cannot expect anything similar for a long time.

As the harvest was a time-bound operation, the delay of even a week could be disastrous, and the difficulties of using mechanical reapers given the local conditions are reflected in the significant amount of abandoned machinery mentioned in the texts.[20]

[16] Ibid. (p. 198). See also Pinilla Navarro (1990, pp. 313–15) and, for Portugal, Reis (1982). In a wider context, the British Commercial Attaché in 1906 wrote with respect to motor cars that 'there appears to be some difficulty in Madrid in getting repairs done, and complaint is made of the delay necessary to replace broken parts from Paris, and this would be still more the case from the United Kingdom' (Parliamentary Papers no. 3957, p. 83).

[17] The reaper produced by Pinagny was a small McCormick adapted for a single animal and known as *La Segadora Navarra*, whilst that of the Elizalde y Compañía, *Nueva Española*, needed a total of four draft animals to work the 2 or 2.5 hectares in eight hours (DGAIC, 1891a, vol. 2, Navarra: p. 494, and vol. 1, Burgos: p. 259). EPAPM (1901 p. 177) and British Parliamentary Papers (1906 no. 3957 p. 95) both claimed that no reapers or binders were made in Spain. By 1912, there was a small domestic production of threshing machines as shown below.

[18] Serrano (1901, p. 177).

[19] Costa (1911a, p. 144).

[20] The reasons are not always clear. Leon's two reapers were reported as working infrequently; in Valladolid, the reaper was abandoned because it was not easy to obtain certain repairs for parts which 'frequently broke', and the early reapers in Zaragoza were largely forgotten, 'either because of the lack of expertise of those that handled

Table 7.2. *Relative prices of animal and human energy in different countries, 1860*

	Feed cost (per week)	Agricultural labour (per week)	Relative cost
Britain	15s	9s 7d	1 horse = 1.56 labourers
United States	$1.03	$3.80	1 horse = 0.27 labourers
Spain	9.70 pts	5.0 pts	1 mule = 1.94 labourers

Sources: Britain and United States – Christensen (1981, table 2); Spain – Simpson (1987, cuadro 5).

Another factor that restricted the diffusion of the reaper in Spain was that, while it saved on labour, it did so at the expense of animal power. Before the internal combustion engine, most energy in agriculture was powered either by human labour or by draught animals, and it was the relative costs of these different forms of energy that determined the most suitable production systems. Christensen has calculated the relative cost of labour and animals in the United States and Great Britain in 1860; in table 7.2 this has been extended to include Spain. Although these estimates can be regarded as only approximate, the relatively high labour costs in the United States encouraged the diffusion of labour-saving technology, whereas in Spain the greater costs of animal power led to the continuation of manual techniques.[21]

In the three examples shown in table 7.1, two mule teams were required and the demand for animal power, like manual labour, tended to be highly seasonal, with the grain harvest already a period of peak demand (for transporting grain and threshing). Even if the 1891 census shows an exaggerated decline in livestock numbers, it seems probable that disposable animal power per unit of cultivated land was appreciably lower in the late nineteenth century than it had been in 1850, or was to be in the twentieth century. If this indeed was the case, farmers might have been faced with the prospect of having to rear extra animals, at a large fixed cost, which had only limited use outside the harvest, or face the uncertainty of renting livestock at a period of peak demand. The labour supply, by contrast, was growing and if nominal wages increased

them, or owing to the machines complexity' (DGAIC, 1891a, vol. 2, León: p. 231; vol. 3, Valladolid: p. 394, and Zaragoza: p. 478).

[21] The shortage of work animals was considered 'a perennial problem' in Spain (British Parliamentary Papers 1948, p. 27). For the 1850s, see García Sanz (1979–80, p. 55). For the high cost of animal-produced energy, see, for example, EPAPM (1915, no. 943, p. 721).

in a few areas in 1860/90, this was offset by rising wheat prices, at least until the 1880s.[22]

The lag in the use of reapers in the nineteenth century was not just a Spanish phenomenon but a European one. According to Collins, reaping machines in France in 1892 cut only 11.5 per cent of the standing corn, whilst in Germany the figure was 6.0 per cent (1895), Holland 1.1 per cent (1882), Belgium 4.1 per cent (1880), and Britain 56.4 per cent (1874) – although not long before, in 1861, this last figure had been only 6.8 per cent.[23] Therefore, with the exception of Britain, Spain appears to have been in line with other European countries in not mechanising this process during the nineteenth century. Yet, as Collins has also shown, the expansion of cereal cultivation in Europe during the nineteenth century took place in many areas faster than the available labour force, and this encouraged a 'switch from lower to higher working capacity tools', with the heavy hook and scythe replacing the sickle in almost all Europe, with the exception of Italy, Portugal, and Spain.[24]

The *Junta Consultiva Agronómica's* study of 1886/90 suggests that the scythe and *vollant* were only found in those areas bordering the Pyrenees and limited areas of Tarragona and Teruel, being very rare elsewhere. As Collins notes for Britain, the significant savings in the primary operation (cutting), was to a certain extent reduced by the greater quantity of labour required for the secondary operations. Thus, in Huesca, the costs and labour required for a hectare were:[25]

Piecework/sickle	30 ptas	4 harvesters + 1.5 helpers
Day-work/sickle	35 ptas	5 harvesters + 2.0 helpers
Day-work/scythe	30 ptas	2.5 harvesters + 2.0 helpers + boy or female helper

However, there were other costs associated with the scythe, namely the greater loss of grain falling to the ground during the harvest.[26] In Huesca the savings per hectare in using a heavier reaping hand tool were 5 pesetas and in Lleida 6 pesetas – savings which would have been eliminated if the grain lost on the ground exceeded only 3 per cent of

[22] Wages appear stagnant in Andalucía (Bernal, 1988, pp. 206–7 and Simpson, 1985a, p. 240) and Murcia (Pérez Picazo, 1991, p. 71). By contrast in Castilla, it has been suggested that wages increased by a third between 1862/4 and 1885/7 (GEHR, 1988, p. 49) and in Cataluña by between a third and a half (Garrabou, Pujol and Colomé, 1991, pp. 40–1).

[23] Collins assumes an area of 60 acres (24.28 hectares) per reaper (1969, table 3). This rate would imply that 21.6 per cent of small grains (wheat, barely, rye and oats) in Spain in 1932 were cut mechanically.

[24] Ibid. (1969, p. 85).

[25] DGAIC (1891a, vol. 2, Huesca: p. 157).

[26] Ibid. (vol. 1, Ciudad Real: p. 377).

the harvest.[27] As there was not a radical change in the ratio between the size of Spain's agricultural labour force and the area sown until the First World War, the vast majority of farmers rarely considered the scythe as a serious alternative.

Unlike northern Europe, threshing was done in Spain immediately after the harvest, and either involved animals treading the grain with their hooves or a threshing board being pulled over the grain by the animal.[28] The final task involved winnowing, which was traditionally done by tossing the grain in the air and letting the wind separate out the chaff.[29] The grain was then ready for storage and sale.

The first threshing machines introduced into Spain in the 1860s were not a success, owing partly to the fact that Spanish farmers, unlike those of northern Europe, fed their animals on the straw, which had to be cut into fine pieces and crushed.[30] However, even when this problem was overcome, the number of machines in the 1880s was small, virtually all being found in Andalucía, with a few in Aragón.[31] Their operating costs and the break-even point have been calculated from the *Junta Consultiva Agronómica*'s figures for 1886/90 in five different provinces, and are shown in table 7.3. According to these calculations, the break-even point in Sevilla, excluding repairs and maintenance, was 2,440 hectolitres (or 227 hectares of sown wheat), Córdoba 3,142 hectolitres (304 hectares), Cádiz 1,766 hectolitres (262 hectares), Huesca 1,913 hectolitres (172 hectares), and Zaragoza 4,133 hectolitres (366 hectares). If annual maintenance and repairs are assumed to have amounted to 10 per cent of the capital cost of the machine, the area required in Sevilla increases to 378 hectares, Córdoba 507, Cádiz 437, Huesca 287, and Zaragoza 610. According to a study of Portugal's Alentejo at the end of the nineteenth century, it was the size of the area required to feed the threshing machines, rather than their capital cost, which delayed the introduction of the machines, with the break-even point being 'normally above 4,000 hectolitres, with some authors suggesting a figure of 6 or 7,000 being

[27] Calculated from ibid. (vol. 2, Huesca: p. 157 and Lleida: pp. 270–1).
[28] In the North, the small quantities of wheat were threshed using a flail.
[29] In some areas, by the end of the century, a winnowing machine (*aventado*) was used. Perhaps rather than on cost grounds, this machine allowed the operation to be done when there was no wind (see, for example, DGAIC, 1891a, vol. 2 Huesca: pp. 159–60).
[30] The *Fomento agrícola* of Jerez de la Frontera sent corn to Ipswich for tests, and the subsequent trials in 1865 of a Ransomes machine in Sevilla proved successful (Abela y Sanz, 1877, pp. 535–52).
[31] In 1881 it was estimated that of 52 machines in Spain, all but three were found in Andalucía (*La Gaceta Industrial*, 1882, cited in Ministerio de Industria y Energía, 1988, p. 99). By the end of the 1880s there were also some operating in Aragón.

Table 7.3. *Late nineteenth-century threshing costs*

	Cádiz	Córdoba	Sevilla	Huesca	Zaragoza
A. *STEAM THRESHERS*[a]					
Hours of work	585	420	384	400	1,000
1. Labour costs					
Operator	180	300	272	225	500
Others	1,147	1,470	1,984	1,015	2,200
Total	1,327	1,770	2,256	1,240	2,700
2. Machine costs					
Fuel	1,350		471	600	2,500
Oil	68		104	180	400
Total	1,418	1,350	575	780	2,900[b]
3. Capital expenditure					
Machine costs	10,000	15,000	13,500	13,500	13,500
Interest 5%	500	750	675	675	675
Deprec. 10%	1,000	1,500	1,350	1,350	1,350
Total	1,500	2,250	2,025	2,025	2,025
Total (1+2+3)	4,245	5,370	4,856	4,045	7,625
Output of wheat (hectolitres)	6,525	9,942	4,224	2,400	7,000
Full cost of threshing (pesetas/hectolitre)	0.65	0.54	1.15	1.69	1.09
Variable cost (i.e. (1+2)/ hectolitre)	0.42	0.31	0.67	0.84	0.80
B. *THRESHING USING TRADITIONAL TECHNOLOGY*					
Cost per hectolitre	1.27	1.03	1.50	1.90	1.29
C. *BREAK-EVEN POINT FOR USING STEAM THRESHERS*					
Excluding maintenance costs (hectolitres)	1,766	3,142	2,440	1,913	4,133
Including maintenance costs[c] (hectolitres)	2,944	5,236	4,067	3,189	6,888
Provincial wheat yields (hectolitres/ha)	6.74	10.33	10.76	11.11	11.29
Break-even point in hectares					
1. Excluding maintenance costs	262	304	227	172	366
2. Including maintenance costs[c]	437	509	378	287	610

[a] No attempt has been made to assign a value to the better quality of grain and straw obtained by using a threshing machine.
[b] Machine costs for Zaragoza have been estimated.
[c] Based on the assumption that maintenance costs amounted to 10% of capital costs.

Sources: For Cádiz, DGAIC (1891b, 1, pp. 299–300); for Córdoba, DGAIC (1891b, 1, pp. 419–22); for Huesca, DGAIC (1891b, 2, pp. 159–62); for Sevilla, DGAIC (1891b, 3, pp. 145–51); and for Zaragoza, DGAIC (1891b, 3, pp. 481–6).

necessary'.[32] Naturally, production costs in Spain and Portugal were different, but table 7.3 gives a figure greater than 4,000 hectolitres in the three examples from Andalucía.

The high capital costs and the relatively large area required for profitable threshing of feed areas, together with the fact that threshing machines were mechanically more complicated than reapers, explains their absence in most regions of Spain. However in Sevilla, and perhaps in other parts of Andalucía, the use of threshing machines at the end of the nineteenth century appears to have been greater than that of reapers. To explain this, table 7.4 summarises the demand for labour and animals on a hypothetical estate in Sevilla, with 300 hectares of wheat and 150 hectares of barley. This table shows that the cheapest method of harvest collection and threshing was to use four reapers and a steam thresher (option 3), and the most expensive was to collect the grain by hand (and pay labour by time), and thresh using traditional technology (option 1a). At first sight, greatest efficiency could therefore be achieved using the more advanced technology. However, demand for work animals varies significantly from 2.03 animals days/hectare in options 4a and 4b, to 5.5 animal days in option 2. Whilst the mechanisation of reaping increased the demand for animals, table 7.4 shows that steam threshing reduced it. As both the harvest and threshing were carried out in periods of peak demand for work animals, it is likely that the possibilities to hire would be low, and the cost of maintaining an extra six mules for only two months' work annually would have been excessive.[33] As table 7.4 assumes that all animals *were fully employed throughout the year*, the speed of mechanical diffusion would depend to a certain extent on the alternative employment available for the animals outside the harvest. Finally, the introduction of the reaper and thresher would seem to complement each other, given the saving of animal energy with the latter.

Technical change: the cereal harvest 1900–1936

The first farm-machine census was undertaken in 1932. It shows that although regional distribution remained very uneven, reapers and threshing machines were widely used (table 7.5 and maps 13 and 14). Here I exclude the North as this was not an important region of small-

[32] Reis (1982, pp. 405–7).

[33] Gómez Mendoza (1982, pp. 108–9) gives an average cost for Spain of 3,500 pesetas (3,350 fixed and 150 variable) for the period 1878/87.

Table 7.4. *Estimated demand for labour and work animals for harvesting and threshing, Sevilla, 1886/90*[a]

Area sown: wheat 300 hectares and barley 150 hectares

	Labour			Livestock			Total costs	
	No. of work days			No. of work days				
Options	Total	Index[b]	per hectare	Total	Index[b]	per hectare	Pesetas	Index
1a	4,798	100	10.66	2,134	100	4.74	19,332	100
1b	3,595	75	7.99	2,134	100	4.74	17,658	91
2	3,670	77	8.16	2,495	117	5.54	16,111	83
3	2,779	58	6.18	1,612	76	3.58	15,733	81
4a	4,471	93	9.94	914	43	2.03	18,954	98
4b	3,268	68	7.26	914	43	2.03	17,280	89

1a=harvested using sickle (day wage) and threshing board.
1b=harvested using sickle (piece-work)[c] and threshing board.
2 =harvested using 4 reapers and threshing board.
3 =harvested using 4 reapers and threshing machine.
4a=harvested using sickle (day wage) and threshing machine.
4b=harvested using sickle (piece-work) and threshing machine.

[a] Includes all operations from cutting the standing corn to delivery of threshed grain (to a centre 2 km from the farm).

[b] Index based on Option 1a (=100).

[c] Piece-work assumes that the job will be finished in 60% of the time normally taken by a day worker.

Source: Calculated from DGAIC (1891a, 3, pp. 143–50).

Table 7.5. *Regional distribution of harvest machinery, 1932*

	Area of cereals[a] ('000 ha)	No. of reapers	No. of threshers	ha/ reaper	ha/ thresher
North	211	30	808	7,033	269
Mediterannean	761	3,153	624	241	1,219
Andalucía	1,331	5,711	567	233	2,347
Interior	5,640	61,447	3,000	92	1,880
Spain	7,943	70,341	4,999	113	1,589

[a] Excludes maize and rice.

Source: AEPA (*año* 1932, pp. 320–1).

grain farming and, although it had the greatest density of threshing machines, the machinery was usually small and manually operated.[34]

A number of explanations can be advanced to explain the level of mechanisation in the cereal harvest of 1932. First, the growing use of reapers and threshing machines worldwide from the late nineteenth century led to three developments: technical improvements of the machinery, development of economies of scale in production, and increasing competition between machine producers as markets grew. Consequently, prices had a tendency to fall, and the machinery to become more efficient. Although national production scarcely existed in Spain prior to the First World War, it can be assumed that some of the benefits were obtained by farmers through imports.[35] Problems remained however. Machinery was regarded as being twice as expensive in Spain than in the country of production, in part because of freight and commissions, but also because of Spanish tariffs and high internal transport costs. The problems of a lack of suitably qualified labour and spare parts also continued, which made some foreign equipment unsuitable for local conditions.[36]

A second factor was the growth of institutions which facilitated the spread and use of the machines. The province of Navarra, despite being

[34] See Villares (1982, pp. 365–7).

[35] In 1912 national production of threshing machines was 30, and winnowing machines 2,000 (Ministerio de Fomento, 1912, vol. 1, p. 372). Garrido claimed that domestic production prior to the First World War had been sufficient to halve the prices of imported machinery (EPAPM, 1920, no. 1136, p. 54).

[36] In 1910 over a dozen threshers of Rushton Procter & C[a] were abandoned in just one small region centred on Navarra because they were considered too complicated, required experienced mechanics to operate and regarded as unprofitable. Many were for sale, often after only one or two years of use, at half or less than their original cost (EPAPM, 1910, no. 675, p. 275).

perhaps an unlikely candidate, had the third largest number of reapers and the second largest number of threshers (per hectare of cereals) of all the provinces. As early as 1910, local industrialists 'anticipated a lucrative business' in renting threshing machines, and companies were formed for this purpose in the towns of Artajona, Mendigorría, Peralta, Caparroso, Carcastillo, Echauri and Mélida.[37] However, it was to be the cooperative movement which would account for much of the diffusion of machinery with, for example, some 130 reapers and reaper-binders in the town of Sesma, or 'more than 150' belonging to the members of the *Caja de Carcastillo* prior to the First World War.[38] In particular, the high concentration of cooperatives especially in areas of small farmers in the Interior, helps to explain the wide diffusion of mechanical reapers, although threshing machines still remained a rarity.

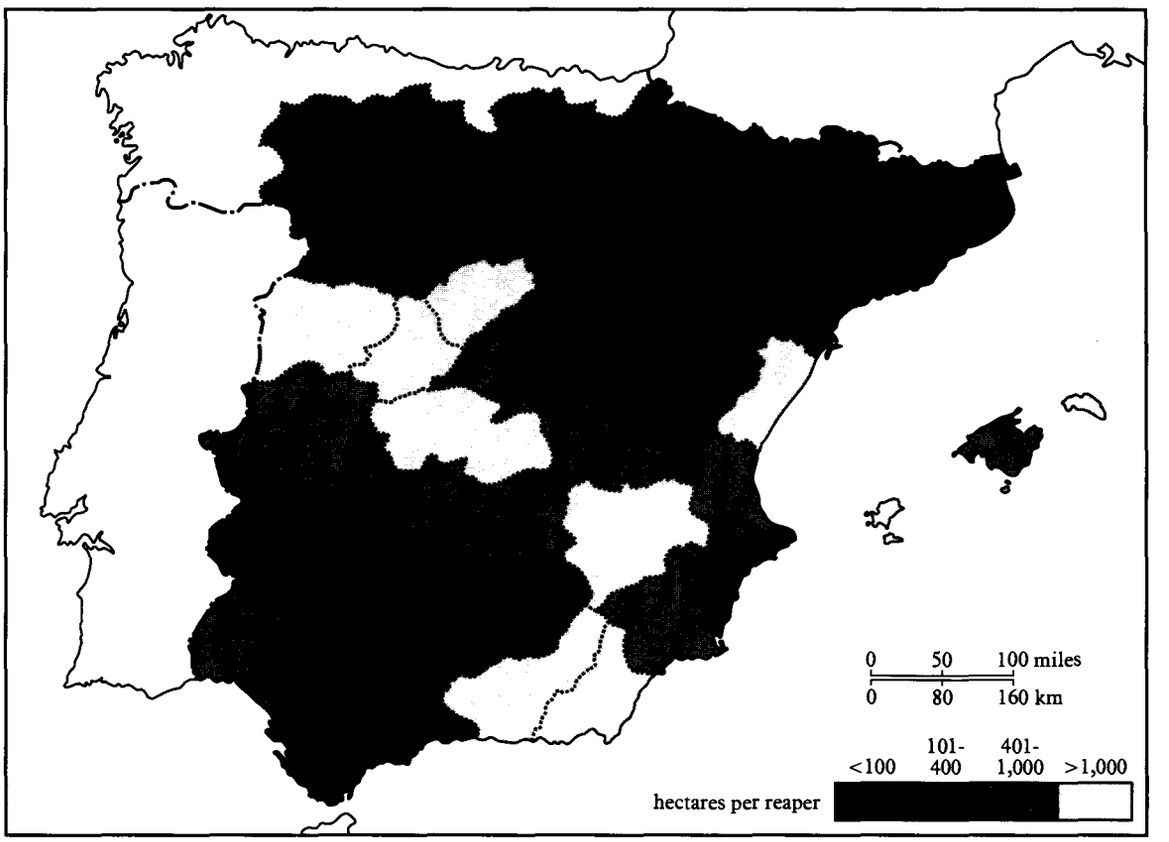
If, on the one hand, manufacturers were gradually able to produce technology more appropriate to local conditions, and the numbers of mechanics and skilled labour in the countryside grew, on the other hand farmers in some areas were finding it increasingly difficult to obtain labour at harvest time. This was the result of two factors, namely the continuing extension of the area cultivated (as shown in chapter 5) and the beginnings of the rural exodus at the turn of the century. The increasing land to labour ratio raised labour costs in some areas. Maps 13–15 and table 7.6 suggest a clear correlation between wage levels and the diffusion of the machinery. Given that the cereal harvest was a period of peak labour demand in rural areas, one would expect 'maximum' wages to show a better fit than 'minimum' wages for 1931.[39] My initial results indicated, perhaps not surprisingly, that the first machine census probably underestimated the number of reapers in Spain, especially in the provinces of Albacete, Avila, Castellón, and Granada.[40] When a constant was applied to these four provinces (see table 7.6), the number of hectares per reaper and level of agricultural salaries showed a much closer relationship. The fact that minimum rather than maximum wages in 1931 fit better can be explained by higher value crops distorting the picture. With threshing machines, the correlation is not as strong,

[37] However, as the machines used were the inefficient Rushton type, no profits were made (EPAPM, 1910, no. 675, p. 275). A rental market also existed in Valladolid as early as 1904, as some 12 or 14 reapers were hired to break the harvest strike in Villalón of that year (*Instituto de Reformas Sociales*, 1977, p. 127).

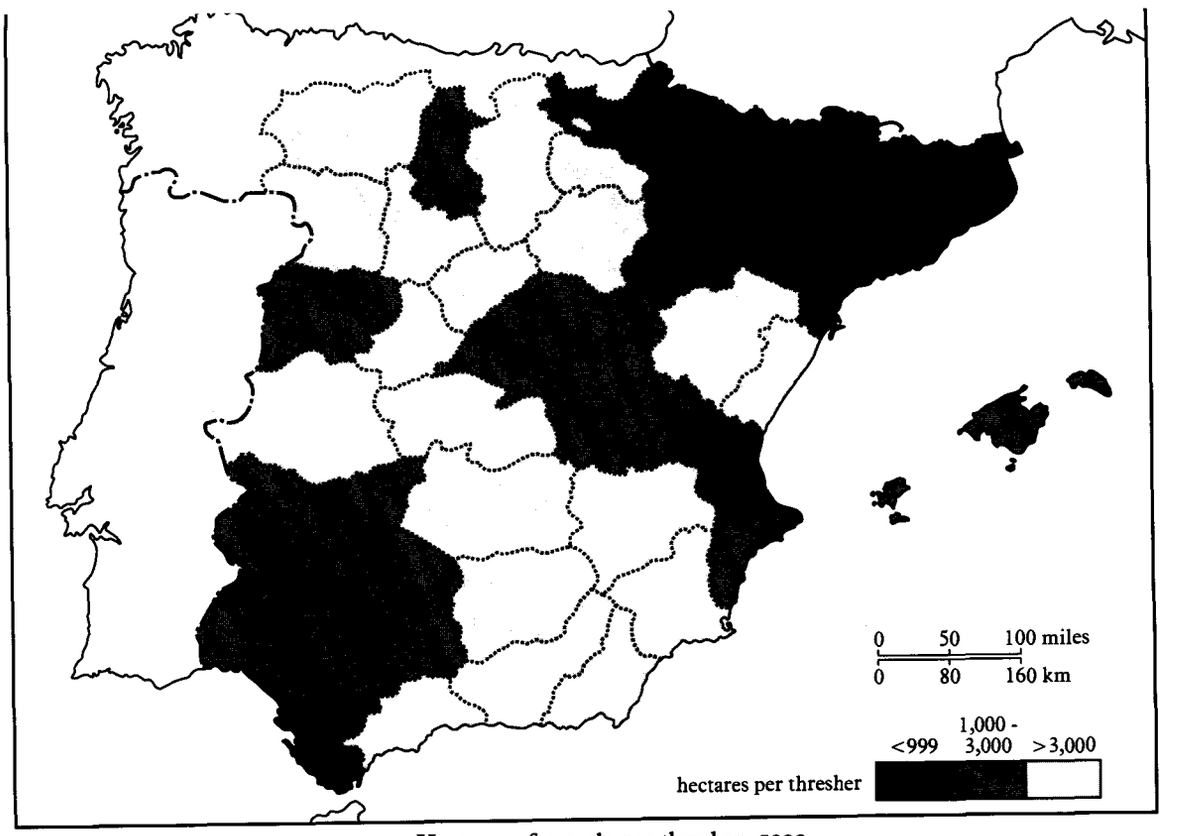
[38] EPAPM (1911, no. 738, p. 521).

[39] I estimate 5 and 6 pesetas per day for Avila, between 5 and 8 for Girona, and 7 and 10 for Madrid.

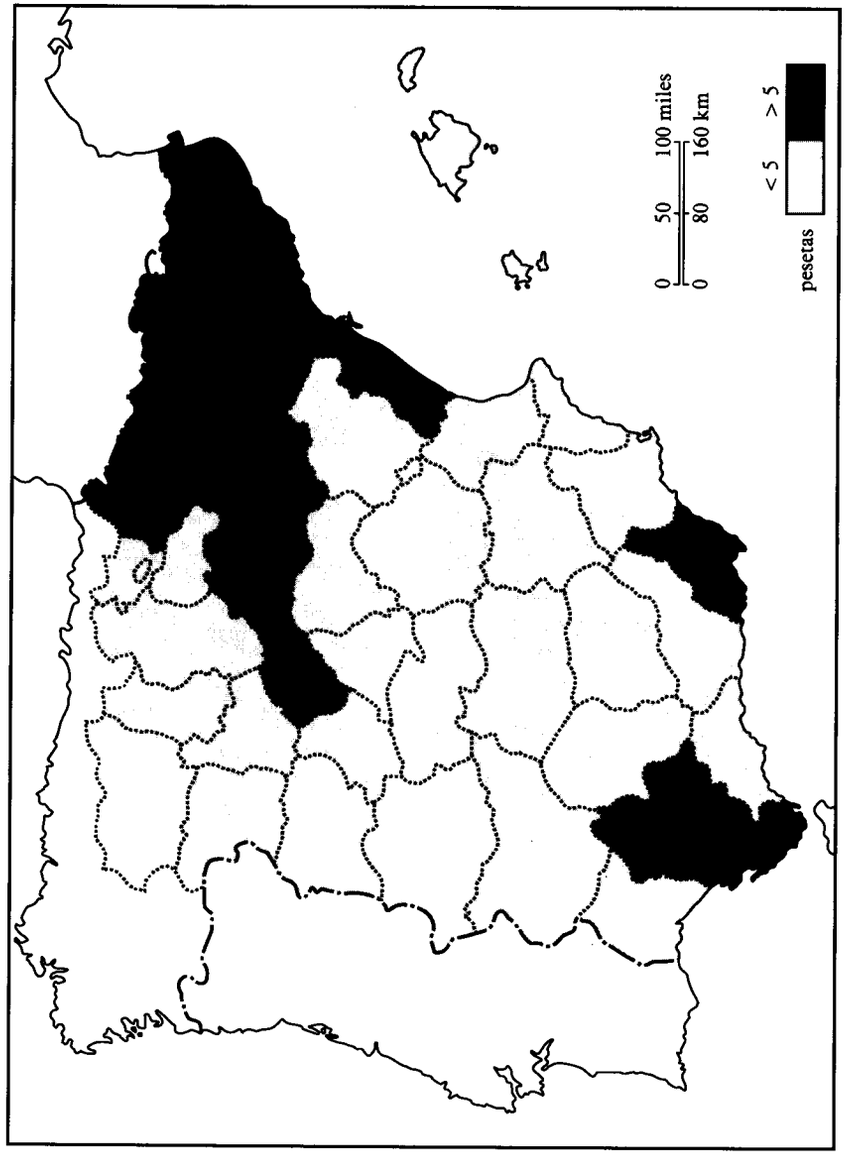
[40] The number of machines and the hectares of cereals per reaper were reported to be respectively: Albacete 66 and 5,505; Avila 30 and 3,687; Castellón 4 and 13,064; and Granada 36 and 6,318. For 1908 I also apply a constant for Baleares (48 and 2,036), Salamanca (134 and 1,801) and Toledo (210 and 2,000).



13 Hectares of cereals per reaper, 1932



14 Hectares of cereals per thresher, 1932
Source: AEPA, *año 1932*; GEHR (1983b)



15 Minimum day wages in rural Spain, 1931

Table 7.6. *Wage levels and the diffusion of cereal harvest machinery in 38 provinces*[a]

A. *Reapers*
(Dependent variable: hectares per reaper in 1932)

Independent variables		Constant	R^2	N
1908 wages	1,155.5	−354.9		
	(1.85)	(−1.17)	0.96	38
1908 wages[b]	950.6	−326.0		
	(3.1)**	(−2.22)*	0.99	38
1931 wages (min.)[c]	101.8	−133.9		
	(3.42)	(−2.07)*	0.96	38
1931 wages (max.)	801.1	−54.2		
	(2.30)*	(−1.10)	0.96	38

B. *Threshers*[d]
(Dependent variable: hectares per thresher in 1932)

Independent variables		Constant	R^2	N
1908 wages	18,191	−6794.8		
	(4.13)**	(−3.16)**	0.66	38
1931 wages (min.)	10,439.8	−1,396.2		
	(4.8)**	(−2.69)**	0.64	38
1931 wages (max.)	6,842	−339.2		
	(2.90)*	(−1.07)	0.58	38

* Statistically significant at 1% level.
** Statistically significant at 5% level.

[a] The North is excluded, as are the provinces of Almería and Segovia, as no machinery was reported. Dummy values given to Albacete, Avila, Castellón and Granada.
[b] Dummy values also given to Baleares, Salamanca and Toledo.
[c] 1931 has been used for maximum and minimum wages because no figures for 1932 were available.
[d] Soria alone has been given a dummy value.

Sources: For wages in 1908, see Rodríguez Labandeira (1991, p. 454) and *Anuario Estadístico de España* (1933, vol. 17, p. 551).

but still strong enough to force consideration of wage levels as an important factor in the diffusion of machinery.

In conclusion, labour productivity in cereal farming over this period was positively related to agricultural wages, at least for harvesting and threshing activities. Why did wages not increase faster? In part, this was because agriculture in Spain was a residual employer, implying that 'the size of the population it had to support . . . was governed not by the

size of the labour requirement but by the numbers seeking work'.[41] The agricultural labour supply was therefore influenced positively by rural population growth, and negatively by the migration of labour in response to better employment opportunities in urban areas, and by emigration overseas. The low labour productivity in agriculture found by Clark in southern and eastern Europe was perhaps the consequence of the low opportunity cost of this labour, caused primarily by the small size of urban centres and the weak industrial base. In the next chapter I shall consider in greater detail why labour in Spain did not leave the land faster than it actually did. Here, just one aspect of it is considered – namely the belief that cereal tariff policy in Spain slowed the rural exodus.

Between 1886/90 and 1930/5 the area sown with cereals and legumes (crops which directly benefited from protection) grew by 1.56 million hectares, or 19.8 per cent.[42] If tariffs encouraged an increase in output, which under conditions found in Spain implied an extension in the area cultivated, we would expect population to be retained in agriculture in those areas which saw such a growth. Table 7.7, however, suggests no obvious correlation. Over half of the country's cereal land in 1930 was found in areas which had seen a fall in population greater than the national average.[43] In particular, it is worth highlighting the case of Castilla-León which saw a growth of 25 per cent in the area sown, but also a fall of the same magnitude in the size of the farm population.

There was, however, one large area where it does appear that the growth in the area cultivated was accompanied by a growth in population, namely La Mancha, Western Andalucía and Extremadura (in reality, the province of Badajoz). These regions saw the area sown increase by a third (or the equivalent to just over half the national increase), whilst the population grew by 11 per cent. If the impact of other crops (viticulture in La Mancha, olives in Andalucía) was also of importance in explaining these changes, it would appear that cereal tariffs perhaps helped retain labour. Yet if this is correct, this poses a paradox, as it would appear that in areas of small farms cereal tariffs encouraged both an extension in the area cultivated which was accompanied by a significant fall in farm population; by contrast, it would be in the areas of large estates and day labourers, in the south of the country, where the extension in cultivation would be

[41] Collins (1987, p. 36).
[42] GEHR (1983b, p. 318). This figure excludes the Canary Islands.
[43] Northern Meseta, Ebro valley, Mediterranean and the North, representing 54.5 per cent of cereal lands.

Table 7.7. *Changes in area sown with cereals and legumes and in the size of the agricultural labour force, 1886/90 and 1930/5*

	% change in area sown	% change in male agricultural labour	% of Spain's cereal land
La Mancha[a]	+35.7	+15.9	18.2
Extremadura	+35.3	+2.4	9.3
Western Andalucía	+34.0	+4.0	8.4
Northern Meseta[b]	+24.8	−24.6	23.8
Ebro Valley	+21.2	−17.3	11.9
Mediterranean	+6.8	−11.2	8.9
North	+3.4	−17.4	6.8
Eastern Andalucía	+4.3	+15.5	9.4
Salamanca	−20.1	−18.9	3.3
SPAIN[c]	+21.2	−6.2	100.0

[a] Includes Albacete, Ciudad Real, Cuenca and Toledo.
[b] Includes Avila, Burgos, Guadalajara, León, Madrid, Palencia, Segovia, Soria, Valladolid and Zamora.
[c] Excludes the Canary Islands.

Sources: GEHR (1983b, pp. 308–16) and *Censos de población.*

accompanied by a growth in the labour force.[44] Clearly, something other than just the price of wheat was determining the rate of outmigration, a point to which I shall return in part IV.

Mechanisation and product quality: olive oil

Andalucía was Spain's major olive oil producing region, accounting for 51.7 per cent of the area cultivated (983,462 hectares), and produced 62.2 per cent of the nation's olive oil (219,343 tons) in 1931/5. Labour requirements were highly seasonal, with almost 80 per cent of demand occurring between the months of January and May, and related to the harvest.[45] In addition, labour was also required in processing the oil, which occurred during the same months. An added problem for farmers was that annual yields fluctuated significantly thereby causing annual fluctuations in both the demand for wage labour and the need for processing and storage facilities.[46] The increasing regional specialisation in

[44] Bernal (1985) pointed out that emigration was greatest in areas of small holdings, and that in the areas of large estates, labour actually increased.
[45] *Sindicato Vertical del Olivo* (1945, pp. 130–2).
[46] Between 1900 and 1935 average annual production was 178 kilograms of oil per hectare, with a standard deviation of 73 kilograms, and a coefficient of variation of 0.41.

the crop therefore meant that even small farmers were dependent on non-family labour during the peak harvest demand.

A mechanical alternative to the labour-intensive task of harvesting was unavailable, and the grower's potential in improving labour productivity was consequently limited. However, once again when organising harvest labour, the farmer could choose between speed, which inevitably resulted in some damage to the crop and spillage, or maximum output at the expense of hiring more labour. Speed was achieved in two ways: by beating the olives to the ground with long poles (instead of using ladders and collecting by hand), and by paying labour piece-work rather than day work. For contemporary agronomists, 'improvements' in harvesting methods became synonymous with the need to increase the care in collecting the fruit, which would bring about a decline in labour productivity. In general, however, farmers aimed to harvest in the shortest time possible, not just to reduce costs, but also to protect the crop from disease, pests and theft. In contrast, farm workers were often more concerned with maximising *total* harvest earnings, even if this meant working more days at lower hourly rates.

The productivity of harvest labour therefore varied according to the form of labour contract established (piece-work or day work), method of collection, and the acquiescence of the labour force. It also varied according to harvest size. A recent study of traditional methods in the olive harvest has noted that when a harvest doubles from one year to the next, a harvester is able to collect approximately fifty per cent more in an hour.[47] In conclusion, although some writers noted improvements in harvesting methods towards the end of the period (i.e. picking instead of beating the fruit), these were usually limited to those farmers for whom quality was important (in the production of olives for consumption or virgin olive oil). In any case, these 'improvements' could, and were, reversed in periods of low oil prices and/or high labour costs.

In contrast to the limited changes in harvesting productivity, the century prior to the Civil War witnessed significant developments in the processing of olives. In Andalucía, changes were noted in the oil mills in the 1870s, with cyclical-shaped stones being substituted by conical ones which increased surface contact.[48] However, it was the changes that occurred at the very end of the century, coinciding with the growth in exports of olive oil for culinary purposes, that transformed the industry. The old wooden presses, especially the beam presses (*vigas*), were replaced with ones worked by hydraulic systems, factories for the chemical extraction of oil from the residue (*orujos*) became increasingly common after 1860, and a totally new operation, refining, was introduced.

[47] López Ontiveros (1978, pp. 194–5).
[48] Manjarrés y Bofarull (1896, p. 105).

Table 7.8. *The modernisation of Spain's olive oil presses, 1890–1930*

	Modern[a] (%)	Intermediate (%)	Traditional (%)	Number
1890	3.6	16.7	79.7	5,427
1900	9.8	21.6	68.6	5,064
1910	21.6	23.8	54.6	5,226
1915	28.2	21.6	50.1	4,567
1922	39.6	22.0	38.3	5,279
1930	54.1	21.4	24.4	7,951

[a] 'Modern' refers to all hydraulic presses, 'intermediate' to the *husillo* and 'traditional' to *rincón* and *viga* presses. Given the greater capacity of the hydraulic presses, the table underestimates the impact of the speed of diffusion. A detailed description of the different types of presses can be found in Simpson (1985a, pp. 162–82) and Zambrana (1987, pp. 141–51).

Source: Dirección General de Contribuciones, Impuestos y Rentas (1857–1930), cited in Zambrana (1987, p. 149).

Between 1888 and 1931/5, the area under olives in Spain increased from 1.15 million hectares to 1.90 million which, even excluding the moderate increase in crop yields, required an increase of about 65 per cent in the country's olive processing capacity.[49] In fact, the number of presses increased by only 46 per cent, implying a growing concentration in the processing of the fruit, as the new presses were installed not just to process the fruit from the growing area of cultivation, but also to replace the older ones (table 7.8).[50]

The 'modern' hydraulic presses offered a number of advantages to producers. In 1901, the provincial agronomist in Sevilla, Noriega y Abascal, compared the production costs of manufacturing olive oil using three different presses: the beam (*viga*) press, a single animal-powered hydraulic press, and a more advanced steam-driven press. By examining the first two in detail, the economic benefits in using the new technology can be established (table 7.9). The capacity of the two presses was about 150 tons a season for the beam press, and 315 tons for the hydraulic. With a yield of 1.25 tons a hectare (the average for Andalucía between 1926 and 1935), then the area that these mills could process would have

[49] The year 1888 is used because of the difficulty in establishing an earlier figure.
[50] Because of the nature of the source (tax returns), the number of presses are likely to be underestimated. See Pequeño y Muñoz (1879, p. 333) and Zambrana (1987, p. 160).

Table 7.9. *Product cost of oil manufacture using beam and hydraulic presses in Sevilla, 1901*

Case 1	Case 2
Mill: 1 *rulo* (conical stone)	Mill: 2 *rulos*
Beam (*viga*) press	Hydraulic press
Original capital outlay: 12,500 pesetas	Original capital outlay: 18,898 pesetas
Olives processed: 151 tons over 120 days	Olives processed: 315 tons over 120 days

	Case 1	Case 2
Annual production costs (pesetas)		
Fixed	810	1,291
Variable	1,488	3,085
Total	2,298	4,376
Olive oil production (tons)	35.8	77.6
Manufacturing costs per ton (pesetas)	64.08	56.37
Variable costs per ton[a]	41.49	39.74
Wage costs per ton	17.57	12.75

[a] Variable costs have been taken as all labour, work animals, fuel and materials used in processing. The value of the residue (*orujo*) is 900 pesetas in Case 1, and 1,890 pesetas in Case 2.

Initial capital costs compare with a figure of 1,000 pesetas per hectare for an olive grove in full production in this part of Spain at the turn of the century (Benítez Porral, 1904, p. 90).

Source: Adapted from Noriega (1981, pp. 320–5).

been 120 and 252 hectares respectively. These areas were significantly larger than most olive farms, and it would have been necessary for mill owners to process olives from other growers.[51] If it is assumed, as Noriega does, that the two mills were fully operational for four months, then the hydraulic press was more cost effective, producing olive oil at 56 pesetas a ton, compared with 64 pesetas a ton with the beam press. In years of harvest failure press owners could hope for little more than to cover operating costs and make a marginal contribution towards fixed cost. However, there is virtually no difference in variable costs between the two presses, and the figures given by Noriega in 1901 suggest that other factors must explain the rapid growth in hydraulic presses during the first third of the twentieth century.[52]

[51] See, for example, Zambrana (1987, pp. 184–5).

[52] Furthermore, given the age of many of the beam presses, most would have been fully depreciated.

In the first instance, labour costs were 27 per cent less with the hydraulic press, and the rapid diffusion of this type of press can in part be explained by the growing wage inflation, especially during and after the First World War. Between 1898/1905 and 1926/35 the production of olive oil almost doubled, yet total labour requirements, despite the lack of mechanisation in harvesting, increased by only a third because of technological change.[53] According to Bernaldo de Quiros, these changes in production methods altered labour opportunities for migrant labour, and the 'immense' flow of migrant labour from the 'cold interior' during the winter months for the olive harvest declined rapidly, especially after the olive harvest failure of 1930/1.[54]

Yet although hydraulic presses produced cheaper oil and reduced labour requirements (an important factor given the growing concentration of the crop in some areas, and the highly seasonal nature of its demand for labour), it seems likely that it was the question of product quality which stimulated the diffusion of the presses prior to the First World War.[55] The hydraulic presses allowed both a greater control in the pressure being applied, essential for the production of virgin oil, and also reduced significantly the length of time the olives were stored prior to processing. As a result, although from the late nineteenth century Spain lost its traditional export markets to cheaper vegetable oils, the improved quality of its products was instrumental in gaining new ones for human consumption. As the Spanish consul in Nice noted in 1911:[56]

> From the time that the first oils arrived here from the Peninsula, very primitive in manufacture, very strong and without interest for the trade that is done here, until today, when the qualities have greatly improved, we see with pleasure imports constantly growing. As qualities have improved, so too have prices.

Improved quality was not just the result of changes in mills and presses. Storage facilities were increased, not only to meet the extra demand, but also to keep separate the olive oil from different pressings. If the new mills were initially related to the export market, the greater economies of scale associated with the hydraulic presses implied that

[53] The actual figures are 95 per cent and 32 per cent respectively, and refer to the provinces of Cádiz, Córdoba, Jaén and Sevilla. Output has been calculated from Zambrana (1987, pp. 384–90) and labour inputs from Simpson (1992b, p. 16).

[54] The provinces cited were Guadalajara, Soria and Teruel (Bernaldo de Quiros, 1973, p. 104).

[55] In the example given by Noriega, the quantity of oil obtained per ton of olives was very similar for all presses, a fact which is consistent with the stagnant industrial yields found during the first third of the century in Andalucía.

[56] Cited in Zambrana (1987, p. 155).

domestic consumers would in time also benefit. Unlike wine producers, the greater scale of production allowed significant capital investment at the manufacturing stage, improving product quality and creating new export markets. The limits to this growth will be discussed in chapter 9. However, this section has shown that farmers, even in Andalucía, were willing to adapt relatively quickly to new techniques when market conditions were favourable.

Conclusion

This chapter has explored some of the changes that took place in three agricultural operations: cereal harvesting, cereal threshing and olive processing. In some tasks, such as olive processing, diffusion of the new technology proceeded relatively quickly from the turn of the twentieth century as a response to new market opportunities. Only by changing the traditional presses and mills were farmers able to compete in international markets. By contrast, with cereal harvesting and threshing, changes were slower and varied across regions. By the 1930s a new generation of farm machinery, namely tractors and combined harvesters, were also beginning to appear. In the case of fixed machinery, new sources of energy (steam, gas, petrol and electricity) were in turn applied, and the machine's productivity, be it in cereal threshing, olive pressing or pumping irrigation water, grew spectacularly from the turn of the twentieth century. Yet despite these possibilities, mechanisation was limited in comparison with other countries in Western Europe, and labour productivity remained low.

The speed of mechanisation in Spanish agriculture can be explained by the delay in the release of labour to other sectors of the economy, and therefore a sufficient pool of labour existed to meet demand, even at seasonal peaks. This was only part of the story, however. Relatively high domestic cereal prices raised the cost of draught animals, which in turn created a disincentive to substitute human energy for animal. Second, not only did farm implements remain expensive because of tariffs on imports, but the lack of domestic mechanics provided a serious barrier to diffusion. If farmers could not efficiently operate their machines, they would not encourage others to buy, which in turn discouraged both domestic industry and the training of mechanics. The lack of a domestic farm equipment industry would delay the all-important adaptation of imported machines to local conditions, and prevent access to the backup required by enterprising farmers who had bought machines from the foreign sales' representatives. Levels of human capital remained limited, as farmers only slowly changed their

production methods.[57] Agricultural mechanisation in Spain therefore was slow to bring about change in the sector, which in turn failed to create industrial demand. The contrast with California during the same period could not be greater:[58]

> Early successes bred other innovations as skilled mechanics and other specialized inputs flowed into the new area of opportunity. The maturation of distribution networks and repair facilities, along with increasing farmer familiarity with one type of machinery, lowered the barriers to adopting the next generation of equipment. The result of this dynamic process was to accelerate mechanization and strengthen the impact of agricultural development in California as backward linkages stimulated urban employment and manufacturing. Like a magnet, agglomeration economies encouraged producers to locate near each other, reducing costs and enhancing the exchange of ideas.

Instead, the abundant labour supply in Spain's south, especially Andalucía, 'choked off the incentive to invent new technologies', making the region more reminiscent of the American South than California.[59] It is not clear to what extent cheap labour (or fragmented, small farms in the northern Interior) 'choked off' the domestic farm-machine industry, or whether a more dynamic machine industry would have speeded up agricultural mechanisation. All that can be said at present is that Spanish farmers did respond to changes in factor and product prices, and the delay in mechanisation was not simply the cause of backwardness in the agricultural sector, but rather the consequence of the limited development achieved by other complementary sectors of the economy.

[57] For a broader study of the question of human capital and economic growth in Spain, see Núñez (1992, especially ch. 7).
[58] Olmstead and Rhode (1988, p. 87).
[59] Whatley (1987).

Part IV

Markets and institutions, 1880–1936

8 The growth of the home market and agricultural specialisation

> It is thus that through the greater part of Europe the commerce and manufactures of cities, instead of being the effect, have been the cause and occasion of the improvement and cultivation of the country.[1]

The role of cities in providing a stimulus to change in the agricultural sector has received much attention from historians and economists in recent years.[2] If towns required labour productivity in agriculture to increase, so that 'a rising proportion of the workforce can find employment in secondary and tertiary activities without prejudicing the supply of food or raising its price inordinately',[3] agriculture was equally dependent on urban demand to permit greater specialisation, economies of scale, and to absorb surplus labour. Thus, as students of the First Agricultural Revolution have noted, the introduction of mixed farming in northern Europe was closely linked to the growing urban demand for meat and dairy produce, which encouraged a reallocation of resources towards livestock. In this chapter I examine the interconnection between the rural and urban economies and argue that if there were obstacles to increasing labour productivity in Spanish agriculture, urban demand was also a weak stimulant to agricultural change.

In the first section I show that despite important changes in per capita income, diets were slow to diversify in the years prior to the Civil War, with consumption of basic staples accounting for both a large part of expenditure and caloric intake, in contrast to the low consumption of superior foods, such as meat or dairy produce. The second section examines the extent to which tariff protection and government intervention in commodity markets were factors in raising food costs and reducing real urban wages. Wheat and meat produce in particular were highly protected in Spain, although evidence suggests that internal prices were not much above those of other countries, such as France,

[1] Smith (1970, p. 515).
[2] See, for example, the classic work by Fisher (1935), together with Bairoch (1988), de Vries (1984), Ringrose (1983), Williamson (1988) and Wrigley (1967 and 1985).
[3] Wrigley (1967, p. 151).

Germany or Italy. In the third section I argue that livestock producers suffered from both stagnant per capita consumption of meat in urban areas and weak urban growth generally. However, meat was relatively expensive in Spain due to supply-side problems, both in livestock production and in transportation, meat processing and marketing. In the final section I consider the question of whether agriculture was slow to release labour, or whether urban demand was insufficient to attract it. Evidence from rural–urban wage gaps suggest that, until 1914, urban growth was held back by a reluctance to migrate, but that this was not the case thereafter.

Low incomes, poor diets

Despite serious measurement difficulties, there can be little doubt that Spain was a poor country on the eve of the Civil War. In one recent estimate, Spanish real GDP per capita in 1929 was only 68 per cent of that of Italy, 40 per of that of Great Britain, 46 per cent of that of France and 57 per cent of that of Germany.[4] The direct result of this was that for most Spaniards diets were poor. The low calorie intake and shortage of animal protein in Mediterranean diets in general – and in diets in Spain in particular – is shown in table 8.1.

Yet it is also true that the limited modernisation of the Spanish economy prior to the Civil War had produced some major changes. In particular, Prados de la Escosura has estimated that GDP per head doubled between 1859/61 and 1933/35.[5] This increase was accompanied by structural changes, with a growth in urbanisation and a decline in employment in agriculture. Therefore, it is of interest to ask to what extent the poor diets that most Spaniards had in 1936 in fact represented an improvement over those of the previous half century, especially given the apparent important increase in per capita income.

The food balance sheet that I calculated for 1900 gives a daily per capita allowance of 2,096 calories, or 2,733 calories when measured in equivalent adult male units. In chapter 1 this was considered as about the minimum for an agricultural society, and emphasis was placed on the low consumption of superior goods, such as meat, dairy produce and sugar. Yet low calorie intake did not imply that no dietary changes took place. In the first place, there was a slow improvement in product

[4] Prados de la Escosura (1992, p. 36).

[5] This is equivalent to an annual increase of 1.0 per cent; Carreras gives a more modest growth of 65 per cent, or an annual growth of 0.7 per cent (Prados de la Escosura, 1995, Table E.2; Carreras 1989c, pp. 556–7).

Table 8.1. *Major characteristics of European diets prior to the Second World War*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
A. *Annual per capita consumption (kg)*														
Cereals (as flour)	131.6	114.4	93.9	123.7	113.0	163.0	131.4	160.4	106.9	119.0	104.6	146.4	109.5	95.3
Potatoes	96.3	156.1	120.0	143.2	187.0	13.6	195.4	36.6	116.0	130.0	76.2	109.4	90.5	82.5
Vegetables	57.8	49.3	58.0	143.2	51.9	27.0	53.2	55.8	67.0	19.3	109.7	114.6	61.9	54.5
Fresh fruit	41.6	28.0	30.1	29.4	42.0	49.0	19.5	33.7	38.3	31.0	40.5	57.0	84.0	41.7
Sugar	24.7	26.4	50.5	24.3	26.3	10.9	38.1	7.9	32.0	36.9	10.2	11.6	38.6	44.5
Fats (excl. butter)[a]	14.3	11.8	19.6	11.2	14.3	13.8	2.9	10.6	15.4	18.6	13.9	14.4	10.2	12.1
Butter[a]	3.0	7.3	7.0	4.4	6.7	0.9	10.6	1.1	5.2	6.3	0.4	0.3	5.3	9.2
Total fats	17.3	19.1	26.6	15.6	21.0	14.7	13.5	11.7	20.6	24.9	14.3	14.7	15.5	21.3
Cheese	3.7	5.7	5.4	6.4	4.4	8.5	0.3	5.3	6.3	6.7	0.9	1.5	8.1	4.0
Milk	185.8	79.8	166.7	85.5	138.6	42.0	146.6	37.3	145.9	175.9	8.9	60.6	244.3	107.3
Meat[b]	48.7	47.2	74.6	55.2	52.8	19.5	54.9	20.1	37.5	37.9	15.0	28.1	53.2	62.6
Fish	3.5	14.1	32.4	14.7	14.1	12.4	6.5	11.8	15.3	40.6	38.3	25.0	2.9	20.6
Eggs	6.7	11.8	7.5	9.0	7.4	4.2	15.8	7.3	9.1	6.9	3.2	4.9	8.8	12.8
B. *Daily per capita consumption*														
Calories	2,940	2,820	3,450	2,880	3,040	2,600	3,400	2,520	2,840	3,200	2,100	2,760	3,140	3,110
Protein (grams)	88	83	93	96	85	84	99	77	81	90	58	88	96	80
Total calories (% from cereals and potatoes)	49	50	33	51	47	61	50	65	44	44	56	59	39	35
Total protein (% from animal products)	51	42	61	43	51	27	48	29	51	54	34	28	56	55

(1) Austria; (2) Belgium; (3) Denmark; (4) France; (5) Germany; (6) Greece; (7) Ireland; (8) Italy; (9) Netherlands; (10) Norway; (11) Portugal; (12) Spain; (13) Switzerland; (14) UK.

[a] Figures refer to the fat content.

[b] Figures refer to carcase weight.

Source: Yates (1960, table 2.4).

quality, as manufacturing and transportation systems improved, and government legislation curbed some of the worst abuses in the food processing industries. In chapter 7, for example we saw the improvements in olive oil presses, and the question of wine adulteration has been discussed elsewhere.[6] From the late nineteenth century, the introduction of roller milling provided a much finer flour, and significantly improved bread quality.[7]

Second, we can note the growth in consumption of non-essential foods. Thus between 1850/9 and 1890/9, per capita consumption of coffee increased by 371 per cent, salted cod by 40 per cent, and sugar (between 1850/9 and 1900/9) by 124 per cent. However, in all cases the base figures were very small, and consumption was concentrated in the major cities.[8] Furthermore, with the exception of sugar from the late 1880s, these shifts in consumption did not benefit Spanish agriculture. Of much greater importance for domestic agriculture was the demand for livestock produce, and here the critical factor was the stagnation in herd size between 1750 and 1936, causing the potential supply of meat per capita to fall to only 68 per cent in 1917 and 74 per cent in 1929, of what it had been in 1865.[9] The relationship between growth in per capita income and meat consumption appears, therefore, to have been negative, at least until the slight recovery during the first third of the twentieth century. I shall return to this subject shortly.

Between 1900 and 1936, total daily calorie consumption increased to 2,426 per person, or 3,155 per equivalent adult male, representing a growth of 15.7 per cent.[10] This is a significant increase. If the minimum requirement for an adult male doing no work is taken as 1,725 calories, this implies that there was a 43 per cent increase in available calories

[6] Simpson (1985a, p. 115; 1985b).
[7] Nadal (1987, pp. 25–30) and Perren (1990).
[8] Simpson (1989a, p. 377).
[9] Taking the herd size (live weight) to have been 100 in 1865, it was 98 in 1750, 87 in 1917 and 105 in 1929 (Garrabou and Sanz 1985, cuadro 20; GEHR 1978, apéndice). One possible source of error lies in the month in which the census was carried out: 1865 (November) was perhaps exaggerated in comparison with 1929 and with 1933 (March), with the former maybe including the annual newborns, but the latter not. The date for the 1917 census is not known (GEHR, 1991, pp. 81–2). The 1865 census includes the number of animals under six months (i.e. added to the national herd since March), and so, if this category is excluded, then the size of national herd in 1865 was still not surpassed until 1913 in the case of cattle, 1917 for swine, 1921 for goats, and 1939 for sheep. In terms of live weight per person, there was a significant fall.
[10] Age distribution given in Nicolau (1989, p. 69); coefficients of calorie distribution estimated by Fogel (cited in Bekaert, 1991, Table 2).

which could be used for work.[11] In part, this is likely to explain the greater labour productivity in agriculture between 1900 and 1930 (shown in table 1.4). Although consumption of basic foods such as cereals and potatoes increased, the implication is that changes in per capita income and urbanisation also led to greater variety in diets. Between 1900 and 1930 consumption of lean meats grew by 35 per cent, milk 127 per cent, sugar 152 per cent and coffee 158 per cent.[12] Yet, once again, base numbers were very small and, as table 8.1 shows, the Spanish diet, like the Mediterranean one in general, remained very poor in comparison with those of central and northern Europe. In general, it was heavily dependent on cereals, potatoes and vegetables for protein, with meat and dairy products remaining rare.

The question of why diets in Spain were so poor in the 1930s cannot simply be a question of the level of economic development. The Irish, for example, consumed 23 per cent more calories per individual, 95 per cent more meat, and 228 per cent more sugar, even though GDP per capita in the two countries was not very different.[13] Table 8.2 shows clearly that, either because urban wages in Spain were significantly lower than elsewhere, or because there were inefficiencies in the production and supply of food, Spanish consumers were consistently worse off than in most other areas of Europe. In the next two sections I consider two possibilities: first, that high cereal tariffs in Spain seriously distorted resource allocation; and second, that the low level of urbanisation did not permit sufficient agricultural specialisation in meat and dairy produce.

What price self-sufficiency? the case of wheat

From the late nineteenth century, Spain was not alone in protecting its wheat growers by tariffs, but levels were considered exceptionally high and helped produce some of Europe's highest bread prices.[14] To compare the real level of protection between countries is notoriously difficult

[11] From 1,000 surplus calories in 1900 to 1,430 in 1930. For minimum requirements, I have assumed that for 17 hours a day a person required the absolute minimum to sustain life (i.e. BMR 1.27), and for the remaining 7 hours undertook very light activity (for example, standing still but not strolling, the equivalent of BMR 1.4). BMR is taken at the bottom of Fogel's range, at 1,350 calories. See Fogel (1991, pp. 40–42) and the Appendix at the end of this book.
[12] Simpson (1989a, cuadro 5).
[13] In 1933 real GDP in Ireland was US$2,680 (1990 PPP), against US$2,840 in Spain (Prados de la Escosura *et al.*, 1993). For diets, see table 8.1.
[14] The tariff and the domestic terms of trade for wheat farmers are considered in chapter 10.

Table 8.2. *Relative purchasing power[a] of building workers[b] in Europe, January 1930*

	Bread[c]	Potatoes	Meat[d]	Milk	Sugar
Spain (4)[e]	1.79	3.93	0.27	1.79	0.73
Italy (7)	1.48	3.73	0.25	2.19	0.43
France (4)	2.34	6.04	0.29	2.53	1.07
Germany (6)	3.10	11.82	0.50	4.48	2.10
Britain (7)	3.40	8.68	0.71	2.85	2.71
Austria (3)	2.05	6.58	0.36	2.55	1.23
Ireland (3)	2.79	13.11	0.64	3.28	2.43
Low Countries (4)	2.93	13.67	0.53	4.56	1.74
Denmark (1)	2.41	12.50	1.14	6.06	4.00
Sweden (3)	2.37	15.83	0.89	8.64	4.52
Estonia (2)	1.94	6.60	0.36	2.20	0.94
Poland (4)	3.00	12.27	0.39	2.81	0.83
Czechoslovakia (3)	3.25	12.21	0.55	3.77	1.30

[a] Purchasing power measured in kilograms or litres of product that wages from one hour's labour could buy in major cities.
[b] Building workers' wages have been taken as an average between skilled (*albañiles*) and unskilled (*peones*).
[c] Bread is from wheat flour, except in the case of Austria, Estonia, Germany and Poland, when rye bread has been used.
[d] Meat refers to an average of beef, lamb, pork and veal, except when information is lacking, namely Denmark (lamb), Britain (veal), Ireland (pork and veal) and Sweden (pork).
[e] The number of urban centres used are given in parentheses.

Source: Dirección General de Trabajo (1931, cuadros lxiii and lxiv), which in turn is based on International Labour Office publications.

given the variety of methods that protection might take, the problems in converting currencies, and the significant dietary variations between countries. Comparing tariff levels alone is not enough.[15] The real level of protection enjoyed by Spanish farmers is perhaps best reflected in Table 8.3, which shows the country to have been virtually self-sufficient in wheat compared to other countries, which had theoretically higher levels of protection according to Liepmann.[16] Therefore, domestic self-

[15] For example, Spain supplemented its tariffs from November 1921 by strict import quotas for wheat and maize and, therefore, in the words of Liepmann, 'Spain's corn duties . . . had only limited practical value for judging her corn-import policy, and the large decreases of her corn imports in post-War periods' (Liepmann, 1938, p. 101). For Spanish tariff policy see EPAPM (1928, pp. 257–60) and Montojo Sureda (1945, pp. 15–47).

[16] The IIA does not allow a figure for 1909/13 to be calculated, as the figures for production refer to post First World War boundaries and imports to the pre-War frontiers.

Table 8.3. *Indices of wheat protection and self-sufficiency in five European importing nations, 1925/9*

	Self-sufficiency in wheat (%)	Estimated tariffs as % of international prices (1927)	Income from customs receipts as % of total imports (1922/30)
Spain	96.9	19.6	19.2
France	86.2	23.0	7.8
Germany	83.9[a]	29.0	8.0
Italy	74.0	27.0	5.6
Great Britain	21.2	—	9.2

[a] Includes both wheat and rye. The level of wheat self-sufficiency was 61.3% and rye 99.7%.

Sources: IIA (various years); Liepmann (1938, pp. 64, 68, 72 and 101); Tena (1992, p. 333).

sufficiency was achieved at a cost to the consumer, as domestic prices remained above international ones. Figure 8.1 compares the internal wheat price in Spain with the English price, which is taken as the 'world price', and has been converted into pesetas at the current exchange rate.[17] Whereas between 1870 and 1877 Spanish wheat prices were cheaper than 'world' prices, this would not be the case for the rest of the period. Only during the First World War, when British prices rose on account of shipping difficulties, did the price difference fall much below 20 per cent. If Spain had, by the 1930s, achieved self-sufficiency in bread grains, this was achieved through low levels of food consumption, high food prices and, as I argue in chapter 10, low incomes for many of Spain's farmers.

Spain was not alone in protecting its wheat farmers. Other countries, such as France or Germany, did so too, but they also enjoyed relatively high agricultural productivity. In the case of France, Lindert has shown that the silver price of wheat grew from being 5 per cent higher than that in England during the 1870s, to around 26 or 27 per cent by the 1890s and 1900s. In other words, not so very different from the Spanish experience.[18] Lindert also reminds us that the Corn Laws kept the

[17] Since much of the wheat consumed in Britain was imported, there is no need to include freight in the calculation. Unlike GEHR (1980), which showed the costs (and profits) of shipping from England to Barcelona, my interest here is simply to illustrate the price 'gap' between the two countries. A moving three-year price average is used. For a wider comparison of international wheat prices between 1880 and 1905, see Palafox (1991, cuadro 1.3).

[18] Lindert (1991, table 2.4).

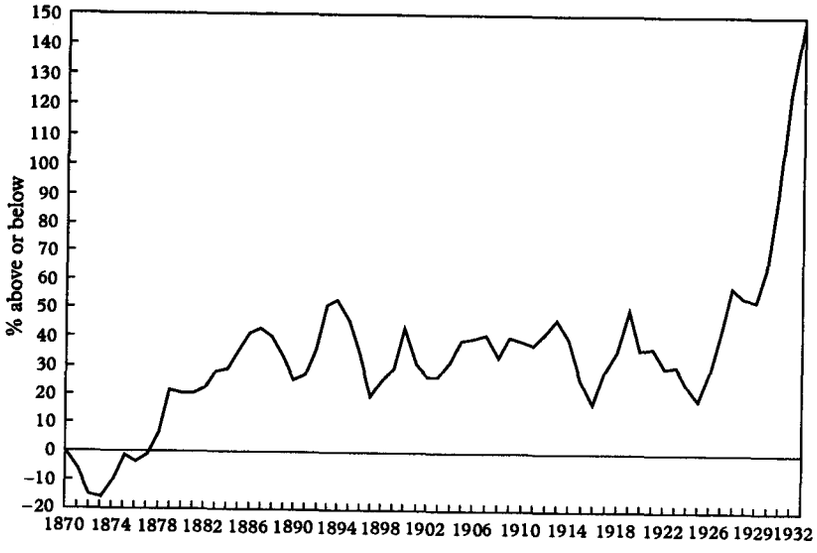


Figure 8.1 Spanish wheat prices as a percentage of 'world' prices (three-year averages used)
Sources: Mitchell and Deane (1962), GEHR (1980) and París Eguilaz (1943) for prices; Carreras (1989, pp. 390–1) for exchange rates.

domestic price of wheat in England significantly above that of other European countries between about 1710 to 1846. Indeed, the gap between Britain and other countries in this earlier period appears remarkably similar to that identified in figure 8.1, between Spain and the 'world price'.[19] It hardly needs mentioning that the period 1710–1846 is not normally considered one of agricultural failure in England. It seems unlikely that higher bread prices caused by tariff protection could make a really significant difference to household budgets in Spain in the period 1891–1936.[20] However, even if cereal protection in Spain was not significantly above that of its neighbours, the low incomes of the country implied that its impact on aggregate demand would be larger than in Germany or France, given its greater weight in family budgets.

A second factor, perhaps of even greater importance in the long run,

[19] Ibid. (table 2.4).
[20] Fraile (1993).

was the question of the low opportunity cost of growing cereals in Spain compared with that in northern Europe. As the rest of this chapter and the next will argue, there were few alternatives to cereal-growing in much of arid Spain.

Urbanisation and commercial livestock farming

From the late nineteenth century, a major factor in productivity growth in northern European agriculture was the movement of resources away from the production of bread cereals, where demand tended to be stagnant and farmers faced growing international competition, and into other commodities where profitability was greater. The result was a sizable increase in the output of meat and dairy produce. Thus, in Great Britain the area devoted to wheat fell by a half, and the number of cattle increased by 30 per cent between 1870 and 1910. In France, whilst the value of cereals stagnated, the output of meat and dairy produce increased by 48 per cent between 1865/74 and 1905/14. In Germany there was no fall in the area of wheat and rye, but the number of cattle rose by a third between 1873 and 1913.[21] In Italy, the number of cattle increased by 40 per cent between 1880 and 1910, and there were significant increases in the numbers of pigs, sheep and goats.[22] In Spain, by contrast, livestock numbers appear to have been much the same in 1865, 1917 and 1929, and the contribution of livestock production to final agricultural output grew only very slowly, from 27 per cent in 1897/1901 to 30 per cent in 1929/33.[23] By contrast, the area of wheat grew throughout most of the nineteenth century, and increased by 24 per cent between 1905/9 and 1930/4.[24]

There can be few doubts that this failure to switch resources out of bread grains and towards meat and dairy produce was a major cause of the low productivity of agriculture in Spain. Furthermore, the low levels of milk and meat consumption shown in table 8.1 illustrate vividly the poor living standards of many Spaniards. That said, it seems difficult to blame the poor performance of livestock husbandry just on tariffs, as domestic wheat prices were at the most 40 per cent higher than the

[21] Tracy (1989, pp. 51, 76 and 100–1). In all countries there was a dramatic decline in sheep flocks in the face of imported foreign wool, and a major increase in pigs.
[22] The number of pigs increased by 28 per cent, sheep by 40 per cent and goats by 36 per cent (Mitchell, 1992, pp. 347–8).
[23] Simpson (1995a, table 2).
[24] Calculated from GEHR (1991).

world price (i.e. prices in the United Kingdom), and the difference would be considerably less if the comparison were made with Germany or France (figure 8.1). Instead, the slow growth in livestock output appears to have been caused by other factors which I shall now examine.

From the turn of the twentieth century, if not before, it was believed that there was a positive correlation between meat consumption, rising per capita income and the level of urbanisation. Thus, Flores de Lemus argued that individuals with incomes of less than 1,250 pesetas a year consumed some 15 kilograms of meat annually, compared to 24 kilograms for those enjoying incomes of between 1,250 and 3,000 pesetas, and 42 kilograms when incomes were between 3,000 and 6,000 pesetas.[25] According to tax returns and data from slaughterhouses, meat consumption was greatest in urban areas, with 33.9 kilograms per person being consumed in the provincial capitals in 1904, more than double the figure (15 kilograms) to be found in the rest of Spain.[26] As in Italy, consumption of meat in most rural areas was perhaps only a third of that in urban areas by this time.[27]

On the demand side, rising per capita incomes and urbanisation might therefore be expected to have increased demand and led to a growth in the sale of livestock products. Yet evidence suggests that consumption of meat in Madrid, and perhaps in other cities, changed little, and that urban growth in Spain was slow compared with other European countries.

Table 8.4 brings together a number of estimates of meat consumption in Madrid over the period covered by this book. By their nature, these figures have to be considered as approximations, but they do illustrate two major features of Madrid's (and probably Spain's) meat market. First, whilst total population grew by at least a factor of six, per capita

[25] For incomes of between 6,000 and 12,000 pesetas the figure was 59 kilograms, between 12,000 and 24,000 pesetas it was 70 kilograms, and above 24,000 pesetas it was 85 kilograms. As expected, the elasticity of demand declines with the increase in income:
1,250/3,000 pesetas to 3,000/6,000 pesetas +0.7
3,000/6,000 pesetas to 6,000/12,000 pesetas +0.4
6,000/12,000 pesetas to 12,000/24,000 pesetas +0.2
Calculated from Flores de Lemus, (1908, cited in GEHR, 1978–9, p. 118). Prados de la Escosura gives average per capita GDP in 1908 as 614 pesetas (1995, table D.5).

[26] Consumption was greatest in the largest cities, being 44.8 kilograms per capita in Madrid and 42.9 kilograms in Barcelona (*Comisión Extraparlamentaria para la Transformación de los Impuestos de Consumos*, vol. 4, cited in GEHR 1978–9, p. 119). These figures exclude rural household production.

[27] In 1916 meat consumption in Madrid was estimated at 35 kilograms per person compared with 13 kilograms in rural areas (Ministerio de Fomento. Dirección General de Agricultura, Minas y Montes, 1920). Toniolo argues that urban meat consumption in Italy was 'at least three times that of the average for the country as a whole' (1990, p. 33).

Table 8.4. *Changes in meat consumption, Madrid, various years between 1757 and 1930 (kg per person)*

	Beef[a]	Mutton	Pork[b]	Total	Population of Madrid
1757	5.8	20.9	7.0	33.7	142,000
1860	16.0	6.8	8.5	31.3	298,400
1900	21.2	5.5	6.2	32.9	539,800
1930	18.2	6.5	4.2	28.8	952,800

[a] For all years, the coefficient of 0.717 for beef has been used to convert carcase weight to lean meat. Note that the 1900 and 1930 figures for beef also include 1.7 kg and 4.0 kg, respectively, of veal.
[b] The coefficient of 0.803 has been used to convert carcase weight to lean meat.

Sources: For 1757, Ringrose (1983, tables II-4, VI-4, D-5); for 1860, calculated from Fernández García (1971, pp. 98–9); for 1900 and 1930, Gómez Mendoza and Simpson (1988, Apéndice 2); for conversion of carcase weights to lean meat, see Sanz Egaña (cited in Gómez Mendoza and Simpson, 1988, Apéndice 2).

consumption in Madrid stagnated. Second, in the mid-eighteenth century the predominant meat consumed was mutton, while a century later it was beef. Information from other cities is scarcer, but in Zaragoza per capita consumption increased by just 5 per cent between 1871/82 and 1925/35.[28]

If urban per capita meat consumption was barely growing (so minimising the impact of growing urbanisation on the livestock sector), the number of people living in Spanish cities was also relatively small in the early twentieth century. This had not always been the case. Bairoch has argued that the countries which underwent early industrialisation – namely England, France, Switzerland, Belgium and the United States – did so from a relatively low level of urbanisation, whereas the more heavily urbanised countries, 'notably Spain, Italy, the Netherlands, and Portugal figure prominently among the late developers'.[29] Indeed, as de Vries has shown, Spain experienced a fall in its urban population from 923,000 (11.4 per cent of the total) in 1600 to 767,000 (8.6 per cent) in 1750.[30]

From the second half of the eighteenth century there was a renewal in Spain's urban growth. It appears strongest in the centres of 10,000 inhabitants or more; taken together, these grew from approximately 7.6

[28] Pinilla Navarro (1990, p. 644).

[29] Bairoch (1988, pp. 331–2).

[30] De Vries (1984, tables 3.2 and 3.7). De Vries defines urban centres at 10, 000 or more inhabitants.

per cent of total population in 1750 to 35.9 per cent in 1930. However, there are good reasons for considering this an unsuitable indicator given the large numbers of agricultural workers to be found in populations of this size in Spain. The 1950 census, for example, which contains information of the employment structure of municipalities of 10,000 inhabitants or more, shows that male agricultural employment was 18.3 per cent, a figure that increases to 27.6 per cent if the industrial provinces of Barcelona and Vizcaya (including Bilbao), and the cities of Madrid and Sevilla are excluded.[31]

A better measurement of urbanisation are the 50 provincial capitals, which grew between 1787 and 1930 'nearly three times as fast as the countryside (1.14 per cent compared with 0.38 per cent per year)'.[32] The share of total population found in these 50 towns increased from 11 per cent in 1800 to 22 per cent in 1930. Importantly, the 1950 census indicates that agriculture accounted for only 11.8 per cent of male employment in provincial capitals. However, the obvious shortcomings of using provincial capitals as a proxy for urbanisation is that it misses some important industrial and commercial centres which were not provincial capitals, including Gijón, Cartagena and Jerez de la Frontera. Furthermore, changes in the size of the provincial capitals cannot readily be used for international comparisons.

As we have noted, it was the largest cities which were the most important markets for agricultural products, with per capita consumption of meat and groceries being considerably greater than in the smaller towns or rural areas. But on this measure, there is no doubting Spain's relative decline: in 1750 Spain could boast six of Europe's forty largest urban centres (Madrid, Granada, Barcelona, Sevilla, Valencia and Cádiz): by 1850, this figure had fallen to three (Madrid, Barcelona and Valencia); by 1950 the figure had fallen to just two (Madrid and Barcelona).[33]

In part, this decline can be attributed to the much slower growth in the Spanish economy compared to some other European nations. However, if the comparison is made using countries at similar levels of development, Spain still appears to be less urbanised than most. Table 8.5 brings together information on per capita incomes, distribution of the active population, and two indicators of urbanisation (per cent of population in cities of more than 20,000 and 100,000 inhabitants). At

[31] Calculated from the *Censo de Población* (1950, 2). Nationally, the active male population was 53.4 per cent in 1950. For the agro-cities of Andalucía, see chapter 2.

[32] Reher (1990b, p. 284).

[33] Chandler and Fox (1974, cited in Hohenberg and Lees, 1985, table 7.2). Europe here includes Russia.

similar levels of per capita income, Spain had a considerably smaller share of its population in major towns compared to other countries, with the exception of France. It had significantly less if the absolute numbers living in the 'great cities' (those of more than 100,000 inhabitants) are considered.[34] In conclusion, although Spain had been a more urbanised society than the countries in northwest Europe in the sixteenth century, this was not the case by the nineteenth or twentieth centuries. If, as has been suggested here, cities played an important role in encouraging agricultural specialisation, then the stimulus for Spanish farmers would have been considerably weaker.

To what extent, then, was the slow growth in meat products caused by the lack of demand, and to what extent to supply constraints? If demand was indeed rising faster than supply, we would expect prices to have risen against that of bread. Figure 8.2 shows how the inelastic demand for bread led to its price rising significantly against that of meat following the poor harvests of 1856/7, 1867/8 and 1882.[35] However, by the mid-1880s, and especially from the turn of the century, relative prices clearly moved in favour of livestock products. This also fits with what we know about national wheat consumption and livestock numbers. After growing from an annual 159.4 kg/person in 1908/12 to 168.8 kg/person in 1918/22, wheat consumption then fell to 150.8 kg/person over the following decade. As early as 1926, Flores de Lemus had noted the growing importance of feed grains compared with those used for bread-making, and suggested that this was to be the future for cereal farmers, given the impossibility of exporting wheat.[36] The government reacted to rising meat prices by allowing imports averaging 282,800 tons of maize each year between 1920 and 1933 – the equivalent of 44 per cent of the domestic harvest. Nationally, farmers were therefore slowly diverting resources into livestock production. However, during the first third of the twentieth century, urban wages in Madrid increased about twice as fast as meat prices, and therefore the stagnation in per capita consumption in this city suggests that any improvements in living standards led to the purchase of other superior foods or consumer goods rather than meat.[37] In other words, even though diets were poor in meat, consumers were not willing to increase consumption at any price. The

[34] The table also suggests that the supposedly rapid decline in agricultural employment in Spain between 1910 and 1930 appears inconsistent with the much slower growth in urbanisation. See Simpson (1995a, pp. 185–6).

[35] By contrast, the rise in 1892 and 1898 was caused by the fall in meat prices.

[36] Flores de Lemus (1926). See also Jiménez Blanco (1986b) and GEHR (1988, p. 61).

[37] Reher and Ballesteros (1993, Apéndice 1) and Gómez Mendoza and Simpson, (1988, Apéndice 3). Note also that, as table 8.4 suggests, there were shifts in preference for different types of meat.

Table 8.5. *Levels of urbanisation in various European countries at similar levels of per capita GDP*[a]

A. *Gross Domestic Product per head, US$1,950–2,150 (1990 PPP)*

	Active population working outside agriculture (%)	Total population in urban centres of 20,000+ (%)	Total population in urban centres of 100,000+ (%)	Millions of people in urban centres of 100,000+
United Kingdom (1840)	78	28.4	17.9	3.3
France (1870)	53	15.8	9.1	3.3
Germany (1890)	60	21.0	12.1	6.0
Italy (1910)	41	28.2	10.9	3.9
Spain (1910)	34	22.7	10.3	2.1

B. *Gross Domestic Product per head, US$2,850–3,050 (1990 PPP)*

	Active population working outside agriculture (%)	Total population in urban centres of 20,000+ (%)	Total population in urban centres of 100,000+ (%)	Millions of people in urban centres of 100,000+
United Kingdom (1860)	75	36.7	23.9	5.5
France (1910)	59	27.8	14.8	6.0
Germany (1910)	63	34.7	21.3	13.8
Italy (1925)	44	31.4	13.3	5.3
Spain (1930)	54	30.5	14.9	3.5

[a] GDP figures and census information nearest to each date have been used.

Sources: Calculated from Prados de la Escosura (1993, table 2), Flora *et al.* (1987) and Mitchell (1992).

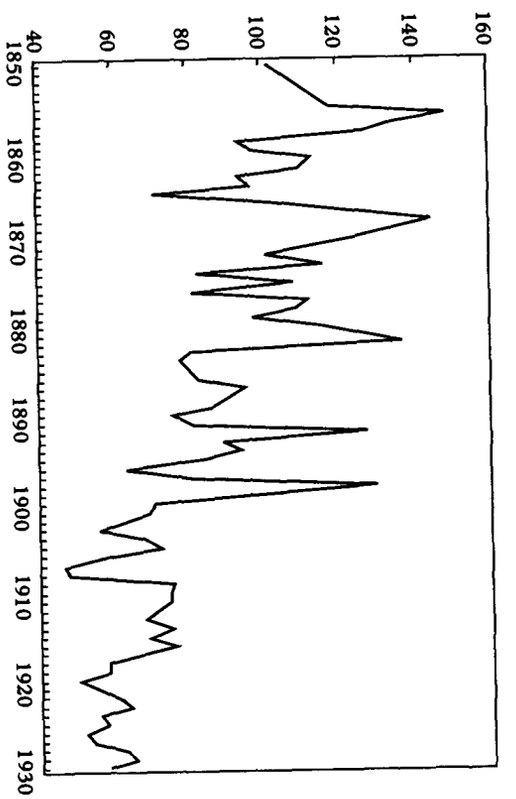


Figure 8.2 Bread–meat price ratio in Madrid, 1850–1930 (five-year averages used; 1848/52=100)
Source: Calculated from Reher and Ballesteros (1993, pp. 139–42).

evidence, albeit slight, would seem to suggest that low meat consumption was primarily a supply problem.

Ringrose argued that Madrid's per capita meat consumption in the mid-eighteenth century was high by European standards, a factor he attributes to favourable natural resources for livestock production.[38] By 1930 this clearly was not the case. The predominance of mutton in 1757 was a consequence of the Mesta and transhumance sheep farming of the Interior. The rising production costs from the late eighteenth century, and the collapse in wool prices in real terms from the second decade of the nineteenth, quickly eroded the favourable conditions for extensive grazing, thereby adversely affecting the supply of mutton.[39]

From the turn of the nineteenth century onwards, the decline in rural industry and the increasing penetration of cereals from the Interior encouraged greater livestock specialisation in the North. This region supplied not just animals for urban markets, but also work animals for farming and transportation elsewhere in the Peninsula.[40] As early as 1802, Pedro Sánchez noted for large areas in Galicia that:[41]

[38] Ringrose (1983, pp. 122). The author cites Viñas y Mey (1965, pp. 75–9).
[39] García Sanz (1978) and Llopis (1982).
[40] For this specialisation, see Domínguez Martín (1988, pp. 103–28) and Puente Fernández (1992, ch. 3).
[41] Sánchez (1802).

. . . cattle everywhere are bred for sale outside the region, and if more are not sold, it is because of obstacles to the trade. Therefore it could be said that instead of factories, this kingdom [i.e. Galicia] has the equivalent to industry in cattle. This is the farmer's great treasure, and his principal resource. From their sale he obtains almost all his subsistence needs.

The North had 7.3 per cent of the agricultural land area, but 36 per cent of livestock output in 1929/33. Rainfall was sufficient to provide good quality natural pastures, allowing hay to be produced for winter fodder. This was supplemented by the production of animal feed, especially maize, grown in intensive rotations. Of the animals sold in Madrid, the North supplied directly 25 per cent of beef animals and 57 per cent of real calves in 1926.[42] Indirectly, the region was responsible for an even greater share as it provided young animals for other provinces, where they were subsequently fattened and sent to the metropolis. However, despite this specialisation, meat consumption per capita in Madrid on the eve of the Civil War was similar to that some two centuries earlier. Livestock specialisation in this region was not hampered by natural resources, but rather by the very small herds and farms, leading to high levels of self-sufficiency and difficulties in obtaining economies of scale to reduce marketing costs.

Outside the North, the biggest problem facing livestock farmers was undoubtedly that of the availability of feed, both because of the poor quality grassland, and because of the high opportunity costs of irrigated land.[43] With the extremely low population densities of the eighteenth and early nineteenth centuries, problems of summer droughts and poor pastures had been successfully solved by extensive grazing and transhumance. During the nineteenth century, population growth and a price structure that encouraged the production of bread grains made this solution much less attractive. Furthermore, poor natural pastures were not easily supplemented by other forms of feed. As late as 1929, the area of artificial pastures and fodder crops in the whole of Spain was only 26.7 per cent of the total sown area. By contrast, in France the figure was 44.2 per cent, in Italy 31.6 per cent and in Great Britain 74.0 per cent – all countries which also benefited from better natural pastures than did Spain.[44] As a result, it was the small animals – sheep, goats and pigs – which supplied the bulk of the meat and much of the milk produced outside the North.

[42] Sanz Egaña (1927, pp. 2–3).

[43] This was especially so in urban areas, where high population densities favoured dairy farming, but where market gardening and fruit farming were often more profitable (Agenjo Cecilia, 1956, p. 3).

[44] *IIA Yearbook* (1930–1). Figures refer to barley, oats, maize and 'all artifical pastures and other forage crops'.

The difficulties facing dairy farmers were perhaps even greater than those facing meat producers (although, given the low level of specialisation, many farmers supplied both dairy and meat products). Traditionally, because of its bulk and short life, milk was consumed near centres of production and often on the farm. Lactations were short, yields small and relatively large quantities were used directly for rearing calves. This is shown in table 8.6, where regions have been listed according to unit price for milk, and the Interior, because of its great diversity, split into three distinct areas. The region with by far the greatest output, the North, had the lowest prices and the second lowest yields.

Conditions over much of the North were favourable for livestock husbandry, and milk provided an important addition to local diets.[45] However, off-farm demand varied greatly across the region, being minimal in much of Galicia, but greater in the industrial areas, especially Bilbao. In Galicia, cattle were kept less for their milk and more as work animals and for meat. As a result, average yields in this region in 1933 were just 767 litres per animal. By contrast, in the Basque provinces of Guipúzcoa and Vizcaya, urban demand led to an average yield of 2,300 litres per animal.[46] At the other end of the scale, where natural conditions were unsuitable for dairy cattle and milk output was consequently small, milk prices and yields were considerably higher than in the North. High yields were obtained in urban dairies and feedlots, where specialised milk-producing animals were kept, and there was little, if no grazing. The country's highest yields therefore tended to be found in Madrid or Barcelona, and urban milk was considered a luxury item, often only used for medical purposes.[47] If these two provinces are excluded, then the natural conditions found in Andalucía, the Mediterranean and the Interior led to approximately equal quantities of goat's and cow's milk being produced.[48] Finally, a few regions, especially in the Pyrenees, were able to combine areas of relatively good natural resources for livestock, with reasonable prices.

By the late nineteenth century the development of refrigeration and pasteurisation technologies, together with growing urban demand, provided the possibility of linking centres of milk production in the North

[45] See chapter 2, p. 53.

[46] Source as for table 8.5. Much of Castilla-León's output was produced under conditions similar to those in Galicia, namely relatively good rainfall but weak demand.

[47] In about 1925 the *Asociación General de Ganaderos* noted that, 'twenty years ago milk was not consumed in most parts of Spain without medical prescription . . .' (p. 50).

[48] Ministerio de Agricultura (1934, pp. 98–103). If the provinces of Barcelona and Madrid are included, then goat's milk represents only 43 per cent of the total. Within Andalucía, the Interior and the Mediterranean, four provinces (out of 40) – Barcelona, Girona, Madrid and Valencia – accounted for 48 per cent of the production of cows' milk.

Table 8.6. *Regional variations in milk yields and output, 1933*

	Yield per cow (litres)	Price (pesetas per litre)	Regional output as % of total (in litres)	Regional output as % of total (in pesetas)
Andalucía	2,402	0.73	2.3	3.7
Extremadura and Centre	2,285	0.60	4.2	5.5
Mediterranean	2,536	0.53	12.9	15.0
Ebro valley	1,940	0.50	5.3	5.8
Castilla–León	1,001	0.52	4.8	5.4
North	1,085	0.42	70.5	64.6
Spain[a]	1,244	0.46	100.0	100.0

[a] Spain excludes the Canary Islands.

Source: Ministerio de Agricultura (1934, pp. 98–9).

with the cities of the Interior. Thus, in 1904 *La Universal Exportadora* was founded to collect fresh milk in the province of Santander and sell it in Madrid, a distance of about 500 kilometres (300 miles). Although it failed in this objective, other new dairies were started after 1910.[49] Santander also saw a rapid increase in the number of dairies for the production of milk products, not just butter and cheese, but also powdered and condensed milk. In neighbouring Asturias, dairies were even more important with two (*La Covadonga de Gijón* and that of Domínguez Gil) each employing over 200 workers by 1900.[50] One aspect of this specialisation was the improvement of livestock breeds through the introduction of foreign animals. By 1927, only 35 per cent of Santander's milking cows were local breeds, 43 per cent were imports, and the rest mixed.[51] The high level of specialisation in milking cows in this province in turn permitted a lucrative trade in the sale of animals to urban dairies elsewhere in the Peninsula.

Yet, on the eve of the Second Republic, most of Madrid's supply continued to be produced within the city or its immediate environs, rather than in the North.[52] Furthermore, national output of cheese,

[49] The failure was in part due to financial reasons, and in part due to the difficulties inherent in the early technology (Puente Fernández, 1989, pp. 269–70). For other dairies see Puente Fernández (1992, p. 177).

[50] Carmona and Puente Fernández (1988, p. 200).

[51] Puente Fernández (1989, p. 189).

[52] Lama y Arenal (1929, pp. 46–7). He notes only one farm, *El Henar*, which produced or collected milk (it is unclear) in Santander to sell through its retail outlet in the Calle de Alcalá. See also García Fernández (1975, p. 46).

utter, and evaporated and condensed milk was still very limited. In 933, Santander was able to dedicate some 30 per cent of its milk production to the manufacture of condensed and evaporated milk, Galicia 8 per cent to cheese production, and Asturias 20 per cent to butter, ut these were the exceptions. Nationally, over 80 per cent of milk was onsumed as liquid milk, a figure which reached 90 per cent outside the Jorth.[53] In conclusion, the amount of liquid milk transferred from areas f surplus (i.e. the North) to areas of shortages and high prices especially Madrid and Barcelona) was small on the eve of the Civil War ecause of transportation problems. Similarly, the quantities consumed y specialised dairies for processing in areas of production also remained mall.

Although the nature of Spanish livestock farming was changing in the eriod prior to the Civil War, especially with respect to improved breeding, better feeding and veterinary knowledge, progress was slow. Without the possibility of cheap feed, intensive feedlot farming was limited o the larger cities. In the North, the small fragmented farms found it difficult to produce sufficient feed to support anything other than very small herds of just three or four animals. A lingering suspicion, however, emains that livestock and dairy production developed slowly because of market failures. In particular, the construction of the cooperative slaughterhouse in Porriño (Pontevedra) in 1928 was a direct result of farmers' frustration with marketing arrangements, and the first packing house using chilling techniques, that of Merida (Badajoz), did not appear until 1927.[54] Finally, in Santander the major source of capital and technological expertise in dairying was not local but that of the multinational, Nestlé. Given the large supplies of relatively cheap milk in the North, it is perhaps surprising that more was not devoted to the production of evaporated and condensed milk. The problem seems to have been the small scale of farms and the high costs of transport. The fact that new and developing livestock technologies for dry lands were developing quickly elsewhere held out possibilities of greater productivity increases in Spain, but the real benefits would not be felt until the late 1950s, as we shall see in chapter 11.

Urbanisation and the rural exodus

Was Spanish urbanisation retarded because agricultural workers were slow to respond to higher urban wages, or did labour remain in the

[53] Ministerio de Agricultura (1934, p. 106).

[54] The Merida experiment, organised by the livestock organisation (*Asociación General de Ganaderos*) soon failed. See Sanz Egaña (1948, p. 425).

countryside because of the weak urban and industrial demand? For example, in the case of Italy, O'Brien and Toniolo have written that:

> The poverty of the rural population before 1914 may be more realistically attributed to the fact that Italy's industrial and urban economy (and the international economy as a whole) had not developed rapidly enough to pull underemployed labour from the countryside of Mediterranean Europe.[55]

In France, the debate also has a long history.[56] In a recent article, Sicsic has attempted to provide a solution by looking at wage-gaps between city and farm, a method I shall now consider for Spain. If labour markets were efficient, it would be expected that the difference in real wages for comparable labour skills between city and farm would be relatively small, and that this 'wage-gap' would remain stable over time as rural labour responded quickly to changing urban demand. If growing urban demand was not met by appropriate rural migration, then the gap would tend to rise as employers fought for an inadequate pool of labour; by contrast, if labour moved off the land faster than employment opportunities grew in the cities, the gap would be reduced.[57]

In table 8.7, urban semi-skilled day wages have been divided by day wages in agriculture to show the wage gap between sectors. If we accept that (a) these labour categories are compatible over time, and (b) that the data contain no major biases, then there would seem to have been a widening wage-gap between 1860 and 1896, which then starts closing slowly. The wage-gap is almost as large (or as small) in 1930 as it was in 1860. Of the twelve subregions, only three experienced wage convergence between 1860 and 1896 (Extremadura, Upper Ebro and Galicia), and only one (Lower Ebro) experienced wage divergence between 1914 and 1930. These trends appear compatible with employment figures. Whereas between 1860 and 1910 approximately two-thirds of the active labour force was found in agriculture, the figure falls to just under half by 1930. Furthermore, as we saw in chapter 1, labour productivity in agriculture grew only slowly in the second half of the nineteenth century, stagnated between 1891/5 and 1909/13, and then increased by approximately 60 per cent by 1929/33. In other words, the relatively high wage-gap between 1896 and 1914 occurred at a time when agricultural productivity was stagnant, and the number of male workers in the sector grew between 1887 and 1910 by 17 per cent. In industry and construction, by contrast, output grew by 75 per cent and employment by only 8 per cent between 1887 and 1910.[58]

Table 8.7 clearly has major limitations in explaining rural outmigration. In the first instance, the measure is in nominal rather than real day wages. However, as shown elsewhere, if urban consumers had greater expenditure than those in the countryside, and therefore the rural–urban wage-gap was smaller than indicated in table 8.7, there is no evidence to suggest that the long-run movement in the shape of the wage gap was any different.[59] Second, rural–urban migration was just one option; by the late nineteenth century, emigration had become a real possibility for some southern Europeans on account of falling transport costs and increased information. For some agricultural workers, the going rate for building workers in Buenos Aires might have been a more relevant factor than for that in Spain's own cities. When emi-

[55] O'Brien and Toniolo (1991, p. 409).
[56] See especially Kindelberger (1964), Ruttan (1978), O'Brien and Keyder (1978) and Heywood (1981).
[57] Sicsic (1992) and Williamson (1987).

Table 8.7. *Urban–rural wage-gap,[a] various years, 1860–1930*

	1860	1896	1914	1930
Eastern Andalucía[b]	1.25	2.11	1.65	1.33
Western Andalucía	1.51	1.99	1.69	1.31
ANDALUCÍA	1.35	2.05	1.67	1.32
Galicia	1.50	1.49	1.72	1.46
Biscay	1.73	1.80	1.57	1.56
NORTH	1.63	1.65	1.64	1.51
Cataluña	1.46	1.94	1.64	1.26
Levante	1.59	1.67	1.74	1.37
MEDITERRANEAN	1.51	1.67	1.74	1.37
Castilla–León	1.68	1.90	1.84	1.69
Extremadura	1.53	1.36	1.79	1.70
Centre (excluding Madrid)	1.58	1.65	1.57	1.40
Madrid	1.30	2.24	2.36	1.54
Upper Ebro	2.18	1.71	1.33	1.22
Lower Ebro	1.39	1.63	1.53	1.55
INTERIOR	1.60	1.75	1.68	1.53
SPAIN	1.53	1.80	1.67	1.44

[a] Calculated by dividing urban wages (nominal and day), by agricultural day wages.
[b] Subregions as given on page xvii, except Cataluña (Baleares, Barcelona, Girona, Lleida and Tarragona) and Levante (Alicante, Castellón, Murcia and Valencia).

Source: Simpson (1995b, p. 199).

[58] Prados de la Escosura (1995, table D.4) and Nicolau (1989, p. 78).
[59] Simpson (1995b, pp. 187–90).

gration is considered, however, our findings concerning labour surplus and low productivity in agriculture between 1890 and 1910 appear to be reinforced. Recent work by Sánchez Alonso suggests that the impact of net emigration on population growth was small between 1882 and 1904, with a net loss of only 185,000 people. Over the next decade, the figures increase dramatically, reaching 819,000. Between 1914 and 1921 there was a net return of 241,000, followed by a loss of 133,000 between 1922 and 1930.[60] Pérez Moreda and Tortella have noted that it was emigration, rather than more regional outmigration to the cities, which attracted rural labour prior to 1914. From the First World War, however, this situation changed dramatically, with a rapid growth in the country's major cities (Madrid, Barcelona and Bilbao).[61] Although a strong rural exodus was only apparent from about 1905, with labour moving intially in large numbers overseas but then also to Spanish cities, there were also apparently some good reasons (apart from official policy) why labour chose to remain in agriculture.[62]

In the first instance, it is perhaps worthwhile stressing the advantages of agricultural employment in the period prior to the First World War. For the risk-averse peasant, access to even a relatively small area of land would protect the family from the wild fluctuations in bread prices which were frequent especially prior to the 1880s. Furthermore, rural society held out rewards for the hard-working and diligent farm worker. In particular, the existence of a 'farm ladder' permitted young adults to start their working lives as landless labourers, and slowly move their way up the ladder to become full property owners.[63] Although no information prior to the Civil War exists for Spain, in France it has been suggested that hired agricultural labourers had either become self-employed in the sector (by renting land or by becoming an owner-operator) or had moved to towns by the time they reached 30 years of age.[64] If the prospect of gaining access to their own land seems to have encouraged labour to remain in French agriculture, it also seems to have been common to large areas, although not all, of Spain. Andalucía, where farm labour actually increased in absolute numbers prior to the Civil War, was probably a case apart.

[60] Calculated from Sánchez Alonso (1995, cuadro A3.6).

[61] Pérez Moreda (1985, p. 58) and Tortella (1985, p. 78). See also Sánchez Alonso (1995, especially pp. 45–7 and 135–42), Mikelarena (1993, p. 225) and Arango (1987, pp. 229–32).

[62] According to Sánchez Alonso's (1995, cuadro A3.6) estimates, gross emigration averaged over 100,000 a year only from 1904 and net emigration averaged over 50,000 only from 1905 (with the exceptions of 1889 and 1896). For contempories' concern over depopulation and emigration, see Robledo (1991, pp. 17–22) and Sánchez Alonso (1995, ch. 2).

[63] For example, for France, Sicsic (1992) and for the United States, Wright (1988).

[64] Sicsic (1992, p. 680, based on Garden, 1988).

It has frequently been noted that in those areas of the North and Cataluña where systems of primogeniture were practised, emigration and internal labour movement was frequent. By contrast, the existence of partible inheritance codes probably acted as a disincentive. The Laws of Toro (1505) established that on the death of either parent, 47 per cent of all the property that the parents had contributed on marriage had to be divided equally amongst all the surviving children, 33 per cent could benefit one or more of the legitimate heirs, and only 20 per cent could be left to other parties.[65] As a result, in large areas of the Interior, both land and the family house were divided to provide each member of the household, thereby helping them to avoid total dependence on wage labour. The implication of this was more far reaching than perhaps is realised today. As the anthropologist Behar has noted for one village in the province of León:

> In fact, Leonese *labradores* (farmers) could rest secure in the knowledge that they gave their children rights not only to a piece of the house but also to a strong communal web of use-rights over village properties of meadow, woodland, and waste. Leonese *labradores*, like the English yeomen E.P. Thompson has written of, 'could risk the practice of partible inheritance without condemning (their) children to poverty' in those villages where 'the grid of communal inheritance was strong'.[66]

However, the sale of the village commons in Spain from the mid-nineteenth century affected the distribution of land wealth and probably eroded the position of those near the bottom of the farm ladder.[67]

Another factor of importance in retaining labour was the question of lease law. Spanish historians have frequently drawn attention to the large areas of land that were leased, often using short-term contracts of two, three or four years.[68] Whilst most historians have derided the leases as being inefficient because they failed to allow tenant farmers time to accumulate capital, or compensate them for any improvements made, they did at least have the virtue of identifying clearly landlords' property rights.[69] This, in turn, encouraged landlords to lease land, and permitted labourers or small farmers greater access to land.

By leaving their farms to work for cash, farmers were able to complement earnings from holdings which otherwise would have been too

[65] The Civil Code of 1889 changed the shares to one-third for each category. In practice, informal mechanisms of property transfer took place, which might allow children access to land before parents died. See Reher (1990a, p. 74).

[66] Behar (1991, p. 34) and Thompson (1976).

[67] See, for example, García Sanz (1985a, p. 38).

[68] Leases were rare amongst vines and tree crops. The length of the lease was determined by and large by the length and nature of rotations.

[69] The question of *what* investments would have been profitable if farmers had access to capital is, however, usually ignored in these studies.

small and to provide the investment necessary to advance to the next rung on the ladder. Evidence suggests a significant temporary movement of people within Spain. Thus, in the second half of the eighteenth century, if not earlier, Galicians set out each year in their thousands for harvest-work in the Interior and Andalucía.[70] Ringrose has drawn attention to the importance of farmers in providing seasonal transport services to the economy.[71] On the eve of the First World War, some 60 to 70 per cent of Asturian miners were also farmers.[72] Lastly, an important study of the Castilian town of Cuenca gives annual inmigration between 1844 and 1847 as 13.7 per cent of total population, and outmigration as 16.2 per cent, suggesting both a highly mobile population and an integrated urban–rural economy.[73]

If labour had started leaving the land in small numbers from the 1880s, the numbers increased significantly from about 1904. Thus, net annual migration represented more than 5 individuals per 1000 in five of Spain's 48 provinces between 1878 and 1887, in seven provinces between 1888 and 1900, in 24 between 1901 and 1910, in 16 between 1911 and 1920 and in 22 between 1921 and 1930.[74] Blanca Sánchez Alonso has argued that the rate of emigration was strongly linked to the level of cereal protection (tariffs and the relative strength of the peseta).[75] If it can be assumed that protection in its various forms kept workers on the land, the major post-1904 increase in labour movement (first in emigration and then a few years later in migration to urban centres), must have been caused by other factors.[76] The trigger for the rapid increase was probably the severe harvest failures of 1904 and 1905 which, because of heavy imports, reduced the value of the domestic wheat harvest to 80 per cent of what it had been between 1901 and 1903.[77] Production recovered after 1906, but the outlook for viticulture remained poor throughout the decade on account of both low prices and diseased vines (phylloxera). By contrast, real salaries in urban

[70] Meijide Pardo (1960).
[71] Ringrose (1970).
[72] Dirección General de Minas, Montes y Agricultura (1911, cited in Schubert, 1990, p. 124).
[73] Reher (1990a, p. 249).
[74] Calculated from Mikelarena (1993, Apéndice 3). The Canary Islands have been excluded.
[75] Sánchez Alonso (1995, pp. 185–92). Construction and levels of exports are also considered crucial in the receiving country, Argentina.
[76] The 1906 tariff was introduced to offset the decline in real levels of protection caused by the stronger peseta.
[77] Calculated from GEHR (1980, p. 197; 1991, p. 1186). For a graphic description of the drought in these years in Andalucía, see especially Díaz del Moral (1977 pp. 206–13), and for the labour conflicts in the Interior, see Instituto de Reformas Sociales, (1977).

ıtres began to improve, increasing by 19 per cent in Madrid between ɔ3/8 and 1909/14.[78]

Conclusion

a recent article on European agriculture, Van Zanden has noted ıt:[79]

may be concluded that by 1870 the level of agricultural productivity was ;hly dependent on the extent of the structural transformation of the econ- ıy and of the level of demand from the urban sector. To put it more ıntly, a highly productive agriculture was always a part of a well-developed ɔnomy.

The case of Spain provides some evidence for this assertion. Resource ocation in Spain was heavily concentrated in the production of basic ɔds; in part this was because of slower urban development. However, ; have also observed that, in the case of Spain (and indeed other ɡions of dry farming), the correlation between urbanisation and ecialised farming was not as strong as in northern Europe. By 1914, estock production in the United Kingdom, constituted some 75 per nt of agricultural output, in Germany 66 per cent, and in France 45 r cent. By contrast, the figure for both Italy and Spain was only 32 r cent.[80] This cannot be explained simply in terms of greater urbanis- .on or greater per capita incomes. In much of Spain, the decline in ternational cereal prices from the 1880s could not be offset as easily in northern Europe by switching resources into livestock farming. By ntrast, in Spain's North, where climatic conditions favoured livestock, e small-scale nature of farms and geographical isolation from the ajor urban areas, hindered specialisation. In this case it was weak arket integration and farm size, rather than simply poor resources, ıich affected productivity.

Prior to the twentieth century, labour was reluctant to leave the agri- ıltural sector, despite the apparently sizable premiums to be earned in e cities. Short-term migrations can allow us to dismiss the notion that ɔour was not mobile. The most likely explanation for the delay in the ral exodus was that, with the exception of Andalucía, most agricul- ral workers either had access to their own land, or believed that at me future date they would have such access. Only when some natural saster affected family incomes, such as when phylloxera attacked vines

Reher and Ballesteros (1993, Apéndice 1).
Van Zanden (1991, p. 226).
O'Brien and Prados de la Escosura (1992, table 3).

in many areas of the country (from about the 1880s), or when urban wages were clearly increasing significantly faster than cereal prices, did labour begin to leave the land in large numbers outside the traditional areas of rural migration, namely the North and Cataluña.

9 Agricultural exports and the international economy

The growth of the international economy during the nineteenth century presented farmers with the possibility of specialising for the export market, thus avoiding the limitations imposed by low per capita incomes, or weak infrastructure of the domestic market. It allowed Spanish farmers to dedicate resources to the production of those goods where Spain enjoyed a comparative advantage in international trade which, in the half century prior to the Civil War, included wines, olive oil and oranges.

In the first part of the chapter I survey recent research on foreign trade which shows that a large share of Spanish trade was of agricultural produce, and that the size of the export sector in Spain was small by European standards. The main part then discusses the limitations to export growth for wine, olive oil and oranges. In the case of the first two products, foreign markets were limited by both foreign governments' tax discrimination and consumer preference. On the supply side, where low entry costs allowed quick responses to short-term upswings in demand, the longevity of both crops discouraged the uprooting of plants at times of weak prices, thereby delaying a return to more stable prices. Finally, both the vine and olive appear to have shared similar characteristics as tropical food products, namely relatively inelastic supplies of cheap labour and suitable land, which had a tendency to depress long-term prices. The orange differed notably from these two crops as it was quickly accepted by consumers in industrial societies, did not compete directly with domestic producers (except in the United States), and had high entry costs. However, these favourable characteristics were offset by the limited potential area for orange cultivation, and the small size of output compared with that of Spanish agriculture as a whole.

Spanish agriculture and export markets

During the first half of the nineteenth century, the Spanish economy became steadily more open. Exports, measured as a percentage of GDP,

grew from just 2.9 per cent in 1830 to 13.4 per cent by 1890. From 1890 however, the growth in world protection (not least in Spain itself), saw the share fall steadily, to 11.8 per cent in 1910, 8.8 per cent in 1920 and 7.7 per cent in 1930.[1] The fact that the Spanish economy was relatively closed in 1929 insulated it from some of the effects of the world depression, but in the long term the failure of the country to export has to be seen as one of the causes of the slow growth of the economy. The export sector in Spain remained small both in comparison with other European countries during the period, and in comparison with Europe and so-called 'Third World' countries at similar levels of per capita income.[2] Despite its small size, the export sector grew at a similar speed to other European countries between 1815 and 1913 (an annual rate of 3.5 per cent in real terms), producing a per capita growth rate of 2.9 per cent.[3] In the case of nineteenth-century Spain, therefore, it was the small size of the export sector, rather than its rate of growth, which hindered export-led development.[4] During the first third of the twentieth century, the speed of growth was to decline markedly.

The contribution of agriculture to Spain's export performance was significant, as in most developing countries. Until 1880, food products accounted for between 50 and 60 per cent of total exports, after which they began to lose ground, accounting for only 40 per cent by 1913.[5] Between 1913 and 1929, total Spanish exports declined by 0.5 per cent annually, allowing agricultural produce once again to account for over 50 per cent.[6] Although Spain did not have the same high level of product concentration in its exports as in many LDCs, the vine and the olive predominated during long periods (table 9.1).[7] Finally, the growing integration of the international economy during the second half of the nineteenth century opened up new markets for some products while also threatening some old established ones. As a result, Spain's traditional export products, such as merino wool, spirits and flour, found it increasingly difficult to compete in world markets, whilst exports of wines (until the 1890s), olive oil, oranges, almonds and cork, grew strongly.

[1] Prados de la Escosura (1988, pp. 207 and 228).
[2] Ibid. (tables 1–7, 5.10, and 6–2). See also Tortella (1992, p. 66).
[3] Prados de la Escosura (1988, pp. 181 and 183).
[4] For a discussion of export size and rates of growth, see Hanson (1977 and 1986).
[5] Prados de la Escosura (1988, pp. 198).
[6] Ibid. (p. 235); Tena, (1989, pp. 348–51). These figures perhaps underestimate the importance of agriculture, as some of the manufactures and semi-manufactures exported, such as cork, were based on domestically-produced raw materials. The agricultural export performance provides a good insight into the competitive nature of the sector and its response to the market.
[7] Hanson (1977, Appendix table 2) shows that of 20 LDCs in 1900, 13 had a single export product accounting for 50 per cent or more of the total.

Table 9.1. *Principal agricultural exports as share of total exports*

	1792	1827	1865/9	1885/9	1905/9	1925/9
1. Products of the vine						
Grapes	..[a]	..	..	1.0	1.2	1.0
Raisins	1.3	5.5	4.1	2.6	1.8	..
Table wine	3.3[b]	16.6[b]	14.4	34.3	4.1	11.7
Sherry	..[b]	..[b]	13.4	3.9	1.4	..
Spirits	15.8	6.0	..	..	..	..
Total	20.4	28.1	31.9	41.8	8.5	12.7
2. Wool	27.5	9.6	1.8	1.7	1.9	..
3. Products of the olive						
Olive oil	1.1	17.0	7.3	2.7	2.5	7.4
Olives	..	..	..	..	..	2.0
4. Oranges	..	2.7	1.7	2.2	5.9	11.9
5. Almonds	..	1.3	..	..	2.0	3.8
6. Wheat and flour	..	3.6	7.9	..	..	..
7. Cork	..	2.9	3.0	2.4	4.3	6.9
8. Livestock	..	..	2.5	2.5	2.5	..
Total	49.0	65.2	56.1	53.3	27.6	44.7

[a] Less than 1%.
[b] Refers to both table wines and sherry.

Sources: Prados de la Escosura (1982, table 7; 1988, tables 2.10 and 6.6).

Table 9.2. *Proportion exported of various crops' total production, 1901/9 and 1930/5 (% by volume)*

	1901/09	1930/5
Wine	20.9	10.8
Olive oil	16.2	22.5
Almonds[a]	10.5	23.1
Oranges[a]	58.9	69.1
Raisins[b]	n.d.	110.8[c]

[a] Refers to 1902 and 1927/31.
[b] Refers to 1931 and 1932.
[c] For an explanation of this figure, see Morilla Critz (1989, pp. 180–1).

Sources: AEPA, APA and *Dirección General de Aduanas*, various years.

The individual shares of agricultural commodities in the export market are perhaps understated in table 9.2, as it is based on volume not value. In general, it was the better quality products (and hence those with greatest unit value) which were exported.[8] For some products, such as sherry, raisins, grapes and oranges, a very large share of output was for the export market. Although extending the area under irrigation and increasing labour productivity in cereals was often difficult, large areas of *secano* were suited to cultivation of the vine and olive. I shall now discuss the limitations to export-led growth for each commodity.

Europe's first wine lakes

The effects of the late nineteenth-century agricultural depression, which affected so many European farmers, were delayed in viticulture because of the significant short-fall in French output caused by phylloxera. However, from the 1890s, a combination of replanting of diseased vines in France, growth of production in countries where the vine had previously been unimportant, and rapid and widespread improvement of yields caused problems of overproduction, which depressed wine prices over much of the first third of the twentieth century.[9] World output, which reached 120 million hectolitres in 1890, increased to 145 million hectolitres in 1900 and had reached 196 million by 1934/38.[10] Unfortunately for growers, most wine was also consumed in producer countries. France, the world's largest producer, was responsible for 51 cent of world imports in 1909/13, and 62 per cent in 1925/9. During this latter period, France was importing seven times more wine than it exported.[11]

For Spanish producers, the French market changed significantly between the nineteenth and twentieth centuries. Between 1900 and 1906 French domestic output recovered to such an extent that growers in the Midi were forced to sell at cost or below in five out of those seven years.[12] Low prices became the rule rather than the exception, and French growers attempted to reduce unit costs through the relocation of production to more suitable areas, and by adopting new technologies – chemicals, labour-saving machinery and new hybrids. Yields, which had stood at some 18 hectolitres per hectare on the eve of the phylloxera

[8] Given the unreliable nature of nineteenth-century production figures, no earlier dates can be provided.
[9] Pujol Andreu (1986, pp. 322–3).
[10] Salas Roca (1954, pp. 29–36, cited in Pujol Andreu, 1986, p. 323).
[11] IIA Yearbooks, 1931 and 1934.
[12] Warner (1960, p. 18).

outbreak in 1860, increased to 30 hectolitres by 1915/20, and reached between 37 and 40 hectolitres by the 1930s. Between 1918 and 1939, the size of the average vineyard doubled from 2 or 3 hectares to between 5 and 6 hectares.[13] Finally, the demand for strong, full-bodied wines for blending was increasingly met by Algerian, rather than by Spanish wines. In 1878, Algeria's total annual production was only 1 million hectolitres but this had increased eleven-fold by 1925/9, with 77 per cent being exported to France under preferential agreements.[14]

Initially, the problem of overproduction was less serious in Spain because phylloxera was devastating the vines there, leaving output lower in the period 1900–7 than it had been during the previous eight years, balancing almost exactly the decline in exports.[15] However, both wine prices and domestic consumption remained depressed.[16] From a maximum of perhaps 2 million hectares in the late 1880s, the area under vines fell to a minimum of 1.24 million in 1914, before recovering to 1.46 million by 1935. Output slipped from about 20 per cent of the world total in 1890/4 to just over 10 per cent in 1930/34.[17]

In the twentieth century, without the benefit of an abnormal short-fall in a major producing country, Spanish growers needed either to increase market share, or to extend the size of the market. It failed to do either, and the country's share of the world trade in wines slipped from approximately half in the 1880s to less than a quarter by 1925/9. The world market for cheap table wines outside France remained limited, in part because producer countries restricted imports to protect domestic growers (the case of Italy), and in part because non-producers placed tariffs on wines both to increase government revenues and to protect other domestically-produced alcoholic drinks (as in the United Kingdom). For Spain, exports never recovered the high levels (by volume or value) achieved in the 1880s (Figure 9.1).[18]

It is possible that improved product quality might have allowed Spain to extend its market. However, the experience in France was for exports of quality wines to decline, from roughly 60 per cent of production of *vins de cru* in 1869/77, to 30 per cent in 1913, and 10 per cent in 1939.[19]

[13] Loubère (1990, pp. 23 and 63–6).
[14] Warner (1960, p. 15) and IIA Yearbooks.
[15] Wine production in Spain in 1892/9 averaged 20.9 million hectolitres, and in 1900/7 17.9 million. Exports were 5.6 and 2.5 million hectolitres, respectively.
[16] See Zapata (1986, 1, pp. 266–71).
[17] Pujol Andreu (1986, cuadro 5) and Simpson (1985a, p. 95).
[18] The recovery suggested in Figure 9.1 during the First World War is only apparent because nominal rather than real prices have been used. No adequate price deflector exists for Spain prior to 1913.
[19] Warner (1960, p. 85).

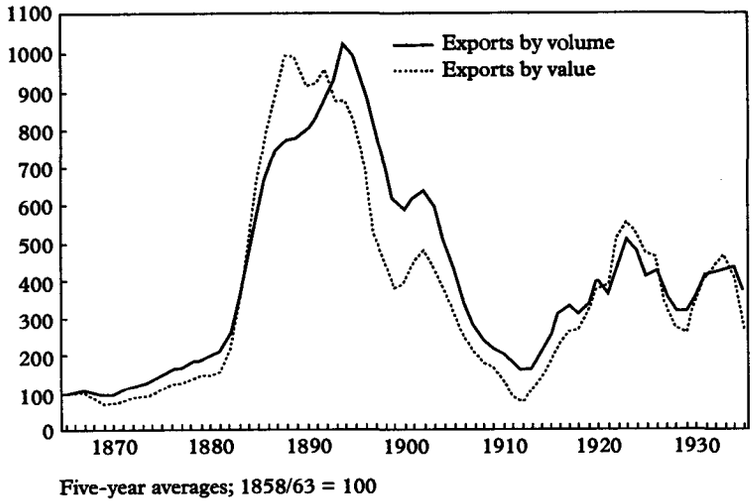


Figure 9.1 Wine exports by volume and value, 1860–1930
Sources: *Dirección General de Aduanas* and Balcells (1980, pp. 375–9)

The market for fine wines in Spain, although growing, was still very small on the eve of the Civil War.[20] The question of quality control and brand names belongs, for the most part, to a later period.[21]

Therefore, the vast majority of producers competed in the market for table wines, where price rather than quality was the determining factor. In Spain, two distinct responses by growers can be noted in their attempts to reduce unit costs. In some areas, often those of traditional intensive production, labour and capital inputs were increased to raise output per hectare. In other areas, usually of more recent production, unit costs were reduced by making economies in the use of labour and capital. This can be illustrated by looking in some detail at two of Spain's leading areas of production, Barcelona in Cataluña, and Ciudad Real in La Mancha.

In the pre-railway era, Barcelona benefited from being able to export quality wines and brandy, making viticulture an important factor in the development of the regional economy. Ciudad Real, by contrast, was

[20] See Pan-Montojo (1994, pp. 83–91 and 351–3). In a breakdown of wine output in 1932, some 94 per cent of output was destined for *vin ordinaire*, (AEPA, *año 1932*, pp. 128–9).

[21] The first control board (*appellation contrôlée*) for sherry was established in 1935. For more details on this, together with international attempts to control the trade, see González Gordon (1972, pp. 40–52), Cabral Chamorro (1987) and Unwin (1991, pp. 310–25).

geographically isolated in the middle of the country, about 200 kilometres from Madrid.[22] Railway construction and the growth of French demand led to an era of prosperity for both areas, although by the early 1880s, Barcelona still had roughly twice the area under vines as Ciudad Real.[23] Phylloxera first appeared in Barcelona in 1882, but the high wine prices encouraged farmers to spend heavily to try to contain the disease. These attempts were abandoned when prices fell sharply from 1886, and by the 1890s over half the province's vines were either dead or dying.[24] By 1909, when all its vines had been destroyed, conditions were regarded as still sufficiently attractive to replant 116,000 of the original 132,755 hectares with American root stock. In Ciudad Real, by contrast, phylloxera arrived later, infecting little more than 3,000 hectares in 1909, and its progress remained very slow, with some areas remaining immune from the disease right up to the Civil War.[25] This regional disparity in the impact of phylloxera was due to differences in climate and soils, the hot summers and loose soils of La Mancha, which hindered the louse's reproduction and movement. Risks of disease were considerably lower and viticulture grew rapidly, so that during the half century prior to the Civil War, the area under vines in Ciudad Real almost tripled while that in Barcelona declined by 10 per cent.[26]

Traditional viticulture in the province of Barcelona used a system of sharecropping, the *rabassa morta*, which had in previous periods encouraged landless peasants to settle on uncultivated land and plant vines. The small area of most of these holdings insured that the sharecroppers cultivated intensely, using high labour inputs to maximise yields. The appearance of phylloxera marked 'the end of traditional viticulture. Science and new technology, together with an intensification of capital investment, would become unavoidable'.[27] It drove up both fixed and variable costs, as it now became necessary to plough or dig the land deeper before planting, and the vines were more dependent on fertilisers than before. In part, changes in production methods helped reduce the planting costs, such as the use of new machinery to remove the dead vines, or ploughs which were able to operate at depths of 0.5 and 0.6 metres. However, this machinery could not be provided economically by the small growers themselves and had to be rented. Thus, although

[22] Measured from Valdepeñas, the main wine centre of Ciudad Real.

[23] In 1883 according to the Ministerio de Fomento (1886, p. 10), Barcelona had 130,000 hectares of vines and Ciudad Real had 67,000.

[24] See especially Carnero i Arbat (1980).

[25] Jiménez Cuende (1934, p. 7).

[26] Barcelona had 121,000 hectares and Ciudad Real 177,000 hectares in 1935 (AEPA, *año 1935*).

[27] Balcells (1980, p. 60, cited in Zapata, 1986, 1, p. 395).

some of the increase in planting costs shown in table 9.3 is the result of wage inflation, which approximately doubled, sharecroppers found that a significant part could not now be met by using unpaid family labour. Where the plough could not be used to plant new vines because of the steep terrain, such as in the Priorat, viticulture was abandoned and population declined.[28]

It was the much greater fixed costs, which resulted from the need to replant diseased vines, that brought about the difficulties in wine production in Barcelona in the interwar period while leaving Ciudad Real almost untouched. In Barcelona the vineyards were no longer self-generating and required significant preparation of the soil and greater use of fertilisers. They also depended on the ability of the grower to select the right hybrid and graft vines – and the plants themselves had a shorter commercial life.[29] Finally, the new vines were much more prone to the dangers of oidium and mildew, especially in the damper climate of Barcelona. This made spraying with sulphur and copper sulphates ('Bordeaux mixture') necessary, further increasing off-farm inputs. In Ciudad Real, phylloxera was much less prevalent, and when it did strike, growers often continued planting European vine stock, and used the same extensive planting techniques as previously.[30] Furthermore, the climate made mildew and oidium rare, and farmers regarded the chemicals as an unnecessary expenditure. The much lower density of vines in La Mancha (due to the summer droughts) greatly facilitated the use of ploughs for annual cultivation, reducing to a minimum the use of hand labour. Finally, vineyards in Barcelona were significantly smaller than those in Ciudad Real.[31]

[28] Perpinya i Grau (1932).

[29] Grafting was, however, a skill which the region had enjoyed, unlike most of the country, in the pre-phylloxera period (*Exposición Vinícola Nacional*, 1878–9, p. 293). The new vines' commercial life was only about twenty years.

[30] As late as the 1960s, a government publication noted that 'the Manchego vinegrower has an improper tendency to utilise on all occasions indigenous plant stock (*viniferas francas*) instead of American varieties, reckoning it more economical, an activity which runs the risk that plantings might be devastated by premature attacks after five years of planting' (Fernández Martínez, 1963, p. 32). By 1978 some 45 per cent of the province's vines were still grown on European root stock (Ministero de Agricultura, Catastro, Ciudad Real, 1979, pp. 71–3).

[31] One estimate for the Penedès (Barcelona) suggests that vineyards averaged 2.5 hectares, which was perhaps a quarter or a half the size of those found in Ciudad Real (Garrabou *et al.*, 1992, p. 35; Ladrón de Guevara Flores, 1988, p. 129). In 1964, when the area of vines had shrunk to 40,000 hectares in Barcelona, and increased to 205,000 hectares in Ciudad Real, some 86 per cent of holdings in the former and 54 per cent in the latter had less than 10 hectares, whilst some 71 per cent of all vines in Barcelona and only 19 per cent in Ciudad Real were on holdings of this size (*Primer Censo Agrario de España*, 1964, p. 32).

Table 9.3. *Wine production costs in Barcelona and Ciudad Real, 1888 and 1925 (pesetas per hectare)*

1888	Barcelona			Ciudad Real		
	(1)[a]	(2)[b]	Total	(1)[a]	(2)[b]	Total
Planting costs	361	180	541	68	18	86
Annual costs	265	84	349	103	10	113
Total[c]			403			122
Wine production (hectolitres)			24			10
Production cost (pesetas per hl)			16.8			12.2
Wine price (pesetas per hl)			22.0			16.0
Labour unit costs (male/day)			2.75			1.75

1925	Barcelona			Ciudad Real		
	(1)[a]	(2)[b]	Total	(1)[a]	(2)[b]	Total
Planting costs	1,695	586	2,281	117	36	153
Annual costs	450	197	647	177	20	197
Total[c]			875			212
Wine production (hectolitres)[d]			28.96			15.12
Production cost (pesetas per hl)			30.2			14.0
Wine price (pesetas per hl)			21.1			21.0
Labour unit costs (male/day)			6.0			3.0

[a] (1) Labour costs (and plough cost where appropriate).

[b] (2) Non-labour costs.

[c] Total costs have been calculated by adding 10% of planting costs (5% depreciation and 5% interest) to annual costs. Taxes and rent have not been included.

[d] 1923/7 average.

Sources: For Barcelona, planting costs taken from *Instituto de Reformas Sociales* (1923, pp. 154–78) where they refer to neighbouring Tarragona; annual costs in 1888 from *Archivo del Ministerio de Agricultura* (Leg. 259, Exp. 1 'Barcelona'), and in 1925 from EPAPM (1926, p. 295).

For Ciudad Real, planting costs taken from *Dirección General de Agricultura, Industria y Comercio* (1891b, p. vii); annual costs in 1888 from AMA (Leg. 259, Exp. 1 'Ciudad Real'), and the 1925 figures have been estimated assuming that (a) wage labour in this province increased at the same rate as in Barcelona between the two dates (this probably exaggerates wage increases, see Simpson (1985a, p. 293)), (b) non-labour costs doubled and (c) unlike Barcelona, production techniques remained unchanged (see text).

Yields for 1923/7 taken from AEPA, although EPAPM gives 40 hectolitres for Barcelona, and wine prices, from París Equilaz (1943, p. 42); it has been assumed that 1 arroba = 16.5 litres, and the wine strength in Tarragona was 13°.

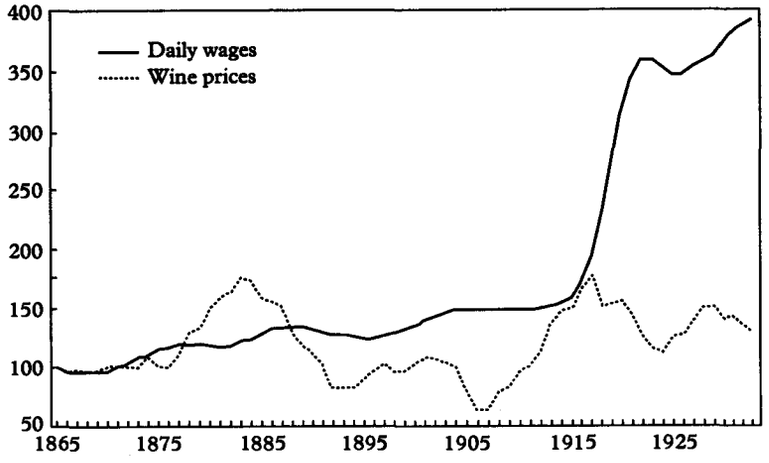


Figure 9.2 Movements in wine prices and wages, Barcelona, 1865–1930 (both series are nominal)
Sources: Balcells (1980, pp. 375–9) for wine prices in Sant Pere de Ribes; Garrabou *et al.* (1991, pp. 40–2) for male agricultural wages in Penedès.

Table 9.3 shows that, although yields in the province of Barcelona were almost double those of Ciudad Real by the mid-1920s, costs were over four times as high. Wine prices are difficult to calculate accurately given the lack of product homogeneity and differences in contemporary estimates, but if wine from Barcelona was sold at a premium over that of Ciudad Real, it was not sufficiently great to offset their higher costs.[32]

Figure 9.2 gives a more dynamic picture of the problem facing wine producers in the Penedès, a major area of viticulture in Barcelona. From the First World War, when replanting had been concluded, rural wages grew considerably faster than wine prices. Even if some farmers were able to operate without recourse to the labour market, the graph illustrates an important decline in relative living standards and the attraction of off-farm employment, especially as urban wages were higher than rural. From 116,000 hectares of vines in 1909, the area of wines in Barcelona hardly

[32] See Simpson (1992a, pp. 126–7). This premium appears to have existed only for the better wines and, as most prices were determined by alcoholic strength, La Mancha's producers enjoyed an advantage.

grew prior to the Civil War, and by 1950 had fallen to 70,000 hectares. By contrast, the population of Barcelona increased from 587,000 in 1910 to 1.28 million in 1950.

The only alternative for growers in Barcelona, and indeed for all areas of labour-intensive viticulture in Europe, was to improve product quality. Despite concerted efforts by government research agencies (such as the *Instituto Agrícola Catalán de San Isidro*) and the growth of cooperatives, especially after the First World War, many growers found it difficult to compete with the low-cost producers of La Mancha.[33] The abundance of suitable land and cheap labour in the Interior seriously undermined the profitability of labour-intensive viticulture in the periphery. In the Interior, as with cereals, Spanish farmers responded to competition by extending the area cultivated and keeping capital and labour inputs per hectare low.

Unfortunately for Spain, the advantage of having large areas of low-cost suitable land and cheap labour was one shared with an increasing number of other producer countries, and in particular Algeria, which by 1924/7 was exporting more than France, Italy and Spain combined.[34] Much of this overproduction of wine during the early part of the twentieth century stemmed from the growth in output from regions such as La Mancha and Algeria, where the crop's opportunity cost was low, phylloxera's presence minimal and labour cheap.[35] However, competition with traditional producers came not only from new low-cost producers such as La Mancha or Algeria, but also from product adulteration. Alcohol produced from wine was relatively expensive, and this encouraged fraud using cheaper raw materials, especially from the sugar beet industry.[36]

In conclusion, Spanish wines competed almost totally in a market where quality was low, consumption limited to producer nations, and where conditions were not dissimilar to those faced by producers of tropical crops, namely low entry costs and elastic supplies of land and

[33] For the growth of research institutions and cooperatives, see Pujol Andreu (1986, pp. 334–7) and Pan-Montojo (1994, pp. 359–73).

[34] An annual average of 7.98 million hectolitres against a combined 6.87 million hectolitres from France, Spain and Italy (*IIA Yearbook*). The vast majority of Algeria's wine went to France.

[35] Opportunity costs are difficult to measure, although for La Mancha (taken as Albacete, Ciudad Real, Cuenca and Toledo) wheat yields averaged only 0.6 tons per hectare in 1909/1914 (Torres, 1944, pp. 247–72), against a national average of 0.9 tons in all Spain, 0.7 tons in Algeria, 1.1 tons in Italy and 1.3 tons in France (calculated from Malenbaum, 1953, pp. 236–9). Lewis notes a figure of 700lb per acre (0.8 tons per hectare) for tropical countries in 1900 (1978, p. 188). In some regions of Algeria, phylloxera was still absent in the 1920s (Lachiver, 1988, p. 443). For La Mancha, see below.

[36] Congreso Nacional de Viticultores (1925, pp. 21–6).

labour.[37] Whereas the extension of cultivation in areas such as La Mancha enabled Spain to enjoy a moderate expansion of exports between 1913 and 1928 in a stagnant world market, the experience of viticulture in the period 1900–50 in general was *de crise en crise*, caused by the planting of vines in large areas of the Mediterranean, where wage labour was cheap.[38] Greater specialisation in viticulture therefore had its limitations, and the contribution of viticulture to agricultural final output declined from about 12 per cent in 1891/5 to 8 per cent in 1929/33.[39]

Olive oil

The olive was another crop of major importance both for the domestic and external market, with about a fifth of total output exported in the decade prior to the Civil War. In the nineteenth century, most of the Spanish olive oil exported was of poor quality, and used for industrial purposes, namely lighting, as a raw material in the manufacture of soap, and as a lubricant for machinery.[40] The growth in exports during the nineteenth century was halted in the last quarter with the availability of other cheaper and more efficient vegetable oils.[41] Between 1880 and 1896 the domestic price of olive oil fell by approximately 20 per cent of what it had been in 1861/79, in part because of the increase in these substitutes, and in part because of the maturing of olive trees planted in earlier periods. In the 1880s some French companies installed themselves in Tortosa (Tarragona) and began manufacturing high quality olive oil (*aceites finos*), by lightly pressing newly picked fruit, which allowed Spain to compete in a quite different market – that of culinary oils.[42] A few years later, encouraged by the depreciation of the peseta, a similar development began to appear slowly in Andalucía, causing major improvements in the processing technology of olives.[43] The old wooden presses were replaced by hydraulic systems, better storage methods facilitated greater hygiene, and the separation of oils from different pressings (which in turn required an increase in the number of

[37] See Lewis (1978, especially chapter 7). Lewis notes: 'Price in the short run is determined by current demand and supply. Price in the long run moves to the level determined by alternative opportunities' (p. 189). For the low opportunity cost of land, see note 35 above and Congreso Nacional de Viticultores (1925, p. 23).
[38] For exports, see Palafox (1986, pp. 186–92), Prados de la Escosura (1988, pp. 236–9) and Tena (1992, p. 346). The quote is from Lachiver (1988, chapter 8).
[39] Simpson (1995a, appendix, 1d).
[40] *Crisis agrícola y pecuaria* (1887–9, vol. 3, no. 132, p. 31).
[41] Zambrana (1987, chapter 7).
[42] Mangrane Escargo (1967, p. 22).
[43] EPAPM (1923, núm. 1289, p. 220).

storage tanks) gave producers the ability to compete in the new market. The impact of these changes led to improvements in both product quality and labour productivity in the industrial process, as discussed in chapter 7. Finally, the appearance of refineries, especially in the ports, allowed shippers a much greater control of the quality and product homogeneity.

As a result, olive oil exports grew from a low of 16,700 tons in the decade 1886/95, to 74,400 tons in 1926/35. However, the six major markets for Spanish olive oil between 1865 and 1935 – Italy, France, Cuba, Argentina, United States and Great Britain – illustrate once again the limitations of the export market for Spanish producers, as five of the six countries were either in the Mediterranean (and therefore producers themselves), or had large Mediterranean immigrant populations. Market size was therefore limited by taste and cultural experience.[44] Furthermore, despite being the world's largest exporter in the first third of the twentieth century, Spain failed to establish brand names or an international reputation for quality as effectively as the French and Italian competition. As late as 1926/35, over two-thirds of Spain's olive oil was still exported in bulk, much to France and Italy, to be sold under their own brand labels.[45] As one writer noted:[46]

> Of all the countries of production, those which have commercial fame for quantity and quality of their oils are France and Italy; all the rest, including our Spain, which sends them our best oils to be mixed with their domestic production, are considered in the markets as producers of inferior oils.

Even though Spain was able to dominate the world market for olive oil during the First World War to such an extent that its government was forced to legislate to retain supplies for domestic consumers, its market share was rapidly lost after hostilities ceased.

Spanish producers therefore tended to compete on cost rather than quality. The milling and pressing of olives required an investment which could not be substituted easily by labour and which, by allowing economies of scale, gave the larger producer an advantage over the smaller one. This led to a greater concentration of production as small producers sold their fruit to the larger manufacturer.[47] Technical change in manufacturing undoubtedly increased product quality and opened up new markets, but most costs were related to cultivation and harvesting. Estimates by the Ministry of Agriculture in 1921 suggest that only 10

[44] The sixth country, Britain, was of declining importance from the late nineteenth century as cheaper vegetable oils were used for industrial purposes.
[45] *Dirección General de Aduanas*, various years.
[46] Lamarca (1922, p. 5).
[47] See the case of Carbonell in Córdoba in Zambrana (1987, chapter 4).

Table 9.4. *Production, area and yields in olive oil production, 1901–1935*

	Production		Area		Agricultural yield[a]		Industrial yield[b]	
	'000 hl	index	'000 ha	index	kg per ha	index	kg per ton	index
1901/12	2,121	100	1,448	100	787	100	187.7	100
1913/25	3,243	153	1,679	116	1,031	131	189.3	101
1926/35	3,920	185	1,921	133	1,006	128	193.6	103

[a] Agricultural yield refers to olives produced per hectare.
[b] Industrial yield refers to the quantity of oil obtained from one ton of olives.

Source: Zambrana (1987, cuadro 6, p. 71).

per cent of the off-farm price of olive oil could be attributed to the manufacturing process.[48] Therefore, 90 per cent of the cost of olive oil was based on the use of extensive areas of relatively infertile soil and some of Europe's cheapest labour. Between 1901/12 and 1926/35, the area under olives grew by a third and agricultural yields increased by 28 per cent. However, these changes in yields are deceptive as an important part of the increase was achieved by having a greater proportion of the nation's trees in full production, and by farmers increasing their annual variable costs (such as extra ploughings, hoeings, and greater care in harvesting) to take advantage of temporary favourable prices (table 9.4). When conditions were not so favourable, such as in the 1950s, yields fell once again.[49]

Although the short-term supply curve for (unadulterated) olive oil was relatively inelastic (given the time it took for the trees to become productive), this was not true over the medium or long term. Within the international market for olive oil, the elastic supplies of land and labour in Andalucía (the country's principal region of production) gave Spain a considerable cost advantage. As a result, olive oil production declined in France and stagnated in Italy during the first third of the twentieth century, and both countries imported a growing amount of olive oil and oil producing seeds, both for domestic requirements and

[48] Córdoba 12.8 per cent (Dirección General de Agricultura y Montes, 1923, pp. 355–7), Zaragoza 10.6 per cent (ibid., p. 129), Huesca 10.4 per cent (ibid., p. 137), Madrid 9.3 per cent (ibid., pp. 12–13), Jaén 6.9 per cent (ibid. p. 289) and Málaga 6.3 per cent (ibid., p. 309). See also Simpson (1985a, pp. 199–201).

[49] Falling from 1.83 tons of oil per hectare in 1931/5 to 1.61 tons in 1955/59 (Barciela, 1986, p. 422).

re-export.[50] However, by the late 1920s other areas of low-cost production were increasingly capturing market share. Thus, Greece, Tunisia and Algeria, which in 1910/14 had accounted for 22 per cent of international trade, saw their share increase to 30 per cent in 1929/33 and 38 per cent in 1934/38.[51]

Finally, the possibility of adulterating olive oil by mixing it with other vegetable oils, tended to stabilise prices and make supply elastic. This fact, together with the high levels of substitution in the non-Mediterranean countries, meant that the olive's growth potential, like that of the vine, would depend significantly on the domestic market.[52]

Valencian oranges

The problems associated with wine and olive oil, namely the difficulties of extending the market internationally and the tendency for supply to run ahead of demand (on account of the abundant supplies of suitable land and cheap labour in the Mediterranean region) were not present with citrus fruit. Exports, principally oranges, faced buoyant demand and the area cultivated was severely limited, both by climate and (initially at least) by the heavy capital investment required. The result was a highly prosperous regional agriculture, based on irrigation and intensive cultivation techniques.

The orange was introduced into Spain during the Muslim occupation, but it remained of only marginal importance until the mid-nineteenth century, when the estimates for both the area cultivated and quantities exported show a rapid growth until the Civil War. By the Second Republic (1931–6) Spain had a total of 73,000 hectares of oranges, but although the tree was found in a total of 30 provinces, three-quarters of total production came from the provinces of Valencia and Castellón.[53] Production was highly geared to the export

[50] French imports of olive oil increased from an average of 18,800 tons in 1910/14 to 27,200 tons in 1929/33; exports increased from 4,600 to 10,100 tons. In Italy, imports climbed from an average of 5,500 tons to 52,500 tons, and exports from 34,100 tons to 58,900 tons. Domestic output fell by over 50 per cent in France and increased by about 10 per cent in Italy between 1905/14 and 1925/34 (IIT yearbooks, cited in Zambrana, 1987, pp. 296–7). For olive oil production, see Mitchell (1992) and Toutain (1961).

[51] Calculated from Zambrana (1987, p. 296).

[52] As a basic necessity, demand had a tendency to be both price and income inelastic. Sagrista (1961, pp. 18–19) estimates a price elasticity of –0.39, and an income elasticity of 0.44 for olive oil in the Spanish domestic market between 1913 and 1950.

[53] Valencia produced 52 per cent of the national crop, Castellón 24 per cent, Murcia 8 per cent, Alicante 7 per cent, and Málaga 2 per cent. Figures refer to 1932.

Table 9.5. *Growth in orange exports*

	Exports in tons	Rate of growth (%)	
1850/4	7,072	1850/4–1870/4	10.9
1870/4	55,825	1870/4–1890/4	3.0
1890/4	101,493	1890/4–1910/4	8.4
1910/4	509,825	1910/4–1930/4	3.1
1930/4	936,648	1850/4–1930/4	6.3

Sources: Dirección General de Aduanas (various years).

market, with perhaps 85 or 90 per cent of the crop sold overseas.[54] From a low base in 1850/54, exports grew strongly during the next two decades at an annual rate of 10.9 per cent. During the Great Depression, this slowed to a still relatively healthy 3 per cent. In the two decades prior to the First World War, growth again reached almost 10 per cent, to be followed once more by a slowing in the pre-Civil War period. Exports peaked in 1930 and, in terms of volume, were unaffected by the Depression in the 1930s. In contrast, prices fell significantly during 1934 and 1935, but this appears to have been caused by a decline in product quality on account of frost, rather than changes in international demand.[55]

Although second to the United States in terms of production, Spain, was by far the world's largest exporter of citrus fruit, accounting for just under half of the total in 1929/33.[56] From this position of strength, the potential threat of Spain's major customers (such as the United Kingdom or France) turning to their colonies for an exclusive supply was minimal. Neither these countries, nor Spain's other major markets (Germany, Belgium, Holland), produced close substitutes to the orange and, although markets were not always free from tariffs or controls, the political incentive to protect them was much reduced in comparison with products such as wine or olive oil. Furthermore, as the case of Britain shows, the consumption of oranges and other fresh fruit had a tendency to be income elastic,

[54] Font de Mora (1938, p. 309) suggests a figure of 12 per cent of the production for the domestic market.

[55] Abad García (1985, p. 249).

[56] Some 45 per cent in 1909/13 and 47 per cent in 1929/33 (calculated from the IIA Yearbooks, 1931 and 1934). Indeed, as lemons and grapefruit were of importance within the general category of citrus fruit in international trade, yet hardly figured in Spanish exports, the country was responsible for well over half the world's trade in oranges.

and thus benefited from the growing prosperity of the Western world from the mid-nineteenth century.[57]

To explain the success of the orange, it is also necessary to examine its production requirements. Barriers to entry were much higher for the orange than for viticulture or olives on account of its greater demands on climate, capital investment and human capital. To overcome drought, it was necessary to provide an adequate irrigation system which usually involved some levelling of the land. Given that most farms were small, some of these costs could be absorbed by the use of unpaid family labour working during the off-season. However, because the principal means of extending the area of oranges in Valencia during the first third of the twentieth century was through the use of tube-wells and pumps, and because the land required large quantities of artificial fertilisers, a significant amount of capital was also required.[58] No return on these investments would be made possible until the first crop – some four or five years after planting. The extension of orange cultivation therefore resulted in important backward linkages with chemical and farm machinary industries. Finally, the greater complexity of farming operations (such as the need for irrigation, the use of fertilisers and pesticides, and the grafting of the most suitable stock) required a level of expertise that was, for the most part, absent from Spain's agricultural sector.

Because orange production also had important forward linkages in the packing and marketing of the fruit, the rapid growth in exports affected more than just the growers. At least a further 50 per cent of value was added to the farm-gate price for oranges before they left Spain.[59] The orange, therefore, not only produced high farming profits and productivity, but also had important backward and forward linkages, which were a major component of the development of the regional economy in the period 1880–36. At a national level, however, its importance was limited; by 1929/33, the 73,000 hectares of oranges represented only 0.5 per cent of the nation's cultivable lands, and production was equivalent to 2.9 per cent of final agricultural output.[60]

[57] Thus in the period 1920–38, the income elasticity of demand for oranges was 0.9, and between the same dates, annual per capita consumption in the United Kingdom increased from 4.5 kilograms to 10.2 kilograms (Stone, 1954, pp. 122 and 124).

[58] Palafox (1985, cuadro 15.4) gives plantation costs for the orange at the beginning of the twentieth century as 2.4 times greater than the olive. See also the important contributions of Calatayud (1989a, 1989b and 1990).

[59] In 1907 it has been estimated as 56 per cent, in 1914 as 77 per cent and in 1926 as 63 per cent. See Simpson (1992a).

[60] Simpson (1995a, Appendix).

Conclusion

In this chapter I have argued that Spain, despite enjoying a comparative advantage in world markets for products such as wine, olive oil and citrus fruit, found difficulties in achieving export-led growth. In the case of wine and olive oil (and especially wine) abundant supplies both in Spain and elsewhere of adequate land and cheap labour led to low entry costs for producers. This factor, together with the ease of product substitution in international markets, restricted growth potential. The nature of production was such that producers were unwilling to uproot plants during periods of low prices, and so surpluses were a frequent problem. Olive oil suffered from similar problems, although these were slightly mitigated by the longer-term nature of the initial investment, together with the need for relatively large quantities of capital for the transformation of the fruit. However, producers of both crops suffered from product adulteration and cheap substitutes.[61] In the case of the orange, these negative factors were absent, and the crop enjoyed important backward and forward linkages with the rest of the economy. However, by the Civil War, citrus fruit remained relatively unimportant within Spanish agriculture as a whole. Despite an apparent comparative advantage, the three crops, which together contributed 20.5 per cent of net agricultural output in 1897/01, saw their share fall slightly to 17.7 per cent in 1929/33.[62] Therefore, the switch of resources from cereal dry-farming (where improvements in yields were difficult) – into more labour-intensive vines and olives was limited by the relatively small size of the export market.

[61] As late as 1981, rapeseed oil intended for industrial uses was sold as olive oil, causing the death of almost 1,000 people and leaving many more permanently affected.
[62] Simpson (1995a, p. 199).

10 The political economy of Spanish agriculture

> To an economist, whether soil is fertile or mediocre and whether resources are abundant or sparse will be determined not by intrinsic physical properties of the land, but by the level of demand, the state of knowledge, and the organization of property rights and markets.[1]

It has been argued in this book that Spanish farmers responded positively to movements in commodity and factor prices. Decision-making, whether by small dairy farmers in Galicia, wine sharecroppers in Cataluña or *latifundistas* in Andalucía, seems to have been economically rational and based on information relating to the cost of factors, commodity prices and the degree of risk which each farmer thought appropriate. Yet, if farmers responded rationally to product and commodity prices, why was it that the sector's low productivity resulted in both high consumer prices and low farm incomes? Self-sufficiency was achieved in basic foodstuffs, but diets remained heavily concentrated on cereals, and farm incomes, if growing at all, remained low. In short, agriculture prior to the Civil War cannot be considered an overall success.

In chapter 8 I argued that cereal tariffs resulted in high food costs and that the impact of urbanisation and growing per capita incomes was limited for the livestock farmers on Spain's *secano*, because of poor pastures and expensive fodder crops. Chapter 9 extended the study to wine and olive oil, and showed that the possibilities for export-led growth were also limited. In this chapter I consider the problem of dry-farming from another angle, that of institutional reform. Given that farmers appear to have been economically rational and that natural resource endowment was generally poor, could incomes be improved by changes in the organisation of property rights and markets?

The first section considers cereal protection in terms of its impact on farm incomes. Government intervention was successful in reducing price instability, but was insufficient to give many producers much more than meagre living standards, especially in the Interior. If the

[1] Wright (1986, pp. 6–7).

government really believed in the importance of preserving family farms, as it so often claimed, what was required was the consolidation of farmers' highly dispersed fields and the development of a dynamic cooperative movement. Neither were pursued with any enthusiasm before the Civil War, and a cereal policy based on commodity prices alone benefited the larger, commercial farmers, rather than the small family operators.

Ironically, the most serious attempts at land reform, during the Second Republic (1931–6), were aimed at dividing land holdings still further. Directed mainly at southern Spain, the reforms had a social objective only, but they would have undermined the region's comparative advantage, namely the large units of production and their potential economies of scale. Furthermore, there were serious domestic and external demand constraints on any significant increase in the output of products most likely to have been produced by the reforms. At best it could only have been a temporary measure to alleviate the chronic underemployment of the region, with the only real solution being to raise rural productivity through off-farm migration.

Tariffs and farm incomes: the case of wheat

The removal in 1765 of the legal regulations concerning the domestic wheat market led in time to a reallocation of resources, permitting an increase in output and a significant increase in the quantity traded through the market. However, the logic of free trade was not extended to the international market. As Sánchez Albornoz has shown, from 1820 government policy successfully reserved the internal and colonial markets for domestic cereal producers.[2] However, by the 1880s the impact of falling production costs in countries of recent European settlement (especially North America) and the decline in rail and sea freight, threatened to weaken the links between the Spanish Interior and its traditional markets on the coast (such as Barcelona and Valencia). Although Spanish prices remained stable, world prices fell significantly, and the tariff now effectively provided farmers with a minimum price, ending the higher prices that farmers had traditionally enjoyed after a harvest failure.[3] In Spain, as elsewhere, this had serious implications as greater stability in prices produced greater *instability* in farm incomes, on account of harvest fluctuations. The First World War saw an extension in government intervention, with attempts to fix maximum and minimum prices. By the end of the war, Spain had become virtually self-sufficient in wheat, and the tariff was supplemented from November 1921 by strict import quotas, and maximum and minimum prices set within the country. For only three of the years between 1922 and 1935 would imports rise above 5 per cent of the national harvest (1928, 1929 and 1932), remaining negligible for the rest.[4] Despite the dubious success in becoming self-sufficient in wheat and stabilising consumer prices, the clamour for still greater protection and reports of distress amongst thousands of wheat farmers during the 1920s, brings into question the suitability of this policy measure.[5]

Farmers complained that, in trying to stabilise the market by fixing wheat prices, government policy benefited the middlemen and not themselves. In years of good harvests, there was no mechanism to force millers to pay the official prices – and millers, so the farmers claimed, were adept at 'creating' grain shortages. Such shortages were allegedly created by keeping wheat off the market, thus forcing the official flour and bread prices upwards, whilst at the same time benefiting the millers through the cheaper grain imports that the artificial scarcity encouraged.[6] The official price series does not support this claim, although the frequency of complaints, the dependency of many farmers on a limited number of mill owners, and the clear opportunity for fraud all suggest that, for the smaller farmers at least, their bargaining powers were limited.[7]

Although industrialists complained of high bread prices, the farming lobby believed, especially after the First World War, that the protection they were receiving was less than that enjoyed by industry. The result was, according to Torres, that relative prices moved against farmers, benefiting industry (as well as flour millers).[8] In the absence of a comprehensive list of consumer and industrial prices, it is difficult to show whether Torres was correct or not. Table 10.1 suggests that whereas wheat farmers were less successful than industry in increasing prices during and after the First World War, the high wheat prices of 1927/9 had allowed them to recover against most other producers, with the

[2] Sánchez Albornoz (1963).
[3] For a useful summary of tariff legislation, see EPAPM (1928, no. 1529, pp. 257–60).
[4] Montojo Sureda (1945). See also Pinilla Navarro (1992, pp. 418–20).
[5] For the Interior, see especially Instituto de Reformas Sociales (1977), Senador Gómez (1915), Castillo (1979) and Hermida Revillas (1989).
[6] Wheat, flour and bread prices were fixed for much of the 1920s (Montojo Sureda, 1945, pp. 18–19).
[7] For a study of wheat and flour prices in the inter-war period, see Palafox (1991, pp. 320–2). The fact that the products were not homogeneous provided significant opportunities for profit-making and probably implies that bread prices are shown as a minimum. During the war and shortly afterwards, high milling profits were obtained by circumventing the law on producing only a single type of flour. See in particular, Montojo Sureda (1945).
[8] Torres (1934, p. 231).

Table 10.1. *Movements in commodity prices in Spain, 1913–1935*

	1913/15	1920/2	1927/9	1933/5
Wheat	100	172	156	152
Flour	100	168	155	153
Woollen textiles	100	177	157[a]	n.d.
Cotton textiles	100	250	225[a]	n.d.
Cement	100	186	190	192
Steel	100	385	143	196
Iron	100	360	141	165
Sulphuric acid	100	193	173	110
Asturias coal	100	419	154	175
Petrol	100	155	74	98
Superphosphates	100	276	122	145
Sugar	100	241	171	177
Coffee	100	151	195	217

[a] Figure refers to 1927 and 1928 only.

Sources: Carreras (1989a, pp. 216–34) and París Eguilaz (1943, pp. 31–67).

notable exceptions of cotton textiles and cement. It would seem that this was only temporary, as by 1933/5 wheat was once again slipping back against most other commodities. In conclusion, if relative prices did move against the farmer between 1913 and 1935, the movement was slight, being limited by government intervention. As chapter 11 shows, it was only from the mid-1950s that cereal farmers faced a significant movement in domestic terms of trade against them.

Spain was certainly not alone in increasing government intervention in agricultural markets during the First World War, and nor was it alone in the establishment of a government monopoly for wheat marketing in 1936. However, if intervention to balance supply with demand was regarded as necessary, not only were the price levels at which this was set probably too high, the instrument of intervention also left much to be desired, as I shall now discuss.

In chapter 5 it was shown that the diffusion of more efficient ploughs, seed drills, improved seed selection and the increased use of chemical fertilisers still failed to raise average wheat yields. Farmers had considered that these resources could be better used for extending the size of their farms. Hence, although the area cultivated grew in size, the yield per hectare did not.[9] However, within Spain there were major regional

[9] 'It is common amongst our peasants that as soon as their harvests allow them to save a few pesetas, they invest them in making more extensive their properties . . .' Cánovas del Castillo and Gamazo Abarca (1915, p. 15, cited in Hermida Revillas, 1989, p. 19).

differences. The area under wheat on the *secano* (dry-farming) changed little in Andalucía and the Mediterranean areas between 1905/9 and 1930/4, but it increased by a third in the Interior (table 5.5). Wheat yields stagnated in the Interior, but showed modest increases in Andalucía and the Mediterranean.

The Interior accounted for 72 per cent of Spanish wheat produced under conditions of *secano* in 1930/4, and was the region where the problems of increased international competition and falls in domestic demand for the product were most difficult to overcome. In the first instance, there were few alternatives to wheat on non-irrigated land. The temporary relief which some cereal farmers had enjoyed during the 1880s through diversification into wine production (vines being suited to the *secano* conditions and intensive in labour requirements) was short-lived. Although the area of vines fell by only 2 per cent between 1888 and 1931/5, this was attributable to a significant increase in large-scale viticulture in one area, La Mancha. If La Mancha is excluded, the region's vines fell by a third, and apart from a few small, select areas of the Interior, viticulture did not recover from phylloxera. Irrigation, which allowed intensive farming of cash crops such as sugar beet, was also rare outside the Ebro valley.

It is clear from the limited information available that farms in the Interior were both small and heavily fragmented. In 1909, the leading agronomist of Castilla-León, Cascón, noted that a typical small farmer had about 30 hectares, of which between a third and a half was rented. The land was divided into about forty different lots, and only half was sown biennially with cereals, being worked with two mules. The farmer, according to Cascón, could do 'little more than survive'.[10] In 1959, when a full Cadastre was finally available, 90 per cent of all owners in Castilla-León occupied just 20 per cent of all land, and the size of average farms of the remaining 10 per cent was still only 52.6 hectares.[11] Even in the mid-1960s, a government study of the region noted that although a farm of 25 hectares was 'very small', it was the average size in most villages surveyed.[12]

As table 10.2 shows, the region of Castilla-León in the Interior combined a high dependence on extensive cereals (an average of 49 per cent

[10] EPAPM (7/1/1909, no. 610, p. 3). Cascón argued for a concentration of holdings together with a reform of lease law.

[11] The Cadastral figure, calculated from Malefakis (1970, appendix C, table F). Malefakis does not include the province of Salamanca in his definition of Castilla-León. The 90 per cent of owners refers to holdings of less than 10 hectares.

[12] Ministerio de Agricultura (1966, p. 48). The survey refers to nine villages chosen 'at random' in the Interior.

Table 10.2. *Dry-farming cereals and farm size in Spain, 1930s*

	Extensive cereals as % of final agricultural output[a]	Area cultivated per farmer (ha)[b]	Agricultural land per male worker (ha)[c]	Average wheat yield (tons per hectare)[d]
Castilla–León	49.0	15.3	9.9	0.92
Lower Ebro	36.7	22.8	9.9	0.95
Extremadura	35.3	74.7	9.5	0.92
Centre	37.6	38.7	10.9	0.70
Upper Ebro	32.3	15.2	7.6	1.28
Interior	40.6	22.8	10.1	0.87
Andalucía	27.4	43.3	5.2	0.99
Mediterranean	10.0	13.7	4.0	0.89
Spain[e]	25.5	22.4	7.1	0.89

[a] Figures are for 1929/33 and include net production of wheat, barley, oats, rye and legumes.
[b] Derived from the number of farm owners given in the 1920 census divided by the area cultivated in 1922.
[c] Figures for male labour in agriculture are for 1930 and area cultivated for 1931.
[d] Yields of wheat on unirrigated land (*secano*), 1930/4.
[e] Spain is here taken as the sum of the Interior, Andalucía and Mediterranean.

Sources: Simpson (1995a, appendix 2c); Rodríguez Labandeira (1991, pp. 440–3); and AEPA (various years).

of output in 1929/33) with small farms and low yields.[13] The yields in Extremadura and the Centre were no better, but the considerably larger farms gave the owners greater economies of scale (as in parts of Andalucía). In the Upper Ebro, farm size was similar to Castilla-León, but this was offset by a greater diversity in the agriculture, and wheat yields were almost 40 per cent higher than in Castilla-León. Cereal farmers in the Lower Ebro probably followed those of Castilla-León in order of hardship, but farms were 50 per cent larger and dependence on cereals was significantly less.

The problems facing Cascón's small farmer of the Interior can be better understood in an international perspective. In the major wheat-exporting areas of countries such as the United States, Canada, Argentina and Australia, the average size of *all* farms on the eve of the

[13] If Salamanca, which had large areas of *latifundios*, is excluded, the dependency on extensive cereals falls marginally to 43 per cent, the quantity of land per farmer remains at 15 hectares, average yields fall to 0.9 tons per hectare whilst the area of wheat increased by 33 per cent between 1905/9 and 1930/4, of which 94 per cent can be accounted for by the growth in area sown.

First World War was almost 100 hectares.[14] This comparison, however, fails to take into account the area under wheat and its relative importance for local farm incomes. The long-term capacity of wheat producers to change and increase productivity can be examined using the example of the United States.

In the first instance, the centre of wheat farming in the United States moved over time. The nineteenth-century pioneer farmer in the Midwest, for example, had originally depended heavily on wheat, before switching later to a more specialised 'corn-and-livestock economy'.[15] Likewise California, having been the nation's second largest wheat producer in 1889, was only the twenty-third largest producer some twenty years later. This was mainly due to farmers specialising in irrigated fruit and vegetable crops instead.[16] The movement out of wheat and into other higher value crops was also the road taken by many grain farmers in northern Europe during and after the late nineteenth-century depression – an option not readily available to the farmer of the Spanish Interior, as we have seen.

Those areas that finally did specialise in wheat in the United States were of relatively late settlement, when mechanisation was already encouraging economies of scale.[17] Using the USDA published accounts of 'typical' farms in 1930, which take into account the different regional crop and livestock mix, and using only those farms where wheat accounted for at least 45 per cent of farm income, average farm size was just over 200 hectares, of which 80 were sown with wheat. Just as in Castilla-León, these were family farms, with off-farm labour accounting for only 17 per cent of costs.[18] Even if Cascón's typical farmer of 1909 had been able to enlarge his farm subsequently, he would still have been been more dependent on wheat while sowing considerably less than his counterpart in the United States. Furthermore, fragmentation

[14] Figures are 85 hectares in the United States, 117 hectares in Canada, 102 hectares in Australia and 78 hectares in Argentina (Offer, 1989, table 6.2).
[15] Bogue (1963, ch. VII).
[16] Olmstead and Rhode (1988, p. 101). Declining soil fertility was also to blame.
[17] For example, in the state of Kansas, which moved from being the sixth leading producer in 1889 to become the leading producer in 1919, average farm size increased from 155 to 283 acres between 1880 and 1930 (United States Department of Agriculture (hereafter USDA), 1932, pp. 53 and 743).
[18] 1930 was the first year. If 1947/9 is taken, the base year used by the survey, then the average farm was almost 250 hectares, of which 91 hectares were sown with wheat, producing 58 per cent of incomes, and with labour accounting for 13.8 per cent of costs (USDA, 1956). The farms used were 'wheat – small grain – livestock farms, northern Great Plains', 'wheat – roughage – livestock farms, northern Great Plains', 'winter wheat farms, Southern Plains' and 'Wheat – pea farms, Washington and Idaho'. From 1933 with the Agricultural Adjustment Act, the US farmer's planting decisions would become more dependent on government intervention.

of holdings in the Spanish Interior meant that the upper limit that a family could work was considerably smaller than in the United States or other regions of recent settlement.

If farmers were unable to switch into higher value crops, the key to remaining competitive in cereal farming lay in mechanisation, which increased the potential area that a family could work and, with the advent of the tractor, reduced the need to produce feed grains for work animals. According to Parker and Klein, mechanisation and the movement westward allowed labour productivity in US wheat cultivation to increase four-fold between 1840 and 1910.[19] The introduction of tractors contributed to a further 70 per cent increase in productivity between 1910 and 1930, and another 135 per cent between 1930 and 1950.[20]

In Spain, high wheat prices helped maintain profitability, and the fact that they were set at levels for the less efficient producers of the Interior, implied considerable profits for the large-scale operations in Andalucía.[21] A policy choice of high wheat prices can also be perceived as a deliberate measure to protect the small family farmer. However, experience from other countries in this period suggests that high prices were not enough for the small farmer. What was also required was a strong cooperative movement which would give farmers greater economies of scale in the purchase of inputs (chemical fertilisers, machinery, seed corn, capital, and so on), and allow them to produce greater profits in the commercialisation of the product.

Perhaps the most successful cooperative movement set up by wheat farmers was in Canada, where 'the homestead system fostered the growth of well-organized rural communities, strong cooperative institutions, and powerful agrarian political movements'.[22] In particular, rural protests at the turn of the twentieth century over transport problems and grain sales led farmers to create 'a vertically integrated system of business to compete with the private marketing system.'[23] The large numbers of medium-sized farmers used their voting rights to lobby for the necessary government legislation to produce institutions that would allow some of the profits from exported grains to be channelled back to farmers. The legislation also created a wheat grading system which helped farmers to compete in international markets.[24]

[19] Parker and Klein (1966, p. 533).
[20] Figures refer to all wheat, rye and rice grains (USDA, 1982, p. 52).
[21] Bernal (1981, p. 65), Tedde de Lorca (1985, p. 309) and Zapata (1986, vol. 1, pp. 814–15).
[22] Solberg (1987, p. 51).
[23] Ibid. (p. 131).
[24] The Canadian wheat cooperatives were not egalitarian, but rather institutions firmly linked to the market, which attempted to capture for farmers the profits associated with the grain trade. At times they were criticised for benefiting the large and medium-sized farmers at the expense of the smaller ones.

In Spain, the number of cooperatives grew spectacularly after the 1906 Law of *Sindicatos Agrícolas*. By 1920, the national association – the *Confederación Nacional Católico-Agraria* (CNCA) – had 500,000 members. These were to be found in areas where small farmers predominated, especially the region of Castilla-León and the Ebro valley, and aimed both to 'save' the peasants and agricultural workers from socialism, and provide economies of scale in the purchase of inputs and off-farm sales.

One of the most successful cereal cooperatives, that of Villalón (Valladolid), built warehouses and, in 1920, a flour mill so that members could benefit both from easier sales and higher prices 'without the need for intermediaries'.[25] This cooperative's aim was to protect the numerous small farmers against:[26]

> the abuses of buyers and sellers which try to obtain at miserly prices the produce of the countryside, and to sell to the farmer at enormous profits machinery, fertilisers and everything else necessary to live and work on the land.

Even if 'miserly prices' or 'enormous profits' were an exaggeration, cooperatives had the potential to play a major role in the transition of an agricultural society to an industrial one, by helping farmers capture a greater part of the profits gained in the storage and selling of the product. However, if the potential profits for cooperative members were so great, it needs to be asked why, when the CNCA claimed some 2,700 cooperatives in 1937, it still had only eleven flour mills.[27]

In the first instance, the construction and running of flour mills was both expensive and difficult, as the *Federación de Sindicatos Agrícolas Católicos de la Rioja* had found in the early 1920s after flour prices collapsed.[28] Yet it is also clear that the cooperatives faced considerable opposition, as the case of the *Sindicato Agrícola de Cervera* (Lleida) shows. Here the first attempts by the cooperative to store grain in order to benefit from the higher spring prices led to a boycott by local millers, who were also legally able to prohibit the movement of grain out of the province. After the construction of a cooperative flour mill, the provincial governor prohibited the sale of flour outside the province, and

[25] *Voz Social* (abril 1931, cited in Castillo, 1979, p. 324). In total, 327 members belonged to the *Cooperativa Harinera*.
[26] *Voz Social* (1922, cited in Castillo, 1979, p. 324).
[27] Exposición al Generalismo (de la CNCA), 1937 in *Voz Social* (dic. 1937, cited in full in Castillo, 1979, pp. 475–9).
[28] The flour mill had been bought in 1920 because of high milling profits in the early postwar years. Falling prices were accompanied by bad management (Castillo, 1979, pp. 267–8).

shortly afterwards, in 1923, it was destroyed by arson, being rebuilt once more the following year.[29] The success of the Cervera cooperative can be attributed not just to the determination of its members, but also to the support of an influential outsider (the Count of Laverne), and the credit conceded by the *Servicio Nacional de Crédito Agrícola* of more than 1 million pesetas. The failure of most cooperatives to obtain the active support of the politically influential and a source of adequate credit meant that their achievements would remain much more modest. In this respect, the absence of a democratic political tradition, which involved the active participation of smaller farmers, left the cooperative movement being controlled by the larger landowners, whose interests naturally differed. This is in complete contrast to the situation in France where the cooperative movement not only helped to supply farmers with cheap inputs and the marketing of their produce, but was instrumental in influencing government policy in promoting policies specifically for the small farmer. As one French historian has noted:[30]

> . . . if technical changes – the mechanisation of arable and pastoral farming or the drive for ever greater production and productivity – have been the most visible aspect of the transformation of rural France, the spread of new forms of cooperation and association has been no less important.

The result was that farms in France of between 5 and 50 hectares accounted for some 42 per cent of the total in 1929, a figure which had increased to 60 per cent in 1955 and remained at that level in 1983.[31] In Spain the corresponding figure was about 28 per cent in 1959.[32] Whereas in France in the mid-1980s, four out of five farmers were members of at least one cooperative, in Spain in 1970, only 0.1 per cent were members.[33] This is not to say that the French model of family farms was the ideal to which Spanish farmers should have aspired. Because of climatic conditions a farm of 25 hectares in France was usually much more productive than a similar sized one in Spain. However, unlike Spanish farmers, those in France and Canada adopted an institutional framework which was compatible with the family farm. This reduced the necessity of having to rely solely on a system of price support which,

[29] The new mill had a daily capacity of 10 tons, and included grain silos able to store 2,000 tons (EPAPM, 15/1/1928, no. 1518, pp. 24–5).
[30] Cleary (1989, p. 167).
[31] Ibid. (p. 13).
[32] This figure has to be considered as only very approximate, given the lack of official statistics on land ownership. See Malefakis (1970, appendix B and C).
[33] Cleary (1989, p. 114) and Schubert (1990, p. 223). This figure for Spain seems excessively small. However, there is no doubting the small number of farmers involved in cooperatives and the latter's organisational weakness.

by its very nature, benefited larger farmers more than the smaller ones, and was at the expense of the consumer.

This picture of small, inefficient cereal farmers in the Interior should not lead us to assume that farm incomes or wages were the worst in this region of Spain. They were not, and labour productivity was only just below the national average. Furthermore, in Castilla-León (the region identified as having the highest dependency on cereals and the greatest number of small farms) labour productivity was above the national average, and between 1887 and 1930, Castilla-León and the Ebro valley lost about a sixth of their agricultural labour force (table 7.7). The real limitation to agriculture in much of the Interior was the lack of any alternative to extensive cereals; furthermore, the rural exodus that took place before 1936 was not fast enough to increase land–labour ratios sufficiently to produce the mechanisation required to reduce unit costs.[34]

Andalucía and the question of land reform

Until 1931, agricultural policy remained strongly influenced by large landowners; however, with the proclamation of the Second Republic, the composition of the *Cortes* changed dramatically and urban and socialist values predominated, at least initially.[35] But instead of aiming to help the small cereal farmer, policy was directed towards a land reform to help landless labourers, especially in the country's south. The nineteenth-century changes in property rights had favoured the *latifundistas* (large landowners), and wheat farmers enjoyed the sort of scale of production that was absent in Castilla-León.[36] There is no evidence that the *latifundistas* were inefficient in their allocation of resources, but the highly skewed distribution of property – and the fact that in 1930 some 58.5 per cent of the active male labour force in Andalucía depended on agriculture – led to widespread underemployment and provided the background to Europe's strongest rural anarchist movement. Indeed, whereas male farm labour fell by 12 per cent between 1887 and 1930 in the North, Mediterranean and the Interior, it increased by 14 per

[34] A second restriction, that of the consolidation of scattered holdings, was of little importance until the 1960s. See Alario Trigueros (1991, especially pp. 83–91).
[35] Of the three elected governments between 1931 and 1936, the first and third were dominated by parties of the Left, and the second by parties of the Right.
[36] See especially Bernal (1979). The low population density in La Mancha meant that the social demand for access to land was less. Extremadura, by contrast, showed characteristics similar to Andalucía. For the calculations in this section, only Andalucía is considered, although I exclude the province of Almería, where property was more equally distributed.

cent in Andalucía, with growth being especially strong in the areas of *latifundios*.[37] It was the demands in Andalucía of the small farmers and landless for changes in property rights – essentially the breaking up of the large estates – which put the 'land problem' on the top of the political agenda during Spain's first real experience of democracy – the Second Republic of 1931–6.

As Malefakis has shown, there are major difficulties in measuring property distribution in Spain. One method is to use the category labelled *patronos agrícolas* in the 1920 census, which can be taken as a proxy for the number of farmers, and from which farm size can be calculated. Table 10.2 shows that farms were, with the exception of Extremadura, much larger in Andalucía than elsewhere. However, the large number of smallholders greatly reduces average farm size. Another source, the Cadastre, identifies landowners, and states that there were some 5,320 owners holding an average of over 725 hectares each and comprising 53 per cent of the seven *latifundio* provinces of Andalucía. Although the Cadastre gives no indication of land use, it records that 7,872 property owners (or 1.8 per cent of the total) produced 53 per cent of the taxable income.[38] The existence of so many large-scale cereal farming operations should not have placed the region at a disadvantage relative to other world producers.

Not only did this region avoid the problems associated with extending the area of cereals on increasingly marginal soils as in the Interior, it also had a more diversified agriculture, with cereals and legumes accounting for only 29.3 per cent of output, against 41.0 per cent in the Interior. By contrast, the olive was responsible for 23.0 per cent of the total in Andalucía, compared with 3.8 per cent in the Interior.[39] At the turn of the century, output from olive groves was 50 per cent greater per hectare than that from land under cereals and, as the former were more intensive in their use of labour, farms tended to be smaller.[40]

The collapse of the monarchy and formation of the Republic in April 1931 coincided with considerable unrest in the countryside. In particular, the failure of the 1930/1 olive harvest, with the estimated loss of 3.7 million days' employment in the province of Sevilla alone, provided an immediate economic justification for anarchist and socialist groups to revive and intensify their traditional claims of direct access to land and

[37] Calculated from *Censos de población*. If Almería is included, the figure is 11 per cent. See especially Bernal (1985).

[38] Carrión (1975, pp. 70–87). As Malefakis (1970, p. 403) notes, this actually underestimates the concentration of land and wealth.

[39] See table 2.4 and Simpson (1995a, appendix 2c).

[40] See table 3.2. For labour demand, see below; for farm size, see Simpson (1985a, pp. 225–9).

better working conditions.[41] The newly elected government acted quickly, passing legislation which restricted the market for labour, and thus indirectly increasing labour's bargaining power and farmers' costs.[42] The result was that, until the Left's setback in the elections of November 1933, 'Spain had probably been the only nation in the world in which wages had actually risen during the Depression'.[43]

Yet it was the attempts by the Second Republic to introduce a land reform that were to be the most controversial. The belief that a land reform was needed was not new – most, if not all, political groupings initially supported the idea. However, opinion differed on why it was necessary, being seen by some as a means of improving economic efficiency, by others as a form of income redistribution, benefiting the landless and smallholders, and by others as a political manoeuvre to remove the influence of the traditional property-owning class from political life.[44] Furthermore, there was considerable argument over the form that reform should take, especially concerning such problems as the type of properties to be expropriated, forms of compensation, speed of implementation and the structure of the new ownership (individual or collective). However, all the Republic's governments faced, on the one hand, the demands by the landless and smallholders for a rapid redistribution of land and, on the other, the inability of the State to provide adequate compensation to landowners. As Malefakis notes, governments had the option of either a slow reform in which owners would have been fully compensated – but at the risk of disturbances by the peasantry – or a rapid reform in which the legal niceties concerning property rights might be overlooked and with the main opposition

[41] EPAPM (22/1/31, no. 1663, p. 47). Significant fluctuations in the size of the olive harvest were common, but the harvest in 1930/1 in Andalucía was unusually small, being just 8.4 per cent of that for the previous year, and 13.1 per cent of those for the previous five years.

[42] The list of legislation is long and continued throughout the Republic, although the presence of a right-wing coalition government between November 1933 and February 1936 implied that laws were not always fully implemented. Of particular importance was the law of municipal boundaries (*Ley de términos municipales*), which gave preference to local over migrant workers, thus increasing their capacity to organise and reducing the landowners' ability to refuse employment to militant workers. A labour contract law introduced a system of arbitration in which employers, workers and government were all represented (and which naturally had a tendency to favour workers' interests until the end of 1933). The 1919 decree for an eight-hour day and a forty-hour week was extended to agricultural workers (Martin, 1990, p. 305). Restrictions on the use of cereal harvesting machinery also occurred on occasions, such as in the province of Sevilla in 1931 (EPAPM 30/6/31, no. 1684, pp. 461–3).

[43] Malefakis (1970, p. 329).

[44] Examples can be found in the speeches presented to the *Cortes*. See, for example, Peces-Barba (1932).

coming from landowners.[45] In general, the government was to alienate both categories and please no one.

The economic justification for land reform lies in the possibility of increasing labour productivity. Development theory and historical experience suggests that small, family-run farms are more efficient at maximising output than larger ones using wage labour, as they are more likely to provide extra labour for tasks such as ploughing or weeding, with less need to organise, motivate and control.[46] The inverse relationship between farm size and labour productivity was fully appreciated by contemporaries. According to the calculations of one influential author in the mid-nineteenth century, the diseconomies of scale associated with the *latifundios* in Andalucía implied that output declined from 84 pesetas a hectare on a farm of 564 hectares to 50 pesetas on one of 4,760 hectares.[47] Likewise, figures provided by Pascual Carrión suggest that a significant growth in output would have been obtained with a shift from extensive to intensive cereal and olive rotations (table 10.3). Finally, given that much of the fixed capital investment in traditional agriculture was intensive in labour, it would be more economically rewarding for the smaller farmer to undertake projects such as terracing, digging irrigation and drainage ditches, and investing in tree crops. These arguments therefore implied that, even if large estates attempted to maximise profits by using large-scale extensive farming systems, land reform would not only increase output, but lead to a significant reduction in underemployment and greater income equality.

In 1929/33, labour productivity in Andalucía was only 59 per cent of that achieved in the North, 61 per cent of that in the Mediterranean and 70 per cent of that in the Interior.[48] A major cause of this low productivity was the region's crop mix because extensive crops accounted for only 24 per cent of arable output in the Mediterranean, 36 per cent in the North and 58 per cent in the Interior, but 63 per cent in Andalucía.[49] As cereals, legumes, olives and livestock provided some 77 per cent of total agricultural output in 1929/33, and probably even

[45] Malefakis (1970, pp. 393–5).

[46] Family labour tends to be considered on small farms as a fixed cost, implying that the family unit would benefit fully from the extra ouput obtained through extra hours worked. By contrast, a farmer using wage labour would try to maximise net profits and, therefore, would not usually employ labour for tasks where its marginal cost was greater than the marginal revenue.

[47] Hidalgo Tablada (1864, 1, pp. 241–8) in which 1 hectare is calculated to equal 2.66 *aranzadas*. The small family farm had its supporters in writers such as Campomanes, Caballero, Costa and Carrión.

[48] See table 2.3. The figures here include Almería. For problems associated with estimating labour productivity, see chapter 2.

[49] Simpson (1995a, appendix 2c). The figures include all cereals, legumes and olives.

Table 10.3 *Labour costs and productivity in Andalucía and Extremadura, 1920/30 (pesetas per hectare)*

	Labour employed (no. of days)	Labour costs[a]	Total income	Total profit	Labour productivity: Output per day[b] Gross[c]	Labour productivity: Output per day[b] Net
Irrigation						
Intensive	375.0	1,500	4,000	1,250	10.7	3.3
Extensive	175.0	700	2,100	770	12.0	4.4
Dry-farming						
Año y vez	25.0	100	350	120	14.0	4.8
Tercio	17.5	70	225	75	12.9	4.3
Cuarto	12.5	50	160	53	12.8	4.2
Rozas	8.8	35	98	20	11.1	2.3
Vines						
Intensive	237.5	950	1,500	365	6.3	1.5
Extensive	43.8	175	495	170	11.3	3.9
Olives						
Intensive	62.5	250	700	250	11.2	4.0
Extensive	31.3	125	350	140	11.2	4.5

[a] Daily wages taken as 4 pesetas.

[b] Labour productivity obtained by dividing total income by days labour (gross) and total profit by days labour (net).

[c] Rent, local and national taxes not included in gross profit.

Source: Calculated from Carrión (1932:1977, pp. 324, 341–2).

more of employment, the implications of a potential land redistribution need to be considered in more detail.[50]

As we have seen, by the time of the Second Republic, Spain was self-sufficient in wheat, and per capita consumption was falling. Despite the fact that a successful land reform might have increased wheat production, demand is unlikely to have risen – although domestic bread prices probably would have fallen. Even with the major assumption that wheat production could have been increased without incurring prohibitive adjustment costs in tasks such as maintaining soil fertility, the provision of working capital to small farmers, or in education, a significant fall in wheat prices would have probably been politically unacceptable given the situation of farmers in the Interior. A second factor was the question of efficiency. It was precisely in the areas of *latifundios* that farm size approached those of the New World. From our knowledge of the Interior, a land reform which converted the landless into small cereal farmers would neither have been economically efficient, nor would it have improved welfare significantly. Finally, the realities of the 1932 reform were that, of the very little land that was redistributed, farms seldom exceeded ten hectares – significantly less even than in Castilla-León or the Upper Ebro.[51]

With the olive, any land redistribution might well have led to an increase in output, as greater care would have been expected in such tasks as weeding and pruning.[52] Yet, as noted in chapter 9, there were limits to the export market, and although some 18 per cent of domestic olive oil production had been exported in the period 1925–9, demand collapsed after 1929. Furthermore, within Spain, increasing per capita incomes were responsible for only 31 per cent in the larger output during the first third of the century, and consumption per capita peaked in 1930.[53]

In conclusion, a land reform is unlikely to have increased the competitiveness of farming under conditions of *secano*, but rather quite the

[50] See table 2.4 and Simpson (1992b).

[51] Matallana, noting Cascón's study of 1909 (see page 225, note 10), suggested that the small farmers of the Interior were poor with 30 hectares, those to be settled under the proposed law of 1931 would receive only between 5 and 30 hectares, and little or no capital would be made available (EPAPM, no. 1698, 15/10/1931, pp. 755–60). The 1932 law made no mention of minimum size. The figures for land distribution is given in Malefakis (1970, pp. 281, 346 and 378). There is no way of knowing how many of the receipients were already landowners.

[52] The olive in any case was found on significantly smaller units than with cereal production.

[53] Exports accounted for 37 per cent of the growth in output, population growth 32 per cent, leaving a further 31 per cent which can probably be attributed to changes in incomes (based on 1898/1902 and 1928/32). For per capita consumption between 1926 and 1956, see Barbancho (1960, p. 299).

reverse. Furthermore, although income distribution would have benefited from a redistribution of property in the short term, the real difficulties in raising output per hectare on the *secano* were likely to lead to both falling incomes (as relative prices moved against cereal producers) and high consumer prices because of low labour productivity. Castilla-León serves as a model of the limitations facing smallholders under conditions of *secano*. The only real long-term alternative would have been to accompany land reform with irrigation. However, the very high capital costs associated with settling farmers made this an unrealistic solution, especially to governments obsessed with the concept of a 'balanced budget', such as those of Spain in 1931–6. Lastly, even if the so-called 'Technical Commission's' solution had been adopted in 1931, which suggested that lands should be leased to the landless and smallholders whilst remaining legally the property of the *latifundistas*, it is debatable whether this could ever have been more than a temporary solution.[54] The problem with Andalucía was that the agricultural workforce was growing rapidly at a time when demand for basic agricultural commodities was slowing. With or without reform, the rural exodus of the 1950s seems inevitable.

Conclusion

This chapter has argued that government policy did not contribute to overcoming the limitations imposed by a poor resource base. Thus, on the one hand, high prices discouraged the movement of resources out of agriculture. In this respect Spain was by no means an exception in Europe but, as one of Europe's *least* efficient cereal producers, it required the *highest* level of protection. On the other hand, few policies were developed to encourage a dynamic cooperative movement such as existed in neighbouring France, despite the many comments on the importance of the peasantry as a social group. By concentrating on price intervention, all farmers benefited although, as EEC policy has shown, it benefits mainly the larger producer and is costly to the consumer. In Spain over this period it was the large cereal farmers who enjoyed economies of scale in production, who influenced price negotiating at a national level, and who sold a larger proportion of their crops, who benefited the most.

It would appear, following the argument of Gavin Wright quoted at the beginning of this chapter, that the slow growth of Spanish agricul-

[54] For the Technical Commission, see especially Carrión (1975, pp. 373–93) and Malefakis (1970, pp. 172–85).

ture was not the result of poor soil or scarcity of resources, but rather 'the level of demand, the state of knowledge, and the organization of property rights and markets'. On Spain's *secano*, greater efficiency could have been achieved by a faster rural exodus and mechanisation. Yet in Spain, as elsewhere, the social cost of emigration was high. Change was also against the interests of many large landlords because low productivity certainly did not necessarily imply low profitability. Much of the land in Castilla-León was worked in small farms but an important area was rented from large landowners. In Andalucía and Extremadura, the skewed property distribution, the lack of an effective and legitimate channel for political protest, and a low and declining land–labour ratio, led to both low levels of disposable income and a delay in mechanisation. Here the smaller farmers and landless labourers eked out a meagre existence, putting their hope in anarchism and a redistribution of landed property which would solve the problem of low incomes. However, given the land–labour ratio, land reform would have been of only temporary assistance and could have only briefly delayed the rural exodus.

One final question needs to be considered and that is whether lower tariffs would have led to a more efficient allocation of resources and to an increased internal demand for industrial products. Certainly bread prices would have been lower but, as Fraile has argued, the impact on consumer purchasing power would have been small.[55] Lower prices would certainly have increased the rural exodus, but the evidence is not clear by how much. As we saw in table 10.2, the region most dependent on cereals (49 per cent of final output in 1929/33) was Castilla-León, a region that saw some 18 cent of agricultural male labour leave between 1887 and 1930. By contrast in Andalucía, where extensive cereals represented 27 per cent of output, male labour in agriculture increased by 11 per cent. Lower prices would have driven more labour out of Castilla-León, but it is not known what levels would have been required to reduce the labour force in Andalucía. Furthermore, the release of labour from agriculture only increases GDP if alternative employment is available. Although we can be reasonably certain that lower farm prices would have driven labour even faster into Spanish cities, it is much less clear how quickly alternative employment opportunities would have been created. Not only does history provide a large number of examples of regions with high unemployment and low wages which failed to industrialise, it also shows that labour released too fast would have simply increased unemployment, reduced urban wages and

[55] Fraile (1993).

increased social discontent.[56] Finally, it has been suggested that lower tariffs would simply have increased imports, and thereby have had an adverse impact on the balance of payments.[57] However, given the low opportunity cost of much of the *secano* this is questionable. A more likely scenario is that output would have remained roughly stable, but that land rents would have weakened (falling instead of rising) and greater mechanisation taken place. In conclusion, although lower cereal prices in Spain, as elsewhere, would have reduced the size of the agricultural population, decreased the price of bread and increased farm mechanisation, it is questionable whether such a policy would have had a significant impact on economic growth.

[56] For the question of cheap labour and industrialisation, see especially Mokyr (1991). Allen (1992, ch. 13) argues the case for labour having been released from agriculture too fast in England in the eighteenth century. By contrast, Williamson (1994, table 13.1) shows that cities grew more slowly in Spain during its period of fastest growth (1900–10) than in other European countries.

[57] See, for example, Pinilla Navarro (1994).

Part V

The State and the end of traditional agriculture

11 The modernisation of Spanish agriculture, 1939–1965

The slow changes in Spanish agriculture during the first third of the twentieth century ground to a halt in the early 1930s. For the next two decades agriculture, together with the rest of the economy, declined and then stagnated. In this chapter, I argue that this long decline in agricultural output cannot be fully explained by either the 1936–9 Civil War or government intervention in commodity markets, which distorted incentives, farm incomes and consumption. Instead, other factors, such as Spain's international isolation and the decline in foreign trade, which in turn restricted the imports of fertilisers and machinery, provide the best explanation of why recovery took longer than in most other European countries. Only from the early 1950s was growth renewed, and by 1960 agricultural modernisation was once more clearly taking place.

This chapter also considers how three major bottlenecks to agricultural growth in the pre-Civil War period were finally overcome. First, the process of outmigration was renewed from the early 1950s, leading to a rapid rise in rural wages, with the domestic terms of trade moving against wheat farmers. For the medium and large wheat farmer this did not imply falling incomes, as mechanisation allowed costs to be cut. Only by the late 1960s would improved seed technologies and cultivation methods raise yields. Second, I consider the question of livestock farming, a sector where unfavourable natural resources (poor pastures and summer droughts) and small farms (in the North), had made supply relatively unresponsive to growing incomes prior to 1936. This problem was solved by a greater willingness to permit imports to overcome shortages. This period also saw the rapid growth of the pig and poultry industries where new technologies allowed intensive production. Finally, the attractions of hydroelectric power encouraged a boom in reservoir construction, which produced both an extension in the area irrigated and improvement in water supplies.

Table 11.1. *Exports and imports of leading agricultural commodities, 1926/35 to 1951/6*

	1926/35	1940/9	1951/6
Oranges	+837	+266	+732
Olive oil	+74	+18	+33
Wine	+3,155	+553	+903
Grapes	+45	+5	+38
Onions	+139	+32	+87
Bananas	+132	+20	+114
Almonds	+22	+9	+26
Potatoes	+62	−46	−18
Rice	+43	+7	+49
Raisins	+14	+2	+5
Wheat	−93	−387	−248

All figures in thousands of tons, except wine which is in thousands of hectolitres.

+ = Exports.
− = Imports.

Sources: Dirección General de Aduanas (various years).

A return to traditional agriculture: Spain's retreat in the 1940s

Self-sufficiency in foodstuffs prior to the Civil War had been achieved largely on the basis of low standards of consumption. The 1940s and early 1950s saw a significant fall in living standards and a worsening of diets. Although the Civil War disrupted agricultural output by diverting resources away from the sector to other users and destroying capital equipment, physical damage was a good deal less than that suffered by many countries in the Second World War. However, although the magnitude of the physical destruction was not as great, the recovery from war in Spain was slower than in most other European countries, with GDP per head not regaining the 1929 level until 1954 (1929 being the peak year prior to the Civil War). In agriculture, output of most commodities shows a similar delay in recovery, leading one agricultural historian to write that 'twenty long years were needed to reach levels of food consumption which had already been achieved between 1931 and 1936'.[1]

In fact, information on agricultural output is very unreliable from the

[1] See Barciela (1986, p. 423 and pp. 383–8) for the impact of the Civil War on Spanish agriculture. GDP figures are from Prados de la Escosura (1995).

ıtbreak of the Civil War to the early 1950s. One indicator of change, at of foreign trade, shows that traditional exports, such as citrus fruit, ive oil, fresh vegetables and wine, fell significantly during the 1940s ible 11.1). A second indicator is the extent of the black market iscussed below), and the fact that the 1940s are still remembered day as being 'years of hunger'. In 1948, the British trade commissioner Madrid noted that:[2]

ıilst the population has gone on steadily increasing at the rate of one per nt per year, the total agricultural output has fallen by 20 per cent and cereal öduction by about 30 per cent.

This perhaps was an exaggeration although, as I have said, the in-curacies of government official statistics make any measurement ıreliable. The cause of the fall in production is normally attributed to ⁄o quite different factors: the shortage of inputs, especially work ani-als and fertilisers, and government price intervention.

The shortage of inputs was the result of the new regime's attempts self-sufficiency, its insistence on maintaining an overvalued peseta, ıd its unwillingness (or inability) to obtain lines of foreign credit.[3] he result was an acute shortage of foreign exchange, and strict ıport controls for foodstuffs, fertilisers, raw materials and capital ›ods. The decline in draught animals can be linked to the Civil ⁄ar, although the droughts of 1940 and 1945 also hindered recovery.[4] ⁄ith little foreign currency to purchase machinery, the 4,000 or so actors that had existed on the eve of the Civil War had either been :stroyed in the fighting, or were worn out by the late 1940s.[5] The :cline in nitrogen and superphosphate fertilisers consumption during ıe 1940s was also the result of import restrictions (table 11.2).[6] Only ith the gradual liberalisation of foreign trade from 1951 were the ıortages overcome.

The response of farmers to the fertiliser shortages was mixed, and ıked closely to product markets. In the case of oranges – a major ›reign exchange earner and also a very heavy consumer of fertilisers – ıtput fell by 30 per cent between 1926/35 and 1940/9. According to

United Kingdom Overseas European Survey (hereafter OES): Spain (1949, p. 21).
Historians have long debated whether the country's disastrous attempts at self-sufficiency were simply the result of circumstances or the goal of the new Franco regime. For a brief introduction to recent works of this period, see Harrison (1993).
Contemporaries argued that the conflict caused a shortage of some 300,000 mules, leading to an increase in the use of cattle as work animals (Naredo, 1989, pp. 53 and 56).
OES (1949, p. 23).
Spain was able to maintain exports of potash, even during this period. See Castro (1957, pp. 52–3).

Table 11.2. *Consumption of mineral fertilisers,[a] 1908–1960*

	Nitrogen	Potash	Phosphorus
1908	14	5	54
1930/5	71	25	166
1945	11	31	86
1952	117	45	188
1960	243	69	287

[a] In thousands of tons and at 100% concentrated equivalents.

Source: Gallego (1986, p. 224).

government statistics, the area actually grew by 7 per cent during the same period, suggesting that fertiliser shortages affected yields and not the area cultivated. However, an American citrus fruit specialist has argued that there had been a significant decline in the area cultivated, especially after the frost of 1946. This fall, he claimed, was not recognised in the official statistics as farmers failed to notify the authorities when they took the land out of cultivation, in order to protect their fertiliser quotas, which were distributed according to the area officially registered as citrus fruit.[7] As late as 1949 orange producers still faced fertiliser restrictions, leaving them no option but to supplement government rations by purchasing on the black market.[8] Even so, given the increased supply of oranges for domestic consumption at this time, fertiliser shortages seem unlikely to have been responsible for the decline in exports shown in table 11.1. Instead, the cause appears to have been the postwar interruptions to international trade, especially in the French and German markets, which could not be offset by the favourable exchange rates that producers received from the Spanish government.[9]

Official wheat statistics show that the area sown fell by 15 per cent, and production by 23 per cent between 1926/35 and 1939/52. It is often argued by historians that low official prices for wheat encouraged farmers to switch into other crops where prices were not fixed, or to declare smaller harvests than they actually collected, with the difference being

[7] United States Department of Agriculture (hereafter USDA) (1950, pp. 1 and 12).

[8] Ibid. (p. 4).

[9] In October 1949 the exchange rate varied between 13.14 pesetas to the dollar for the export of iron ore (an export which the Spanish government did not want to encourage), to 26.3 pesetas for goods such as books and leather. For oranges the rate was between 16.5 and 17.5 pesetas. Because of multiple exchange rates, 'the "cost of production" of a commodity has little influence on its competitiveness in international trade' (USDA, 1950, p. 64).

sold on the black market.[10] However, as prices were much higher on the black market than the official one, considerable fortunes were made during these years, especially by the medium and larger farmers, who had a surplus to sell, and who had the social connections to avoid prosecution.[11] If estimates for prices and quantities sold on the black market are taken into account, as figure 11.1 shows, returns per hectare in the 1940s were actually extremely high. Given the existence of the black market, it appears to have been shortages in fertilisers and draught animals that led to stagnant output in the face of rising demand, rather than just low official prices set by government intervention. When price restrictions began to be lifted during the early 1950s, and greater supplies of imported fertilisers and machinery became available, many farmers were shown to have accumulated significant cash reserves which could be invested.[12]

For cereals it seems to have been the lack of inputs, especially fertilisers, rather than government price policies, which led to the shortfall in agricultural output during the 1940s. However, as Amartya Sen has argued, hunger is as much about food entitlement as it is about food production.[13] This is suggested by real wages which by 1950 had fallen to perhaps half their pre-Civil War level (another factor boosting profits of those farmers who could sell on the black market), and which forced wage earners to take extra employment and work longer hours. According to one source:[14]

> . . . it is estimated that the wages in the towns amount in terms of real values to less than 50 per cent of the pre-Civil War level. Family earnings, however, have not fallen in the same proportion as most workmen take extra jobs in their spare time and members of the family who did not work before now do in a wide variety of ways, often on a casual basis, in order to eke out the basic earnings.

The combination of higher bread prices and falling real wages resulted in many consumers taking measures to reduce uncertainty in food supplies. The much reported 'return to the land' led to the numbers

[10] Barciela (1986, pp. 390–8) and García González and Barciela (1983).

[11] The smaller farmers had greater problems, although Pitt-Rivers, in his classic book on the village of Grazalema in the Sierra de Cádiz in 1954, noted that, 'since the price paid by the government for the grain collected bears no relation to the real price, a farmer who made an honest declaration every year would soon be bankrupt' (1971, p. 20). For the importance of the black market for larger farmers, see Naredo (1981).

[12] For the growth of farm savings, see OES (1949, p. 23). A later report suggested that the 'extremely low level of fertiliser consumption over the past fifteen years has probably contributed more than any other single factor to the deterioration of Spanish agriculture since 1936' (OES, 1952, p. 27).

[13] Sen (1981).

[14] OES (1949, pp. 120–1). Another important factor influencing 'entitlement' right was the double figure inflation during the 1940s. For a brief survey of real wages during this period, see Carreras (1989b, pp. 11–5).

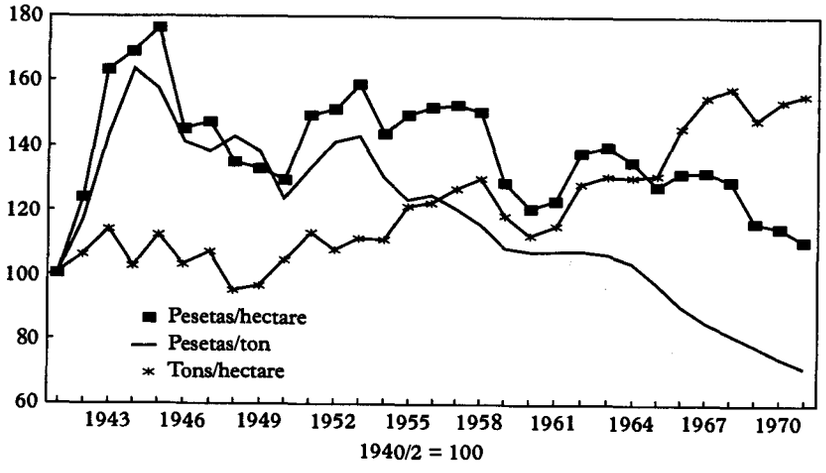


Figure 11.1 Changes in output per hectare, prices and yields in wheat production, 1940/2 to 1970/2 (three-year averages and constant prices used; the wheat price reflects the size of the black market)
Source: García González and Barciela López (1983, cuadro 3).

employed in agriculture increasing by 22 per cent between 1935 and 1945, with the primary sector's share of the total active population increasing from 44.6 to 50.3 per cent.[15] This increase represented a change in attitudes towards the market, leading to an increase in self-sufficiency. Of the highly commercial orange groves of Valencia, one report of 1950 states:[16]

> In rural Spain one has the impression that this is not basically a money economy, but rather the large portion of the real earnings of the people is obtained from home-grown produce. It is this factor which stabilises what would otherwise be an impossible situation, considering the wage rates and prices of food.

The impact of diminished food supplies and falling real wages led to a decline in both food consumption and welfare. For the period 1953/6, when the situation was much improved on earlier years, Barbancho estimated a daily per capita consumption of 2,250 calories, similar to my estimate for 1900.[17] Yet it would be wrong to believe that consumption

[15] Alcaide (cited in Carreras, 1989b, p. 29). Urban growth declined slowly from an annual growth rate of 2.25 per cent between 1920 and 1930, to 2.2 per cent in the 1930s, and 2 per cent in the 1940s and 1950s. Figures refer to provincial capitals.
[16] USDA (1950, p. 79).
[17] Barbancho (1960) and Simpson (1989a).

patterns did not change. Barbancho himself noted that the high cost of animal fats after the Civil War encouraged the consumption of olive oil in some provinces, where previously it had hardly been consumed.[18] Likewise, given the absence of export markets, orange producers had to take the domestic market more seriously, and consumption rose from an annual average of 11.6 kilograms to 22.8 kilograms per person between 1926/30 and 1941/5.[19]

The 1940s was an interesting, if sad period of Spanish agriculture. The strong demand for basic foods and absence of stocks produced prosperity for those farmers that were able to sell an appreciable part of their produce on the black market. For those that could not, it resulted in an increase in self-sufficiency and low levels of consumption.

The renewal in agricultural growth and the transformation of traditional agriculture began once more in the early 1950s. Two points should be made here which will be examined in more detail in the remainder of this chapter. First, if the key to economic development was to raise labour productivity in agriculture, this indeed was achieved. Between 1949/51 and 1959/61 it rose by an annual 3.8 per cent, and from 1959/61 to 1969/71 annual growth reached 6.6. per cent.[20] This was caused primarily by increased mechanisation of agricultural tasks in response to rising real wages caused by the gradual, but sustained, decline in the agricultural population (see below). Second, the structure of Spanish agriculture changed from one dominated primarily by the extensive crops of the *secano* (short fallow cereals, legumes, vines and olives) to one where more intensive production systems and livestock played a dominant role. Whereas in 1929/33 cereals, vines and olives still accounted for half of final output (i.e. total output net of seed corn and animal feed), this had fallen to just a quarter by 1965.[21] This, as we will see, was caused by the development of intensive livestock farming and the extension of (and improvements to) irrigation.

The rural exodus

The total number of male workers in agriculture fell from 5.35 million in 1950 (47.6 per cent of the active labour force) to 4.70 million (36.6 per cent) by 1960. A decade later the figures stood at only 2.96 million (22.8 per cent). Three million had left for the country's rapidly trans-

[18] Barbancho (1960, p. 92).
[19] Ibid. (p. 291) and Rosón Pérez (1948, p. 121).
[20] See table 1.5.
[21] Simpson (1995a, appendix 1) and AEA, (*año 1980*, p. 610).

forming cities or for northern Europe's industrial and service sectors.[22] The cause of this rural exodus is complex but four broad explanations can be put forward. First, the destruction of the anarchist movement and the *jornaleros'* ambition of becoming property owners after the defeat of the Republican government in 1939 changed attitudes towards the land, especially in the areas of *latifundios*. According to Barciela, of the 6.3 million hectares of land that had been occupied during the Republic and the Civil War, some 5.8 million were simply reoccupied by their previous owners without any legal controls.[23]

Second, there was a trend towards direct cultivation by landowners, especially after the passing of legislation in 1942 which provided significant protection to tenants, and thereby discouraged leasing arrangements. As a result, in Andalucía on the eve of the Civil War, some 70 or 80 per cent of the land was leased; by 1950, 65 per cent was cultivated directly.[24] The possibility for landless labourers to progress up the farm ladder by way of rental agreements was thus now seriously weakened and, according to Naredo, it was wage labourers rather than property owners who made up a large share of the migrants of the 1950s.[25] With their hopes of access to land destroyed by the events of the Civil War and the move to direct farming, a third factor was the serious erosion of rural real wages during the 1940s, which meant that labour was more willing to consider the alternatives that arose in the 1950s. Finally, as most Spanish emigration was temporary, even from the late nineteenth century, the increasing demands for unskilled labour in northern Europe became a more attractive option than Latin America.[26]

The nature of off-farm migration can be seen in table 11.3. After the agricultural labour force had declined in all four regions between 1910 and 1930, it then increased significantly over the next two decades so that, taking the period 1910 and 1950 as a whole, the agricultural labour force actually increased in three out of the four regions. As a result, surplus labour in agriculture in the mid-1950s was estimated to be 'as high as two million people'.[27] This renewal of surplus labour in the sector appears to have been both a cause and a symptom of the low productivity in the Spanish economy at this time. By contrast, the period

[2] Employment figures from Nicolau (1989, pp. 78–9). Figures for the rural exodus are from Leal *et al.* (1975), which also includes an excellent section on the difficulties in interpreting the statistics of these years.
[3] Barciela (1986, pp. 400–1).
[4] Naredo (1977, p. 36) and García de Oteyza (1952), both cited in Barciela (1986, p. 406).
[5] Naredo (1977, p. 112).
[6] Baines (1994, p. 533).
[7] OES (1957, p. 10).

ble 11.3. *The rural exodus, 1910–1970*

	No. of male farm labourers (% change)			
	1910–30	1910–50	1950–70	1910–70
rth	−27	+7	−40	−36
diterranean	−28	−13	−49	−56
erior	−21	+2	−50	−49
dalucía	−3	+20	−43	−31
in	−20	+4	−46	−44

rces: Population censuses.

50–70 saw a strong outmigration in all areas, ranging from 40 per nt in the North to 50 per cent in the Interior.

A solution to low-yield wheat farming

we saw in chapter 5, a major characteristic of traditional Spanish eat farming prior to the 1960s was the virtual stagnation of crop lds, making changes in output highly correlated to changes in the a sown. This remained true even from around the time of the First orld War, when the extension of the area cultivated became increasgly dependent on the availability of fertilisers and improved tillage uipment. A sudden shortage in the supply of these inputs, as occurred er the Civil War, led to a rapid fall in the area cultivated and a return a situation similar to that which existed in the decade prior to the rst World War (table 11.4).[28]

Before the use of hybrid wheat varieties there were physical restricns to the extent that yields could be increased using dry-farming ethods. A study of the North Meseta in the Interior in 1965 illustrated at using existing seed varieties, work practices and cost-price trends, minishing returns quickly set in when only modest amounts of fertiers were applied.[29] This technological barrier to increasing yields uld not be solved by the farmer alone, but rather required state intertion, either in developing new varieties for local conditions, or

For mineral fertiliser usage, see table 11.2.
By 1965 at least two-thirds of the area under wheat received both nitrogen and phosphate mineral fertilisers. Of 30 farmers studied in the North Meseta, all of whom used 32 kg/ha of nitrogen and 33 kg/ha of phosphate, 'no correlation could be found between increased yield and increased fertilizer rates exceeding 30 kg/ha of phosphate' (*Sindicato Nacional de los Cereales*, 1965, cited in International Bank for Reconstruction and Development and Food and Agriculture Organization (hereafter IBRD/FAO), 1966, p. 145).

Table 11.4. *Changes in wheat area and yields, various periods, 1905 to 1980*

	Area sown[a] ('000 ha)	Production ('000 tons)	Yields (tons per ha)
1905/14	3,805	3,330	0.88
1939/50	3,828	3,238	0.85
1926/35	4,610	4,128	0.90
1951/60	4,300	4,180	0.97
1961/70	4,069	4,637	1.14
1971/80	2,970	4,624	1.56

[a] Includes both *secano* and irrigated areas.

Sources: AEPA and AEA (various years).

through a change in policy which encouraged resources to move out of wheat production altogether. As table 11.4 shows, it was only in the 1970s that the traditional wheat production systems based on extending the area cultivated to meet increasing demand can be said to have finally ended. Thus, in comparison with the 1950s, the area sown declined in the 1970s by almost a third while average yields increased by three-fifths.[30]

Another consideration must be the reduction in the area of unsown fallow and a shortening of rotations. Progress was slow and was achieved in the post-Civil War period (through better fertilising and improved tillage machinery) only on the better soils, such as the *campiña* in Andalucía. One major constraint on wider cultivation of the fallow was the difficulty of introducing mechanisation with traditional legumes. This was eventually overcome with the introduction of new crops which could withstand mechanised cultivation techniques, especially sunflowers, whose area of cultivation increased from just 11,000 hectares in 1965 to 792,000 hectares a decade later. Even so, non-irrigated cereal land in Spain today still remains unsown between a half and a third of the time. In conclusion, the speed of mechanisation in reducing labour inputs, rather than increasing yields, was still by far the most significant factor in improving labour productivity in cereals even in 1965.

As already noted, between about 1936 and 1950 a combination of foreign exchange shortages and falling real wages meant that the

[30] As the combined area sown of wheat and barley changed little, it seems to be improved wheat strains, rather than the abandoning of marginal land, that was the cause of the better yields from the mid-1960s.

country's stock of farm machinery remained (at best) stagnant. However, from the early 1950s, the renewal of the rural exodus was accompanied by rising real wages, which in turn reduced the threshold at which labour-saving machinery became financially viable. On the supply side, considerable technical advances had occurred over the previous two decades. For example, the tractors of 1950 now came equipped with rubber tyres, electric starters and lighting systems; they were diesel-powered, had a hydraulic lift and 'live' power connections to other equipment, making them more energy efficient and considerably more reliable and versatile than the pre-Civil War models.[31] The cost of this technology had fallen in real terms by the 1950s, even though foreign manufacturers produced machines in Spain which were sold at 25 to 30 per cent more than elsewhere as late as 1966.[32]

Table 11.5 shows the impact of growing unit wage costs between 1953 and 1967, and the potential for savings through mechanisation for different crops, at three distinct levels of technology. Level 3 represents the most advanced technology, which in the case of winter cereals (all small-grain cereals except rice), includes a 90 h.p. tractor and self-propelled combine harvester. Level 1 refers to traditional methods while level 2 refers to intermediate technology (a 50 h.p. tractor, reaper-binder and threshing machine). Reducing labour costs through mechanisation proved simplest with small grains, given the ease in mechanising the harvest and threshing processes. At the extreme, a worker using a self-propelled combine harvester processed the production of a hectare in 3 or 3.5 hours, compared with 100 or 130 hours using traditional methods.[33] By contrast, the harvesting of olives and grapes could not be mechanised, and only small tractors were able to be used amongst the plants. As a result, rising wages led farmers to reduce labour inputs, even though yields would be adversely affected.[34]

Given the large potential savings through mechanisation, the number of tractors rose from 12,800 to 56,800 between 1950 and 1960, and reached 130,100 in 1964. In terms of horsepower per hectare cultivated, the increase was even faster, growing from 1.9 to 9.9 h.p. between 1950

[31] Gray (1975, vol. 2, pp. 52–7) and Naredo (1989, p. 55).

[32] IBRD/FAO (1966, p. 150). This was still below the mark-up price on imported tractors, 'which in the case of British and Italian models averaged over 60 percent'. In 1963 not only were import quotas in place, but duties amounted to 40 per cent of factory cost (ibid., pp. 147 and 150).

[33] Naredo (1977, pp. 42–3).

[34] Martínez Alier (1971, ch. 2) and Naredo (1977, p. 44). For earlier periods of reducing labour inputs to cut costs during times of low prices, see Zambrana (1987, p. 61) and Simpson (1985a, p. 250).

Table 11.5. *Changing labour costs per hectare[a] with mechanisation, 1953 and 1967*

Crop[b]	Level of mechanisation[c]	1953	1967	Increase 1953–67	Index base (level 3=100)[d]
Small grains	1	654	3,277	2,623	716
	2	168	910	742	202
	3	82	448	366	100
Fallow	1	130	625	495	516
	2	37	203	166	173
	3	21	117	96	100
Olives	1	904	4,912	4,008	133
	2	637	3,659	3,022	101
	3	633	3,641	3,008	100
Vines	1	718	4,083	3,365	133
	2	485	3,004	2,519	100
Legumes	1	498	2,617	2,119	148
	2	322	1,817	1,495	100
Potatoes	1	1,762	9,058	7,296	132
	2	1,312	7,274	5,962	108
	3	1,203	6,742	5,539	100
Oranges	1	1,919	9,941	8,022	200
	2	1,263	6,992	4,019	100
Almonds	1	783	4,346	3,563	114
	2	671	3,805	3,134	100

[a] Measured in nominal prices.
[b] All crops *secano*, except oranges which were irrigated.
[c] Level 1 = traditional technology; level 2 = intermediate; level 3 = most advanced.
[d] Level 2 for vines, legumes, oranges and almonds.

Source: Naredo (1977, cuadro 5).

and 1960, and reaching 25.4 h.p. by 1964. Finally, whereas there existed one tractor for every 406 agricultural workers in 1950, this had risen to one in 85 in 1960, and to one in 35 by 1964.[35]

This potential for labour-saving in small-grain cultivation allowed the medium and large farmers to maintain, or even increase profits, even though the terms of trade were moving slowly against wheat. Naredo has estimated that farmers using advanced cereal technologies (i.e. level 3) faced an increase in costs between 1953 and 1967 of 1,764 pesetas a

[35] In terms of horsepower per worker, the increase was 0.01, 0.4, and 1.3 respectively. Horsepower refers to tractors and motocultivators only. Labour includes male and female (AEA, *año* 1980).

hectare, which was more than offset by a rise in income of 2,393 pesetas, leaving a modest growth in profits of 629 pesetas in 1967. Level 2 saw costs increase by 2,171 pesetas per hectare, producing a minimal growth in profits of 222 pesetas. Finally, if the farmer failed to change traditional methods, operating costs would have increased by 4,225 pesetas per hectare, leaving the farmer with a deficit of 1,832 pesetas in 1967.[36]

The scope for cost reduction through technological change occurred at a time when the real price of wheat fell by about 40 per cent between 1953 and 1967. When the slightly better yields and the higher prices paid on the black market are taken into account, wheat output in real terms fell from 722 pesetas per hectare in 1952/4 to 597 pesetas per hectare in 1966/8 (figure 11.1).[37] In conclusion, while consumers saw a fall in real bread prices, the growing labour shortages and higher wages in the countryside were forcing the larger producers to mechanise, which in turn allowed them to protect their profits. Given the potential for mechanisation, the medium and larger cereal farmers would be much more willing to accept a decline in agriculture's terms of trade, than they had been in the 1920s.

Despite these potential savings on labour, for every farm worker with a tractor, there were 34 without one in the mid-1960s. Most cereal farmers did not mechanise because of the small size and fragmented nature of their farms, although some would enter into co-ownership of machinery, or use contractors. For cereal farmers working units of 10 to 30 hectares, the increase in wage costs would not affect them directly, as approximately 80 per cent of their labour was provided by the family, involving no cash outgoings. Therefore, although these farmers often could not mechanise profitably, the increase in real wages only minimally affected profitability. Of greater concern for these farmers were commodity prices and the fall in real wheat prices which implied a sharp fall in real incomes. By 1960, the emigration of farmers, as opposed to wage labourers, becomes noticeable.[38]

After the Civil War the government introduced a number of measures to help the smaller family farmer, the most important being the 1952 law that provided the legal framework for consolidation of fragmented holdings (*Ley Experimental de Concentración Parcelaria*). In the subregion of Castilla-León, various studies suggest that by the 1950s it was land

[36] Nominal prices are used and average yields are for the whole 1953–67 period. The increase in labour costs is as shown in table 11.5, and the growth in non-labour costs was 1,398 pesetas (level 3), 1,429 pesetas (level 2) and 1,602 pesetas (level 1) (Naredo, 1977, cuadro 7).
[37] García González and Barciela López (1983, cuadro 3).
[38] Naredo (1977, p. 112).

fragmentation, rather than the small size of farmers' landholdings, which was the major retarding factor to mechanisation. Thus, in a study of some 150,000 hectares in the Duero valley (provinces of Salamanca, Soria and Valladolid), the average operating farm was 34.5 hectares, although almost two-thirds of land was in farms of over 60 hectares. However, average field size before consolidation was just 0.6 hectares.[39] In 1966 it was estimated that the minimum area required for a 40 h.p. tractor to be profitable in Spain was 45 hectares, but in fact there was only one tractor for every 188 hectares in the Northern Meseta (which includes this part of the Duero valley).[40] Overcoming fragmentation was a slow process at first, with little more than half a million hectares having been consolidated by 1962, leaving Spain with a much higher level of fragmentation than most other countries in Europe (table 11.6). However, over the next two decades the area consolidated reached 5.5 million hectares.[41] By 1984, some 59 per cent of Castilla-León's land had been consolidated, and the region accounted for 61 per cent of Spain's total consolidation, partly because of its traditionally highly fragmented holdings, and partly because of the homogeneity of the land.[42] Finally, the threat of land reform did not disappear entirely with Franco's victory, and the *Instituto Nacional de Colonización* appears to have enjoyed more success than the 221,000 hectares expropriated between 1939 and 1964 would suggest. As de Janvry has reminded us, the simple existence of the legal machinery for land expropriation can, in some circumstances, be enough in itself to change production systems.[43]

The intensification of livestock husbandry

Following Engel's Law, rising real wages (together with the decline in the relative price of wheat) led to both a switch in budgetary spending away from food as a category, and within the food category, towards those products with a higher elasticity of demand, such as meat. Between 1955 and 1965 real per capita incomes increased by 41 per cent, real wages (agricultural) by 92 per cent, and by the mid-1960s

[39] After consolidation average field size rose to 4.6 hectares (García de Oteyza, 1963, pp. 25–34).

[40] IBRD/FAO (1966, pp. 140 and 142). For Spain, the average was one tractor per 145 hectares of arable.

[41] Alario Trigueros (1991, pp. 84 and 100).

[42] Ibid. (1991, cuadro 4) and Sevilla Guzman (1979, cited in Alario Trigueros, 1991, p. 94). See also Behar (1991, pp. 293–300), who argues that the process of consolidation represented the final success of the individual over the village community in this region.

[43] OECD (1969, p. 272) and de Janvry (1981, p. 232). In this case, changes on the *latifundios* were encouraged by the favourable conditions for large-scale agriculture from 1939 to the mid-1960s.

Table 11.6. *Fragmentation of agricultural land,* c. *1960*[a]

	Average number of plots per farm	% of holdings with over 10 plots
Spain	14	33[b]
Germany	10	31
Greece	7	37[b]
Turkey	7	16
Portugal	6	14
Belgium	5	14
Italy	4	6
Holland	3	6
Ireland	2	0

[a] The FAO world census includes 38 countries giving an average of 4.3 plots per farm with 9% of holdings having over 10 plots. None of the countries surveyed approached Spain in terms of the level of fragmentation.

[b] Ten plots or more.

Sources: OECD (1969, p. 18) and FAO (1960, v, p. 113).

demand was boosted further by some 15 million foreign tourists.[44] The first household budget study of 1958 suggests that food consumption accounted for as much as 53.4 per cent of expenditure, a figure that had fallen to 44.4 per cent just ten years later. Within the food budget, cereals fell from 18.5 per cent to 13.8 per cent of the total; by contrast, meat increased from 17.6 per cent to 26.3 per cent. Although meat prices increased faster than the general price index, consumption per capita increased by 72 per cent in the seven years between 1957/9 and 1963/5, eggs increased by 90 per cent, milk by a more modest 3 per cent, whilst the consumption of cereals fell by 11 per cent.[45] This growth in demand for livestock produce was met in three ways: through increased supplies of feed for animals, improved livestock productivity, and by recourse to imports. I shall look at each briefly in turn.

As early as 1926, the distinguished economist Flores de Lemus had observed a tendency in Spanish cereal farming for the output of animal feed to grow faster than that of bread grains, a situation which he believed would have to continue if the problem of domestic saturation

[44] Per capita income (Banco de Bilbao estimates in 1970 prices) and farm wages are found in both Carreras (1989, p. 562) and Maluquer de Motes (1989, p. 523). Tourism had doubled to over 30 million by 1972 (Harrison, 1985, p. 155).

[45] AEA *año 1980*, (pp. 652–3) and Barciela (1989, p. 159).

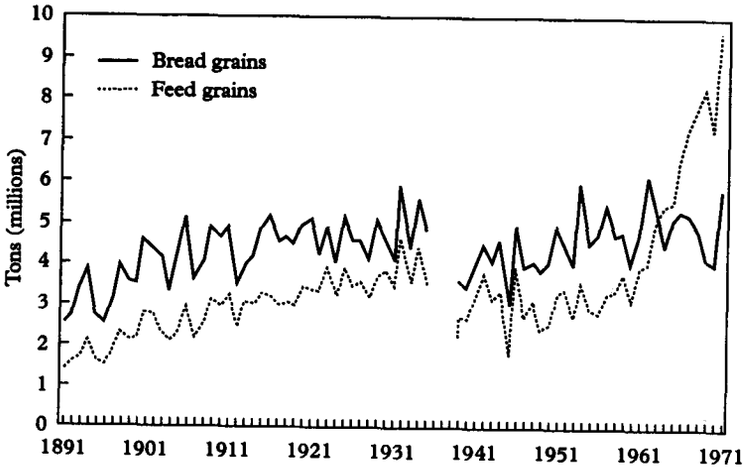


Figure 11.2 Supply of bread and feed grains in Spain, 1891–1971
No figures are available for the period 1936–9
Sources: GEHR (1981) and Barciela (1989)

of wheat markets in that period was to be solved. Figure 11.2 shows the domestic supply (national production plus imports minus exports) of the five major cereals – wheat, rye, barley, maize and oats. By taking only wheat and rye as bread grains, I am exaggerating the importance of feed grains during the early twentieth century, as maize remained an important bread grain in parts of the North. The figure shows that the supply of feed increased more quickly than bread grains from about the First World War to the Civil War, the trend was then reversed until the late 1950s when it grew quickly once more. By the 1960s, other animal feeds not shown in the figure, such as oil seeds, were becoming increasingly important, with the area under sunflowers growing rapidly. In addition, imports of soya grew from virtually nothing in the early 1960s, to 1 million tons by the end of the decade. By the mid-1960s, the animal feed industry was becoming firmly established in Spain.

Increasing the supply of feed was essential to meet the growing demand for livestock products, but in itself was not enough. With cereals, falling demand and rising labour costs could be offset by mechanisation; but the situation facing livestock and dairy producers was very different. The potential gains from introducing new breeds or feeding methods carried far greater risks for the farmer. This was because whilst labour saving technologies allowed farmers to cut production costs directly – and were therefore easier to measure – meat producers had

to recover their investment at some future date in potentially unstable markets.[46] In many countries, the role of government was essential in carrying out research for livestock breeders, but in Spain the sector received less support than other areas of agriculture, even in 1965.[47]

By the 1960s a number of important production changes were apparent. In the mid-1950s the first hybrid chickens were introduced into Spain and the poultry industry started an unprecedented increase in output and productivity. Production was located close to urban areas and feed was bought off-farm. In Spain, poultry production increased from 12,688 tons in 1960 to some 500,000 tons in 1970, and domestic consumption soared accordingly (table 11.7).

In the case of pigs, it was not until 1963 that domestic production reached the 1929 figure, but improved breeding and feeding systems allowed much younger animals to be slaughtered, saving the farmer on feed. As a rough measure of productivity, I have divided total carcase weight produced each year by the total number of sows kept for breeding.[48] This exercise gives a figure of 195 kilograms per breeding sow in 1935, which had risen to 215 kilograms by 1965, before doubling over the next five years. This productivity growth was also reflected in the age of the animals. Those over a year old that had been kept for fattening fell from almost half the national herd in 1929, to 26 per cent in 1965, whilst a decade later the figure stood at three per cent.

In both poultry and pig production three factors appear relevant to explain the rapid growth in output: first, the introduction of high yielding breeds and better knowledge concerning optimum conditions for fattening; second, the use of imported feedstuffs (which helped offset Spain's poor resource base); and third, growing vertical integration and economies of scale which allowed improvements in production technologies to be passed onto the consumer in the form of lower prices. The role of foreign capital and technology were crucial in the changes.[49]

As table 11.7 shows, growth was significant, although more modest, in the production of beef and dairy products. Carcase weights and milk yields were improved through the import of selected breeding stock and

[46] Guaranteed prices for meat were only introduced in 1964 (OECD, 1969, p. 263).
[47] 'At the moment, government technical effort continues strong in such traditional crops as wheat, vines and olives, but is relatively weak in key sectors such as livestock, pasture and fodder production, and horticulture' (IBRD/FAO, 1966, p. 42). See also Buxadé Carbo (1982, p. 86).
[48] AEA (*año 1975*, pp. 409 and 423). Unlike San Juan (1986, p. 327), I include a figure for young animals that have been reserved for breeding. Where no figures are given for animals between two months and one years, I assume it to be 1.8 times the figure for animals over 12 months. No figure has been included for animals younger than two months.
[49] San Juan (1986).

Table 11.7. *Meat and dairy production and farm-gate prices, 1950–1970*

A. *Domestic production per capita*[a]

	Beef	Mutton[b]	Pork	Poultry	Eggs[c]	Milk[d]
1950	3.3	0.7	5.1	0.3	7.4	51.9
1955	4.8	0.7	6.4	0.4	8.2	59.3
1960	5.3	0.7	8.5	0.4	9.9	60.1
1965	5.7	0.7	8.3	7.4	15.2	60.3
1970	9.2	0.7	14.6	14.8	20.2	74.9

B. *Farm-gate prices* (1965=100)

	Beef	Lamb	Pork	Poultry	Eggs	Milk
1950	24	24	36	n.d.	n.d.	37
1955	34	38	45	n.d.	61	46
1960	53	53	58	n.d.	80	76
1965	100	100	100	100	100	100
1970	99	99	91	87	91	115

[a] Meat in carcase weight and measured in kilograms.
[b] Mutton also includes goat.
[c] Eggs are measured in dozens.
[d] Milk is measured in litres and refers to liquid milk for consumption. That destined for industrial use is not included.

Source: Calculated from AEA (1980, ch. 16–18).

the use of artificial insemination. For some farmers, the fall in relative cereal prices encouraged the production of meat and milk, and animals which had previously been kept essentially for work increased in average weights, and had more regular and frequent calving.[50] However, the problem of scale in Spanish livestock farming (noted in chapter 8) remained. As late as 1974, 77 per cent of breeding and milking cattle were found on farms with less than six animals, a figure which increased to 89 per cent when only animals for fattening are considered.[51]

Even though domestic beef production grew by 18.5 per cent between 1959/62 and 1963/5, imports increased from an average of 9.8 per cent of domestic consumption to 25.6 per cent.[52] By the early 1970s, domestic producers had responded, and beef and veal production was responsible

[50] For a description of this change in one village in León, see Behar (1991, p. 38). Behar notes that traditionally cows calved only once every two years, making for a very irregular supply of milk.
[51] San Juan (1986, pp. 368–9).
[52] OECD (1969, p. 220).

once more for over 90 per cent of consumption, with better carcase weights and calving ratios leading to an increase of 56.5 per cent in the amount of meat produced per breeding animal between 1960 and 1970/2.[53] However, of equal importance was the fall in pork and poultry prices relative to beef and lamb, which from the late 1960s lead to a rapid increase in consumption of these products, encouraged by the 'efficient and expanding pig and poultry industries'.[54]

If the changes in pork and poultry production were not unique to Spain, but rather were part of an international movement in technology, their impact in Spain was especially great, given the traditionally low levels of per capita meat consumption. The ability to achieve major economies of scale in contrast to traditional livestock farming, and the possibilities of importing large quantities of feed, released Spanish producers from the natural and institutional resource constraints which had plagued the agricultural sector since the decline in prosperity of the Mesta. In just a decade, from 1960 to 1970, livestock increased its contribution to final agricultural output from 30 to 40 per cent.

The extension of irrigation

The final area in which significant changes appeared was irrigation. The Franco regime carried out a massive construction of reservoirs and irrigation systems (table 11.8). Although the principal goal of such development was hydro-electric power, the area of irrigated land also increased by 600,000 hectares (41 per cent), between 1950 and 1965. Better water supplies, together with improved seed strains, and growing domestic and export markets all led to an important growth in output. Thus, whilst in 1932 some 29 per cent of agricultural final production can be identified as coming from irrigated lands, the figure had risen to 40 per cent in 1965.[55] This is reflected in the performance of such crops as alfalfa, which saw output grow by 77 per cent between 1955/59 and 1965/69, maize (63 per cent), sugar beet (50 per cent), oranges (73 per cent), peaches (111 per cent), apricots (72 per cent), pears (90 per cent) and apples (74 per cent).[56] Of equal importance to farmers were the improvements in the food processing industries, distribution networks and retail outlets. By the end of the period, foreign capital and technology were making an important

[53] San Juan (1986, p. 62) and *Fondo para la Ordenación y Regulación de Precios y Productos Agrarios* (1981, p. 7, cited in San Juan, 1986, p. 367).
[54] IBRD/FAO (1966, p. 13).
[55] Calculated from AEPA (*año 1932*) and IBRD/FAO (1966, p. 44).
[56] AEA (various years). Not all output of these crops was found on irrigated land.

Table 11.8. *Reservoir capacity in Spain, 1900–1970 (million cubic metres)*

	1900	1940	1950	1955	1960	1965	1970
Norte	..	35	127	610	1,861	2,614	3,334
Duero	..	1,371	1,626	1,722	2,790	3,173	6,394
Tajo	24	341	370	757	3,285	5,708	9,390
Guardiana	10	52	52	60	1,821	3,974	4,034
Guadalquivir	..	633	1,565	1,820	2,026	2,981	4,579
Sur	..	41	132	132	132	219	219
Segura	38	365	365	365	885	911	918
Júcar	..	47	55	1,404	1,500	1,516	1,637
Ebro	..	729	1,323	1,488	3,204	3,665	5,886
Pirineo	6	6	6	6	6	183	478
Canarias	..	..	..	..	5	5	10
Total	78	3,620	5,621	8,364	17,515	24,949	36,879

Source: AEA (1980, p. 10).

contribution to Spain's food industries.[57] Finally, between 1950 and 1970 the share of urban population (in municipalities greater than 20,000) increased from 40 per cent to 55 per cent. In absolute terms the growth was from 11.4 million to 18.7 million inhabitants.

Conclusion

Agricultural change in Spain between 1950 and 1965 was extremely rapid, and a combination of technical change and outmigration doubled labour productivity. Furthermore, unlike the 1920s, the process was allowed to continue, so that by 1990 Spanish agriculture employed just 10.5 per cent of the active population.[58] Yet even if the 'Siesta' was clearly over by 1965, the productivity gap between Spain and northwest Europe was as large as it had been at the end of the nineteenth century. However, the rapidly declining share of agriculture in Spain's economy implied that the importance of this 'productivity gap' for economic development was also diminishing.

[57] Peinado Gracia (1985, ch. 6).
[58] If fishing is included, the figure is 11.2 per cent (AEA *año 1990*, p. 16).

Conclusion

12 Spanish agricultural change in a European context

Between about 1750 and 1950 Spanish agriculture successfully increased its output to feed a population which had tripled in size. Furthermore, by the 1880s the supply of food from one year to another remained fairly constant, and price fluctuations for consumers were considerably less than they had been only a few decades earlier. Yet, even in the early 1950s, Spain was still a poor country. It was poor, both because a large share of its active population was employed in agriculture, and because the levels of productivity in the sector were conspicuously below those found in richer countries. Thus, in 1950, half the active labour force was still employed in agriculture, only a quarter lived in urban centres of more than 100,000 inhabitants and agriculture's share of GDP remained at about 30 per cent. However, perhaps the most conspicuous evidence of the 'failure' of agriculture was to be found in people's diets. These were high in carbohydrates and low in animal protein, with the quantity of calories consumed per capita/day derived from milk, meat, fish and eggs being only 250 in southern Europe compared to 940 in northern Europe in the mid-1950s. Furthermore, to obtain this poor diet, the inhabitants of Italy, Greece, Spain and Portugal spent about 40 to 50 per cent of their per capita income on food, compared to only 30 to 35 per cent in northern Europe.[1]

If the figures for 1950 represent a recovery from the disastrous years of the Civil War and its immediate aftermath, they still reflect the consequences of excessive government intervention in all aspects of the economy (chapter 11). By 1960 the economy, and agriculture in particular, was performing considerably better, and the advances that had taken place during the interwar years were once more occurring. But the vital question remains: Why did Spanish agriculture not do better?

It is true that low yields in traditional dry-farming and livestock pro-

[1] Yates (1960, table 2.1 and p. 85). Northern Europe taken by Yates to be the United Kingdom and Scandinavia.

Table 12.1. *Average wheat and milk yields in Europe, 1909/13 and 1961/5*

	Wheat yield (tons per hectare)		Milk yields ('0000s litres per cow/year)	
	1909/13	1961/5	1909/13	1961/5
Denmark	3.3	4.1	2.6	3.7
Holland	2.4	4.4	2.7	4.2
Belgium	2.5	3.9	n.d.	3.7
United Kingdom	2.1	4.0	1.9	3.6
Germany	2.4	3.2	1.8	3.1
Switzerland	2.1	3.3	2.7	3.3
Ireland	2.5	3.3	1.9	2.3
Sweden	2.1	3.4	n.d.	3.4
Norway	1.7	2.6	1.5	2.9
Austria	1.4	2.6	n.d.	2.7
France	1.3	2.9	1.6	2.6
Italy	1.1	2.0	1.5	1.9
Finland	1.1	1.7	1.4	3.2
Greece	1.0	1.5	n.d.	0.9
Spain	0.9	1.1	0.9	1.4
Portugal	0.7	0.8	n.d.	2.5

Sources: Yates (1960, p. 197); FAO Yearbooks; and Simpson (1995a).

duction in the Mediterranean countries such as Italy, Greece, France and Spain (table 12.1) were caused by the lack and unpredictability of summer rainfall and, to a lesser extent, by poor soils.[2] Yet simply to argue that poor natural resource endowments account for Spain's agricultural backwardness, or even that of the Mediterranean region, is insufficient for three reasons. First, one Mediterranean-like economy – that of California – was able to surge ahead from the 1860s and stand at the forefront of technical change in agriculture and intensive livestock farming.[3] Second, poor natural resource endowments cannot explain how Spanish agriculture eventually managed to overcome obstacles and achieve rapid productivity growth from the 1960s. Third, poor natural resource endowments have everywhere restricted agricultural output to some degree. Perhaps the extreme case in Europe is that of Ireland, where unfavourable agricultural resource endowments and institutions were responsible for large-scale emigration from the 1820s.

[2] The most recent historian to stress the role of resource endowments as an obstacle for change in Spanish agriculture is Tortella (1994a, pp. 8–9).

[3] For technical changes in Californian agriculture see, for example, Olmstead and Rhode (1988, pp. 86–112) and Scheuring (1983, ch. 9). A more recent case is that of Israel.

he real problem was not one of poor yields, but rather that the low sical output per hectare was also accompanied by poor labour pro- tivity. Of the seventeen European countries shown in table 12.2, in had the second lowest output per hectare, and only Yugoslavia, tugal and Greece had lower output per male worker. Furthermore, differences in labour productivity between Spain and the leading opean countries were as great in 1980 as they had been a hundred s earlier.[4]

et, even though the 'gap' between labour productivity in Spain and thern Europe was to remain, agriculture in Spain began a process hange in the 1950s which totally transformed the sector. Between 9/51 and 1964/66 the agricultural labour force declined by about 1.2 ion (23 per cent) while labour productivity grew by 74 per cent. Over next fifteen years employment fell by another 1.8 million, leaving the or with just 16.5 per cent of the total active labour force. Labour ductivity over this period grew by a further 129 per cent. Even faster wth in the rest of the economy resulted in agriculture's contribution GDP falling from 38.07 per cent to 6.9 per cent between 1890 and 0; the consequences for the economy of the labour productivity 'gap' n northern Europe were therefore now much reduced.[5] A second manent change was that of diet. Table 12.3 shows that this gap was ing by the 1960s. By the 1980s, the major dietary differences ween Spain and northern Europe were caused not so much by ome but rather by cultural preferences.

Given that Spanish agriculture has been able to change rapidly since 1950s, the question has to be asked why this did not occur earlier. o factors clearly were not responsible. First, as I have argued in this k, farmers responded rationally to changes in factor and product es, and if farming methods changed only slowly it was usually ause of some sound economic reason. Explanations that the farmers e simply 'inefficient' appear to be unjustified. Second, although poor ural resources played their part in the delaying the modernisation of in's agricultural sector, they did not change overnight and therefore y cannot explain the subsequent rapid growth from the late 1950s. tead, I have identified four factors which can explain both the slow elopment of agriculture prior to 1950 and the growth experienced rwards. These factors are: farm size and scale, the speed of rural

ountries include Denmark, France, Germany, Italy, the Netherlands and the United ingdom. See table 1.7.

or GDP figures see Prados de la Escosura (1995, table D. 4) and for employment see EA (*año 1980*, p. 16).

Table 12.2. *European agriculture, 1960*

	Output[a] (US$ million)	Output per male worker[b]	Output per hectare[b]	Land: labour ratio (ha)	Tractor h.p. per 100 hectares	Livestock units per 100 hectares[c]	No. of agricultural college graduates per 10,000 male farm workers[b]
Austria	771.6	156	101	13.1	55	69	199
Belgium	967.5	253	276	7.8	76	163	369
Denmark	1,244.6	250	211	10.1	103	152	191
Finland	483.0	159	90	15.1	80	73	220
France	6,863.9	161	105	13.0	55	61	73
Germany FR	4,744.8	193	176	9.3	113	105	254
Greece	893.8	46	53	7.4	9	40	31
Ireland	616.3	107	69	13.2	26	100	134
Italy	4,890.7	71	140	4.3	41	64	49
Netherlands	1,436.5	231	328	6.0	80	181	354
Norway	278.4	169	143	10.0	152	135	320
Portugal	609.8	34	69	4.2	7	48	19
Spain	3,049.2	48	49	8.3	4	28	27
Sweden	823.2	221	102	18.5	109	65	225
Switzerland	564.2	150	148	8.6	32	92	181
UK	3,372.0	256	90	24.2	65	75	257
Yugoslavia	1,361.0	33	48	5.8	8	57	123
Europe	32,970.4	100	100	8.5	45	65	100

[a] Agricultural final output in US relative prices and refers to 1957/62. It has been obtained by converting each country's net production into wheat units using US relative prices ('USA weights'), which I have multiplied by US$67.6, the price of one wheat unit (1 ton).

[b] Relative to the average for Europe (=100).

[c] A measure of the density of animals, based on the following weights: horses and mules = 1.0; cattle and asses = 0.8; pigs = 0.2; sheep and goats = 0.1; and poultry = 0.01.

Source: Calculated from Hayami and Ruttan (1985, appendix A).

Table 12.3. *Dietary changes[a] in five European countries, 1951/3 to 1979/81*

		Spain[b]	Italy	France	UK	Germany
Cereals	1951/3	122.6	146.4	116.4	96.7	98.9
	1964/6	102.5	131.3	88.6	76.5	72.6
	1979/81	118.5	183.6	105.9	94.5	92.8
Potatoes[c]	1951/3	104.4	40.5	121.9	104.4	172.3
	1964/6	106.3	42.5	101.0	101.6	111.4
	1979/81	112.0	41.2	79.8	102.6	80.7
Sugar and honey	1951/3	10.6	14.2	26.3	42.7	25.6
	1964/6	22.0	25.9	34.1	50.6	33.7
	1979/81	31.0	34.6	42.2	44.9	44.4
Fats and oils	1951/3	15.3	12.0	15.7	21.2	22.6
	1964/6	23.0	17.6	23.5	22.6	26.5
	1979/81	22.6	26.3	29.1	13.2	29.1
Meat[d]	1951/3	14.2	17.5	60.6	55.1	41.2
	1964/6	28.6	36.9	77.3	69.5	66.5
	1979/81	68.3	73.1	99.9	74.9	97.7
Fish[e]	1951/3	9.9	4.4	5.8	9.9	6.9
	1964/6	14.6	5.5	7.7	9.5	6.6
Eggs	1951/3	4.7	6.9	11.0	12.4	8.0
	1964/6	10.3	9.6	11.1	14.7	13.7
	1979/81	15.8	11.4	14.6	13.0	17.0
Fresh fruit	1951/3	66.8	69.4	50.7	56.9	70.1
	1964/6	90.9	102.3	75.9	44.7	100.0
	1979/81	127.0	129.1	68.2	55.5	104.8
Total calories per day	1951/3	2,490	2,480	2,840	3,110	2,880
	1964/6	2,806	2,818	3,108	3,233	2,927
	1979/81	3,294	3,688	3,529	3,249	3,351
Protein of vegetable origin	1951/3	52.0	50.6	49.8	39.8	38.4
	1964/6	48.0	49.9	41.8	35.7	29.3
	1979/81	44.8	54.7	38.1	36.2	32.8
Protein of animal origin	1951/3	17.8	21.3	43.0	44.9	39.2
	1964/6	29.2	34.1	56.4	52.9	50.8
	1979/81	51.0	50.2	70.1	53.9	59.9

[a] Based on net per capita food supply. Units are in kilograms except for proteins which are in grams.

[b] 1952/3 figures used.

[c] Includes other roots and tubers.

[d] Includes offal.

[e] Estimated edible weight.

Sources: FAO (1971 and 1984) and FAO *Production Yearbook* (1968).

outmigration, the role of comparative advantage in foreign trade, and levels of investment in research and development.

Farm size and scale

Although the question of scale has long been recognised as a problem in the development of Spanish agriculture, the simple division of the country into large areas of *minifundios* and *latifundios* is not enough to explain the failure to close the productivity gap with other countries. Some of Spain's most efficient farmers were to be found within both categories. Thus by the mid-1960s, the growing numbers of machines (such as combine-harvesters) attest to progress on the larger estates. At the other extreme, the fact that Spain accounted for half of the world's exports of oranges on the eve of the Civil War, and about a third in the period 1960/9, reflects the capacity of small farmers, often with less than two hectares at their disposal, to react to international demand.[6] Yet land distribution and farm organisation did affect labour productivity. At the one extreme, the small size of farms in the North, especially in Galicia, was an important constraint on specialisation. As ever, Spanish statistics make any accurate measurement impossible, but a few figures illustrate the difficulties. Given that the regional specialisation was in cattle, the presence of *minifundios* in land holdings was also extended to herd size. Thus, the 1865 census estimated that the average herd size in Galicia was 3.1 animals; by 1974 this had increased to just 4.5 animals.[7] The low livestock densities caused by the physical isolation of many farmers, and the small numbers of animals that most farmers could market hindered both the formation of cooperatives and access to the higher incomes of urban markets.

A second problem was that, with the exception of the area of *latifundios*, farms of even an apparently reasonable size suffered inefficiencies because of fragmentation. One of the most cited agricultural works, *Memoria sobre el fomento de la población rural* by Fermín Caballero, first published in 1863, had as its main theme the need to consolidate fragmented holdings. The costs of the excessive fragmentation in the nineteenth century were essentially limited to the time taken by farmers to travel from one field to another. They increased significantly, however,

[6] The figure in 1960/9 was 31.4 per cent in terms of volume and 26.4 per cent in value (FAO, *Trade Yearbooks*). In 1962, 60 per cent of Valencia's oranges were found on holdings of less than 5 hectares, and a further 18 per cent between 5 and 10 hectares (*Primer censo agrario de España, Valencia*, p. 14).

[7] Domínguez Martín (1990, p. 191) and Ministerio de Agricultura, (1974, pp. 61, 167 and 175).

when the possibilities for mechanisation began to be considered seriously from the turn of the twentieth century. Land fragmentation was especially serious on the *secano* where, as we have seen, improved labour productivity was achieved by increasing the land to labour ratio. Yet legislation to encourage consolidation was only passed in 1952, and progress over the next decade was slow, with only 580,000 hectares being consolidated. By the 1960s, the problem of land fragmentation was worse in Spain than in most other European countries (table 11.6). However, between 1963 and 1971 the area consolidated was 2.9 million hectares, and in Castilla-León, the region where initially most consolidation occurred, average field size increased from 0.3 hectares to 2.5 hectares.[8] By this time, the rural exodus, land consolidation, and mechanisation – together with price support for cereals – had all helped this region to enjoy Spain's highest rate of labour productivity.[9]

Finally, the large estates of absentee landowners in Andalucía and elsewhere provided comfortable incomes to their owners achieved through protected markets and a cheap, abundant labour force. Certainly the *latifundistas* appear to have responded to market signals but the result, as in the southern United States, was not propitious to long-term growth.[10] If property was held in large farms which theoretically might have been mechanised much earlier, the region of Andalucía had very low land to labour ratios, even by Spanish standards (table 10.2). The incentive to mechanise was therefore seriously restricted, and the opportunity to develop an agricultural-machine-tools industry lost.

In all three of these cases there was a need for State intervention to alter property rights. In Spain, as elsewhere, governments were not adverse to changing property rights when it suited them. The large sales of church and municipal lands, and the failed attempt at land reform during the Second Republic provide only two examples. Yet the Spanish governments were slow to appreciate the inevitable demise of the agricultural sector as industrialisation took place, and to provide a more representative government which reflected urban interests. The consequences of this latter omission were, of course, a major factor behind the Civil War. While it would be unusual in the extreme to expect large farmers to legislate against their interests, a number of instances can be cited when they acted particularly harshly against the sector which they claimed so fervently to support. It took, for example, between 1763 and 1926 to provide the legal framework to settle the problem of the *foro* in Galicia, which finally allowed the occupiers of the land full legal pos-

[8] Alario Trigueros (1991, pp. 84 and 131).

[9] Molina Ibáñez (1993, pp. 51–9).

[10] For Southern USA, see especially Whatley (1987).

session (chapter 3). The attempts at creating cooperatives were, in comparison with a country such as France, especially weak (chapter 8). The subdivision of property in north-western Spain increased travel time for farmers and, by the early twentieth century, was increasingly acting as a restriction to mechanisation. The *latifundios* in the south might have become more productive if there had been more fiscal or legal restrictions on the leasing of land, thereby encouraging direct cultivation. Furthermore, with direct cultivation, mechanisation was more likely to occur. Mechanisation and migration would also have been helped by greater levels of literacy in the region. In a recent article, Clara Eugenia Nuñéz has shown that, prior to the 1931–6 Republic, Andalucía suffered not so much from a lack of educational resources but from their poor distribution. Money tended to be spent providing good quality education for a minority rather than basic primary education for all.[11] Naturally, all these points would have threatened some groups' interests. Few pieces of legislation do not. What stands out in the Spanish case is that in the period of the Restoration of the monarchy (1874–1931), there was virtually no real help from the State to increase the output and efficiency of the small and medium-sized farms, and none to undermine the privileged position of the large landowners. There were two notable exceptions to this statement, namely tariff policy and the decline in the real burden of taxation from the late nineteenth century.[12] But if both these policies helped the smaller farmers, they benefited much more those who produced the largest surpluses, namely the big landowners. The logic of government policy has recently been pointed out by Comín, who noted that the Spanish State in the twentieth century has combined low levels of public expenditure (relative to other western European countries) with very high levels of regulation of the economy.[13] Regulation costs little, and has tended to benefit commercial farmers and industrialists – groups which would undoubtedly have had to pay more if the State had invested more in transport infrastructure, education, and health care.

The rural exodus

In the mid-1950s, just before Spain's second rural exodus began in earnest, it was estimated that surplus agricultural labour accounted for as

[11] Núñez (1991, especially pp. 129 and 145).

[12] For the decline in the tax burden for agriculture, see especially Comín (1987, p. 450; 1995, figure 13).

[13] Comín (1990, Table 1). He notes (p. 438) that 'so long as it did not cost the Treasury anything, economic intervention by the Spanish state was limitless'. See also Tortella (1994b, pp. 350–1).

ıany as 2 million workers, or 'over one-third of the total'.[14] Surplus ıbour implies that agricultural output would not have been affected by s reallocation to other sectors of the economy, and economists have laimed to have found it existing in most societies at one time or nother.[15] Although the existence of surplus labour in Spanish agricul-ıre is impossible to prove, it is noticeable that contemporaries rarely omplained of labour shortages. There are two characteristics of excess ıbour in Spanish agriculture over the period. In the first instance, xcess labour was found within the agricultural sector as a result of the elatively long periods of seasonal unemployment. Annual labour emand per hectare for crops such as cereal, olives and vines was often mall. In the Interior and Andalucía, there was little inter-cropping, and ıe second half of the nineteenth and first third of the twentieth century 'as characterised by increasing crop specialisation, which accentuated ıe seasonal demands for labour. Dairy farming, which has traditionally een a major employer of labour in northern Europe, was conspicuously bsent in Spain's *secano*. The crowded Spanish plazas on many weekays represented not a work-shy labour force, as many northern Euroean visitors believed, but rather the hapless victims of a highly seasonal griculture. Whereas workers in countries such as France or Britain ften had as many as 270 days' employment a year, workers in southern pain had perhaps less than half that number.[16] Finally, seasonal unemloyment was rarely off-set by part-time employment outside agricul-ure. Therefore, it seems that there was much less scope over most of ural Spain for households to respond to a growing supply of marketed ommodities by increasing their work efforts, as de Vries has recently uggested occurred in Europe and the United States between the mid-eventeenth and mid-eighteenth centuries.[17]

[14] OES (1957, p. 10).

[15] For example, Schultz (1945, pp. 91–5) claims this was the situation in the United States in the interwar period.

[16] O'Brien and Toniolo (1991, pp. 398–9) suggest 265 days a year for male farmers in Italy and the United Kingdom, and 220 days for landless labourers in Italy. For Andalucía I have estimated about 130 days a year on the eve of the Civil War (Simpson, 1992b, p. 16).

[17] The recent provocative article by de Vries (1994) on the 'industrious revolution' contributes two interesting alternatives to the debate on why Spain was a latecomer. Was it because, as I argue above, there were greater restrictions on the productive employment of household labour even though there was an increase in the supply of goods offered in the market place? Or was it caused by demand restraints for manufactured goods after 1850 as a result of households withdrawing wives and children from the paid labour force because, as occurred in the more developed economies, 'a new set of . . . commodities associated with hygiene and nutrition, the health and education of children, and the achievement of new standards of domesticity and comfort in the home came to appear superior to the available range of market-supplied goods and services' (p. 263). Much more research is required before we can confidently discuss the relative importance of these two factors in Spanish economic development.

Table 12.4. *Relative changes in the number of male workers in European agriculture between 1880 and 1970*[a]

	1880–1	1930–1	1950–1	1970–1
Spain	100	93	118	64
Belgium	100	75	54	20
Denmark	100	92	83	40
France	100	95	71	45
Netherlands	100	124	131	57
Ireland	100	77	59	34
Italy	100	119	113	42
Norway	100	163	146	61
Portugal	100	104	125	77
Sweden	100	108	78	30
UK	100	75	65	41

[a] Dates as given, except Spain 1877, Belgium 1947, France 1954 and 1968, Netherlands 1947 and Ireland 1926.

Sources: Mitchell (1992); for Spain, Nicolau (1989).

If labour appears to have been underemployed in many regions, it is also true that wages were low in the agricultural sector because there was simply too much labour. As shown in chapter 8, emigration prior to the turn of the twentieth century was relatively low and urban growth sluggish, despite what appears to have been a significant difference between agricultural and urban wages. Table 12.4 suggests that Spain's agricultural exodus was not especially slow between 1880/1 and 1930/1 when considered within a European context. Furthermore, as this book has shown, there was considerable regional diversity. In particular, the active population of Andalucía increased by 10 per cent compared to a fall of 13 per cent in the rest of the country. Given what I have said about the level of productivity in this region, the low level of mechanisation and the low land to labour ratios, it is clear that population growth was not a catalyst for agricultural improvement. If labour in Andalucía had left at the same rate as in other regions, then not only would mechanisation have occurred faster, but the need for the controversial Land Reform would have been less.

A second consideration is that Spain differed from most other European countries in that the rural exodus was reversed during the period 1930/1 and 1950/1. Despite a rapid decline after 1950/1, over the period 1880/1 to 1970/1, only Portugal lost labour at slower rates. By 1964, some 34 per cent of the active population was still in agriculture in Spain, compared to 25 per cent in Italy. Both figures are considerably above the 18 per cent in France, 11 per cent in West Germany, 9 per cent in Holland, 6 per cent in Belgium and 4 per cent in the United Kingdom.

Finally, and most importantly, it was neither the speed of the rural exodus nor the absolute numbers employed in agriculture that reflected the weakness of Spanish agriculture. Rather, it was the fact that until the 1960s improved productivity in Spanish agriculture was heavily dependent on reducing labour inputs. Given the importance of extensive cultivation in Spain, productivity increases were achieved essentially by mechanisation, which in turn required increasingly greater land to labour ratios (table 12.2). Between 1890 and 1960, the ratio increased by just 20 per cent in Spain, whilst in Italy the increase was some 30 per cent, in Germany 42 per cent, in Denmark 60 per cent, in the United Kingdom 95 per cent, in France 117 per cent and in the United States 198 per cent.[18] The problem is not therefore simply whether labour left Spanish agriculture faster between 1880 and 1960 than in Ireland or Italy, for example. The crucial point is that, compared with other western European countries, the very nature of Spain's agriculture meant that productivity growth was much more highly geared to improvements in labour-saving technologies (mechanisation) than to improvements in crop yields.

Foreign trade

From the late nineteenth century, if not earlier, Spanish agriculture enjoyed a comparative advantage in the production for export of wine, olive oil and citrus fruit. However, demand was often restricted because foreign governments wished to protect competing domestic products (in the case of wine), or because close substitutes existed (in the case of olive oil). Only with citrus fruit was Spain able to increase output and maintain market share. Yet in terms of employment, it was the vine and olive which were far more important and here there were limits to profits on account of the large quantities of cheap and suitable land and labour. Furthermore, given the low opportunity costs of land, a fall in commodity prices was not usually met by taking plants out of production, but rather by cutting variable costs (mainly labour). The problem was therefore a tendency to overproduce.

In the case of cereals and livestock, resources remained in production, not because the country enjoyed a comparative advantage, but rather because of the low opportunity costs of *secano* land. Although Spain

[18] O'Brien and Prados de la Escosura (1992, tables 5 and 6).

protected its cereal farmers, so too did other countries, such as France and Germany.[19] It is often argued that protection was greater in Spain than other countries on account of the political bargaining power of the larger landowners. However, it is also true that for most cereal land in Spain there were few alternatives, unlike that in the more temperate areas of Europe. If the fall in international grain prices at the end of the nineteenth century encouraged farmers in countries such as Denmark or England to switch resources out of grain and into livestock, this option was not available throughout much of the Mediterranean. As a result, possible changes in crop mix, or the introduction of intensive livestock, allowed many regions of central and northern Europe to adjust to the growing world economy in cereals quicker than in Spain. A measure of this competitive loss can be seen in that Spanish cereals represented 31 per cent of final output in *c.* 1910 when measured in pesetas, but only 23 per cent when measured in pounds sterling.[20] As late as 1960, Lamartine Yates wrote that 'the *secano* provides the technical headache to which the scientists have as yet no adequate answer'.[21] The *secano* in Spain covered approximately 80 per cent of the country's land mass.

Technical change

Finally, we have considered at length in this book the question of technical change. In 1960 Yates wrote that:

> *A priori* one would expect some narrowing of the gap between the more advanced and the less advanced countries, with the latter acquiring the new techniques and catching up the leaders. Not at all. The leaders of 1909–13 have increased most . . .[22]

However, it has been argued that much of the agricultural technology in use in northern Europe had only limited relevance to Spanish conditions. As Hayami and Ruttan have suggested, the direction of technological change and its speed of implementation are likely to be determined by changes in relative prices of factor inputs and commodities. Until the late nineteenth century the abundance of land and the rise in commodity prices ensured that growth in output was achieved through an extension of the area cultivated. From about 1900 to 1936,

[19] See figure 8.1. In 1960 Spanish wheat was 26 per cent above international prices, in 1963 it was 36 per cent above and, in 1966, it was 51 per cent above (OECD, 1969, p. 261).
[20] O'Brien and Prados de la Escosura (1992, p. 526).
[21] Yates (1960, p. 128).
[22] Ibid. (p. 195).

and again in the 1950s, the government's direct and indirect support of commodity prices and the availability of improved ploughs and mineral fertilisers were exploited by farmers to extend once more the area cultivated rather than to improve crop yields. This was the result of both the difficulties in improving crop yields using traditional seed varieties, and the fact that mechanisation offered an easier alternative to reducing unit costs.

Despite stagnant cereal yields, mechanical technology was slow to be introduced in cereal farming prior to the First World War for a variety of reasons – for example, the presence of low wages, the low levels of human capital, lack of support industries, small fragmented farms and the relatively high cost of animals (chapter 7). That low wages continued to be a determining factor at the end of the period can be seen in figure 12.1, which shows that Spanish agricultural wages were the second lowest in Europe (after Portugal). Land fragmentation, as we have seen, was also worse than in most European countries, and land to labour ratios below the average. To measure international levels of human capital is difficult, and much debate exists over which variables are most relevant. Only half the population was literate as late as 1910, although by 1950 the figure had reached 83 per cent.[23] On a more practical level, if the number of motor vehicles per head of population can be considered as a proxy for the number of mechanics, then in 1960/2 Spain had only 11 per cent of the number in France and the United Kingdom, and 30 per cent of those in Italy.[24] According to table 12.2, Spain had less horse power provided by tractors per 100 hectares than any of the seventeen countries.

Spanish cereal farmers benefited from government price intervention, either indirectly through tariffs and import quotas, or directly through fixed domestic prices. As output was essentially increased by bringing more land into cultivation, and by the twentieth century costs were cut through mechanisation, there was little demand for government investment in research into biological technologies. This has led Barciela to note the 'almost total absence of agricultural research' in Spain.[25] Yet some limited research did take place. In chapter 6 we saw that farmers in areas of traditional irrigation, such as Valencia, were adept at changing the crop mix and developing new seed varieties. Progress was considerably slower in the areas of newer irrigation, such as the Ebro, but even here the role played by the experimental farm in Zaragoza can be considered vital. However, the predominance of the *secano* in Spain,

[23] Tortella (1994a, table 6).
[24] Calculated from Mitchell (1992, pp. 4–8 and 718–21).
[25] Barciela (1986, p. 445, cited in Tortella, 1994b, p. 253).

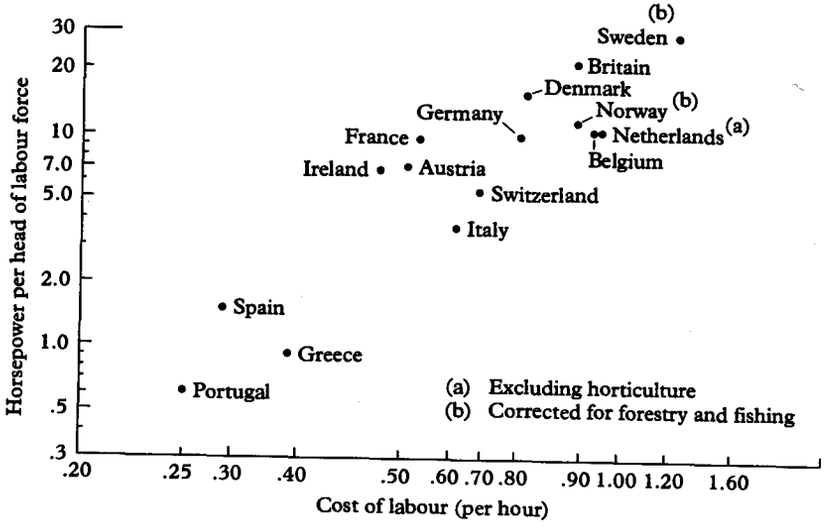


Figure 12.1 Horsepower per head and cost of labour, European countries, 1966
Source: Royal Commission on Farm Machinery – Canada (no date)

together with the fact that most farms in irrigated areas were small, meant that there was less demand for state investment in research and development compared to most other countries. As table 12.2 shows, Spain was again bottom of the European league, with the exception of Portugal, in the number of college-trained agricultural graduates per 10,000 agricultural male workers. Given the low levels of research undertaken by the State, it was the growing links with large food producers that provided farmers with the information and skills to increase both output and quality. This can be seen from the turn of the century in such activities as sugar production and dairying (links with Nestlé), but its real development and influence on diets had to await the late 1950s and 1960s.

From what has been said, it is clear that a major cause of Spain's slow growth over the twentieth century, and, by definition, the slow growth of agriculture, was on account of the two 'lost' decades of the 1930s and 1940s. Two reasons can be identified. First, the failure of a modernising Spain to adopt a more democratic system of government. The rapid growth of cities and the speed of rural outmigration in the interwar period created new demands and expectations. The use of price intervention as in cereals rather than other forms of income support (such as the use of cooperatives), the failure to reform lease law, estab-

lish an income tax or provide systematic poor relief all, in their own way, reflect the economic power of a minority being able to resist the pressures for reform. The same was true, as Pedro Fraile has shown, for industry, where business leaders were able to close markets from foreign competition over long periods.[26] Spain was not unique in these matters, but the Civil War, instead of allowing sweeping changes, simply permitted a continuation of the power held by these classes.[27] Only with the growing emphasis on industry, the opening up of markets and the possibility of international emigration from the late 1950s, was the rural exodus renewed. The backlog of technology available to cereal farmers implied that both rising real wages and declining terms of trade for the sector could be overcome, at least for the larger farms, through mechanisation.

The second feature was the slow growth in trade, and especially the serious contraction that took place between the Depression of the 1930s and the Korean War. As is frequently mentioned, Spain suffered considerably less than most other European countries during the Depression because of the small size of its external sector and its high tariffs. By contrast, the country was probably the last Western nation to recover from the slowdown in international trade after the Second World War. The cause is quite clear – the inability of the early Franco regime to resume normal trade agreements with other European states. As a result, Spanish agriculture in 1950 was probably more 'traditional' than it had been two decades earlier. These decades were essentially lost because the country had failed to establish a widely based democratic regime and because it was unable to continue the rapid structural changes that had been under way since the First World War. Even before Franco's death in 1975, Spain had become a modern society, and traditional agriculture was disappearing rapidly. Now the political transition to democracy was to be achieved, together with entry into the European Economic Community. Spain has since been faced increasingly with modern agriculture's dilemma: that of rapidly increasing productivity creating ever-growing surpluses.

[26] Fraile (1991, especially chapter 6).
[27] This goes against Olson, who notes that political upheavals tend to remove 'growth-repressing organizations and combinations' (Olson, 1982, p. 77).

Appendix: Estimates of agricultural output and consumption in nineteenth-century Spain

Historians of the nineteenth century face serious statistical problems in measuring Spanish agricultural output and productivity.[1] The *Censo de Frutos y Manufacturas* of 1799, which is the most famous of the several attempts by the Spanish government between 1787 and 1803 to measure national agricultural output failed, partly on account of the frequent inertia of local representatives of the Crown, and partly because of their inability to determine accurately the cultivated area.[2] Josep Fontana has demonstrated the weakness of the *Censo de Frutos* as a historical source, both on account of its production estimates and for the prices used.[3] The unpublished figures of the *Junta General de Estadística* (hereafter JGE) for 1857 and 1859, and their 'correction' by Fermín Caballero, illustrate that relatively little had improved by the mid-nineteenth century. The JGE lamented their inability to obtain reliable information from local authorities and regarded their own estimates as far too low. Caballero's correction appears to have been a doubling of the quantities for most products, although for wheat he chose to increase it by 376 per cent![4]

The creation of the *Junta Consultiva Inspectora* in 1883 (later to be the *Junta Consultiva Agronómica* – hereafter JCA) brought about renewed interest in the preparation of annual harvest estimates, although the newspaper *Norte de Castilla* had started publishing them for wheat in 1882. From 1891, annual estimates of the area cultivated, production and crop values are available for all the major cereals and

[1] In Spain, the tithe was not abolished until 1841, but the falling production curves in most series from the time of the Peninsular War are generally regarded as having been caused by a decline in enforcement rather than a simple fall in output (Canales, 1982, pp. 128–68).

[2] See the complaints of Polo y Catalina (1803) who had the unenviable task of organising the data for the *Censo de Frutos*, and Simpson (1989a, pp. 356–8).

[3] Fontana (1967).

[4] Tortella (1985, pp. 73–7). Another problem was that the harvest was one of the century's worst.

legumes, together with products of the vine and olive.[5] If the 1880s estimates are definitely unreliable, those for the 1890s must also be used with caution. Although the statistics still hold a few surprises in the twentieth century, they do, in the words of GEHR, 'improve consistently after 1898'.[6]

The livestock censuses for 1750 (Crown of Castilla only), 1865, 1917, 1929 and 1933 are usually considered reasonably accurate. Others exist (for example in 1799, 1859, 1891 and 1905) but give much less information on how the figures were collected, provide no breakdown by municipality (which might allow more vigorous checking), and they are generally regarded as having been collected by less scientific means than for those years cited above.[7]

Given the limitations in the source material, the room for debate over the changes that took place in agricultural production during the nineteenth century is enormous. To measure changes in the volume of cereals, wine and olive oil produced between 1795 and 1895, Garrabou and Sanz used the *Censo de Frutos* and official estimates from the 1890s.[8] These sources show an annual average increase in gross cereal output of 0.62 per cent, with the increase for the main bread grains, wheat and rye, being 0.54 per cent, slightly below that for population at 0.57 per cent. According to these authors, this small decline in per capita output was offset by imports of wheat (equivalent to 10 per cent of domestic production by the end of the nineteenth century), the relative decline of rye consumption (an inferior grain), and the rapid growth in potato consumption, equivalent to 124 kilograms per person in 1902. Output of wine (must) increased by an annual 1.31 per cent and olive oil by 1.39 per cent. However, as noted in chapter 1, Garrabou and Sanz's estimates for wine in these years should really be 1.03 per cent, and the *Censo de Frutos* in any case is even less reliable for these two crops than for cereals. Although Garrabou and Sanz do not attempt to measure livestock output, they accept that numbers experienced a 'major' decline between 1750 and 1887/91.[9]

A much more ambitious attempt is made by Prados de la Escosura who estimates demand for agricultural products to ascertain whether the contemporary figures for 1799, 1857, 1886/95 and 1903/12 are viable

[5] See Sanz (1981).

[6] GEHR (1983a, p. 246). See also GEHR (1991, pp. 31–3) and Simpson (1989a, pp. 359–61).

[7] See GEHR (1978–9; and especially 1991, pp. 79–92).

[8] Garrabou and Sanz (1985, pp. 121–39).

[9] Ibid. (p. 117).

or not. The model he uses is similar to that used by Crafts and Jackson for eighteenth-century England, and consists of the following equation:[10]

$$\pi D = n \cdot \pi Y + e \cdot \pi R + \pi P$$

where π is annual change, D the demand for agricultural produce (i.e. production minus exports plus imports), Y real per capita income, P population, R relative agricultural prices (i.e. agricultural prices deflated by the general price index) and n and e income and price elasticities of demand.[11]

The model itself contains a number of difficulties. First, there is a circularity in the reasoning, as the equation implies a knowledge of national income, which cannot be calculated unless agricultural production is previously known.[12] Second, the changes in demand are unlikely to be identical to changes in production.[13] Finally, it has to be assumed that there were no changes in income distribution, which would affect the demand for agricultural production.[14] Apart from these theoretical difficulties, economic historians have yet to find any information which might give us a reasonable idea of income and price elasticities for food products in nineteenth-century Spain. Information concerning per capita income is still deficient, and prices series are highly localised during the first half of the century. To reduce the possibility of error, Prados de la Escosura calculates both higher and lower bound figures, using different estimates of per capita income, income elasticities (0.7 and 1.0) and price elasticities (−0.5 and −0.3). The results range from a growth in labour productivity of 50 per cent between 1800 and 1910 on the one hand, to a small decline on the other.[15]

Prados de la Escosura's calculations based on contemporary figures are at the top end of his demand-based estimates and suggest that output virtually tripled over the century, with labour productivity increasing by slightly over a third. According to these calculations, output grew slowly between 1800 and 1857, but then quickened between 1857 and 1903/12. This caused labour productivity to fall in the first period, followed by a rapid recovery during the second half of the

[10] Crafts (1976) and Jackson (1985).
[11] Prados de la Escosura (1988, p. 103).
[12] Tortella (1988, p. 15) and O'Brien (1985, p. 774).
[13] For France, see Ruttan (1978, pp. 714–28).
[14] Prados de la Escosura (1988, p. 122).
[15] Ibid. (cuadro 3.5). However, as Ruttan (1978, pp. 717–8) notes, income elasticity for food at the farm level is often much lower than at the retail level.

century.[16] This scenario appears unlikely, especially given the problems facing farmers towards the end of the nineteenth century and beginning of the twentieth (phylloxera in viticulture, foreign competition for cereal growers and falling livestock numbers). Apart from the major difficulties already noted with nineteenth-century contemporary estimates and the demand model used by Prados de la Escosura, another difficulty is that his contemporary estimates are based on total output (i.e. they include seed and intermediate products), rather than final output. This reduces the problems facing the livestock sector in his estimates, thus exaggerating the increase in total output.

More recently, Prados de la Escosura has recalculated agricultural final output from 1850.[17] For crops between 1855 and 1882, estimates were obtained by using rail and water transport statistics of non-animal output, whilst after 1882 official production statistics were used. Livestock was calculated based on the census figures in 1865, 1891 and 1905/9. These new estimates show a slower growth in labour productivity between 1857 and 1903/12 than his earlier ones, at 41 per cent rather than 67 per cent. This is still appreciably greater than I argue in chapter 1, and it is questionable whether greater commercialisation can be considered an accurate proxy for the growth in output. However, assuming that both Prados de la Escosura's original estimates for the period 1800 to 1857 and his new estimates for 1857 to 1903/12 are correct, then labour productivity is shown to grow by only 20 per cent over 110 years.[18]

Wrigley's attempts to estimate growth in agricultural labour productivity in pre-industrial economies by examining changes in the relative size of the non-agricultural population is frustrated in the case of Spain by the poor quality of much of the census material. However, the evidence for a significant growth in the nineteenth century is lacking. If it is assumed that per capita consumption of food did not change, that international trade remained constant and that the agricultural population was comprised of only those living in the countryside, then the fact that the urban population increased from around 11 per cent of total population in 1800 to 17 per cent in 1900 implies that agricultural productivity would have increased by just 7 per cent.[19] If these assumptions cannot be expected to hold, it is equally true that in Spain there

[16] Output grew by 35 per cent between 1799 and 1857, and 117 per cent between 1857 and 1903/12. Labour productivity fell by 18 per cent, and rose by 67 per cent between the same dates (Prados de la Escosura, 1988, cuadro 3.8).
[17] Prados de la Escosura (1995, pp. 12–20).
[18] Prados de la Escosura (1988, cuadro 3.8; 1995, table 3.1).
[19] See Wrigley (1985, p. 168). Urban population is taken as being that of Spain's provincial capitals.

was not a significant number of workers employed in tasks other than agriculture living in rural areas, unlike England.

In conclusion, if agricultural output grew significantly during the nineteenth century it was driven essentially by demand from population growth. Given this fact, and that agriculture employed approximately two-thirds of the labour force throughout the century, increases in labour productivity were towards the lower of Prados de la Escosura's estimates.

The argument for a slow growth in agricultural output as presented in chapter 1 is based essentially on two arguments: a low level of per capita consumption of calories, and the lack of diversity in diets. As the methods used to calculate the food balance sheet have been discussed in detail elsewhere, I shall concentrate here on the relationship between the supply of calories and the demands on them in a pre-industrial economy.[20] The section is heavily influenced by the pioneering work of Fogel.

To what extent can a diet of 2,096 calories per capita, or 2,733 calories when measured by equivalent adult male units, be considered an adequate diet in an economy such as Spain's in 1900 where two-thirds of the active population were employed in agriculture?[21] In the first instance some measure is required of the distribution of calories according to income groups. Recent studies from less developed countries have reconstructed possible models for eighteenth- and nineteenth-century Europe. Clearly the distribution of calories is less elastic than the consumption of some individual foods (such as meat and fish). Following Fogel's estimate for France and England for the 1790s, I take a coefficient of variation of 0.3, 'the best approximation in the light of current knowledge'. The distribution therefore is virtually identical to his estimate for England in the 1790s (table 13.1).

The human body's demand for calories can be broken down into three different categories. First, the amount of energy required while at rest – the basal metabolic rate (BMR). Second, energy required to eat and digest food, together with essential hygiene; and, finally, other activities whose demand varies considerably. Simply surviving, which involves the first two categories, is estimated at 1.27 BMR, although converting this figure into calories is not easy. For adult males between 20 and 39, living in moderate climates, the BMR range is between 1,350

[20] Simpson (1989a).

[21] For the 2,096 calories, see Simpson (1989a, cuadro 5). The conversion to equivalent male units is based on age distribution as given in Nicolau (1989, p. 69) and coefficients of calorie requirements from Fogel (cited in Bekaert, 1991, table 2).

Table 13.1. *Estimated distribution of daily calories per equivalent adult male in England* c. *1790 and Spain* c. *1900*

Population decile	Daily calorie consumption	Cumulative (%)
Highest	4,329	100
Ninth	3,514	84
Eighth	3,155	71
Seventh	2,897	59
Sixth	2,684	48
Fifth	2,492	38
Fourth	2,309	29
Third	2,120	21
Second	1,903	13
First	1,545	6

X = 2,700 calories per adult male.
(s/X) = 0.3.

Source: Fogel (1991, table 1.3) and see text.

and 2,000 calories 'depending on height and weight'.[22] In the case of Spain, it is likely that the figure was considerably nearer the lower figure in the nineteenth century. The limited information concerning heights shows that Spaniards were some of the shortest people in western Europe, and there is little reason to suppose that they carried excess weight.[23] As a result, I assume that the BMR is equivalent to 1,350 calories per adult male, making the survival diet (i.e. involving no work or leisure activity whatsoever) some 1,715 calories.

When work and leisure activities are included, then the figure becomes considerably higher. Fogel suggests that for a 25-year-old male engaged in subsistence farming in contemporary Asia, 'a typical distribution would be: BMR and maintenance 71 percent, work 21 percent (i.e. 5 hours), and discretionary activity 8 percent'.[24] Converting this into BMR units might produce the following: maintenance (0.71*1.27) + (0.28*5.0) + (0.08*1.4), giving BMR as 2.06 units. If this is converted using the minimum number of calories required for BMR, the figure is 2,800 calories per adult male/day, or slightly above our average 2,733

[22] FAO/WHO/UNU (1985, cited in Fogel, 1991, p. 41).

[23] For the short stature of Spanish males, see Floud, Wachter and Gregory (1990, pp. 20–7).

[24] Fogel (1991, p. 41).

Table 13.2. *Calorie consumption in nineteenth-century Europe*

		Per capita	Adult male equivalent
Spain	1900	2,096	2,733
England	1790		2,700
Italy	1910/14	2,696	3,220
France	1845/54	2,370	3,078
Belgium	1812	2,039	2,674
	1846	2,068	2,693

Sources: Bekaert (1991, table 3); Fogel (1991, p. 44); Simpson (1989, cuadro 5); and Spina (1932, cited in Zamagni, 1989, table 5.6).

figure for Spain in 1900. This figure cannot have been very different from that required in Spanish agriculture.[25] However, such a figure is significantly above what large numbers of the population were receiving, as shown in table 13.1. The bottom third of the population in particular appears to have had insufficient energy to have done more than an hour's hard physical work a day, and for most even that would have been impossible. According to Fogel, insufficient diets were widespread:[26]

> for many European nations prior to the middle of the nineteenth century, the national production of food was at such low levels that the lower classes were bound to have been malnourished under any conceivable circumstance, and that the high disease rates of the period were not merely a cause of malnutrition but undoubtedly, to a considerable degree, a consequence of exceedingly poor diets.

To compare calorie consumption across countries has its problems because of differences in methods of calculation.[27] However, table 13.2 suggests that per capita calorie availability in Spain in 1900 was not so different from that in other European countries at earlier periods during the nineteenth century. Poor diets did not disappear with industrialisation – some 38 per cent of British volunteers to the Boer War were

[25] For example, on a base of 1,728 calories, five hours ploughing would require between 905 and 1,526 additional calories, five hours weeding between 304 and 1,013 more, and five hours collecting and spreading manure would require 1,409 more (calculated from Fogel 1991, table 1.2).

[26] Ibid. (p. 40).

[27] First, a figure for food loss and wastage is sometimes omitted, and calories obtained from alcoholic beverages ignored. Second, no figures are included for such activities as hunting and scavenging. Because it is not known how representative a sample is for the country as a whole, estimates based on household expenditure must be treated with caution.

declared unfit, and Britain in 1914 'was still so chronically undernourished that for millions of soldiers and civilians wartime rations represented a higher standard of feeding than they had ever known before'.[28] It therefore should not come as too much of a surprise to learn that in Spain at about the same time, the general population suffered from an inadequate diet and that meat-eating was considered a luxury of the wealthy.

[28] Burnett (1989, p. 243).

Bibliography

For abbreviations used, see page xx.

PRIMARY SOURCES

Abela y Sanz, E. (1877) 'La trilla mecánica en España', GAMFM, *1a* época, 3, pp. 535–52.

Agenjo Cecilia, C. (1956) *Enciclopedia de la leche*, Madrid.

Antúnez, L. (1887) *Informe sobre la crisis actual de las industrias pecuaria y vitivinícola emitido por una Junta de Notables convocada al efecto y presidida por Don Luis Antúnez*, Barcelona.

Anuario Estadístico de España, various years, Madrid.

Arévalo y Baca, J. (1886) *Estado actual de la producción de la naranja y medios de mejorarlo*, Valencia.

Arrazola, F. (1896) *Informe acerca de la producción, comercio y consumo de trigo en España*, Madrid.

Asociación General de Ganaderos (*c.* 1925) *Leche, queso y manteca. Estadística de la producción en España*, Madrid.

Asso, I. de (1798) *Historia de la economía política de Aragón*, Zaragoza.

Bello, S. (1914) 'Coste de las obras hidráulicas en España', *1 Congreso Nacional de Riegos celebrado en Zaragoza en octubre de 1913*, Zaragoza, vol. 2.

Benítez Porral, C. (1904) *Memoria que obtuvo el accésit en el Concurso 'El problema agrario en el Mediodía de España'*, Madrid.

Bernaldo de Quirós, C. (1973) 'Informe acerca del paro de los jornaleros del campo de Andalucía durante el otoño de 1930' (first published 1931), in Ministerio de Trabajo, *Estudios y documentos – La crisis agraria andaluza de 1930–1*, Madrid.

Brenan, G. (1960) *The Spanish Labyrinth*, (1st edn: 1943), Cambridge.

Caballero, F. (1864) *Memoria sobre el fomento de la población rural*, (1st edn: 1863), Madrid.

Cánovas del Castillo, J. y Gamazo y Abarca, J.A. (1915) *Aspecto económico-arancelario de la producción cereal en España*, Madrid.

Carrasco García, J.M. (1952) *Compendio arrocero*, Valencia.

Carrión, P. (1975) *Los latifundios en España*, (1st edn: 1932), Madrid.

Cascón, J. (1934) *Agricultura española*, Madrid.

Castro, L. (1957) 'Los fertilizantes en España', *Revista de Estudios Agro-Sociales*, no. 20, pp. 49–73.

Cavanilles, J.A. (1795–7) *Observaciones sobre la historia natural, geografía, agricultura, población y frutos del reino de Valencia*, Madrid, 2 vols.

Caxa de Leruela, M. (1975) *Restauración de la antigua abundancia de España*, (1st edn: *c.* 1630), Madrid.

Confederación Nacional de Viticultores (1925) *La crisis vitícola y sus soluciones*, Valencia.

Costa, J. (1911a) 'El cultivo de cereal es antieconómico en España', *Agricultura Armónica*, (1st edn: 1880), Madrid.

(1911b) 'Agricultura de regadío', *Política Hidráulica*, (1st edn: 1892), Madrid.

(1911c) 'El Canal de Tamarite, cien años después', *Política Hidráulica*, (1st edn: 1892) Madrid.

(1911d) 'Caracteres de la política hidráulica', *Política Hidráulica*, (1st edn: 1896), Madrid.

(1911e) 'Agricultores, !a europeizarse', *Agricultura Armónica*, (1st edn: 1901), Madrid.

Crisis Agrícola y Pecuaria, La (1887–9) *Actas y dictámenes de la comisión creada por el Real Decreto de 7 de julio de 1887 para estudiar la crisis que atraviesa la agricultura y la ganadería*, Madrid, 6 vols.

Crisis Arrocera (1887) *Actas y Dictámenes de la comisión creada por R.D. de 20 de julio de 1886 para estudiar la situación del cultivo del arroz en las provincias de Levante*, Madrid.

Denman, J.L. (1876) *Wine and its Counterfeits*, London.

Díaz del Moral, J. (1977) *Historia de las agitaciones campesinas andaluzas* (1st edn: 1929), Madrid.

Dirección General de Aduanas (various years) *Estadísticas de Comercio Exterior*, Madrid.

Dirección General de Agricultura, Industria y Comercio (1891a) *Avance estadístico sobre el cultivo cereal y de leguminosas asociadas en España, formado por la Junta Consultiva Agronómica, 1890. Quinquenio 1886 a 1890, ambos inclusive.* Madrid, 3 vols.

(1891b) *Avance estadístico sobre el cultivo y producción de la vid en España formado por la Junta Consultiva Agronómica, 1889.* Madrid.

(1892) *La Ganadería en España. Avance sobre la riqueza pecuaria en 1891, formado por la Junta Consultiva Agronómica conforme a las memorias reglamentarias que en el citado año han redactado los ingenieros del Servicio Agronómico.* Madrid, 5 vols.

Dirección General de Agricultura y Montes (1923) *El aceite de oliva*, Madrid.

Dirección General de Minas, Montes y Agricultura (1911) *Informe relativo al estado económico de las minas de España y la situación de los obreros*, Madrid.

Dirección General de Trabajo (1931) *Estadística de salarios y jornadas de trabajo referidas al período 1914–1930*, Madrid.

Elías de Molins, J. (1904) *Algunos datos y consideraciones sobre los trigos y vinos de España*, Barcelona.

Espejo, Z. (1900) *Costumbres de derecho y economía rural consignadas en los contratos agrícolas usales en las provincias de la península española, agrupadas según los antiguos reinos*, Madrid.

Exposición Vinícola Nacional (1878–9) *Estudio sobre la . . . de 1877*, Madrid.

Ferrari, E. (1926) 'Irrigation in Spain: a new type of institution', *International Review of Agricultural Economics*, iv, 3, July–Sept, pp. 397–414.
Flores de Lemus, A. (1926) 'Sobre una dirección fundamental de la producción rural española', reprinted in *Moneda y Crédito*, 1951 no. 36, pp. 141–68.
Font de Mora, R. (1938) *Comercio de los agrios españoles*, Valencia.
(1939) *El arroz: su cultivo, molinería y comercio*, Barcelona.
(1954) *El Naranjo, su cultivo, explotación y comercio*, Madrid.
Food and Agricultural Organization (1950) *Farm Mechanization*, Rome.
(1960) *World Census*, Rome.
(1963) *The World Rice Economy in Figures, 1909–1963*, Rome.
(1971) *Food Balance Sheets 1964–66*, Rome.
(1984) *Food Balance Sheets 1979/81*, Rome.
(various years) Production Yearbooks, Rome.
Ford, R. (1970) *Gatherings from Spain*, (1st edn: 1846), London and New York.
Granja Instituto de Zaragoza (1906) *Colección de trabajos publicados 1881–1906*, Zaragoza.
Guía mercantil de España (1829) Madrid, 2 vols.
Hidalgo Tablada, J. de (1864) *Curso de Economía Rural Española*, 2 vols., Madrid.
(1870) *Tratado del cultivo de la vid en España*, Madrid.
Instituto Nacional de Estadística (INE) (1964). *Encuesta de Renta Agraria, Año 1964*, Madrid.
Instituto de Reformas Sociales (1977) *Memoria acerca de la información agraria en ambas Castillas*, (1st edn: 1904), Madrid.
(1923) *La rabassa morta y su reforma*, Madrid.
International Bank for Reconstruction and the Food and Agriculture Organization of the United Nations (1966) *The Development of Agriculture in Spain*, Washington, D.C.
International Institute of Agriculture (various years) *Yearbook*.
Janini Janini, R. (1914) *El perfeccionamiento de los métodos de cultivo del arroz en la provincia de Valencia como causa del cambio de su población equina*, Valencia.
Jiménez Cuende, F. (1934) *Reconstitución del Viñedo*, Madrid.
Jovellanos, G.M. de (1986) *Informe sobre la ley agraria*, (1st edn: 1793), Madrid.
Laborde, A. de (1827–30) *Itinéraire descriptif de l'Espagne*, Paris, 5 vols.
Labrada, J.L. (1971) *Descripción económica del Reino de Galicia*, (1st edn: 1804), Vigo.
Laguna, León (1903) 'La tierra labrantía y el trabajo agrícola en la provincia de Huesca', *Revista de Huesca*, I, pp. 95–116 and 164–78.
Lama y Arenal, (1929) *El abstacimiento de leche a las grandes poblaciones*,
Lamarca, A. (1922) *El comercio de aceites en España*, Madrid.
Larraz, J. (1935) *El ordenamiento del mercado triguero en España*, Madrid.
Liepmann, H. (1938) *Tariff Levels and the Economic Unity of Europe*, London.
Llauradó, A. (1884) *Tratado de aguas y riesgos*, Madrid, 2 vols.
Llorente, A. (1899) *Los abonos*, Madrid.
López y Peñalver (1812) *Reflexiones sobre el precio del trigo*, Madrid.
López Guardiola, E. (1914) 'Operaciones culturales de recolección y de elaboración: máquinas más indicadas para perfeccionar y abaratar estas operaciones', *V Congreso Internacional de Arroces celebrado en Valencia del 16 al 24 de Mayo de 1914*, Valencia.
Madoz, P. (1848–50) *Diccionario geográfico, estadístico e histórico de España y sus posesiones de Ultramar*, Madrid, 16 vols.
Mallada, L. (1969) *Los males de la patria*, (1st edn: 1890), Madrid.
Manjarres y Borarell, R. (1871) *Memoria sobre el mejoramiento de nuestros aceites*, Barcelona.
(1896) *El aceite de oliva*, Madrid.
Martínez Catalán, V. (1896) *Examen de las causas que han producido la pérdida de la cosecha de seda desde 1854*, Valencia.
Maylin, A. (1905) *Manual práctico para el cultivo del naranjo*, Valencia.
(*c.* 1905) *Manual práctico para el cultivo del arroz*, Valencia.
Melgares, R. (1887) *Memoria acerca del estado de la industria sericola en España*, Madrid.
Ministerio de Agricultura (1934) *Tres estudios económicos. Apéndice al Anuario estadístico de las producciones agrícolas. Año 1933*, Madrid.
(1966) *El medio rural castellano y sus posibilidades de ordenación*, Madrid.
(1974) *Mapa Ganadero Nacional.* I. Vacuno, Junio, 1974, Madrid.
(1979) *Catastro vitícola y vinícola, 13-Ciudad Real Año 1978*, Madrid.
Ministerio de Agricultura, Comercio y Obras Públicas. Dirección General de Agricultura, n.d., *Noticias estadísticas sobre la producción agrícola española por la Junta Consultiva Agronómica, 1902*, Madrid.
(1904) *El regadío en España. Resumen hecho por la Junta Consultiva Agronómica sobre riegos, conforme a las Memorias de 1904 remitidas por los ingenieros del Servicio Agronómico Provincial.* Madrid.
Ministerio de Fomento (1886) *Información vinícola*, Madrid.
Ministerio de Fomento (1912) *Memoria relativa a los servicios de la Dirección General de Agricultura, Minas y Montes*, Madrid, 2 vols.
Ministerio de Fomento. Dirección General de Agricultura, Minas y Montes (1915) *Avance estadístico de la riqueza que en España representa la producción media anual en el decenio de 1903 a 1912 de cereales y leguminosas, vid y olivo . . .*, Madrid.
(1918) *Medios que se utilizan para suministrar el riego a las tierras y distribución de los cultivos en la zona regable. Resumen hecho por la Junta Consultiva Agronómica de las Memorias de 1916, remitidas por los ingenieros del Servicio Agronómico Provincial.* Madrid, 2 vols.
(1920) *Estudio de la ganadería en España. Resumen hecho por la Junta Consultiva Agronómica de las Memorias de 1917, remitidas por los ingenieros del Servicio Agronómico Provincial*, Madrid, 2 vols.
(1921) *Material fertilizante empleado en la agricultura. Resumen hecho por la Junta Consultiva Agronómica de las Memorias de 1919 remitidas por los ingenieros del Servicio Agronómico Provincial*, Madrid.
Ministerio de Obras Públicas. Centro de Estudios Hidrográficos (n.d.) *Plan nacional de obras hidráulicas*, Madrid, 3 vols. Published in 1933 or 1934.
Montojo Sureda, J. (1945) *La política española sobre trigos y harinas (Años 1900–1945)*, Madrid.
Moore, W.E. (1945) *Economic Demography of Eastern and Southern Europe*, League of Nations, Geneva.

Morote, F. (c.1914) 'Comercio mundial del arroz: conveniencia de una reglamentación internacional que garantice la autenticidad de las marcas y procedencias', *V Congreso Internacional de Arroces celebrado en Valencia del 16 al 24 de mayo de 1914*, Valencia.
Naval Intelligence Division, English Admiralty, *Spain and Portugal*, London, 4 vols.
Nicolau, J. (1905) *Las obras de riego en Egipto*, Madrid.
Nicolau, J. and Puig de la Bellacasa, N. (1908) *Las obras de riego en los Estados Unidos de América*, Madrid.
Noriega y Abascal, E. (1981) 'Memoria acerca la fabricación de aceites en la provincia de Sevilla', *Agricultura y Sociedad*, 19, (first published 1901).
Organization for Economic Co-operation and Development (1969) *Agricultural Policy Reports*, 'Agricultural Development in Southern Europe'.
Parada y Barreto, D. (1868) *Noticias sobre la historia y estado actual del cultivo de la vid y del comercio vinatero de Jerez de la Frontera*, Jerez de la Frontera.
Peces Barba, G. (1932) *Ley de reforma agraria*, Madrid.
Perpinya i Grau, R. (1932) *La crisi del Priorat*, Barcelona.
Pequeño y Muñoz, J. (1879) *Nociones acerca de la elaboración de aceite de oliva*, Madrid.
Polo de Bernabé, F. (1846) *Memoria sobre el guano y su aplicación para varias cosechas en el reino de Valencia*, Valencia.
Quevedo y García Lomas, J. (1904) *Memoria . . . al concurso de 1903. El socialismo agrario en Andalucía y la reforma del servicio agronómico del Estado*, Madrid.
Redding, C. (1851) *History and Description of Modern Wines*, London.
Rivera y Casanova (1897) *La tierra labrantía y el trabajo agrícola en la provincia de Zaragoza*, Madrid.
Rodrigánez, C. (1977) *Memoria que obtuvo el premio ofrecido por S.M. el Rey en el Concurso . . . ante el Instituto de Reformas Sociales*, (1st edn: 1904), Madrid.
Rosón Pérez, L. (1948) *La riqueza citrícola Española*, Madrid.
Royal Commission on Farm Machinery – Canada (n.d.) *Demand for farm machinery – western Europe*,
Sánchez, P. (1802) *Memoria sobre los ganados de Galicia*.
Sanz Bremón, M. (1979) 'Memoria sobre el estado de la agricultura en la provincia de Valencia', *Estudis d'història agrària*, 2, pp. 212–53, (first published 1875).
(1979) 'Contestación al interrogatorio publicado por la DGA con fecha 20 de enero de 1881', *Estudis d'història agrària*, 2, pp. 254–88, (first published 1881).
Sanz Egaña, C. (1927) *Estadística del Matadero y mercado de ganados de Madrid. Año 1926*, Cuenca.
(1948) *Enciclopedia de la Carne*, Madrid.
Shaw, T.G. (1863) *Wine, the Vine and the Cellar*, London.
Shaw, T. (1911) *Dry Land Farming*, St. Paul, Minnesota.
Senador Gómez, J. (1915) *Castilla en escombros*, Valladolid.
Serrano, F. (1901) 'Consejos acerca de la siega con máquinas segadoras en España', EPAPM, nos. 237, 239, 240; 165–6, 177–8, 187–8.
Smith, A. (1970) *The Wealth of Nations*, (1st edn: 1776), Penguin Books.

Torres, M. de (1934) 'El precio del trigo y del pan' in *Agricultura Revista Agropecuaria*, vol. vi, no. 64, pp. 231–3.
(1944), *El problema triguero y otras cuestiones fundamentales de la Agricultura española*, Madrid.
Tovey, C. (1880) *Wine Revelations*, London.
Townsend, J. (1791) *A Journey Through Spain in the Years 1786 and 1787, with Particular Attention to the Agriculture, Manufactures, Commerce, Population, Taxes and Revenue of that Country*, London, 3 vols.
United Kingdom, *Overseas Economic Survey* (1949) 'Spain. Economic and Commercial Conditions in Spain', by J. Walker, Board of Trade, London.
(1952) 'Spain. Economic and Commercial Conditions in Spain', by G.C. Pelham, Board of Trade, London.
United Nations – Food and Agricultural Organization (1954) *European Agriculture. A Statement of Problems*, Geneva.
United States Bureau of the Census (1975) *Historical Statistics of the United States*, Washington, D.C.
United States Department of Agriculture (1932) *Fifteenth Census of the United States: 1930, Agriculture*, vol. iv, Washington D.C.
(1950) *Foreign Agricultural Economic Report no. 56*, 'A study of the citrus industry of Spain', by J.H. Burke, Washington, D.C.
(1956) *Statistical Bulletin no. 197*, 'Costs and returns. Commercial family-operated farms by type and size', Washington, D.C.
(1965) *Foreign Agricultural Economic Report no. 27*, 'Changes in agriculture in 26 developing nations, 1948 to 1963', Washington, D.C.
(1982) *Statistical Bulletin no. 697*, 'Economic indicators of the farm sector. Production and efficiency statistics, 1980', Washington, D.C.
Utor, L.M. (n.d.) *La agricultura moderna*, Madrid.
Vizetelly, H. (1876) *Facts about Sherry Gleaned in the Vineyards and Bodegas of the Jerez, Seville, Moguer, and Montilla Districts during the Autumn of 1875*, London.
Zulueta Gomis (n.d.) *Canales de Riego*, Barcelona.

SECONDARY SOURCES

Abad García, V. (1984) *Historia de la Naranja (1781–1939)*, Valencia.
Alario Trigueros, M. (1991) *Significado espacial y socioeconómico de la concentración parcelaria en Castilla y León*, Madrid.
Allen, R.C. (1988) 'The growth of labour productivity in early modern English agriculture', *Explorations in Economic History*, 25, pp. 117–46.
(1991) 'The two English agricultural revolutions, 1450–1850', in Campbell and Overton (eds.), pp. 236–54.
(1992) *Enclosures and the Yeomen, The Agricultural Development of the South Midlands 1450–1850*, Oxford.
(1994) 'Agriculture during the industrial revolution', in Floud and McCloskey (eds.).
Allen, R.C. and Ó Gráda, C. (1988) 'On the road again with Arthur Young: English, Irish, and French Agriculture during the Industrial Revolution', *The Journal of Economic History*, 48, 1, pp. 93–116.

Anderson, M. (1988) *Population Change in North-Western Europe, 1750–1850*, Basingstoke.
Anes, G. (1969) *Economía e 'Ilustración' en la España del siglo XVIII*, Barcelona.
(1970a) *Las crisis agrarias de la España moderna*, Madrid.
(1970b) 'La agricultura española desde comienzos del siglo XIX hasta 1868: algunos problemas', in Schwartz (ed.) *Ensayos sobre la economía española a mediados del siglo XIX*, Madrid.
(1984) 'El sector agrario en la España moderna', *Papeles de Economía Española*, no. 20, pp. 2–19.
Angladette, A. (1969) *El arroz*, Barcelona.
Arango, J. (1987) 'La modernización demográfica de la sociedad española', in Nadal, Carreras and Sudriá (eds.), pp. 201–36.
Baines, D. (1994) 'European emigration, 1815–1930: looking at the emigration decision again', *Economic History Review*, 47, pp. 525–44.
Bairoch, P. (1988) *Cities and Economic Development: From the Dawn of History to the Present*, Chicago.
(1989) 'Les trois révolutions agricoles de monde développé: rendements et productivité de 1800 à 1985', *Annales ESC*, 2, pp. 317–53.
Balcells, A. (1980) *El problema agrario en Cataluña. La cuestión Rabassaire*, Madrid.
Barbancho, A.G. (1960) 'Análisis de la alimentación española', *Anales de Economía*, 18, pp. 73–119 and 271–367.
Barciela, C. (1986) 'Introducción', in Garrabou, Barciela and Jiménez Blanco (eds.), pp. 383–454.
(1989) 'Sector agrario (desde 1936)', in Carreras (ed.), pp. 131–56.
Barreiro Gil, J. (1983) 'La generalización de la producción de mercancías y la modernización productiva de la agricultura en Galicia, 1876–1976', *Revista de Historia Económica*, 1, pp. 133–46.
Behar, R. (1991) *The Presence of the Past in a Spanish Village, Santa María del Monte*, (2nd edn), Princeton.
Bekaert, G. (1991) 'Caloric consumption in industrializing Belgium', *Journal of Economic History*, 51, pp. 633–55.
Bernal, A.M. (1978) 'El latifundio y su evolución', in Artola, Bernal and Contreras, *El latifundio. Propiedad y explotación ss. XVIII-XX*, Madrid.
(1979) *La lucha por la tierra en la crisis del Antiguo Régimen*, Madrid.
(1981) 'El rebaño hambriento en la tierra feraz', in Domínguez Ortiz (ed.), *Historia de Andalucía*, 8, Madrid.
(1985) 'La llamada crisis finisecular (1872–1919)', in García Delgado (ed.), *La España de la Restauración*, Madrid.
(1988) *Economía e historia de los latifundios*, Madrid.
Bilbao, L.M. and Fernández de Pinedo, E. (1984) 'La producción agrícola en el País Vasco Peninsular, 1537–1850. Tendencia general y contrastes comarcales: una aproximación', *Sociedad de Estudios Vascos*, San Sebastián, pp. 83–196.
Binswanger, H.P. (1984) *Agricultural Mechanization: A Comparative Historical Perspective*, World Bank Staff Working Papers, no. 673, Washington.
Blum, J. (1978) *The End of the Old Order in Europe*, Princeton.

Bogue, A. (1983) 'Changes in mechanical and plant technology: the Corn Belt', *Journal of Economic History*, vol. 43, pp. 1–21.
Boserup, E. (1965) *The Conditions of Agricultural Growth*, New York.
(1981) *Population and Technology*, Oxford.
Burnett, J. (1989) *Plenty and Want. A Social History of Food in England from 1815 to the Present Day*, (3rd edn), London.
Buxade, C. (1982) *Perspectivas de la ganadería española*, Madrid.
Cabo, A. (1986) 'Agricultura y ganadería', in Terán, Solé Sabarís and Vilá Valentí (eds.) *Geografía general de España*, Barcelona.
Cabral Chamorro, A. (1987) 'Observaciones sobre la regulación y ordenación del mercado del vino de Jerez de la Frontera 1850–1935: los antecedecentes del Consejo Regulador de la Denominación de Origen 'Jerez-Xérés-Sherry"', *Agricultura y Sociedad*, 44, pp. 171–99.
Calatayud, S. (1984) 'Transformaciones jurídicas y sociales en la Acequia Real del Júcar durante el s. XIX', *Estudis d'Història Contemporània del País Valenciá*, 5, pp. 295–322.
(1986) Agricultura y capitalismo. El desarrollo agrario valenciano durante la segunda mitad del siglo XIX: la Ribera del Xúquer, unpublished Ph.D. thesis, University of Valencia.
(1989a) *Capitalismo agrario y propiedad campesina. La Ribera del Xúquer, 1860–1930*, Valencia.
(1989b) 'L'expansió citrícola valenciana. Producció i propietat de la terra a la Ribera del Xúquer, 1860/1930', *Recerques*, 22, pp. 95–116.
(1990) 'Los inicios de la mecanización en el regadío valenciano, 1850–1930', *Areas. Revista de Ciencias Sociales*, 12, pp. 201–11.
(1992) 'Explotación de la tierra y tipos de mercado en la agricultura de la España contemporánea. Un comentario', *Noticiario de Historia Agraria*, 2, pp. 233–44.
Campbell, B.M.S. (1991) 'Land, labour, livestock, and productivity trends in English seignorial agriculture, 1208–1450', in Campbell and Overton (eds.), pp. 144–82.
Campbell, B.M.S. and Overton, M. (1991) 'Productivity change in English agricultural development', in Campbell and Overton (eds.), pp. 1–50.
(eds.) (1991), *Land, Labour and Livestock: Historical Studies in Agricultural Productivity*, Manchester.
Canales, E. (1982) 'Los diezmos en su etapa final', in Anes, (ed.) *La economía española al final del Antiguo Régimen, 1. Agricultura*, pp. 105–87.
Carmona Badía, J. (1990) *El atraso industrial de Galicia. Auge y liquidación de las manufacturas textiles (1750–1900)*, Barcelona.
Carmona Badía, X. and Puente, de la, L. (1988) 'Crisis agraria y vías de evolución ganadera en Galicia y Cantabria', in Garrabou (ed.), pp. 181–211.
Carreras, A. (1989a) 'Industria', in Carreras (ed.), pp. 169–247.
(1989b) 'Depresión económica y cambio estructural durante el decenio bélico (1936–1945)', in Tuñón de Lara (ed.), *El primer franquismo. España durante la Segunda Guerra Mundial*, Madrid.
(1989c) 'Renta y riqueza', in Carreras (ed.).
(ed.) (1989) *Estadística históricas de España siglos XIX-XX*, Barcelona.

Carnero i Arbat, T. (1980) *Expansión vinícola y atraso agrario (1870–1900)*, Madrid.

Castillo, J.J. (1979) *Propietarios muy pobres. Sobre la subordinación política del pequeño campesino. La Confederación Nacional Católico-Agraria (1917–1942)*, Madrid.

Castro, C. de (1987) *El pan de Madrid. El abasto de las ciudades españolas del Antiquo Régimen*, Madrid.

Chandler, T. and Fox, G. (1974), *3000 Years of Urban Growth*, New York.

Christensen, P. (1981) 'Land abundance and cheap horsepower in the mechanization of the antebellum United States economy', *Explorations in Economic History*, 18, pp. 309–29.

Clark, G. (1987) 'Productivity growth without technical change in European agriculture before 1850', *Journal of Economic History*, 47, pp. 419–32.

(1991) 'Labour productivity in English agriculture, 1300–1860', in Campbell and Overton (eds.), pp. 211–35.

Cleary, M.C. (1989) *Peasants, Politicians and Producers: The Organisation of Agriculture in France since 1918*, Cambridge.

Collins, E.J.L. (1969) 'Labour supply and demand in European agriculture, 1800–1880', in Jones, E.L. and Woolf, S.J. (eds.), *Agrarian Change and Economic Development. The Historical Problems*, London.

(1987) 'The rationality of "surplus" agricultural labour: mechanization in English agriculture in the nineteenth century', *Agricultural History Review*, 35, pp. 36–46.

Colomé i Ferrer, J. (1990) 'Les formes d'accés a la terra a la comarca de l'Alt Penedès durant el segle XIX: el contracte de rabassa morta i l'expansió viti-vinícola', *Estudis d'Història Agrària*, 8.

Comín, F. (1987) 'Las transformaciones tributarias en la España de los siglos xix y xx', *Hacienda Pública Española*, 108/9, pp. 441–65.

(1990) Las administraciones públicas', in García Delgado (ed.) *España Economía*, Madrid, pp. 431–69.

(1995) 'Public Finance in Spain during the 19th and 20th Centuries', in Martín Aceña and Simpson (eds.).

Cordero, R. and Menéndez, F. (1978) 'El sistema Ferroviario Español', in Artola (ed.) *Los ferrocarriles en España, 1844–1943*, Madrid.

Crafts, N.F.R. (1976) 'English economic growth in the eighteenth century: a re-examination of Deane and Cole's estimates', *Economic History Review*, 29, pp. 226–35.

(1985) *British Economic Growth during the Industrial Revolution*, Oxford.

David, P. (1975) *Technical Choice, Innovation and Economic Growth*, Cambridge.

Domínguez Martín, R. (1988) *Actividades comerciales y transformaciones agrarias en Cantabria, 1750–1850*, Santander.

(1990) 'Sociedad y reproducción de las economías familiares en el norte de España (1800–1860)' in Sierra Alvarez, *Campesinos y pescadores del norte de España*, F. Le Play, Madrid.

(1992) Campesinos y mercado. La economía campesina del norte de España, 1750–1880, unpublished Ph.D. thesis, University of Cantabria.

Dopico, F. (1983) 'Fuerza de trabajo, rendimientos y producción agraria en Galicia a fines del siglo XX', *Revista de Historia Económica*, 1, pp. 147–64.

Drumond, J.C. and Wilbraham, A. (1958) *The Englishman's Food: A History of Five Centuries of English Diet*, London.

Escrivá, J.L. and Llopis, E. (1987) 'La integración del mercado triguero en la Castilla la Vieja-León del Antiguo Régimen: avance y estancamiento', *Hacienda Pública Española*, 108–9, pp. 117–31.

FAO/WHO/UNU (1985) *Energy and Protein Requirement*, Technical Report Series, no. 724, Geneva.

Fernández Clemente, E. (1990) 'La política hidráulica de Joaquín Costa', in Pérez Picazo y Lemeunier (eds.), *Agua y modo de producción*, Barcelona.

Fernández García, A. (1971) *El abastecimiento de Madrid en el reinado de Isabel II*, Madrid.

Fernández de Pinedo, E. (1974) *Crecimiento económico y transformaciones sociales del País Vasco (1100–1850)*, Madrid.

Fernández Marco, J.I. (1961) *El Canal Imperial de Aragón, estudio geográfico*, Zaragoza.

Fernández Martínez, (1963) *La vid y el vino en La Mancha*, Madrid.

Fisher, F.J. (1935) 'The development of the London food market, 1540–1640', *Economic History Review*, 5, pp. 46–64.

Flora, P., Kraus, F. and Pfenning, W. (1987) *State, Economy, and Society in Western Europe 1815–1975*, 2 vols, Frankfurt.

Floud, R. and McCloskey, D. (eds.) (1994) *The Economic History of Britain since 1700*, (2nd edn), Cambridge.

Floud, R., Wachter, K. and Gregory, A. (1990) *Health, Height and History: Nutritional Status in the United Kingdom, 1750–1980*, Cambridge.

Fogel, R.W. (1991) 'The conquest of high mortality and hunger in Europe and America: timing and mechanisms', in Higonnet, P., Landes, D.S. and Rosovsky, H., *Favourites of Fortune: Technology, Growth and Economic Development since the Industrial Revolution*, Cambridge, Massachusetts.

Fontana, J. (1967) 'El Censo de Frutos y Manufacturas de 1799: un análisis crítico', *Moneda y Crédito*, 101, pp. 54–89.

(1975) *Cambio económico y actitudes políticas en la España del siglo XIX*, (2nd edn), Barcelona.

(1978) 'La crisis agraria de comienzos del siglo xix y sus repercusiones en España', *Hacienda Pública Española*, 55, pp. 177–90.

(1985) 'La desamortización de Mendizábal y sus antecedentes', in García Sanz and Garrabou (ed.), pp. 219–44.

(1986) 'La dinámica del mercado interior', in Martínez Vara (ed.), *Mercado y desarrollo económico en la España contemporánea*, Madrid, pp. 85–96.

Fraile, P. (1991) *Industrialización y grupos de presión. La economía política de protección en España, 1900–1950*, Madrid.

(1993) 'La economía política del proteccionismo', paper presented at the *V Congreso de la Asociación de Historia Económica*, San Sebastián, 1993.

Franks, P. (1992) *Japanese Economic Development. Theory and Practice*, London.

Frax Rosales, E. and Matilla Quiza, M.J. (1988) 'Transporte, comercio y comunicaciones', in Artola (ed.), *Enciclopedia de Historia de España*, vol. 1, Madrid.

Galassi, F. (1986) 'Reassessing Mediterranean agriculture: retardation and growth in Tuscany, 1870–1914', *Rivista di storia economica*, 3, pp. 91–121.

(1992) 'Tuscans and their farms: the economics of share tenancy in fifteenth-century Florence', *Rivista di storia economica*, 9, pp. 77–94.
Gallego, D. (1986) 'Transformaciones técnicas de la agricultura española en el primer tercio del siglo XX', in Garrabou, Barciela and Jiménez Blanco (ed.), pp. 171–229.
García Badell, G. (1960) 'La distribución de la propiedad agrícola de España en las diferentes categorías de fincas', *Revista de Estudios Agro-Sociales*, pp. 7–32.
García González, A. and Barciela López, C. (1983) 'Un análisis crítico de las series estadísticas de los precios del trigo entre 1937 y 1980', *Agricultura y Sociedad*, 29, pp. 69–151.
García Fernández, J. (1975) *Organización del espacio y economía en la España atlántica*, Madrid.
(1988) *Sociedad y organización tradicional del espacio en Asturias*, Gijón.
García Sanz, A. (1974) 'Agronomía y experiencias agronómicas en España durante la segunda mitad del siglo XVIII', *Moneda y Crédito*, 131, pp. 29–54.
(1978) 'La agonía de la Mesta y el hundimiento de las exportaciones laneras: un capítulo de la crisis económica del Antiguo Régimen en España', *Agricultura y Sociedad*, 6, pp. 283–316.
(1979–80) 'Jornadas agrícolas y presupuesto familiar campesino en España a mediados del siglo xix', *Anales del Cunef*, pp. 51–71.
(1985a) 'Crisis de la agricultura tradicional y revolución liberal', in García Sanz and Garrabou (eds.), pp. 7–99.
(1985b) 'Negocio lanero y vida pastoril', in Martín, Valdeón and García Sanz, 'La Mesta'. *Cuadernos Historia 16*, 7, Madrid.
García Sanz and Garrabou, R. (eds.) (1985) *Historia agraria de la España contemporánea. 1 Cambio social y nuevas formas de propiedad (1800–1850)*, Barcelona.
Garden, M. (1988) 'L'évolution de la population active', in Dupâquier (ed.) *Historie de la population française*, 3, pp. 243–68, Paris.
Garrabou, R. (1985) *Un fals dilema. Modernitat o endarreriment de l'agricultura valenciana (1850–1900)*, Valencia.
(ed.) (1988) *La crisis agraria de fines del siglo XIX*, Barcelona.
(1990) 'Sobre el atraso de la mecanización agraria en España (1850–1933)', *Agricultura y Sociedad*, 57, pp. 41–77.
(1992) *Propiedad y explotación campesina en la España contemporánea*, Madrid.
Garabou, R., Barciela, C. and Jiménez Blanco, I. (1986) *Historia agraria de la España contemporánea, 3. El fin de la agricultura tradicional (1900–1960)*, Barcelona.
Garrabou, R. and Pujol, J. (1988) 'La especialización de la agricultura mediterránea y la crisis. Cataluña y el País Valenciano', in Garrabou (ed.), pp. 94–129.
Garabou, R., Pujol, J. and Colomé (1991) 'Salaris, ús i explotació de la força de treball agrícola (Catalunya 1818–1936)', *Recerques*, 24, pp. 23–51.
Garabou, R., Pujol, Colomé and Saguer (1992) 'Estabilidad y cambio de la explotación campesina (Cataluña, siglos XIX-XX)', in Garrabou (ed.), pp. 15–92.
Garabou, R. and Sanz, J. (1985) 'Introducción', in Garrabou, R. and Sanz, J. (eds.), *Historia agraria de la España contemporánea. 2. Expansión y crisis (1850–1900)*, Barcelona, pp. 7–191.

Germán Zubero, L. and Forcadell, C. (1988) 'La crisis finisecular en la agricultura interior: el caso de Aragón', in Garrabou (ed.), pp. 69–93.
Giralt i Raventos, E. (1965) 'El conflicto rabassaire y la cuestión social agraria en Cataluña hasta 1936', *Revista de Trabajo*, 7.
(1978) *Dos estudios sobre el País Valenciano*, Valencia.
Gómez Mendoza, A. (1982) *Ferrocarriles y cambio económico en España, 1855–1913*, Madrid.
(1989) *Ferrocarril, industria y mercado en la modernización de España*, Madrid.
Gómez Mendoza, A. and Simpson, J. (1988) 'El consumo de carne en Madrid durante el primer tercio del siglo XX', *Moneda y Crédito*, 186, pp. 57–91.
González Gordon, M. (1972) *Sherry*, London.
Grantham, G. (1989) 'Agricultural supply during the industrial revolution: French evidence and European implications', *Journal of Economic History*, 49, pp. 43–72.
(1991) 'The growth of labour productivity in the production of wheat in the Cinq Grosses Fermes of France, 1750–1929' in Campbell and Overton (eds.), pp. 340–63.
Gray, R.B. (1975) *The Agricultural Tractor: 1855–1950*, Michigan, 2 vols.
Grigg, D. (1992) *The Transformation of Agriculture in the West*, Oxford.
Grupo de Estudios de Historia Rural (GEHR), (1978–9) 'Contribución al análisis histórico de la ganadería española, 1865–1929', *Agricultura y Sociedad*, 8, pp. 129–82 and 10, pp. 105–69.
(1980) *Los precios del trigo y la cebada en España, 1891–1907*, Madrid.
(1983a) 'Notas sobre la producción agraria española, 1891–1931', *Revista de Historia Económica*, 1, pp. 185–252.
(1983b) 'Evolución de la superficie cultivada de cereales y leguminosas en España, 1886–1935', *Agricultura y Sociedad*, 29, pp. 285–325.
(1988) 'La crisis agrícola en Castilla la Vieja y Andalucía: los casos del trigo y el olivar', in Garrabou (ed.), pp. 35–68.
(1989) 'Sector agrario (hasta 1935)', in Carreras (ed.), pp. 91–129.
(1991) *Estadísticas Históricas de la Producción Agraria Española, 1859–1935*, Madrid.
Grupo de Historia Agraria de Murcia, (1992) 'La propiedad de la tierra en los regadíos del Segura durante los siglos XIX y XX', in Garrabou, pp. 159–90.
Gutiérrez Bringas, M.A., (1993) 'La productividad de la tierra en España 1752–1930: tendencia a largo plazo', *Revista de Historia Económica*, 11, pp. 505–38.
Hanson, J.R. (1977) 'Diversification and concentration of LDC exports: Victorian trends', *Explorations in Economic History*, 14, pp. 44–68.
(1986) 'Export shares in the European periphery and the Third World before World War I: questionable data, facile analogies', *Explorations in Economic History*, 23, pp. 85–99.
Harley, C.K. (1980) 'Transportation, the world wheat trade, and the Kuznets cycle, 1850–1913', *Explorations in Economic History*, 17, pp. 218–50.
Hayami, Y. (1975) *A Century of Agricultural Growth in Japan*, Tokyo and Minneapolis.
Harrison, J. (1976) 'El coste de oportunidad del programa naval español de 1907: ¿pantanos o acorazados?', *Hacienda Pública Española*, 38, pp. 111–22.

(1985) *The Spanish Economy in the Twentieth Century*, London and Sydney.
(1993) *The Spanish Economy. From the Civil War to the European Community*, Basingstoke.
Hayami, Y. and Ruttan, V.W. (1985) *Agricultural Development. An International Perspective*, (2nd edn), Baltimore.
Heran, F. (1980) *Tierra y parentesco en el campo Sevillano: la revolución agrícola del siglo XIX*, Madrid.
Hermida Revillas, C. (1989) *Economía agraria y agitaciones campesinas en Castilla la Vieja y León: 1900–1936*, Madrid.
Herr, R. (1989) *Rural Change and Royal Finances in Spain at the End of the Old Regime*, Berkeley and Los Angeles.
Heywood, C. (1981) 'The role of the peasantry in French industrialization, 1815–80', *Economic History Review*, 34, pp. 359–76.
Hohenberg, P. and Lees, L. (1985) *The Making of Urban Europe 1000–1950*, Cambridge, Massachusetts.
Holderness, B.A. (1989) 'Prices, productivity, and output', in Thirsk (ed.), *The Agrarian History of England and Wales, vol. vi, 1750–1850*, Cambridge.
Houston, J.M. (1950) 'Irrigation as a solution to agrarian problems in modern Spain', *The Geographical Journal*, 116, pp. 55–63.
Hoyo Aparicio, A. (1993) *Todo mudó de repente. El horizonte económico de la burguesía mercantil en Santander, 1820–1874*, Santander.
Jackson, R.V. (1985) 'Growth and deceleration in English agriculture, 1660–1790', *Economic History Review*, 36, pp. 333–51.
Janvry, de A. (1981) *The Agrarian Question and Reformism in Latin America*, Baltimore and London.
Jeffs, J. (1970) *Sherry*, London.
Jiménez Blanco, (1986a) 'Introducción', in Garrabou, Barciela and Jiménez Blanco (eds.), pp. 9–141.
(1986b) 'Flores de Lemus y la producción rural de su tiempo,' in García Delgado (ed.), *La crisis de la Restauración: España, entre la Primera Guerra Mundial y la II*.
Johnson, B.F. and Mellor, J.W. (1961) 'The role of agriculture in economic development', *American Economic Review*, pp. 571–81.
Jones, E.L. (1988) *Growth Recurring. Economic Change in World History*, Oxford.
Jones, E.L. and Woolf, S.J. (1969) 'The historical role of agrarian change in economic development', in Jones and Woolf (ed.), *Agrarian Change and Economic Development*, London.
Kussmaul, A. (1990) *A General View of the Rural Economy of England, 1538–1840*, Cambridge.
Kindleberger, C.P. (1964) *Economic Growth in France and Britain, 1851–1950*, Cambridge, Mass.
Klein, J. (1920) *The Mesta; A Study in Spanish Economic History, 1273–1836*, Cambridge, Mass.
Kondo, A.Y. (1990) *La agricultura española del siglo xix*, Madrid.
Lachiver, M. (1988) *Vins, vigne et vignerons*, Lille.
Ladrón de Guevara Flores, M.P. (1988) *Ciudad Real en el primer tercio del siglo xx (tierra, propiedad y cultivos, 1900–1930)*, Ciudad Real.
Le Roy Ladurie, E. (1976) *The Peasants of Languedoc*, Urbana.

Leal, J.L., Leguina, J., Naredo, J.M. and Tarrafeta, L. (1975) *La agricultura en el desarrollo capitalista español (1940–1979)*, Madrid.
Lévy-Leboyer, M. and Bourguignon, F. (1990) *The French Economy in the Nineteenth Century*, Cambridge.
Lewis, W.A. (1978) *Growth and Fluctuations, 1870–1913*, London.
Lindert, P. (1991) 'Historical Patterns of Agricultural Policy', in Timmer, C.P. (ed.), *Agriculture and the State: Growth, Employment, and Poverty in Developing Countries*, Ithaca and London.
Llopis, E. (1982) 'Las explotaciones trashumantes en el siglo XVIII y primer tercio del XIX: la cabaña del Monasterio de Guadalupe, 1709–1835', *La economía española al finales del Antiguo Régimen. 1. Agricultura*, Madrid.
(1983) 'Algunas consideraciones acerca de la producción agraria castellana en los veinticinco últimos años del Antiguo Régimen', *Investigaciones Económicas*, 21, pp. 135–51.
(1986) 'El agro castellano en el siglo XVII: ¿depresión o "reajustes y readaptaciones"?', *Revista de Historia Económica*, 4, pp. 11–37.
(1989) 'Almacenamientos, volatilidad de los precios de los granos y distribución de la renta: Comentarios a la réplica de Bartolomé Yun', *Revista de Historia Económica*, 4, pp. 173–85.
López Estudillo, A. (1992) 'La vid y los viticultores de Jerez, la crisis comercial y el impacto de la filoxera: un campo abierto a la investigación', *Revista de Historia de Jerez*, 1, pp. 43–71.
López Gómez, A. (1974) 'Nuevos riegos en Valencia en el siglo XIX y comienzos del XX', in Nadal and Tortella (eds.), *Agricultura, comercio colonial y crecimiento económico en la España contemporánea*, Barcelona.
López Ontiveros, A. (1978) *El sector oleícola y el olivar: oligopolio y coste de recolección*, Madrid.
Loubère, L.A. (1990) *The Wine Revolution in France. The Twentieth Century*, New Jersey.
Luna, G. (1988) 'La población urbana en España, 1860–1936', *Boletín de la Asociación de Demografía Histórica*, Madrid, 6, pp. 25–68.
Madrazo, S. (1984) *El sistema de transportes en España, 1750–1850*, Madrid, 2 vols.
Malefakis, E. (1970) *Agrarian Reform and Peasant Revolution in Spain. Origins of the Civil War*, New Haven and London.
Malenbaum, W. (1953) *The World Wheat Economy, 1885–1939*, Cambridge, Massachusetts.
Maluquer de Motes, J. (1989) 'Precios, salarios y beneficos', in Carreras (ed.), pp. 495–532.
Mangrane Escargo, D. (1967) *El problema del aceite virgen de oliva*, Barcelona.
Martin, B. (1990) *The Agony of Modernization. Labor and Industrialization in Spain*, Cornell University, Ithaca.
Martín Aceña, P. and Simpson, J. (1995) *The Economic Development of Spain since 1870*, Aldershot.
Martín Rodríguez, M. (1982) *Azúcar y descolonización: origen y desenlace de una crisis agraria en la vega de Granada. El 'ingenio de San Juan', 1882–1904*, Granada.
(1984) *Pensamiento económico español sobre la población*, Madrid.
Martínez Alier, J. (1971) *Labourers and Landowners in Southern Spain*, London.

Martínez Carríon, J.M. (1989) 'Formación y desarrollo de la industria de conservas vegetales en España, 1850–1935', *Revista de Historia Económica*, 7, pp. 619–49.

Martínez Shaw, C. (1985) 'La Cataluña del siglo xviii bajo el signo de la expansión', in Fernández, R. (ed.) *España en el siglo xviii. Homenaje a Pierre Vilar*, Barcelona.

Mateu Tortosa, E. (1987) *Arroz y paludismo*, Valencia.

(1993) 'Difusión de nuevas tecnologías en la agricultura valenciana, siglo XIX', *Agricultura y Sociedad*, 66, pp. 43–68.

Meijide Pardo, A. (1960) *La emigración gallega intrapeninsular en el siglo XVIII*, Madrid.

(1984) *Testimonios históricos sobre la antigüedad del cultivo de la patata en Galicia*, La Coruña.

Mikelarena, F. (1993) 'Los movimientos migratorios interprovinciales en España entre 1877 y 1930', *Cuadernos Aragoneses de Economía*, 3, pp. 213–40.

Millán, J. and Calatayud, S. (1992) 'Formas de explotación y mercados de trabajo en la agricultura valenciana de regadío (1800–1930)', in Garrabou (ed), pp. 325–49.

Ministerio de Industria y Energía (1988) *España, 200 años de tecnología*, Madrid.

Mitchell, B.R. (1992) *International Historical Statistics. Europe 1750–1988*, New York.

Mitchell, B.R. and Deane, P. (1962) *Abstract of British Historical Statistics*, Cambridge.

Mokyr, J. (1985) *Why Ireland Starved: A Quantitive and Analytical History of the Irish Economy*, London.

(1989) 'Has the Industrial Revolution been crowded out? Some reflections on Crafts and Williamson', *Explorations in Economic History*, 24, pp. 293–319.

(1991) 'Dear labor, cheap labor, and the Industrial Revolution', in Higonnet, P., Landes, D.S. and Rosovsky, H., *Favourites of Fortune. Technology, Growth and Economic Development since the Industrial Revolution*, Cambridge, Massachusetts.

Molina Ibáñez, M. (1993) 'Cambios estructurales en el sector agrario español: 1955–1987', in Gil Olcina and Morales Gil (eds.), *Medio siglo de cambios agrarios en España*, Alicante.

Moral Ruiz, (1979) *La agricultura española a mediados del s.XIX, 1850–1870*, Madrid.

Morilla Critz, J. (1989) 'Cambios en la viticultura de Andalucía Oriental durante la crisis de finales del siglo XIX', *Revista de Historia Económica*, 7, pp. 157–93.

Moulin, A. (1991) *Peasantry and Society in France since 1789*, Cambridge and Paris.

Nadal, J. (1973) 'The failure of the Industrial Revolution in Spain 1830–1914' *The Fontana Economic History of Europe*, vol. 4 (2), Glasgow.

(1975) *El fracaso de la Revolución Industrial en España, 1814–1913*, Barcelona.

(1984) *La población española (Siglos XVI a XX)*, (2nd edn), Barcelona.

(1985) 'Un siglo de industrialización en España en el siglo xix', in Sánchez Albornoz, (ed.) pp. 89–101.

(1987) 'La industria fabril española en 1900. Una aproximación', in Nadal, Carreras and Sudrià (eds.), pp. 23–61.

(1990) 'El desarrollo de la economía valenciana en la segunda mitad del siglo XIX: ¿una vía exclusivamente agraria?', in Nadal and Carreras, *Pautas regionales de la industrialización española (siglos XIX y XX)*, Barcelona.

Nadal, J., Carreras, A. and Sudrià, C. (eds.) (1987) *La economía española en el siglo XX. Una perspectiva histórica*.

Nadal, J. and Sudrià, C. (1993) 'La controversia en torno al atraso económico español en la segunda mitad del siglo XIX (1860–1913)', *Revista de Historia Industrial*, 3, pp. 199–227.

Nadal Reimat, E. (1981) 'El regadio durante la Restauración: la política hidráulica (1875–1902)', *Agricultura y Sociedad*, 19, 129–63.

Naredo, J.M. (1977) *La evolución de la agricultura española*, (3rd edn), Barcelona.

(1981) 'La incidencia del "estraperlo" en la economía de las grandes fincas del Sur', *Agricultura y Sociedad*, 19, pp. 81–128.

(1989) 'El proceso de mecanización en las grandes fincas del sur', *Información Comercial Española*, 666, pp. 51–73.

Nghiep, L.T. and Hayami, Y. (1979) 'Mobilizing slack resources for economic development: the summer–fall rearing technology of sericulture in Japan', *Explorations in Economic History*, 16, pp. 163–81.

Nicolau, R. (1989) 'Población', in Carreras, A. (ed.), pp. 49–90.

North, D.C. and Thomas, R.P. (1973) *The Rise of the Western World. A New Economic History*, Cambridge.

Nugent, J.B. and Sanchez, N. (1989) 'The efficiency of the Mesta: a parable', *Explorations in Economic History*, 26, pp. 261–84.

Núñez, C.E. (1991) 'El gasto público en educación en la España contemporánea', *Hacienda Pública Española*, Homenaje a D. Felipe Ruíz Martín, pp. 121–46.

(1992) *La fuente de la riqueza. Educación y desarrollo económico en la España Contemporánea*, Madrid.

O'Brien, P. (1985) 'Agriculture and the home market for English industry, 1660–1820', *English Historical Review*, 100, pp. 773–800.

O'Brien, P. and Keyder, C. (1978) *Economic Growth in Britain and France, 1780–1914. Two Paths to the Twentieth Century*, London.

O'Brien, P. and Prados de la Escosura (1992) 'Agricultural productivity and European industrialization, 1890–1980', *Economic History Review*, 45, pp. 514–36.

O'Brien, P. and Toniolo, G. (1991) 'The poverty of Italy and the backwardness of its agriculture before 1914', in Campbell and Overton (eds.), pp. 385–409.

Offer, A. (1989) *The First World War: An Agrarian Interpretation*, Oxford.

Ó Gráda, C. (1989) *The Great Irish Famine*, London.

Olmstead, A.L. (1975) 'The mechanization of reaping and mowing in American agriculture', *Journal of Economic History*, 35, pp. 344–51.

Olmstead, A.L. and Rhode, P. (1988) 'An overview of California agricultural mechanization, 1870–1930', *Agricultural History*, 62, pp. 86–112.

(1993) 'Induced innovation in American agriculture: a reconsideration', *Journal of Political Economy*, 101, pp. 100–18.
(1995) 'Beyond the threshold: an analysis of the characteristics and behaviour of early reaper adopters', *Journal of Economic History*, 55, 1, pp. 27–57.
Olson, M. (1982) *The Rise and Decline of Nations. Economic Growth, Stagflation and Social Rigidities*, Yale.
Ordish, G. (1972) *The Great Wine Blight*, London.
Palafox, J. (1985), 'Exportaciones, demanda interior y crecimiento económico en el País Valenciano', in Sánchez Albornoz, (ed.), pp. 319–43.
(1986) 'Comercio exterior y vía nacionalista. Algunas consideraciones', in García Delgado (ed.). *La crisis de la Restauración*, pp. 179–97.
(1991) *Atraso económico y democracia. La Segunda República y la economía española, 1892–1936*, Barcelona.
Pan-Montojo, J.L. (1994) *La Bodega del Mundo. La vid y el vino en España, 1800–1936*, Madrid.
París Eguilaz, H. (1943) *El movimiento de precios en España*, Madrid.
Parker, W. and Klein, J. (1966) 'Productivity growth in grain production in the United States, 1840–60 and 1900–10', NBER, *Output, Employment, and Productivity in the United States after 1800*, New York and London.
Peinado Gracia, M. (1985) *El consumo y la industria alimentaria en España*, Madrid.
Perren, R. (1990) 'Structural change and market growth in the food industry: flour milling in Britain, Europe, and America, 1850–1914', *Economic History Review*, 43, pp. 420–37.
Pérez Moreda, V. (1984) 'Evolución de la población española desde finales del Antiguo Régimen', *Papeles de Economía Española*, 20, pp. 20–38.
(1985) 'La modernización demográfica, 1800–1930. Sus limitaciones y cronología', in Sánchez Albornoz (ed.), pp. 25–62.
Pérez Picazo, M.T. (1990) 'Pautas de industrialización de la región murciana. Del textil al agroalimentario', in Nadal and Carreras, *Pautas regionales de la industrialización española (siglos XIX y XX)*, Barcelona.
(1991) 'Riqueza territorial y cambio agrícola en la Murcia del siglo XIX. Aproximación al estudio de una contabilidad privada. (circa, 1800–1902)', *Agricultura y Sociedad*, 61, pp. 39–95.
Pérez Picazo, M.T. and Lemeunier, G. (1987) 'La sericultura murciana. Producción, difusión y coyuntura, s. XVI–XX', *Revista de Historia Económica*, 6, pp. 553–75.
Pérez Sarrión, G. (1989) 'Crecimiento sin desarrollo e integración de mercados. El sector agrario aragonés en el siglo XVIII', in Ministerio de Agricultura, Pesca y Alimentación, *Estructuras Agrarias y Reformismo Ilustrado en la España del siglo XVIII*, Madrid.
Peris Albentosa, T. (1989) *Propiedad y cambio social. Alzira (1465–1768)*, Valencia.
Pinilla Navarro, V. (1990) La producción agraria en Aragón desde 1850 hasta 1935, unpublished Ph.D. thesis, University of Zaragoza.
(1992) 'La producción agraria en Aragón (1850–1935)' *Revista de Historia Económica*, 10, pp. 399–429.

(1994) 'Cambio agrario y comercio exterior en la España contemporánea', unpublished manuscript.
Piqueras, J. (1985) *La agricultura valenciana de exportación y su formación histórica*, Madrid.
Pitt-Rivers, J.A. (1971) *The People of the Sierra*, (1st edn: 1954), Chicago.
Prados de la Escosura, L. (1982) *Comercio exterior y crecimiento en España 1826–1913*, Madrid.
(1988) *De imperio a nación. Crecimiento y atraso económico en España (1780–1930)*, Madrid.
(1989) 'La estimación indirecta de la producción agraria en el siglo XIX: réplica a Simpson', *Revista de Historia Económica*, pp. 703–8.
(1992) 'Crecimiento, atraso y convergencia en España e Italia: introducción', in Prados de la Escosura and Zamagni (eds), pp. 27–55.
(1993) 'Spain's Gross Domestic Product, 1850–1990: A New Series', Documento de Trabajo, *Ministerio de Economía y Hacienda, Dirección General de Planificación*.
(1995) 'Spain's Gross Domestic Product, 1850–1993: Quantitative Conjectures', Universidad Carlos III de Madrid, Working Paper 95–05/6.
Prados de la Escosura, L., Dabán Sánchez and Sanz Oliva (1993) 'De Te Fabula Narratur? Growth, Structural Change and Convergence in Europe, 19th–20th Centuries', Documento de Trabajo, *Ministerio de Economía y Hacienda, Dirección General de Planificación*.
Prados de la Escosura, L. and Zamagni, V. (eds.) (1992) *El desarrollo económico en la Europa del Sur*, Madrid.
Price, R. (1983) *The Modernization of Rural France*, London.
Puente Fernández, L. de la (1989) Transformacionesa agrarias en Cantabria. El proceso de especialización del ganando vacuno 1860–1930, unpublished Ph.D. thesis, Universidad de Cantabria.
(1992) *Transformaciones agrarias en Cantabria*, 1860–1930, Santander.
Pujol Andreu, J. (1986) 'Las crisis de sobreproducción en el sector vitivinícola catalán, 1892–1935', in Garrabou, Barciela and Jiménez Blanco (eds.), pp. 317–46.
Quintana Garrido, X. (1990) 'Campesinos que se adaptan y agricultura que se mueve: de la historia agraria de la Galicia contemporánea', *Areas. Revista de Ciencias Sociales*, 12, pp. 145–65.
Read, J. (1973) *The Wines of Spain and Portugal*, London.
Reher, S.D. (1990a) *Town and Country in Pre-industrial Spain: Cuenca, 1550–1870*, Cambridge.
(1990b) 'Urbanization and demographic behaviour in Spain, 1860–1930', in Van der Woude, Hayami and de Vries (eds.), *Urbanization in History*, Oxford, pp. 282–99.
Reher, S.D. and Ballesteros, E. (1993) 'Precios y salarios en Castilla la Nueva: La construcción de un índice de salarios reales, 1501–1991', *Revista de Historia Económica*, 11, pp. 101–51.
Reis, J. (1982) 'Latifúndio e progresso técnico: a difuşao da debulha mecanica no Alentejo, 1860–1930', *Análise Social*, 18, pp. 371–433.
Ringrose, D.R. (1970) *Transport and Economic Stagnation in Spain, 1750–1850*, Durham.

(1983) *Madrid and the Spanish Economy, 1560–1850*, Berkeley and Los Angeles.
Robledo, R. (1984) *La renta de la tierra en Castilla la Vieja y León, 1836–1913*, Madrid.
(1991) 'Los complejos objetivos de una reforma agraria, 1914–1935', *Noticiario de Historia Agraria*, 1, pp. 17–22.
Rodríguez Galdo, M.X. and Dopico, F. (1981) *Crisis agrarias y crecimiento económico en Galicia en el siglo XIX*, La Coruña.
Rodríguez Labandeira, J. (1991) *El trabajo rural en España (1876–1936)*, Madrid.
Rueda, G. (1986) *La Desamortización de Mendizábal y Espartero en España*, Madrid.
Ruiz Torres, P. (1985) 'El País Valenciano en el siglo XVIII: la transformación de una sociedad agraria en la época del absolutismo', in Fernández, R. (ed.), *España en el siglo XVIII*, Barcelona, pp. 132–248.
Ruttan, V.W. (1978) 'Structural retardation and the modernization of French agriculture: a skeptical view', *Journal of Economic History*, pp. 714–28.
Saavedra, P. and Villares, R. (1985) 'Galicia en el Antiguo Régimen: la fortaleza de una sociedad tradicional', in Fernández, R. (ed.), *España en el siglo XVIII*, Barcelona, pp. 434–504.
Sagrista, A. (1961) 'Un estudio preliminar sobre la demanda de aceite de oliva en España', *Estadística Española*, 12, 14–25.
San Juan, C. (1986) *Eficacia y rentabilidad de la agricultura española*, Madrid.
Sánchez Albornoz, N. (1963) *Las crisis de subsistencias de España en el siglo XIX*, Rosario.
(1975) *Los precios agrarios durante la segunda mitad del siglo XIX. 1. Trigo y Cebada*, Madrid.
(1977) *España hace un siglo: una economía dual*, (2nd edn), Madrid.
(ed.) (1985) *La modernización económica de España*, Madrid.
Sánchez Alonso, B. (1995) *Las causas de la emigración española, 1880–1930*, Madrid.
Sánchez Salazar, F. (1988) *Extensión de cultivos en España en el siglo XVIII*, Madrid.
(1990) 'Incidencia de la ocupación francesa en el medio rural: venta de tierras de propios y comunales. Una aproximación al estado de la cuestión', *Agricultura y Sociedad*, 55, pp. 125–66.
Sanz, J. (1981) 'Notas introductorias al libro de Eduardo de la Sotilla: Producción y riqueza agrícola de España en el último decenio del siglo XIX y primero del XX', *Agricultura y Sociedad*, 18, pp. 303–30.
Sen, A. (1982) *Poverty and Famines. An Essay on Entitlement and Deprivation*, Oxford.
Scheuring, A. (ed.) (1983) *A Guidebook to Californian Agriculture*, Berkeley and Los Angeles.
Schofield, R. (1983) 'The impact of scarcity and plenty on population change in England, 1541–1871', in Rotberg and Rabb (eds.), *Hunger and History*, Cambridge.
Schubert, A. (1990) *A Social History of Modern Spain*, London.
Schultz, T.W. (1945) *Agriculture in an Unstable Economy*, New York and London.
(1964) *Transforming Traditional Agriculture*, New Haven.

Schumpeter, J.A. (1954) *History of Economic Analysis*, New York.
Sicsic, P. (1992) 'City-farm wage gaps in late nineteenth century France', *Journal of Economic History*, 52, pp. 675–95.
Simón Segura, F. (1973) *La desamortización española en el siglo XIX*, Madrid.
Simpson, J. (1985a) Agricultural growth and technological change: the olive and wine in Spain, 1860–1936, unpublished Ph.D. thesis, University of London.
(1985b) 'La Producción de vinos en Jerez de la Frontera', in Martín Aceña and Prados de la Escosura (eds.), *La Nueva Historia Económica en España*, Madrid, pp. 166–91.
(1987) 'La elección técnica en el cultivo triguero y atraso de la agricultura Española a finales del siglo xix', *Revista de Historia Económica*, 5, pp. 271–99.
(1989a) 'La producción agraria y el consumo español en el siglo xix', *Revista de Historia Económica*, 7, pp. 355–88.
(1989b) 'Una repuesta al Profesor Leandro Prados de la Escosura', *Revista de Historia Económica*, pp. 719–23.
(1992a) 'Los límites de crecimiento agrario en España, 1860–1936' in Prados de la Escosura and Zamagni (eds.), pp. 103–38.
(1992b) 'Technical change, labour absorption and living standards in rural Andalucía 1886–1936', *Agricultural History*, 66, pp. 1–24.
(1995a) 'Spanish agricultural production and productivity 1890–1936' in Martín Aceña and Simpson (eds.), *The Economic Development of Spain since 1870*, Aldershot.
(1995b) 'Real wages, urban-rural wage gap and the rural exodus, Spain 1860–1936', in Scholliers and Zamagni (eds.), *Labour's Reward. Real Wages and Economic Change in 19th and 20th Century Europe*, Aldershot.
Solberg, C.E. (1987) *The Prairies and the Pampas. Agricultural Policy in Canada and Argentina*, Stanford.
Spina, L. (1932) 'I consumi alimentari della popolazione italiana nell'anteguerra (1910–14) e negli ultimi anni (1926–30)', *Metron*, 1–2.
Stone, R. (1954), *The Measurement of Consumers' Expenditure and Behaviour in the United Kingdom, 1920–1938*, Cambridge, 2 vols.
Sumpsi, J.M. (1978) 'Estudio de la transformación del cultivo al tercio al de año y vez en la Campiña de Andalucía', *Agricultura y Sociedad*, 6, pp. 31–70.
Tedde de Lorca, P. (1985) 'Sobre los orígenes históricos del subdesarrollo andaluz' in Sánchez Albornoz, (ed.), pp. 299–318.
Tena, A. (1989) 'Comercio exterior', in Carreras (ed.), pp. 327–61.
(1992) 'Protección y competitividad en España e Italia, 1890–1960', in Prados de la Escosura and Zamagni (eds.), pp. 321–55.
Thompson, E.P. (1976) 'The grid of inheritance: a comment', in Goody, Thirsk and Thompson, *Family and Inheritance: Rural Society in Western Europe, 1200–1800*, Cambridge.
Thompson, F.M.L. (1968) 'The second agricultural revolution, 1815–1880', *Economic History Review*, 21, pp. 62–77.
Timmer, C.P. (1988) 'The Agricultural Transformation', in Chenery and Srinivasan (eds.) *Handbook of Development Economics*, vol. 1, Amsterdam, pp. 276–331.

Toniolo, G. (1990) *An Economic History of Liberal Italy*, London.
Torras Elías, J. (1976) 'Aguardiente y crisis rural. Sobre la coyuntura vitícola, 1793–1832', *Investigaciones Económicas*, 1, pp. 45–67.
Torre, J. de la (1990) 'Crisis de una economía agraria y repuestas campesinas en la quiebra del Antiguo Régimen: Navarra, 1808–1820', *Revista de Historia Económica*, 8, pp. 1–35.
Tortella, G. (1985) 'Producción y productividad agraria en España, 1830–1930', in Sánchez Albornoz (ed.), pp. 63–88.
(1987) 'Agriculture: A slow-moving sector, 1830–1935' in Sánchez Albornoz, *The Economic Modernization of Spain, 1830–1930*, New York.
(1988) 'Prólogo' in Prados de la Escosura, *De imperio a nación. Crecimiento y atraso económico en España (1780–1930)*, Madrid, pp. 11–16.
(1992) 'La historia económica de España en el siglo XIX: un ensayo comparativo con los casos de Italia y Portugal', in Prados de la Escosura and Zamagni (eds.), pp. 56–80.
(1994a) 'Patterns of economic retardation and recovery in south-western Europe in the nineteenth and twentieth centuries', *Economic History Review*, 47, pp. 1–24.
(1994b) *El desarrollo de la España contemporánea. Historia económica de los siglos XIX y XX*, Madrid.
Toutain, J.C. (1961) 'Le produit de l'agriculture française de 1700 à 1958', *Cahiers de l'ISEA*, AF 4.
Tracy, M. (1989) *Government and Agriculture in Western Europe 1880–1988*, London.
Unwin, T. (1991) *Wine and the Vine. A Historical Geography of Viticulture and the Wine Trade*, London and New York.
Van Zanden, J.L. (1991) 'The first green revolution: the growth of production and productivity in European agriculture, 1870–1914', *The Economic History Review*, 44, pp. 215–39.
Vassberg, D.E. (1984) *Land and society in Golden Age Castile*, Cambridge.
Vilar, P. (1978) *Cataluña en la España Moderna*, (1st edn: 1962), Barcelona, Spanish edition, 3 vols.
Villares, R. (1982) *La propiedad de la tierra en Galicia, 1500–1936*, Madrid.
Viñas y Mey, C. (1965) 'Apuntes sobre historia social y económica de España', in Fernández Alvarez (ed.), *Estudios sobre historia de España*, Madrid.
Vries, J. de (1984) *European Urbanization 1500–1800*, London.
(1994) 'The Industrial Revolution and the Industrious Revolution', *The Journal of Economic History*, 54, pp. 249–70.
Warner, C.K. (1960) *The Winegrowers of France and Government since 1875*, Columbia.
Weiss, T. (1993) 'Long-term changes in US agricultural output per worker, 1800–1900', *The Economic History Review*, 46, pp. 324–41.
Whatley, W.C. (1987) 'Southern agrarian labor contracts as impediments to cotton mechanization', *Journal of Economic History*, 47, pp. 45–70.
Williamson, J.G. (1988) 'Migration and urbanization', in Chenery and Srinivasan, *Handbook of Development Economics*, Amsterdam, vol. 1, pp. 425–65.
(1987) 'Did English factor markets fail during the Industrial Revolution', *Oxford Economic Papers*, 39, pp. 641–78.

(1994) 'Coping with city growth', in Floud and McCloskey (eds.).
World Bank (1982), *World Development Report 1982*, Oxford.
Wright, G. (1986) *Old South, New South*, New York.
(1988) 'American agriculture and the labor market: what happened to proletarianization', *Agricultural History*, 62, pp. 182–209.
Wrigley, E.A. (1967) 'A simple model of London's importance in changing English society and economy, 1650–1750' *Past and Present*, 37, pp. 44–70, [reprinted in *People, Cities and Wealth*, Oxford 1987].
(1985) 'Urban growth and agricultural change: England and the Continent in the Early Modern Period' *Journal of Interdisciplinary History*, 15, pp. 683–728, [reprinted in *People, Cities and Wealth*, Oxford 1987].
(1987) 'Some reflections on corn yields and prices in pre-industrial economies', *People, Cities and Wealth*, Blackwell, Oxford.
(1988) *Continuity, Chance and Change. The Character of the Industrial Revolution in England*, Cambridge.
Wrigley, E.A. and Schofield, R.S. (1989) *The Population History of England 1541–1871. A Reconstruction*, Cambridge.
Yates, P.L. (1960) *Food Production and Manpower in Western Europe*, London.
Yun Casalilla, B. (1987) *Sobre la transición al capitalismo en Castilla. Economía y Sociedad en la Tierra de Campos, 1500–1830*, Salamanca.
(1989) 'De molinos y gigantes', *Revista de Historia Económica*, 7, pp. 461–477.
(1990) 'Ultima réplica a los comentarios de Enrique Llopis', *Revista de Historia Económica*, 8, pp. 187–90.
(1991) 'Mercado de cereal y burguesía en Castilla, 1750–1868. (sobre el papel de la agricultura en el crecimiento económico regional)', in Yun Casalilla (ed.) *Estudios sobre el capitalismo agrario, crédito e industria en Castilla (siglos xix y xx)*, Salamanca.
Zamagni, V. (1987) 'A century of change: trends in the composition of the Italian labour force, 1881–1981', *Historical Social Research*, 44, pp. 36–97.
(1989) 'An international comparison of real industrial wages, 1890–1913: methodological issues and results', in Scholliers, P. (ed.), *Real Wages in 19th and 20th Century Europe. Historical and Comparative Perspectives*, New York.
Zambrana, J.F. (1987) *Crisis y modernización del olivar español, 1870–1930*, Madrid.
Zapata, S. (1986) La producción agraria de Extremadura y Andalucía Occidental, 1875–1935, unpublished Ph.D. thesis, Universidad Complutense de Madrid, Madrid.

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