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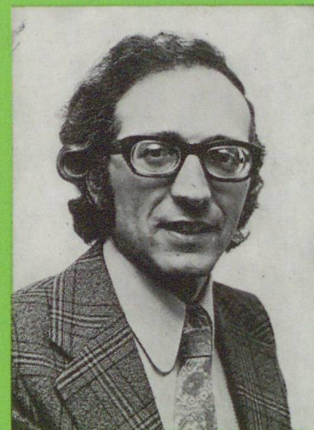

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AGRICULTURE IN THE REPUBLIC OF IRELAND

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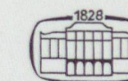
DESMOND A. GILLMOR

AGRICULTURE IN THE REPUBLIC OF IRELAND

Agriculture in the Republic of Ireland is an important economic sector even today. How far this is so is well illustrated by the role Ireland plays within the EEC, where — true to the traditions of her historical development and special natural conditions — she is mainly an exporter of products. In this richly illustrated book D. A. Gillmor presents a detailed picture of the natural conditions and geographical structure of Irish agriculture, and utilizing statistical and cartographic data, as well as the data of his field researches, provides us with a comprehensive survey of agriculture on the "Emerald Isle".

This book, the first systematic economic monograph on Irish agriculture, is a fine example of how agriculture in small countries might be analyzed. For comprehensiveness, the historical is combined with the more modern statistical approach, with the cluster analysis employed holding promise of becoming an important quantitative method of geographical delimitation.



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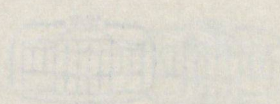

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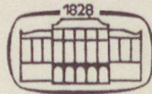

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1. INTRODUCTION

An understanding of agriculture in the Republic of Ireland is fundamental to a knowledge of the country's geography. Irish life has been closely related to the land, to which there has been a traditionally strong attachment. Farming has a vital role in national employment, income and exports. Although the relative position of agriculture has declined, particularly with development over the last two decades, it is still of great economic, social and political importance. This significance applies throughout most of the country but there is considerable spatial variation within farming, despite the small size of the state. The complexity of agricultural geography is the result of a long history and a great variety of physical and human influences.

The aim of this book is to analyse the characteristics of agriculture in the Republic of Ireland, nationally and in particular spatially within the state. The emphasis is on a portrayal of the situation immediately prior to accession to the European Economic Community in 1973, which initiated a major new phase in the evolution of Irish agriculture. National trends over the preceding fifty years since Independence are outlined where appropriate through the book but because of space limitations little attention is given to areal change. The framework of Irish agricultural geography is examined initially, with separate treatment of the physical environment, the evolution prior to Independence, the subsequent economic and political circumstances and the characteristics of the farm population. Various aspects of the agrarian structure are analysed, followed by discussion of the use and improvement of agricultural land. Two chapters are devoted to separate treatment of arable crop and livestock categories, though crop and livestock combinations are outlined in concluding sections of the respective chapters. The following chapter is concerned with attempts to integrate the different elements of agriculture and farming output on a regional basis. In the final chapter national and regional agricultural development are considered, concluding with reference to the impact of farming on the environment.

Although comparatively little has been published on Irish agricultural

geography, a substantial amount of literature was found valuable in writing this book and is acknowledged by inclusion in the bibliography. The amount of material on agricultural economics has begun to expand significantly but there is a great dearth of work on the social aspects of modern farming. In contrast, references to the evolution of agriculture, rural settlement and land affairs prior to Independence are voluminous and have not been included in the bibliography. Also omitted have been general regional studies which incorporate some description of local farming, including a number of articles in the early volumes of *Irish Geography*.

The major source of statistical material has been the agricultural enumeration, recorded annually in June. These data have been summarised in four government publications titled *Agricultural statistics 1847–1926*, *Agricultural statistics 1927–1933*, *Agricultural statistics 1934–1956* and *Agricultural statistics 1960*. Additional and more recent figures have been published in *Statistical Abstract of Ireland* and *Irish Statistical Bulletin*, which also contain output and trade data. Annual statistics are available for the state, the four provinces and the 26 counties. Figures for the last two decades have been based mainly on sample enumerations with complete enumerations at intervals of five years, the most recent being for 1970. Data for the 158 rural districts in the state were published only for years in which there was a complete enumeration. The rural districts are far from being ideal statistical areas; they range in size from 8,178 to 140,795 hectares, they vary greatly in shape and some include contrasting farming areas within their boundaries *(Fig. 1.1)*. The rural district is the smallest unit for which agricultural statistics are published and the majority of maps in the book are drawn on this basis. The images of the spatial patterns of agricultural characteristics which they convey can be no closer to reality than the mesh of rural districts permits. Unless otherwise indicated, the data used in the compilation of maps relate to 1970 but state provincial and county statistics for 1972 are quoted in the text and national figures are given in *Appendix A*. The most recent years for which some data are available are 1960 with respect to agriculture and 1961 and 1966 for population but where this earlier material is quoted its date is specified in the text. There was an official analysis of a 10 per cent sample of agricultural holdings with respect to certain characteristics for 1960 but no more recent data have been published. In addition to the published agricultural and population census data, statistics were derived from other published sources and unpublished material was provided by the Central Statistics Office, the Department of Agriculture and Fisheries and other organisations. All statistics have been converted to metric units.

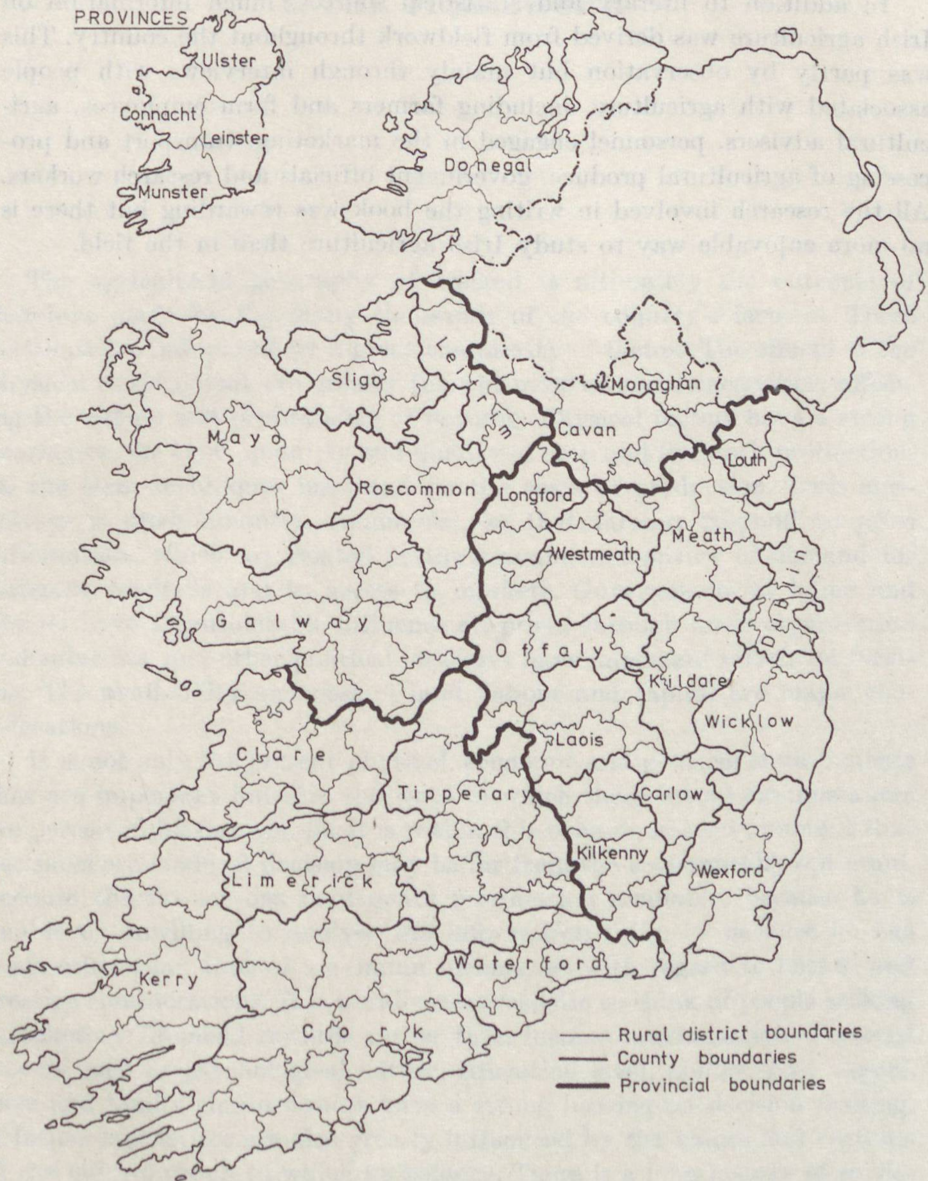


Fig. 1.1. The provinces, counties and rural districts of the Irish Republic

In addition to literary and statistical sources, much information on Irish agriculture was derived from fieldwork throughout the country. This was partly by observation but mainly through interviews with people associated with agriculture, including farmers and farm employees, agricultural advisers, personnel engaged in the marketing, transport and processing of agricultural produce, government officials and research workers. All the research involved in writing the book was rewarding but there is no more enjoyable way to study Irish agriculture than in the field.

2. THE FRAMEWORK

The agricultural geography of Ireland is ultimately the outcome of decisions made by the many thousands of the country's farmers. These decisions are influenced by a great complexity of factors. The effects of the physical environment are greater than in most economic activities, affecting the nature and profitability of farming. Physical factors have a strong bearing on the type, quantity and quality of crop and livestock production, on the farm techniques used and on the costs of production. Irish agriculture is predominantly commercial, so that farmers respond to price differentials, which are related to the amount and nature of demand for different products and to access to markets. Governments at home and abroad have a considerable influence on prices through trade organisation and subsidies, and other political measures have important effects on farming. The availability and cost of land, labour and capital are major considerations.

It is not only the present physical, economic and political environments that are important but also the ways in which these actual circumstances are perceived by farmers, for it is within this behavioural environment that decisions are made. A decision may be far from the economically optimum, because the farmer has inadequate information available, because he is unable or unwilling to analyse the information fully, or because he has goals other than that of maximum income, as with regard to leisure and prestige considerations. It is usually more realistic to think of people seeking satisfactory financial rewards rather than income maximisation. Personal factors such as psychological nature, education level, ability, past experience and family circumstances have a strong bearing on decision making. A farmer's practices are also greatly influenced by the values and customs of the culture group to which he belongs. There is a long history of settlement and agriculture in Ireland, with important effects on present farming patterns; many of the most significant regional differences originated in previous centuries. Although there have been major developments in recent years, the force of tradition is strong and the capacity to change is limited by the conditions and experiences of the past.

While the importance of personal psychological and social influences on decision making at the level of the individual farm is recognised, in this chapter attention is focused on the major factors of the framework of Irish agricultural geography which affect the national characteristics and broad regional patterns of farming. Relevant features of the physical environment are first outlined, the elements of relief, climate and soil being treated separately, though they are closely interrelated. In the second section, the evolution of Irish agrarian affairs until the political partition of the island is briefly traced. Economic and political circumstances since 1922, being inextricably linked, are then considered together, with more specific aspects of the development of agriculture since establishment of the state being referred to at appropriate points in subsequent chapters. Characteristics of the population, especially those people concerned directly with farming, are described in the final section of the chapter.

PHYSICAL ENVIRONMENT

RELIEF AND DRAINAGE

The relief of the Republic of Ireland is varied but predominantly low-lying, with less than 15 per cent of the land exceeding 200 metres and only 1 per cent above 500 metres. The state consists essentially of a broad central lowland with a discontinuous upland rim. The lowland, which is underlain principally by carboniferous limestone, seldom rises to more than 125 metres, except where some isolated ranges and plateaux project above its flat or undulating surface. Minor relief features are the result mainly of variations in the widespread cover of glacial drift; to the north of a line from Lough Mask to Drogheda there is an extensive swarm of drumlins with considerable impediment of drainage, further south there are eskers and moraines. The major rivers which drain the central lowland have gentle average gradients, with limited slope drainage and many swampy areas along their courses.

Although slopes on minor relief features, as on the sides of drumlins, may hinder the operation of machinery, the main topographical handicaps to agriculture occur in the peripheral mountains. The most extensive tract of continuous upland is the Leinster Chain in the southeast but mountains are more widely distributed and their terrain is more rugged along the western seaboard. The uplands are formed mainly of older igneous and metamorphic rocks, comprising granite, gneiss, schist, quartzite, slate and

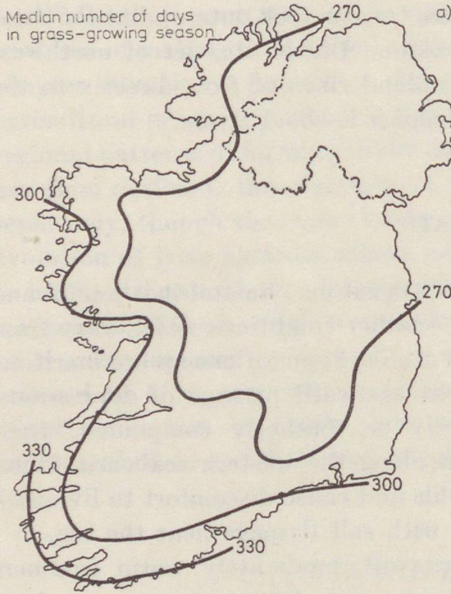
shale, with sandstone in the south. There is some rock outcrop but the most extensive exposure is in the bare limestone Burren district of northwest Clare. The streams which rise in the upland rim and flow directly to the adjacent coast are swifter than the sluggish lowland rivers.

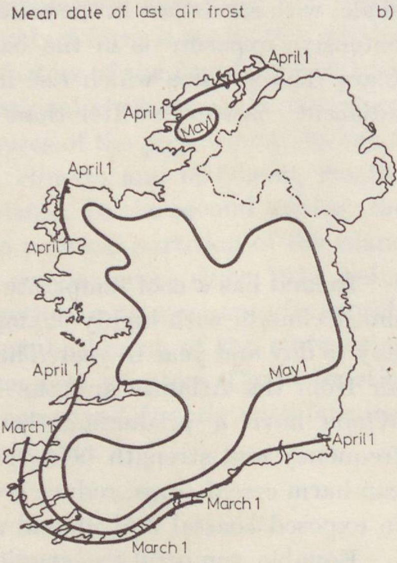
CLIMATE

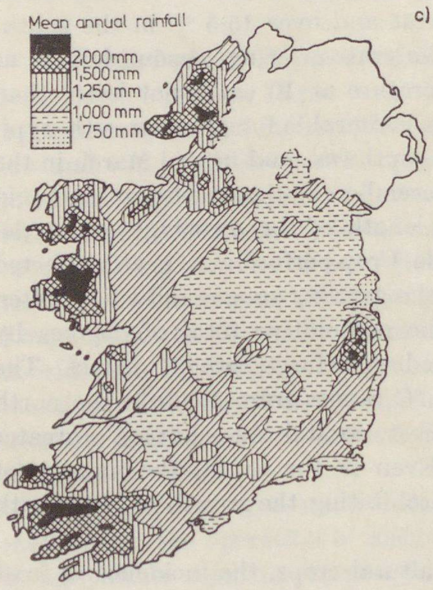
Ireland has a cool-temperate western maritime climate; it is a mild and moist climate with highly changeable weather conditions which vary from day to day and year to year. The main atmospheric influences are maritime air from the Atlantic and the frequent eastward passage of depressions. Winds have a predominantly westerly or southerly component, their frequency and strength being greatest along the western seaboard. Wind can harm cereal crops, reduce crop yields and cause discomfort to livestock in exposed coastal and upland areas, with salt damage near the sea.

Equable temperature conditions prevail, moderately warm summers alternating with mild winters. January mean temperatures vary from 4·5 °C in the northern interior to 7·0 °C on the southwest coast; July mean temperatures are 14·5 °C in the northwest and over 15·5 °C in the southeast. The general spatial variation in the grass-growing season, defined as the period during which the soil temperature at 10 cm is not lower than 6 °C, is shown in *Figure 2.1a*. Conditions favourable for grass growth typically commence in early February in the southwest and in mid March in the north midlands, terminating in late December in the southwest and mid November in the north midlands. The length of the growing season decreases by one day for each 6 m of altitude. Crop performance is also affected by the amount of heat received during the growing season and this is often measured in degree-days, which are the cumulative total of degrees by which mean daily temperatures exceed specific threshold values. The annual number of degree-days above 6 °C ranges from 1,400 in the north of the state to over 1,700 in the southwest, coastal areas having a greater growth potential than inland places. Even in the south, the number of degree-days above 10 °C is only 700, prohibiting the growth of crops with high temperature requirements.

For some plants, particularly horticultural crops, the incidence of frost is a critical temperature factor. Occurrence of late frost in spring and early summer is most hazardous, because the susceptibility of plants to damage is then greatest. The mean dates of the last air frosts are shown on *Figure 2.1b*, the probability of frost occurring later than two weeks after the dates







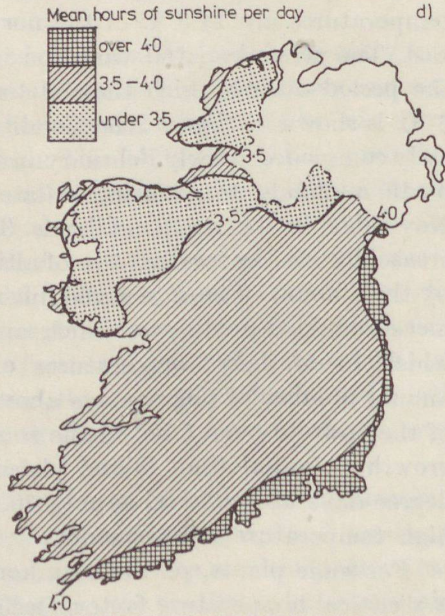


Fig. 2.1. Climatic features

(a) Grass-growing season; (b) Late frost in spring and early summer; (c) Rainfall; (d) Sunshine

indicated being only 25 per cent. The spatial pattern of the occurrence of first frosts in late autumn and early winter is broadly similar, the mean date ranging from 15 October in the interior to 15 December along the western and southern coasts. Local frost conditions can be greatly influenced by aspect and shelter.

Although the influence of temperature conditions is most evident in relation to crops, it also affects livestock production, through both the direct effect of temperature on the animals and the indirect influence on fodder provision. Irish winter temperature conditions are very favourable as compared with continental climates, in that there is not the same need to provide expensive housing for livestock as a protection against extreme cold and winter fodder requirements are less.

Although the mean precipitation of about 1,100 mm is not exceptionally high, the Irish moisture regime is characterised by great frequency of rain, usually high relative humidity and uneven spatial distribution of rainfall. Rain falls at all times of the year, nowhere does even the driest month have an average of less than 40 mm. Winter is the wettest season and the driest is spring, followed by a substantial increase in rainfall in July and August which causes harvesting difficulties. There is a westward gradient in precipitation *(Fig. 2.1c)*, related mainly to the direction of depression movement and the disposition of high relief. Mean annual rainfall ranges from less than 750 mm in County Dublin to over 2,500 mm on the mountains of west Connacht and Kerry, but most of the agricultural area has 750–1,250 mm. In general rainfall is twice to three times the mean annual evapotranspiration, so that there is a substantial amount of effective moisture available to the farmer, though there is a summer potential water deficit of about 50 mm in the southeast, diminishing to zero in the interior northwest. Crop production is not restricted by lack of soil moisture in an average year, though there is some limitation to growth in the instance of shallow-rooted grass and garden crops in the east and southeast. The number of days in the year on which rain falls is high, ranging from less than 200 in the southeast to more than 250 in most of the west. The frequency of cloud cover limits the amount of sunshine to less than one-third of that possible, the mean daily duration varying from less than 3·5 hours in much of the northwest to more than 4 hours along the south and east coasts *(Fig. 2.1d)*.

The cloudy and moist nature of the Irish climate is distinctly more favourable to grassland than arable farming. Cereal crops in particular are subject to ripening and harvesting difficulties and to disease risk. Damp and sunless weather promotes potato blight. Although there is luxuriant

growth of grass, livestock farming encounters difficulties such as in the drying of hay, the effect of driving rain on livestock and the incidence of liver fluke in cattle and sheep. Excessive rainfall is detrimental to all types of farming; the effects are most evident in the west. Flooding causes damage in lowlying areas, particularly along the River Shannon. Severe thunderstorms, hail and snow are seldom hazards, though snow drifts may endanger outwintered stock on mountains.

SOILS AND LAND QUALITY

The nature of Irish soils and their spatial distributions are largely the outcome of interaction between five factors of soil formation: parent material, climate, relief, living organisms and time. Most Irish soils are derived from glacial drift and are relatively immature. The drift varies greatly in nature, a result of the number of source rocks and differences in its constitution. Although glacial drift often contains an intermixture of materials derived from several rock types, most of it is of relatively local origin and limestone is the most common source rock. Calcareous drift is inherently richer in mineral nutrients than material derived from the other rocks. The drift ranges in constitution from heavy compact till to open course sands and gravels, affecting the texture of the derived soil. Much of the drift has a high clay content, so that many soils tend to be of fine texture and heavy nature, with the lightest soils of coarse texture occurring on sands and gravels. The excess soil water which the Irish climate affords results in the removal of fine material and minerals as it percolates through the soil, this leaching being greatest in the wetter west and uplands and on coarse drift. Such soils tend to be acidic. Where there is inadequate slope drainage or impediment of percolation because of very fine texture, waterlogging of the soil occurs, resulting in the process of gleisation because of reduction of certain soil constituents in the anaerobic conditions. Extensive peat formation reflects excessively moist conditions. The soils have been altered to varying extents by human activity, especially through forest clearance, reclamation of hill land and bog, drainage and cultivation practices.

Irish soils are very varied in type, differing not only between one part of the country and another, but sometimes even within a single field. The number of great soil groups can be reduced to 9 for simplicity, with 31 soil associations, but these have been further generalised to yield six categories in *Figure 2.2,* with the percentages of the total land area which each occupies.

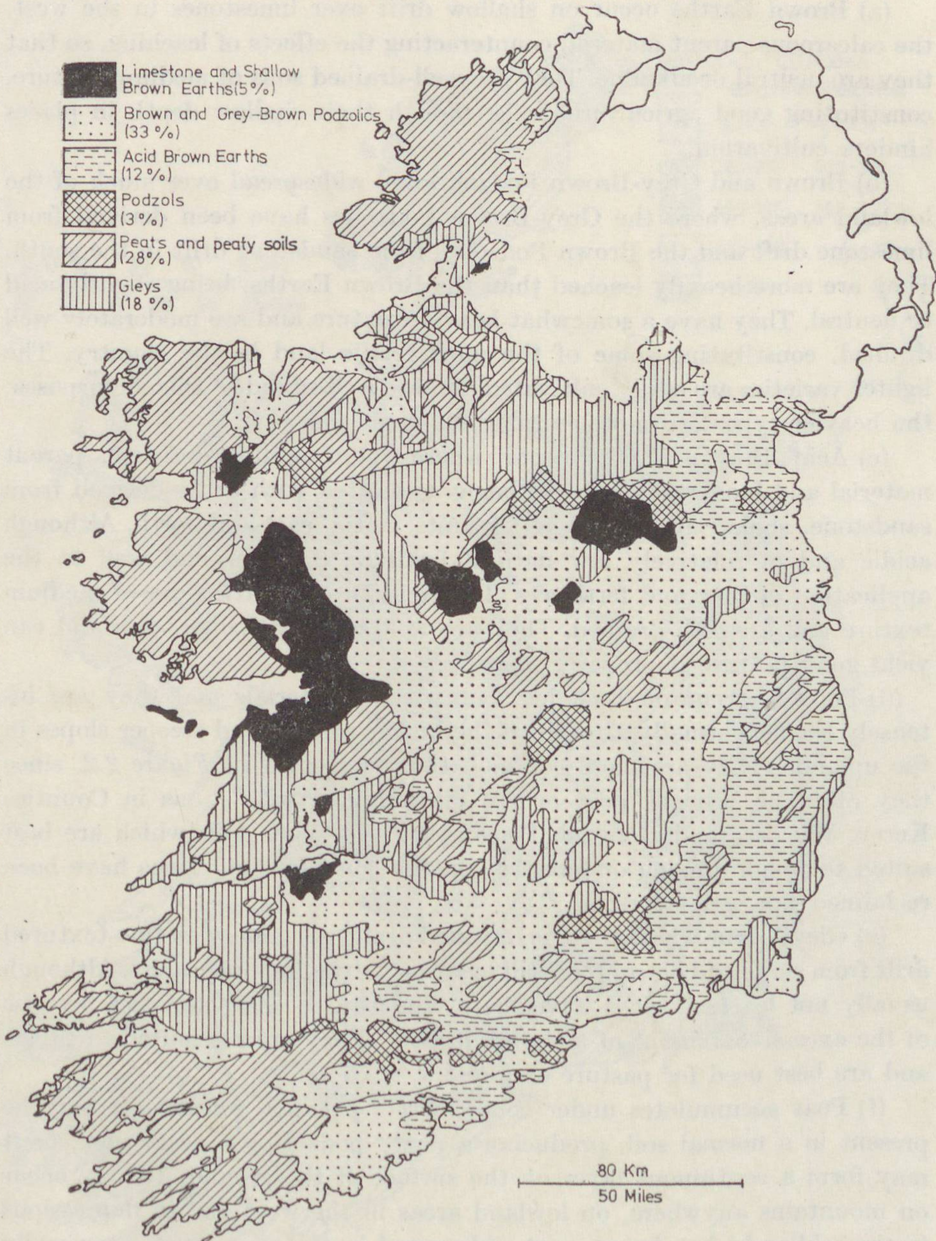


Fig. 2.2. **Soils**

(a) Brown Earths occur on shallow drift over limestones in the west, the calcareous parent material counteracting the effects of leaching, so that they are neutral or alkaline. They are well-drained soils of medium texture, constituting good agricultural soils, though their shallow depth in places hinders cultivation.

(b) Brown and Grey-Brown Podzolics are widespread over much of the lowland areas, where the Grey-Brown Podzolics have been derived from limestone drift and the Brown Podzolics from sandstone drift in the south. They are more heavily leached than the Brown Earths, being slightly acid to neutral. They have a somewhat heavier texture and are moderately well drained, constituting some of the most fertile land in the country. The lighter varieties are easily cultivated and are well suited to tillage purposes; the heavier types are more suitable for grassland.

(c) Acid Brown Earths occur where there is lime-deficient parent material and moderate leaching, being associated with drifts derived from sandstone, shale, mica-schist and granite in the east and north. Although acidic and of relatively low natural fertility, they respond well to the application of lime and fertilisers. The Acid Brown Earths are of medium texture and are well drained. They are well suited to cultivation and can yield good pasture if properly managed.

(d) Podzols occur on lime-deficient parent materials and they are intensely leached, usually a result of the higher rainfall and steeper slopes in the uplands. They are more common than suggested in *Figure 2.2*, since they often lie beneath peat or are intermingled with it, as in Counties Kerry, Wicklow and Donegal. Podzols are very poor soils which are best suited to rough grazing or forestry, though some lowland areas have been reclaimed for agriculture.

(e) Gleys occur where there is impeded drainage, mainly on fine-textured drift from shale and on compact till in areas of drumlin topography. Although usually not leached, gleys have many undesirable characteristics because of the excessive amount of moisture present. They are not suited to tillage and are best used for pasture or forestry.

(f) Peat accumulates under conditions of extreme wetness. It may be present in a normal soil, producing a peaty podzol or a peaty gley, or it may form a continuous layer on the surface of the ground. It may occur on mountains anywhere, on lowland areas in the west and in depressions in the midlands, bog being most widespread in the west. Peat is generally not farmed but it is suitable for forestry and when reclaimed and properly managed it can be agriculturally productive.

Irish soils differ greatly in productive capacity and in the range of uses

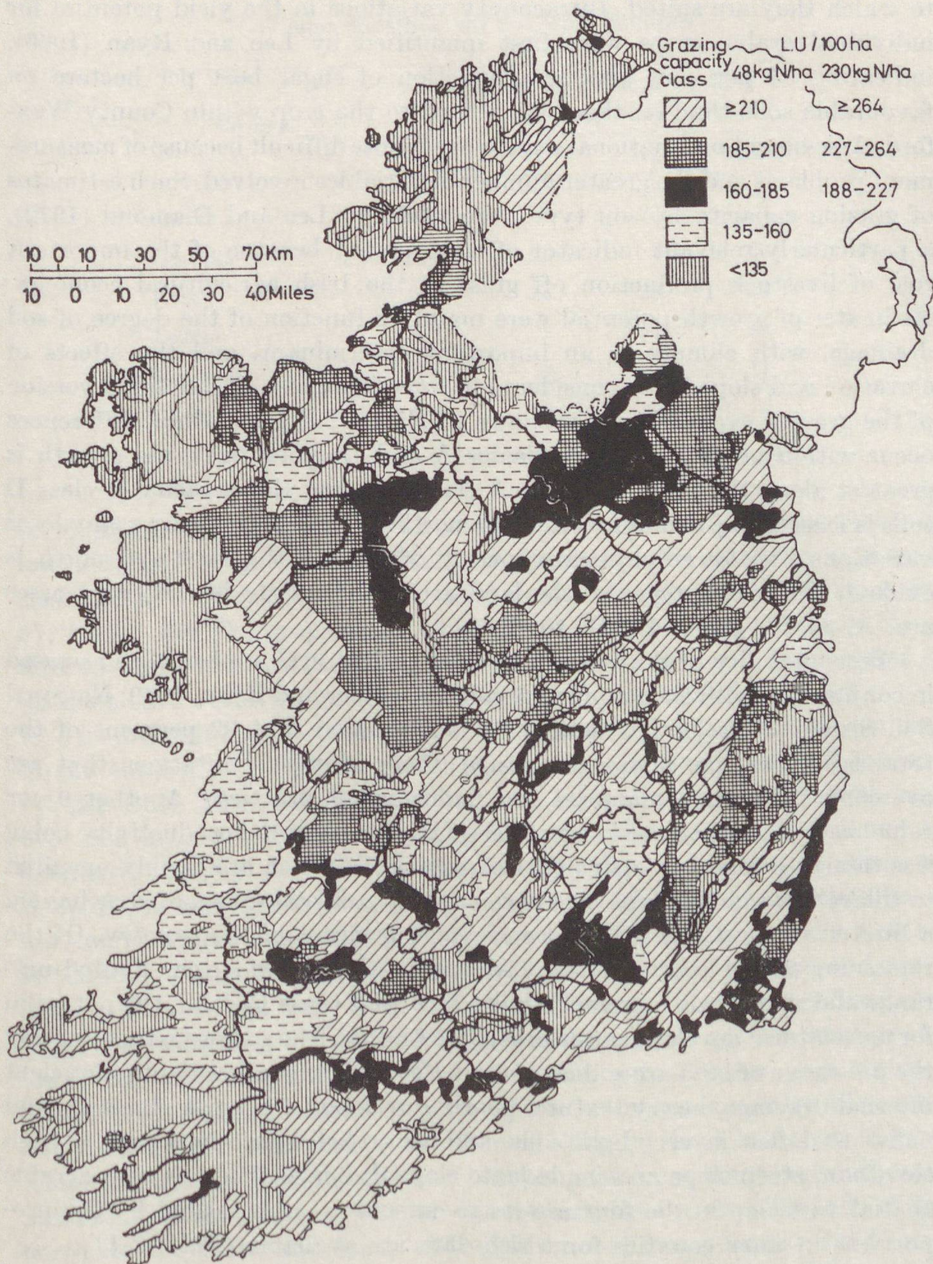


Fig. 2.3. Grazing capacity

to which they are suited. Intracounty variations in the yield potential for individual arable crops were first quantified by Lee and Ryan (1966), indicating 54 per cent greater production of sugar beet per hectare on favourable soils than on those less suited to the crop within County Wexford. Assessment on a national scale is even more difficult because of measurement problems and the greater number of variables involved. Such estimates of grazing capacity by soil type were made by Lee and Diamond (1972), a particularly relevant indicator of land quality because of the important role of livestock production off grass in the Irish agricultural economy. Estimates of growth potential were mainly a function of the degree of soil drainage, with climate as an important determinant, and the effects of elevation and slope being considered in some instances. A simplified version of the grazing capacity map is shown in *Figure 2.3*. Latitudinal differences occur within grazing capacity classes A and D; potential grass growth is greatest along the south coast on A class soils and the capacity of class D soils is least in the drumlin belt of the north. Although there are many local variations, the lower physical capacity of land in the west and north is evident. The percentages of the land area of the state in the five classes are: A, 33; B, 12; C, 14; D, 10; E, 31.

The suitability of the land for general agricultural use has been assessed in conjunction with the mapping of soils (Gardiner and Ryan, 1969; National Soil Survey of Ireland bulletins). It is estimated that 32 per cent of the total land area has a wide use-range (Class I), with limitations that are overcome by normal manurial and management practices. Another 9 per cent has a moderate use-range (Class II), the potential productivity being less though improvements could be made. Soils which are mainly unsuited to tillage but can be adapted to permanent grassland are regarded as having a limited range (Class III) and occupy 30 per cent of the country. Of the remaining 28 per cent, one-third is considered to have a very limited use-range and two-thirds extremely limited. On this Class IV land, the potential for agricultural development is greatly restricted. The major factors limiting the use-range of land are soil characteristics such as shallow depth, deficient internal drainage, heavy texture, poorly developed and weak structure and moisture deficit in very light soils, and also relief restrictions such as high elevation, steep slope and inadequate slope drainage. There is considerable spatial variation in the four use-range categories, as indicated by the proportions in some counties for which data are available *(Table 2.1)*.

A different, though related, categorisation of land quality has been devised in determining the extent of difficult land areas in the country (Lee and Gardiner, 1974). It was estimated that 43 per cent of the land

Table 2.1.

A land classification for some counties

County	Percentage distribution by land use-range class			
	I	II	III	IV
Carlow	67	4	23	6
Donegal	13	25	2	60
Kerry	10	14	23	53
Leitrim	1	2	64	33
Limerick	38	8	43	11
Wexford	60	13	22	5

is Good (dry mineral lowland), 11 per cent Intermediate (partly wet mineral lowland) and 45 per cent Difficult or Marginal. The percentage of land classified as Difficult by province is: Leinster, 24; Munster, 44; Connacht, 57; Ulster, 60. The proportions by county range from 8 per cent of Wexford to 91 per cent of Leitrim, with 70 per cent of the 3 m. hectares of difficult land occurring in the eight seaboard counties of the west.

The difficult land may be subdivided into mountain and hill (22 per cent of the total area), lowlevel peat (12 per cent) and wet mineral lowland (11 per cent). The mountain and hill unit generally corresponds with land over 150 m and belongs to grazing capacity class E, though it is not so extensive (see *Fig. 2.3*). Difficulties for agriculture include rock outcrops, steep slopes and inaccessibility to machinery, high rainfall and cloudiness, low temperatures and short growing season, exposure, and stony and infertile soils. Problems are less severe on the mountains of the east and south than on those of the west. Irish mountain areas tend to be more disadvantaged than those of much of the E.E.C. because of their greater wetness and lower summer temperatures. Lowlevel peat provides an impoverished environment for agriculture in parts of the country, especially Connacht, but most of the peat area is not farmed. The midland basin peats have a higher potential than the climatic blanket peats of western areas. The wet mineral soils are gleys and occur most widely in the drumlin belt of the north, to the north and south of the Shannon Estuary and on the Castlecomer Plateau, largely corresponding with class D soils in *Figure 2. 3*. Difficulties derive mainly from the impeded drainage of the heavy, imperme-

able and weak-structured soils, combined with moderately high rainfall. As a result, there is severe poaching of the land by the treading of livestock, the grazing season is shortened and there are substantial winter fodder requirements, herbage growth is restricted in wet seasons, and wheelspin and sinking hinder the use of machinery. The problems are most acute in Leitrim and west Cavan.

HISTORICAL PERSPECTIVE

Neolithic agriculturalists had reached Ireland by 3000 B.C., introducing crop cultivation and livestock rearing. Wheat was the dominant crop, with barley increasing in importance later. Cattle and sheep were kept but the pigs eaten may have been either domesticated or wild. Farm output was supplemented by food obtained through gathering, hunting and fishing. The Neolithic people lived mainly on the fringes of the uplands, on the lighter limestone and sandy soils and in coastal districts. In such places the soils were easily worked with primitive implements and the forest cover was light or absent, so that clearance was possible and grazing for livestock available. They avoided densely forested lowlands and marshy districts. The agricultural area expanded during the Bronze Age but farming was fundamentally a continuation of earlier practices.

The Celts, who arrived in Ireland about 300 B.C., had a profound effect on the country's landscape and agriculture. A dispersed settlement pattern predominated, with the people living in farmsteads termed raths. There are about 30,000 raths still in existence, their distribution indicating that the country had become widely peopled within the limits of the present agricultural land, avoiding the higher mountains and marshy areas. The use of iron implements had facilitated clearance of the denser forest and cultivation of the heavier and more fertile soils.

The nature of Celtic agrarian affairs is revealed in the Brehon Laws, a legal code which prevailed in much of Ireland until the seventeenth century. There was a tribal system of land tenure, with individual land ownership and claims on the clan lands depending on status in a complex social hierarchy which comprised different grades of nobles, tenants and labourers. Tenants had security on the land, with freedom from eviction. Mixed farming with a strong pastoral emphasis prevailed. Cattle, sheep, pigs, goats, poultry, bees and horses were kept. Cattle were units of exchange and measures of wealth. Dairy produce was a major summer food and meat was salted in autumn for winter use, there being little winter animal fodder.

Tillage was concentrated around the farmsteads, with barley, oats, wheat, flax and vegetables as common crops. Provisions were made for regulating the quality of farm produce and for agricultural training.

The Anglo-Norman invasion in the twelfth century brought western European feudalism to parts of Ireland. The lords and most of the free tenants came from England and Wales. The Irish were unfree tenants and serfs, though some had free tenant status, especially in less fertile districts. Anglo-Norman control fluctuated, there being a general resurgence of Gaelic power in the fourteenth and fifteenth centuries. The effectively feudalised area was confined to the lowlands of the east and south, in Leinster and east Munster. The agrarian landscape comprised manor houses and their farms, regularly arranged farm villages, large open fields cultivated in alternate years and outside these common grazing land and forest. Villagers had fragmented holdings, scattered in regular strips without fences across the two or three open fields around each village. Farming was mixed but with a stronger emphasis on arable cropping than in the Gaelic Irish areas, a contrast resulting from the different agricultural practices introduced by the Anglo-Norman settlers and facilitated by the more favourable climatic and soil conditions in the areas which they held.

The field system which had evolved over much of the country and was most evident in the west and north was less formal than that of the feudalised areas. It is termed rundale and was similar to the Scottish runrig. The people lived in clachans, which were small, irregular clusters of houses or cabins. They continuously cultivated a large open field around or beside the clachan, known as the infield, on which each had scattered plots. It was fenced off from the surrounding outfield, where the clachan inhabitants had grazing rights on rough pasture, bog, mountain and woodland. There was a form of short-distance transhumance, termed booleying, involving the use of rough grazing on uplands or bogs for cows during the summer months.

Developments during the sixteenth and seventeenth centuries had a profound and long-lasting impact on Irish agrarian affairs. There was widespread English reconquest and land confiscation. In attempts to achieve effective subjugation, a policy of plantation was introduced, whereby English and Scottish settlers were brought in to replace dispossessed Irish owners. Plantations differed in time and effectiveness, the most successful being in Ulster, but much of the country outside Connacht and west Munster was affected to some extent. In the mid seventeenth century there was much more general confiscation, with 50–80 per cent of the land in individual counties being taken for allocation to creditors of the English parliament. Only the counties of Mayo, Roscommon, Galway and Clare were

reserved for dispossessed landowners from other parts of the country. Although the bulk of the people throughout the country were left undisturbed, these changes resulted in an almost complete transfer of wealth and power. Almost the entire Irish upper class disappeared and with it the old Gaelic economic and social order. Control was now in the hands of a minority which was British in origin, differing from the majority in loyalties, religion, language and tradition. This was further extended through application of the Penal Laws which imposed severe restrictions on the purchase, inheritance, ownership and renting of land by Roman Catholics. By the late eighteenth century, when these laws were relaxed, 95 per cent of the land was owned by Protestants.

The new settlers regarded land as a source of profit rather than subsistence and a substantial commercial element developed in Irish agriculture in the seventeenth century. The expanding British market for cattle, sheep and wool was actively exploited until restrictions on Irish trade were imposed by the English parliament. The export of wool was controlled and imports to Britain of Irish livestock and livestock products were prohibited under the Cattle Acts of the 1660s. Deprived of the major market for store animals destined for fattening on British farms, Ireland developed a less profitable provisions trade but one which became of prime importance in the eighteenth century. Salted meat and butter were exported to Europe and the American colonies and for the victualling of ships. Dairying and pig production developed in addition to cattle and sheep rearing. Flax growing expanded with the linen industry, especially in the north. Subsequent to relaxation of the Cattle Acts from 1759, the nature and direction of livestock exports began to change once more, with increasing live shipments to Britain. Pastoral farming predominated in the mid eighteenth century, with net imports of grain. Thereafter increasing demand and prices for grain in Britain, together with measures to encourage the production and export of wheat, oats and barley under the Corn Laws from 1758, led to a major expansion of cereal growing. Cultivation of the potato, which had been introduced to Ireland about 1600, was greatly extended to improve the soil for cereals and to feed the rapidly expanding population. There had been about 2·5 m. people in Ireland in the early eighteenth century but by 1800 the population was 5 m.

Responding to the stimulus of the developing cash economy, improving landlords and the more privileged tenants effected many changes in the Irish agricultural scene during the eighteenth and early nineteenth centuries, especially in the east and south. Improvements included the introduction of new farm management practices, better crop varieties and livestock

breeds, improved implements and buildings, greater use of fertilisers, land reclamation and field enclosure. The rural landscape was trasnsformed by enclosure of the open fields and some of the common lands, the laying out of consolidated holdings and the dispersal of settlement, changes occurring at a later stage in the west. However many landlords effected little improvement, especially the substantial numbers who were absentee and whose estates were managed by middlemen.

There was a marked dualism in Irish rural society, the poverty of the bulk of the population contrasting with the position of the privileged landlord class. Although many tenants had long leases and arrangements were better in the north of the country, there was general insecurity of tenure with constant fear of eviction. Farmers were not compensated at the end of their tenancy for improvements which they had made to the holdings. A high proportion of output was paid in rents, which were excessive and increasing rapidly. Worst off were the landless labourers, including cottiers who rented small patches of land on which to grow potatoes.

The population, which was predominantly rural, was increasing at about 2 per cent per annum, reaching nearly 8·5 m. in the mid 1840s. As population grew, there was intensive subdivision of holdings, a trend reinforced for some time by political advantages which a landlord derived through having a large number of tenants. Small farms multiplied and 90 per cent of all holdings were under 12 hectares. There was widespread reclamation of mountain, bog and other unimproved land. After 1815 market forces operated contrary to the need to accommodate more people on the land, for agricultural prices collapsed, with those for tillage products being most affected and recovering less than those of grazing livestock. With resulting relative increase in the profitability of pastoral farming, the economic opportunities for labour in farming declined and there was little employment available outside agriculture. The plight of many was grave, barely subsisting on potatoes and endeavouring to sell sufficient livestock and crop products to pay the rent. Conditions were worst in the highly congested west, with a rural population density of 150 per square kilometre of agricultural land.

Under the prevailing conditions, severe and prolonged failure of the potato crop resulted in the Great Famine of 1846–48. More than one million people died from starvation and disease and a further million emigrated, so that by 1851 the population was 6·5 m. The Famine accelerated trends which had begun in the preceding decades and others were initiated. Emigration and a diminishing birth rate had existed prior to the Famine and they continued afterwards, so that by 1926 the population of the island

was 4·2 m., about half its prefamine level. The Famine resulted in the demise of many small holdings, those of under 2 hectares decreasing from 440,000 to 125,000.

With diminishing population pressure in the post-Famine period, there was a trend towards farm enlargement. Yet land reclamation continued until the improved area reached a peak in the 1870s when there was an agrarian depression. Cereal prices fell after repeal of the Corn Laws in 1846 and with growing imports to Britain from foreign sources. The prices for cattle and sheep increased as demand for meat in Britain expanded and transport to this market was improved. These price trends encouraged an increasing emphasis on pastoral farming, reinforced by the declining labour force and home consumers of arable products. The tillage area had diminished by more than half by 1914, increasing temporarily during the succeeding war years. Cereals were most affected, especially wheat. In contrast, the number of dry cattle doubled between the Famine and 1920, the total number of cattle first exceeding the population of Ireland in the early 1890s. Poultry production was the only other enterprise to expand significantly, for, after initial increases, the numbers of sheep and pigs fluctuated about fixed levels and the numbers of cows had been almost static since the 1820s. Although the total volume of agricultural output did not increase greatly in the seventy years after the Famine, it was produced by a diminishing labour force whose economic status improved considerably.

Land has for long been a contentious issue in Irish life, with various phases of agrarian agitation against the injustices of the landlord system. In the middle of the nineteenth century the land was held by 19,000 landlords, of whom one-fifth owned four-fifths of the farmland. A series of Land Acts was introduced from 1870 with the initial aim of remedying the worst abuses and later the policy of transferring ownership to the tenants. The Land Act of 1881 conceded the three Fs, which were fixity of tenure, fair rent and free sale of the tenant's interest in a holding. Rents were reduced by an average of 21 per cent. Land Acts from 1885 regulated tenant-purchase, providing government finance for the purpose, repayable by farmers as annuities at less than the levels of existing rents. To facilitate the improvement of farm structure, powers were provided for the acquisition of untenanted land by the state and its allocation to those in need. The Congested Districts Board was established in 1891 to tackle the particular problems of the most densely populated parts of the west. Major changes in land holding were effected in the comparatively short time span up to 1921, with the change-over from tenancy to owner-occupancy largely accomplished.

ECONOMIC AND POLITICAL CIRCUMSTANCES

Agriculture has always been the basis of the Irish economy. In 1926 the agricultural sector accounted for 53 per cent of employment, 33 per cent of gross national output and three-quarters of domestic exports. In common with other developed countries, the role of agriculture has tended to diminish substantially with economic development and diversification. Between 1960 and 1972 its share of national totals decreased from 36 to 25 per cent of employment, from 24 to 17 per cent of gross national product and from 61 to 41 per cent of exports. The role of agriculture in the economy is even greater than these measures of direct contribution indicate. Manufacturing industries have developed to provide the inputs required by farmers and to process farm produce; agriculture-based industries contribute one-third of total manufacturing output. The marketing and transport of agricultural produce and the provision of other services for farmers are significant aspects of the tertiary sector of the economy. There is strong interdependence between agriculture and other industries. The beneficial contribution of agricultural exports to the balance of payments situation is particularly great compared with manufactured goods because of the very low import content in production. The important role of agriculture in the Irish economy contrasts with the situation in other Western European countries, the 24 and 17 per cent shares of employment and income respectively comparing with 11 and 5 per cent in the E.E.C. as a whole.

The economic and political environment in which Irish agriculture operated altered with independence and there have been many changes over the succeeding fifty years. For a century prior to independence Ireland had formed part of a free trade area with Britain, whose market for food was open to world producers. These circumstances remained substantially unchanged during the 1920s from the viewpoint of the Irish farmer but the comparative prosperity of World War I conditions had given way to increasing market competition and diminished agricultural prices. The first government of the Irish Free State gave definite priority in its policies to the interests of agriculture, with the principal aim of maximising farmers' incomes. Emphasis was placed on development of those existing enterprises in which the country's comparative advantage was greatest, measures being introduced to improve livestock production and marketing. Efforts were directed towards recovery and expansion of the export trade, which was predominantly to Britain. A 'laissez-faire' policy was followed, with farmers receiving no direct assistance through subsidies, guaranteed prices or tariffs but permitted to purchase inputs such as feed-

stuffs and fertilisers at low prices on the world market. One-half of the agricultural output of the Irish Free State was exported.

Political and economic circumstances altered markedly in the 1930s, being characterised by world surpluses, state intervention in agriculture and diminished markets and prices. In 1930–31 duties were imposed on imports to Ireland of butter, oats and bacon and in early 1932 Britain introduced general tariffs to protect its agriculture. Trends prompted by the world economic depression were accelerated by the coming to power in 1932 of the Fianna Fáil party, with a different set of values and policies. The new government favoured self-sufficiency in food production to as great an extent as possible, with protection of the home market. Exports were accorded a diminished role and less economic dependence on Britain was sought. These policies entailed a relative shift in emphasis from livestock production to arable farming. The tendency towards trade isolationism was reinforced by an economic dispute with the United Kingdom which was precipitated by the Irish government's discontinuance of payment of the land annuities to Britain. Retaliatory special duties were imposed and later quotas on Irish livestock and livestock products entering the United Kingdom. Between 1929 and 1934 the volume of Irish exports declined by one-third and the value by more than one-half. Although bounties were paid by the government, farm income diminished by one-third and the price of inputs increased. The circumstances of the 1930s had a long-lasting impression on Irish agriculture.

Commercial arrangements with Britain and agricultural prices began to improve from 1935 and an Anglo-Irish trade agreement in 1938 marked the end of the economic war. Duty-free access to the British market was granted to Irish agricultural produce in return for preferential treatment of British manufactured goods, the basic conditions of the agreement being renewed in 1948 and 1960. Although quantitative restrictions could be imposed on imports to the United Kingdom, export possibilities revived and World War II greatly lessened the prospect of competition from foreign producers on the British market. However the wartime disruption of trade made Irish self-sufficiency in temperate zone foodstuffs necessary and disrupted fertiliser supplies, so that there was further emphasis on tillage and livestock output contracted. After the war the main contribution which Ireland could make to the European Recovery Programme was indentified as being the production of more food for sale abroad. In this situation of shortages, attention once again turned towards export markets, with the bulk of the expanding trade continuing to be with the United Kingdom. Conditions had changed by the early 1960s and Irish exports were facing difficulties

on the British market because of the introduction of quota controls over imports, a result of greatly increased supplies of agricultural produce from foreign sources and from British farms. The Anglo-Irish Free Trade Agreement which became operative in 1966 redressed to some extent the disadvantageous developments in Ireland's trading position, in particular improving its status as an exporter to the British market in the cattle and sheep sectors.

There had been relative stagnation in Irish agricultural production over the thirty years after independence, output in 1951 being only 5 per cent greater than in 1926–27. Against this background the first systematic plan for the Irish economy was published as *Economic development* in 1958. The need to place increased reliance on exports was recognised and hence the necessity of making agriculture more competitive was emphasised. Although some price supports were required, it was intended that increasing state expenditure would be concentrated more on measures designed to improve agricultural productivity. The main emphasis was placed on a dynamic policy of grassland exploitation, especially in relation to the cattle industry, since its exports did not require subsidy. The *Second programme for economic expansion* (1963) was more specific in its objectives, envisaging an increase of 40 per cent in the volume of gross agricultural output over the decade 1960–70, equivalent to 3·4 per cent per annum. It stressed the need to focus attention on three aims of agricultural policy: more favourable trade arrangements on export markets, rapid improvement in productive efficiency and amelioration of farm structure in areas of small holdings. The agricultural target in the *Third programme economic and social development 1969–75* was an increase of 11 per cent in the volume of gross output over the period, or 2·7 per cent per annum. It was envisaged that cattle, milk and pigs would make the greatest contribution to growth. Development policy would include the fields of animal health, agricultural education and training, advisory service and research, co-operation, credit and general farm improvement.

The relatively small sizes of the non-agricultural sector of the Irish economy and of the revenue derived from it have been a severe limitation on government support of farming. State expenditure in relation to agriculture was £4·3 m. in 1938–39, £10·9 m. in 1950–51, £26·3 m. in 1960–61 and £107·1 m. in 1971–72, when it was 15 per cent of total state expenditure. The distribution of state agricultural expenditure amongst different categories is shown in *Table 2.2*. State schemes had aimed at promoting farm efficiency rather than giving direct subsidies but over the past decade expenditure in the form of income support has expanded greatly.

Table 2.2.

State expenditure in relation to agriculture in selected years (£000)

Category	1938–39	1950–51	1960–61	1966–67	1971–72
Product subsidies	548	2,833	4,034	16,560	36,210
Subsidies on inputs	37	28	2,606	4,897	7,637
Livestock headage grants				2,329	9,000
Land improvement schemes	721	1,695	4,487	5,178	7,981
Livestock improvement and disease elimination	147	489	5,244	2,836	6,539
Building and equipment grants		513	867	2,610	4,752
Education, research, advisory and technical services	269	642	1,538	3,855	8,002
Relief of land annuities, rates, etc.	2,593	4,718	7,493	16,512	26,973
Total	4,315	10,918	26,289	54,777	107,094

Irish agricultural production began to increase during the 1950s and since then there has been substantial expansion. In the period 1960–72 there was a 41 per cent increase in the volume of gross output, defined as that part of total agricultural production which is sold off farms or consumed by persons on farms. However, the volume of farm materials (fertilisers, feedstuffs and seeds) used grew by 129 per cent, so that the volume of net output increased by only 22 per cent. In 1972 gross output was valued at £478 m. and farm materials used at £102 m., so that net ouput was £376 m. If other expenses of agriculture at £84 m. are deducted and £13 m. added for subsidies not related to sales, the income arising in agriculture is estimated to be £305 m. Of this income, wages and salaries amounted to £25 m. and the rent element of land annuities £3 m., so that the family farm income was £277 m. Although farm expenses have increased substantially, Irish agriculture is of an essentially low cost character. The income arising in agriculture and the family farm income in 1972 were 135 per cent and 156 per cent respectively above the values for 1960. These increases resulted in part from the greater volume of output and in part from an increase of 83 per cent in agricultural prices, which had been static during the 1950s. The structure of agricultural output is shown in *Table 2.3.*

Table 2.3.

Output of agricultural products in 1962 and 1972

Product	Unit of quantity	1962 Quantity ('000)	1962 Percentage of value of total gross output	1972 Quantity ('000)	1972 Percentage of value of total gross output
Milk	kilolitres	2,378	21·5	3,219	23·8
Cattle, calves, hides	number	1,186	29·8	1,677	41·2
Sheep, lambs, wool	number	1,782	6·1	1,621	4·2
Horses	number	17	1·7	22	1·2
Pigs	number	1,621	11·1	2,246	10·0
Poultry			6·6		4·2
Total livestock and livestock products			76·9		84·6
Wheat	tonnes	423	4·9	239	1·7
Barley	tonnes	437	4·1	748	4·4
Oats	tonnes	50	0·5	34	0·2
Potatoes	tonnes	537	4·1	446	2·4
Sugar beet	tonnes	930	3·0	1,113	1·9
Cabbage	tonnes	104	0·9	101	0·7
Fruit			0·6		0·4
Other crops			2·3		2·3
Turf	tonnes	1,864	2·7	1,138	1·2
Total crops and turf			23·1		15·3

There has been a captive domestic market for most agricultural produce because of protection, though home consumption now accounts for less than half of total agricultural output. Food and non-alcoholic beverages comprise 29 per cent of total personal expenditure on consumer goods and services. The population numbers less than three millions but the national per capita intake of calories is one of the highest in the world. Estimated annual per capita consumptions of major foodstuffs in 1972, with percentage change over the preceding decade given in brackets, were: potatoes 131·5 kg (−15 per cent); household flour 21·8 kg (−41 per cent); bread 59·0 kg

(—12 per cent); sugar 26·5 kg (—3 per cent); fresh milk 206 litres (—1 per cent); creamery butter 12·2 kg (+1 per cent); cheese 3·0 kg (+106 per cent); eggs 209 (—22 per cent); poultry 11·9 kg (+127 per cent); pigmeat 30·5 kg (+31 per cent); mutton 11·0 kg (—2 per cent); beef 19·7 kg (+23 per cent). The food consumption trends are towards a higher quality of diet, with important implications for the structure of agricultural output.

Because of the high proportion of agricultural output which is exported, Irish farmers are greatly affected by marketing conditions abroad. World markets for temperate zone products are generally characterised by trade restrictions and low prices, so that export opportunities have been limited and unstable. The mean percentages of agricultural exports consigned to different destinations in the five years 1968–72 were: Britain 64, Northern Ireland 14, E.E.C. 7, U.S.A. 8 and others 7. The export trade of the Irish Republic has been characterised by a marked reliance on the United Kingdom market, a result of spatial proximity, traditional links and the complementary nature of the two economies. Irish agricultural exports have had privileged access to this market but prices have tended to be low because of Britain's cheap food policy, whereby imports were admitted at open market prices and deficiency payments made to United Kingdom farmers in compensation. Irish farmers have been at a disadvantage as compared with their British colleagues because of the much lower level of state support and the transport and marketing costs incurred. The pattern of production and the income in Irish agriculture have been greatly influenced by British policies. The structure of agricultural exports is shown in *Table 2.4*.

The potential benefits to the agricultural sector were the major reason for the enthusiasm with which the Republic of Ireland joined the E.E.C. in 1973. The Community's Common Agricultural Policy is based on three major provisions: unrestricted movement of farm produce between member states; a common policy with respect to agricultural trade with non-member states; joint financing to support internal farm production, to modernise the agricultural sector and to subsidise exports to areas outside the E.E.C. Common prices are set throughout the Community at levels considered to be remunerative to farmers. Levies are imposed on imported produce to raise its price and protect the internal market from outside competition. There are internal floor prices at which Commission agents purchase any produce offered. Under the terms of the Accession Treaty, Irish agricultural policy is being progressively integrated into the Common Agricultural Policy during a transitional period of five years. The great attractions to Irish agriculture are the gaining of access to a much enlarged and protected market with guaranteed prices and returns above those prevailing outside

Table 2.4.

Agricultural exports, 1972

	Volume	Value (£m.)	Percentage of total value
Live animals		83·6	32·6
cattle	597,000 animals	70·9	27·6
horses	17,000 animals	9·7	3·8
Meat		96·8	37·6
beef	128,900 tonnes	61·2	23·8
mutton and lamb	11,800 tonnes	5·8	2·2
bacon, ham and pork	57,500 tonnes	19·3	7·5
Dairy products and eggs		41·7	16·2
milk (incl. dried or powdered)	39,200 tonnes	9·4	3·6
butter	37,600 tonnes	18·0	7·0
cheese	25,900 tonnes	12·3	4·8
Cereals and cereal products		1·7	0·7
Fruit and vegetables		6·8	2·6
Miscellaneous food articles		13·3	5·2
Hides, skins, wool and hair		10·7	4·2
Crude animal and vegetable materials		2·3	0·9
Total		256·9	100·0

the Community, together with external financial assistance towards the costs of farm income support and agricultural improvement. Membership of the E.E.C. also involves transference of responsibility for many of the major issues and decisions in agriculture from the Irish government to the Community.

FARM POPULATION

Ireland's demographic history is unique in the world, with a decrease in total population extending over more than a century. The decline, initiated at the time of the Famine, continued at a diminished rate after establishment of the state, with a reduction of population at each inter-

censal period, except 1946–51, until the 1960s. The population was 2,971,992 in 1926 and had decreased to 2,818,341 by 1961. The trend was then reversed, with increases of 2·3 per cent and 3·3 per cent over the subsequent two intercensal periods, the total reaching 2,978,248 in 1971. The rate of natural increase, ranging between 0·5 and 1·0 per cent per annum, has been depressed by a very low marriage rate and a high average age at marriage. Yet as the number of births has always exceeded that of deaths, population decline has been the result of substantial emigration. Net emigration had ranged from 0·6 to 0·9 per cent per annum but increased to 1·4 during the 1950s, diminishing to 0·5 in the 1960s. Net emigration per annum was 42,400 in the period 1956–61 but had lessened to 10,800 in 1966–71, accounting for the reversal in the population trend. The reduction in emigration has been related to greater employment opportunities in secondary and tertiary industry at home but also to diminished prospects in Britain and North America. Emigrants have been mainly young adults, resulting in a low proportion of people in the 15–44 age groups and a high dependency ratio.

There have been considerable spatial variations in population change, with growth occurring mainly in east Leinster and decline being greatest in the west and north. The population of Connacht declined by 29 per cent between 1926 and 1971, the greatest county decrease being 49 per cent in Leitrim. Regional variations are partly a result of differences between urban and rural areas, the level of urbanisation being low in the west and north. Urban places, officially classified as towns exceeding 1,500 population, have had a continuous increase in population, accounting for 52 per cent of the total in 1971. The growth of Dublin has been particularly marked, so that Dublin, Dun Laoghaire and their suburbs now have a population of 778,000, 26 per cent of the national total, with substantial expansion also occurring in adjacent towns.

The settlement pattern of the Irish farm population is almost entirely dispersed, so that data for open country population are more relevant to agricultural considerations than those relating to the officially designated rural areas, though there are also many non-farm dwellers in country districts, especially in the east. Open country dwellers amount to 41 per cent of the population of the state but in western areas the proportion exceeds two-thirds. Despite the reversal of the total population trend in the 1960s, numbers in the open country declined by 4·1 per cent in 1961–66 and 2·2 per cent in 1966–71. Recent decline in open country population in the west and north has been about twice the national average.

There has been continuous decline in the agricultural labour force, both

in absolute numbers and as a proportion of total employment. In 1926 there were 672,129 persons with agricultural occupations, representing 52 per cent of those gainfully occupied; by 1971 the values were 281,411 and 25 per cent. Change has been most pronounced since World War II, with declines of 24 per cent in the decade 1951–61 and 27 per cent in 1961–71, compared with changes of −13 per cent and +1 per cent in the total number gainfully occupied. The rate of decline increased in recent years, despite the opposite trends in total and open country populations. The agricultural labour force decreased by about 11,000 per annum during the 1960s, three-quarters of the loss being attributable to retirements and deaths and the remainder to a twofold excess of people leaving the industry over new entrants. The low rate of outflow over the history of the state as compared with other Western European countries is at least in part a result of the limited employment opportunities in other sectors of the economy, so that emigration was often the alternative to remaining on the land. The number of agricultural occupations in 1971 represented an average of 5·9 persons per 100 hectares of agricultural land and 101 per 100 agricultural holdings.

The structure of the agricultural labour force and changes in the different categories of employment are shown in *Table 2.5*. Farmers are the most stable element, constituting an increasing proportion of the diminishing labour force. Farmers are less inclined than others to leave agriculture because they own land and a home and because they are less suited to other work as a consequence of their older age structure. The incentive to enter

Table 2.5.

The agricultural labour force in 1951 and 1971

	1951		1971		Percentage change 1951–71
	Number	Percentage of total	Number	Percentage of total	
Farmers	235,331	46·3	181,627	64·5	−22·8
Relatives assisting on farm	171,085	33·6	52,921	18·8	−69·1
Agricultural labourers	84,657	16·6	35,569	12·6	−58·0
Others	17,686	3·5	11,294	4·0	
Total	508,759	100·0	281,411	100·0	−44·7

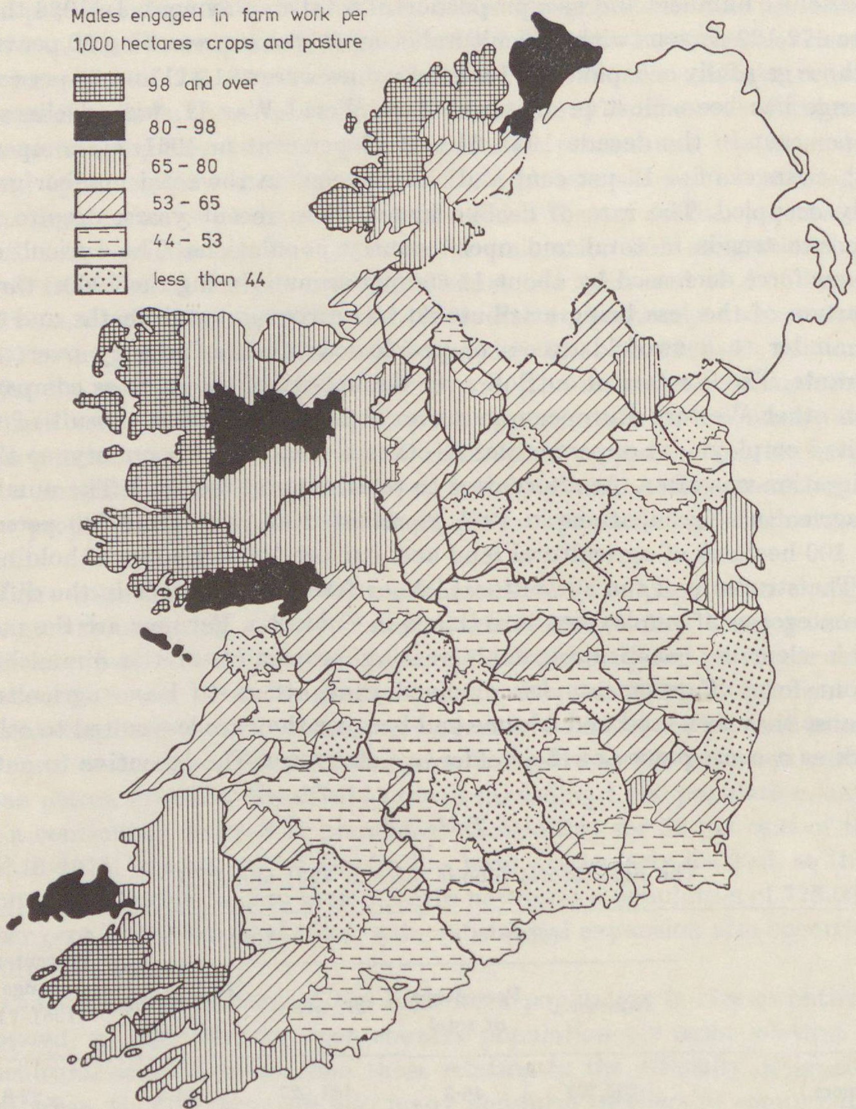


Fig. 2.4. Farm employment

agriculture is stronger for those who can acquire a farm. Farmers' wives are not included amongst relatives assisting on the farm. The greatest decline has been in farmers' sons and daughters helping on farms, who decreased by 73 per cent during 1951–71, with the number of girls in 1971

being only 14 per cent of the 1951 value. The decline amongst relatives and employees has led to difficulties in the acquisition of permanent or seasonal labour for some farmers.

More frequent and spatially detailed information is available concerning male employment in agriculture than with respect to the farm labour force as a whole, as data are recorded at the agricultural enumeration. In 1972 there were 257,600 males engaged in farm work, 220,000 being members of the farm family and two-thirds of the others were employed on a permanent basis. Many factors affect the spatial labour density pattern *(Fig. 2.4)*. Farm size is the most obvious influence, with high densities occurring in the small farm areas of the west and north, and especially on tiny holdings along the western seaboard (see *Fig. 3.2*). Historical influences are related to the distribution of farm size. A further associated factor is the level of mechanisation (see *Fig. 4.3*). The farming system has a significant effect on labour requirements, demands tending to be higher in arable farming and in dairying areas than in drystock production districts. Other influences affecting the density of farm labour include alternative employment availability, the age structure of the farm population and its productivity, the layout of farms and the nature of the physical environment. The structure of the labour force varies spatially, particularly with regard to hired labourers, who are employed mainly on the larger farms of the east and south. Connacht and Ulster have 43 per cent of the total farm family members engaged in agriculture but only 12 per cent of other permanent workers.

The Irish agricultural labour force has an old age structure, compared both with those engaged in farming in other countries and also with other sectors of the Irish economy. Of those engaged in agriculture, 24 per cent are aged less than 35 years and 18 per cent are 65 years and over, compared with 61 per cent and 4 per cent respectively in other occupations. Relatives assisting on farms are the youngest sector of the agricultural labour force, 65 per cent being under 35 years old in 1966. Although 15 per cent of agricultural labourers were under 20, 40 per cent were aged 45 to 64 but only 7 per cent were 65 years and over. Farmers, who are the most numerous group and control decision making in agriculture, have a much older age structure *(Table 2.6)*. Persons aged 65 years and over accounted for 27 per cent of farmers in 1966 but only 7 per cent of employers and managers, the comparable socio-economic group in other sectors of the economy. Old farmers are likely to have less capacity for the physical work of a farm and to be less responsive to innovations and to development incentives than are their younger colleagues. The age structure of farmers tends to be

older on small farms and in western areas. The old age structure of farmers results from the selective migration of young people out of agriculture and the relatively small number of new entries, the reluctance of farmers to retire and to transfer managerial control and ownership to the next generation until an advanced age or death, and the large number of farms on which there is no person to succeed to ownership if the farmer were to retire. Transfer of managerial responsibility from father to son tends to occur abruptly, rather than a more desirable planned and gradual relinquishment of control.

Table 2.6.

Age structure and marital status of farmers, 1971

Marital status	Age group							All ages	Percentage distribution
	14–24	25–34	35–44	45–54	55–64	65–74	75 and over		
Single	3,067	6,734	11,201	14,591	13,747	8,897	3,041	61,278	33·7
Married	236	6,404	17,085	26,000	28,439	17,323	5,967	101,454	55·9
Widowed	3	85	653	2,668	5,449	6,237	3,800	18,895	10·4
Total	3,306	13,223	28,939	43,259	47,635	32,457	12,808	181,627	100·0
Percentage distribution	1·8	7·3	15·9	23·8	26·2	17·9	7·1	100·0	

The agricultural labour force is 91 per cent male, 90 per cent of farmers, 89 per cent of relatives assisting on the farm and almost 100 per cent of hired employees. Only 9 per cent of female farmers are aged less than 45 years and 46 per cent are 65 years and over. The proportion of female farmers who are widowed is 66 per cent and 26 per cent are single. Women normally become owners of farms through the death of their husbands or because they have remained single at home and there is no brother to succeed to the farm. There is a high rate of celibacy in the male farm labour force, the percentages which were single in 1966 being: all agricultural occupations 53, farmers 33, relatives assisting on farms 93 and labourers 65, compared with 42 per cent in non-agricultural occupations. The proportion of single persons in the age group 45–54 years was 33 per cent amongst farmers and 7 per cent amongst other employers and managers. The rate of celibacy diminishes with increasing farm size. Factors which

contribute to the low rate and late age of marriage of farmers include the extent of migration of females from the farm population, with a resultant severe imbalance in the sex structures of rural areas, the late age at which many farmers' sons inherit their holdings and houses, and the reluctance of some women to marry farmers and to live in rural areas. It may be expected that on average married farmers work their holdings more intensively than single or widowed farmers of the same age, as they are more likely to have dependents to support and the chances of a direct successor to the farm are greater.

The educational status of the agricultural labour force compares unfavourably with that of other sectors of the economy. The proportion whose education terminated at primary level was 83 per cent for agricultural occupations and 59 per cent for other occupations in 1966. The percentages of persons whose full-time education ceased at under 15 years was: farmers 73, relatives assisting on farms 63, agricultural labourers 84 and all other occupations 44. Small farmers tend to be less well educated than those with larger holdings. Formal post-primary education is available in secondary schools, vocational schools and agricultural colleges. The number of students attending agricultural colleges is 650 annually but only about one-third of these become farmers. Research on the acquisition of information about useful practices has shown that the mass media sources, including farm magazines, newspapers, radio and television, are very widely used by farmers at the awareness and information stages and to a lesser extent at later stages in the adoption process (Bohlen and Breathnach, 1970). The role of local farmers and relatives is very important. The advisory service far outranked other sources in being named as the most knowledgeable, trustworthy and readily available source of information. There is great need for more formal and informal education of the agricultural labour force, especially training oriented towards farming, in order to meet the requirements of modern agriculture.

Part-time farming has become increasingly significant in Irish agriculture with the growing availability of other employment within commuting distance of farms. In 1961, 7 per cent of farmers considered themselves as engaged principally in agriculture but having a subsidiary occupation, the practice being most common in the west and north. More important is the ownership of agricultural holdings by persons who are engaged principally in occupations other than that of farmer. In 1966 there were 85,306 such landholders, representing 31 per cent of all landholders. Such holdings were less significant in terms of area than they were numerically, 61 per cent being 0·4–6·1 hectares. They accounted for 92 per cent of all

holdings under 2 hectares, 40 per cent of holdings 2–6 hectares, 15 per cent of holdings 6–20 hectares and 7 per cent of holdings of 20 hectares and over. Land ownership by persons other than farmers is most common in the east and least prevalent in the west and north, reflecting the availability of other employment opportunities. Women owned 24 per cent of all the holdings concerned. Four-fifths of the women were classified as being engaged in home duties. The principal occupations of the men were retirement, labourers and unskilled workers, farm labourers and other agricultural occupations, proprietors and managers of retail and wholesale trading establishments, building personnel, manufacturing employees and professional people. Size of holding varied with socio-economic status, proprietors, managers, directors and professional people owning 51 per cent of those holdings over 40 hectares not held by farmers.

It is difficult to assess the precise role and effect of part-time farming. Research has shown that part-time farmers in the Shannon area have certain characteristics which tend to distinguish them from other farmers, being younger and better educated, having smaller holdings and farming operations, and being more often married and with larger households (Curry, 1972). Certain motives are likely to be more important to people who are not dependent solely on their farm for a livelihood, including the value of the farm as a home, amenity, recreational and prestige considerations, and the speculative and security appeal of land. Part-time farmers tend to favour simple systems of farming, with an emphasis on extensive enterprises and low labour and management requirements. There are great variations in the standard of part-time farming, ranging from those who completely neglect their holdings to those who use the additional capital to effect improvements and are important innovators.

Many influences contribute to the decline in full-time farming relative to the growth of part-time involvement and the expansion of employment in other sectors of the Irish economy. The operative factors may be seen within a pull-push-hold framework. The most important factor in decline is the perceived attraction of other employment which offers higher incomes, better working conditions, shorter and more regular hours, holidays and superior prospects. For some of those who migrate, there is the enticement of urban living. Alternative employment is more readily available in the east but the potential financial gains to the westerner are greater because of his smaller farm income, though change of occupation more often necessitates migration. Decline in the farm population has been slightly greater in the north and west than in the south and east. Push factors include farm mechanisation, changes towards more extensive and specialised farming

systems, accommodation and transport problems of agricultural labourers, and conditions of health, age and death. There may even be a natural decrease in the farm population, because of its high rate of celibacy, late age of marriage and old age structure. Factors which tend to hold people in agriculture include the forces of inertia, the attractions of the independent, varied, open-air farming life in the country, lack of qualifications and experience in other occupations, scarcity of alternative jobs locally combined with reluctance to migrate and sell the land, the guarantee of subsistence and employment in times of recession which a farm affords, family bonds, advancing age, and the availability of social welfare assistance and remittances from emigrants.

In common with other developed countries, the Irish agricultural labour force is declining but the farm population is an aging one, with a high celibacy rate, an increasing proportion of female farmers and a low educational status. These characteristics involve major social difficulties for agriculture. The implications of increased part-time farming are not fully understood. In recent years the proportion of retirements and deaths has increased but the number of new entrants into farming has lessened. In the context of current economic and demographic circumstances, it seems likely that decline in the agricultural labour force will continue for some time.

3. AGRARIAN STRUCTURE

Agrarian structure refers to the nature of land ownership and control and to the size, shape and subdivisions of farm units. The land is divided into many thousands of farms, which constitute the individual units of operation in agriculture. The farmer's decisions and practices are strongly influenced by the ownership, size and layout characteristics of the land which he works. The agrarian landscape has evolved over centuries and its structural characteristics inherited from the past are not always well adapted to meet the needs of modern agriculture. Structural problems are a major hindrance to agricultural development.

The Irish Land Commission is the state body responsible for implementing government policy in relation to agrarian structural reorganisation. It had been established in 1881 as a rent-fixing body, later developing into a tenant-purchase agency, but during the last thirty years its main functions have been relief of rural congestion, enlargement of uneconomic holdings, farm improvement and reduction of farm fragmentation. It was granted considerable land acquisition and distribution powers, though within carefully defined limits to safeguard the rights of owners. In practice much of the land for agrarian reform is obtained through purchase on a voluntary basis rather than by compulsory acquisition. The powers and activities of the Irish Land Commission are controlled by comprehensive agrarian legislation contained in a series of Land Acts. The scale of activity may be gauged from the fact that during the period 1945–72 the Land Commission distributed 341,000 hectares in land settlement operations, creating 2,300 new farms, enlarging 23,500 existing farms and expending £16·5 m. on estate improvement.

LAND TENURE

Land tenure concerns the arrangements regarding the ownership, control and use of land. The Irish tenure system is based on an almost universal owner-occupancy of land. About 94 per cent of the land is held in owner-

like possession, compared with an average of 74 per cent in the eleven European countries for which data are available (F.A.O., 1971, 99). Since abolition of the landlord system, letting of land has been restricted to periods of less than one year. About 6 per cent of the farmland is let on this short-term basis, referred to as conacre.

Although tenant proprietorship had been largely attained before establishment of the state, there remained in 1921 114,000 tenants on 1·2 m. hectares. Rural landlordism was finally abolished by the Land Act 1923, which accepted the principle of compulsion to expedite land transfer but continued compensation of landlords. The tenants became tenants of the Land Commission, at reduced rents, pending transfer of ownership to them. This has now been largely effected, the residue of tenanted land comprising only 2,600 holdings. These residual holdings are mainly in western areas and they require improvement, enlargement and consolidation before being vested in the tenant-purchasers. The main difficulty is that of obtaining sufficient land in their immediate vicinity to facilitate the enlargement and consolidation, but they are receiving special attention by the Land Commission.

Successive governments have regarded owner-occupancy as being the most desirable form of tenure, both socially and politically. The individual has a direct interest in the land through his personal ownership and working, so that there is a strong incentive to care for and develop it. The occupier has control over use of the land, he has no rent to pay, he achieves capital gains as land prices rise and he can borrow capital through the security of his holding. Yet the present tenure system contributes to the relative immobility of the land resource between occupiers. Farmers have developed strong attachments to specific tracts of land, ownership is associated with social status and with security in old age and there is a fear that the selling of land may imply financial difficulties. There is the tendency to retain ownership even when sale of the land would improve economic position. Reluctance to relinquish ownership, legal complications and the inflation in land prices hinder transfer of land to people who would make more productive use of it. This is a major obstacle to those who try to increase the size of uneconomic holdings and to young people who wish to enter farming but have no land or capital.

In recent years there have been criticisms of the prevailing land tenure system and suggestions for modification have been made. Crotty (1966) felt that the absolute individual ownership of land has been the cause of misallocation and immobility of land amongst farmers, low farming standards and the extensive livestock farming system. He proposed the imposi-

tion by the state of a land tax, approximating to the competitive rental value of the land, in order to ensure its economic utilisation and accelerate the transfer of ownership and to effectively appropriate the income accruing to land for the use of society as a whole. Scully (1971, 169–72) recommended the introduction of long-term tenancies to facilitate structural reform in western Ireland. The tenancy period should be at least ten years, enabling the tenant to obtain a satisfactory return on permanent investments, with provision for renewal of contracts. Tenants should be compensated for permanent farm improvements and a system of assessing equitable rents would be necessary. In this way the advantages of good tenancy arrangements could be achieved without the major defects of the former landlord system. The separation of ownership of land from its use was also considered to be logical, practicable and necessary by the authors of a farming organisation report on farm inheritance and succession (Macra na Feirme, 1973). They suggested that a land policy geared to the transfer of land from retiring or non-viable farmers to those on developing farms or in a position to use land was necessary to increase the mobility of the land resource.

The methods of transfer of farm ownership are varied. In a sample of one thousand farms the percentage distribution according to means of acquiring title was: inheritance after death 23, intestate succession 8, gift transfer 34, marriage agreement 14, purchase 18, acquisition from the Land Commission 1 (Macra na Feirme, 1973, 26). The low proportion of acquisitions through purchase indicates a high degree of continuity and stability in family farm ownership. In parental transfers 64 per cent of successors acquired the farm during the lifetime of the parents. Lifetime transfers usually occur when the parent 'makes over' the family holding as a gift to the successor. There is also a practice of making conditional transfers of title in the event of the successor's marriage, such marriage agreements being commoner on the larger farms.

The demographic characteristics of the farm population have important consequences for farm succession. Because of the extent of old age, celibacy and migration, a substantial number of farms will probably cease to exist as independent units at the end of the present generation. In western areas, one-third of farmers over 50 years of age are unmarried or childless and in many other instances there is no direct heir or all the children have migrated, so that it has been estimated that one-half of farmers over 50 years are without prospective successors (Scully, 1971, 38). The absence of successors is greatest on the smaller farms and declines as farm size increases.

Many Irish farmers make little effort to secure a proper title to their holding and many delay or do not make arrangements for its transfer to

a successor. Of the transactions completed by the Probate Offices during the period 1967–72, 44 per cent were intestacies, the incidence being greater among the rural population (Macra na Feirme, 1973, 26). Intestacies and the absence of legal titles are most common on the smaller farms. The proportion without possession of legal titles was found to range from 8 per cent for those with over 40 hectares to 30 per cent on holdings under 12 hectares. The absence of a title was commoner among older, single and female farmers, and it was more prevalent in Connacht and Ulster than in Leinster and Munster. In a sample of five thousand western farmers, 33 per cent were found to have no registered title to their holdings (Scully, 1971, 30). Procedures are available whereby ownership title could be obtained in most instances by the occupier establishing a good legal claim to the property.

The absence of a title is an impediment to agricultural development. The incentive to invest capital and effort is lessened when the occupier does not own the farm and there is uncertainty about its future. Major capital borrowing is impeded when the holding cannot be offered as security. When a son has managership of a farm but the title is retained by his parents, farm planning and development are hindered. In most other instances there is apathy about title status and no great disadvantages in being without a title are perceived by those concerned. Presumably this is because those who had not secured a title are unlikely to be the most enterprising farmers and do not plan to engage in major developmental activity.

SIZE OF AGRICULTURAL HOLDINGS

The size of a farm business might be measured by the amount of inputs in terms of land, labour force and capital investment, or by the volume or value of output. Land area alone is not an adequate indicator but it is the only one for which regional data are available in the Republic of Ireland and it is the gauge in general usage. There is a positive correlation between land area and farm income in agriculture as a whole and within particular farming systems, though area could be misleading in inter-system comparisons, particularly between intensive and extensive farm systems. In using area as a measure of farm size, it would be desirable that values should be weighted according to the quality of the land but this is not practicable.

One difficulty in using area data is that the agricultural holding, as

defined in the agricultural enumeration, is not synonymous with the concept of the farm as a business unit (Fennell, 1968a, 175–7). An agricultural holding is defined as "All land used wholly or partly for agricultural or livestock production, that is, operated, directed or managed by one person, alone or with the assistance of others without regard to title, size or location and may be in one or more pieces if they are in the same neighbourhood and are known and operated as a single holding or property" (*Irish Statistical Bulletin*, 1971, 342). Land let in conacre is recorded as being in the holding of the rated occupier, rather than in that of the person to whom it is let, as it would be in the economic sense of a farm business. Widely separate holdings under the same management are recorded individually and there are different interpretations of 'in the same neighbourhood'. It is likely that the definition of an agricultural holding is not always accurately and uniformly applied. A person or family may prefer to return a multiple holding under its separate parts because of factors such as rates liability, social benefit payments, grant prospects, death duties, legal complications, family tensions, prestige, or the inertia of continuing to refer to an amalgamated holding under the names of its component parts. The definition includes large gardens, sports fields and the grounds of institutions used even in part for grazing. There is some arbitrariness in the data relating to holding numbers and sizes, with an expected tendency to exceed the number of farm businesses and to underrepresent their size. Yet there was a close correspondence between the 290,308 holdings over 0·4 hectares recorded at the 1960 agricultural enumeration and the 288,830 farmers and landholders of other occupation who were returned as owning land exceeding 0·4 hectares at the 1961 census of population.

The size distribution by total area of agricultural holdings is shown in *Table 3.1*. Holdings of small and medium size predominate but large holdings' share of the total area of crops and pasture is proportionately greater than their numerical strength. Holdings of less than 12·1 hectares account for 48 per cent of the total and 17 per cent of the crops and pasture, those of 12·1–40·5 hectares comprise 42 per cent of all holdings and 46 per cent of the crops and pasture, and those of over 40·5 hectares are 11 per cent of the total and have 36 per cent of the crops and pasture. The mean area of crops and pasture per holding is 17·2 hectares. The size structure of agricultural holdings is larger than that of most countries of Western Europe, the average for the E.E.C. being 15 hectares. In Europe 74 per cent of holdings are less than 10 hectares and they occupy 34 per cent of the crops and pasture, as compared with 40 per cent and 15 per cent respectively in Ireland (F.A.O., 1971, 28).

Table 3.1.

Size distribution of agricultural holdings in 1931 and 1970

Size of holding (hectares)	1931		1970	
	number	percentage	number	percentage
0·4–6·1	104,049	31·0	67,109	24·0
6·1–12·1	90,364	26·9	65,773	23·5
12·1–20·2	62,267	18·6	60,235	21·6
20·2–40·5	49,873	14·9	56,238	20·1
40·5–80·9	21,081	6·2	23,351	8·4
80·9+	7,949	2·4	6,744	2·4
All sizes	335,583	100·0	279,450	100·0

There are marked spatial differences in farm size structure. This is indicated by the variation in the distribution of each county's crops and pasture among different sizes of holding *(Fig. 3.1)*. The most obvious feature is a general westward decline in the area occupied by large holdings, accompanied by increased significance of the small unit northwestward. The extreme instances are County Kildare, where 64 per cent of the crops and pasture is occupied by holdings of over 40·5 hectares, and County Mayo, in which 49 per cent of the area is on holdings of under 12·1 hectares. In the province of Leinster 24 per cent of the crops and pasture is on holdings of under 20·2 hectares, in Connacht the proportion is 62 per cent.

The intermixture of farms of different sizes which occurs everywhere is masked when the average size of holding is computed but the resultant map clearly illustrates the general spatial pattern of farm size *(Fig. 3.2)*. The mean area of crops and pasture per holding is taken as being a more realistic index than the total area of holding, the difference between the two being greatest in upland areas where farms incorporate unimproved land. Small farm size predominates in the north and west, contrasting with the remainder of the state.

The small farm problem in Ireland is accentuated by the fact that in many areas of small holdings the inadequate tracts of land are also of inferior quality. This areal association between land quality and farm size is evident at both the national level (see *Figs 2.3* and *3.2*) and also the local level, as in diminishing size towards hill and bog margins. It is at least in part a result of the historical pattern of land confiscation and colonisa-

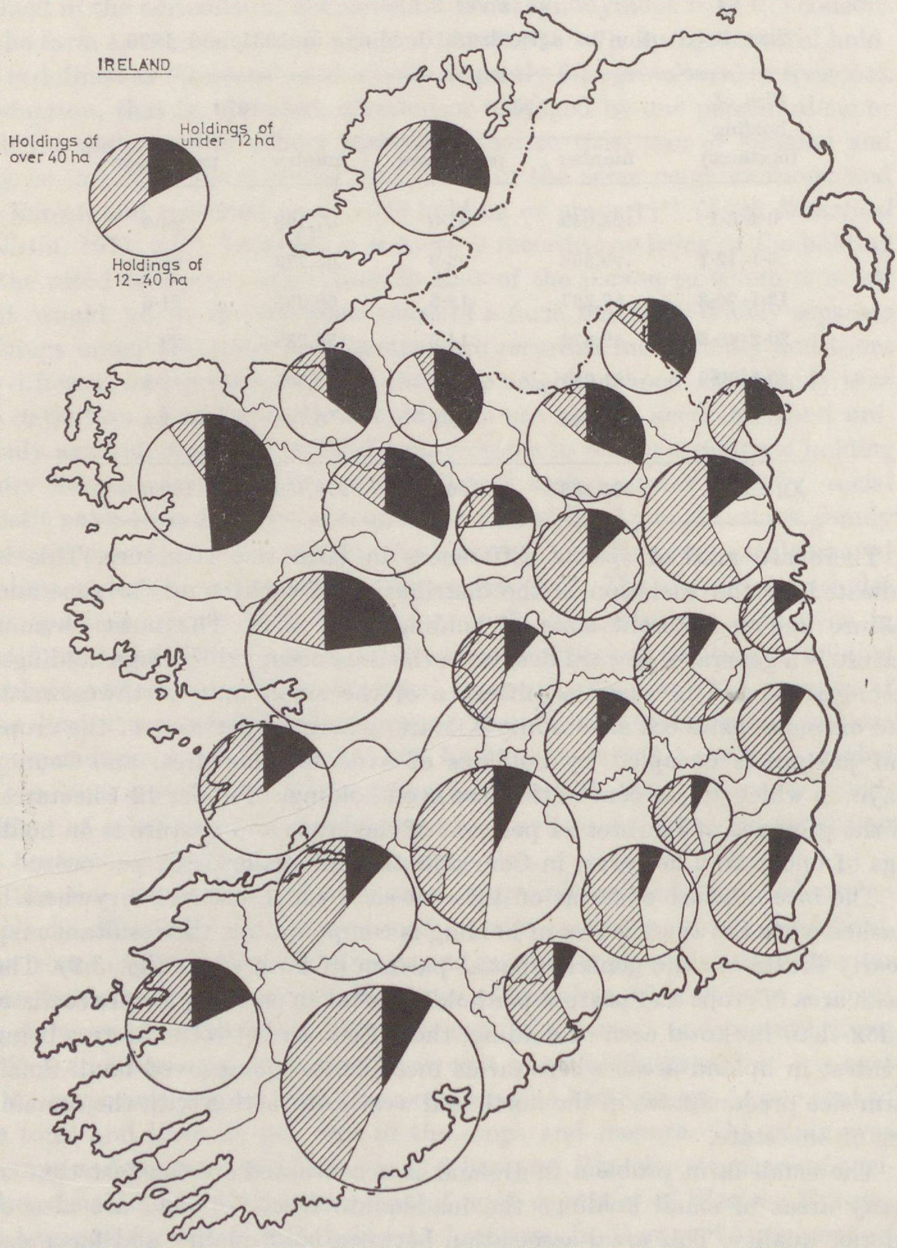


Fig. 3.1. Proportions of agricultural land by size of holding

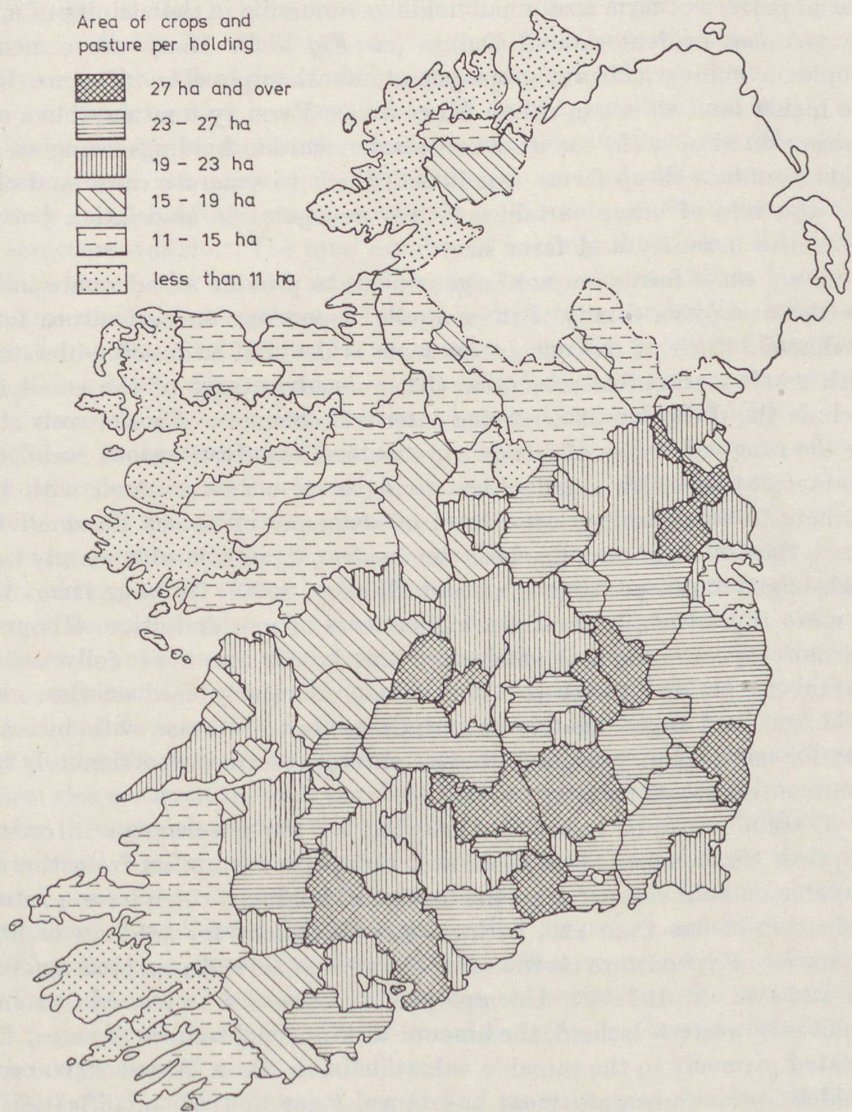


Fig. 3.2. Average size of holding

tion, whereby the better land, especially in the east and south, came under foreign ownership in medium and large farms, with displacement of native population on to inferior land, especially in the west, which became more congested. Farmers with good land can better afford to extend their area through land purchase. The location of cities and towns has an effect on the

spatial pattern of farm size, small holdings occurring in the vicinity of urban places, most evident around Dublin (cf. *Fig. 3.2*). Many are owned by people in non-agricultural employment, another possible influence being the higher land values in urban fringe areas. Farm system may have some bearing on size, with, for instance, market garden holdings being smaller than mountain sheep farms, but it is difficult to separate cause and effect and the role of other variables in any recognisable association between enterprise intensity and farm size.

Many small farms are not large enough to provide an adequate income for the occupying family if it is wholly dependent on agriculture for its livelihood. Much of the output on some is devoted to family subsistence, with small marketable surpluses. Other disadvantages of the small farm include the difficulty of achieving internal economies of scale, restrictions on the range of choice of farming system and disadvantageous sociological characteristics which smallholders tend to have as compared with large farmers. A significantly lower level of economic efficiency on small Irish farms than on large ones has been demonstrated, attributable mainly to the high labour input per unit of output (Hickey, 1970). On large farms there is more capital available and a higher level of mechanisation, labour can be more specialised, and machinery and labour are more fully utilised. However, the land factor is often more productively used on the smaller holdings, land input relative to output tends to increase with increasing size for most farm systems. Intensive enterprises are proportionately more common on small holdings.

Certain measures have been adopted by the government in order to improve the incomes of smallholders. Complete exemption from the rates payable on land is granted to the owners of holdings which have a rateable valuation of less than £20, with partial abatement for holdings of higher valuation. Expenditure on the relief of rates on agricultural land amounted to £24·4 m. in 1971–72. Unemployment assistance is payable to smallholders in western Ireland, the amount of this social welfare payment being related inversely to the rateable valuation of the farm. About 20,000 smallholders receive unemployment assistance. Prior to 1966, qualification had been based on the amount and type of livestock and crops on the holding, acting as a disincentive to increased farm productivity. In order to promote development of potentially viable small holdings, the Small Farm (Incentive Bonus) Scheme was introduced in 1968 and 13,000 farmers had embarked on the scheme by March 1973. Bonus grants were paid to participants who implemented a farm development plan, drawn up in consultation with their agricultural adviser, and who kept simple farm accounts.

Changes in the holding size structure over the period 1931–70 are evident in *Table 3.1.* Holdings of less than 20·2 hectares diminished by 25 per cent, the rate of decline being greatest among the smallest holdings. Those of 20·2 to 80·9 hectares increased by 12 per cent and there was a reduction of 15 per cent in the number exceeding 80·9 hectares. The result of these trends is a more equable distribution of land. Although many of the very small holdings ceased to function, the rate of change in holding size structure was slow. The total number of holdings diminished by 56,133, or 17 per cent, the annual rate of decline being almost always less than 0·5 per cent. The average area of crops and pasture per holding increased from 14·1 hectares in 1931 to 17·2 hectares in 1970. The pattern of structural change has been quite uniform in the different provinces, with the rate being slower in Munster and Leinster than in Connacht and Ulster.

Decline in the number of holdings has been in large measure an adjustment to reduction in the farm population, though occurring at a much slower rate. It has also been related to increased mechanisation, the effort to achieve greater efficiency and a desire for higher living standards. Some small holdings which ceased to function as independent units were abandoned or afforested but most were amalgamated with other farms through purchase or inheritance. Many other small farms were extended through land acquisition. The general tendency is for expanding farmers to add land to the home farm, rather than move to a larger holding in the neighbourhood. In the Macra na Feirme (1973, 8) study sample, over half the increases in farm size occurred through purchase on the open market and almost one-quarter through inheritance from relatives. The amount of land offered for sale is small, limiting the rate of structural change. Recent major increases in land prices have been a further handicap to farm enlargement, making acquisition of additional land too expensive for many smallholders and resulting in subsequent capital scarcity for effective use of the extra land purchased by some. A desire not to lessen entitlement to the remission of rates payable on land and to state social benefits has been a disincentive to the extension of many small farms.

The Irish Land Commission has played an important role in structural change. The decline in the number of very large holdings is mainly a result of acquisition and subdivision by the Land Commission. Land which is not being worked adequately may be taken compulsorily. The Land Commission has allotted 639,904 hectares under the various Land Acts since 1923, representing one-ninth of the total area on farms in the state. Of this land, 285,132 hectares was used to enlarge 57,792 uneconomic holdings, an average allocation of 4·9 hectares per holding. The remaining 354,772 hectares

were subdivided into 39,769 holdings for former employees on the estates, evicted tenants, migrants and others, a mean of 8·9 hectares per holding. Entire holdings created by the Land Commission in the 1920s were only 8–10 hectares and the standard has been progressively increased to the present 16–18 hectares of good land or its equivalent, adopted in 1962. The proportion of the total farmland affected and the small size of individual allocations indicate the limitations of the Land Commission contribution to effective farm enlargement. In addition, some viable farms have been subdivided into small holdings and the purchase of land by many medium and large farmers has been thwarted, the land being used instead for subdivision. Land Commission policy in recent years has aimed at an annual land resettlement programme of about 14,000 hectares. Difficulties in reaching this target have been encountered because the reserve of land available for acquisition has diminished and because of the extent to which land prices have increased.

Diamond and Lee (1972–73) have shown that 34 per cent of holdings in the Republic of Ireland are too small to support 20 livestock units and 76 per cent are too small to support 60 livestock units, even at high levels of nitrogen application. These targets are suggested as being those necessary to generate an income comparable with average manufacturing earnings and to keep one labour unit efficiently employed respectively. In order to raise the size of all holdings to these critical levels, assuming that existing holdings above these levels were to remain as at present, would necessitate reductions of 17 and 38 per cent respectively in the total number of holdings.

Transformation of small holdings into efficient family farms, which would permit more rational use of labour and farm equipment and provide an adequate income, would undoubtedly involve a huge programme of farm amalgamation. It is occurring only slowly within the existing land market and inheritance mechanisms but could be accelerated by the encouragement of earlier retirement and the introduction of long term leasing of land. Farm enlargement schemes should not be undertaken in isolation but as an integral part of regional economic and social development programmes designed to provide non-agricultural training and employment.

FARM LAYOUT

The majority of Irish farms consist each of a single tract of land subdivided into a number of enclosed fields, the boundaries between farms being generally indistinguishable in the landscape from other field bound-

aries. Such consolidated farms vary greatly in shape but no systematic studies of layout have been made. They are highly irregular in outline, with a tendency towards compactness, though in some areas farms are inconveniently elongated. Such 'striped' holdings occur in some western upland districts, the arrangement giving each farmer a share of different slope and land types. Almost all farmsteads are located on their holdings, so that the rural settlement pattern is highly dispersed. Small clusters of farmsteads which occur along parts of the west coast and in south Kilkenny are relics of former nucleation.

Of all holdings, 33 per cent are fragmented, comprising two or more non-contiguous parcels. Fragmentation is a hindrance to farm efficiency and management because of the cost, time and effort incurred in movement between the separated parcels, the obstacle to mechanisation and improvement works, and the difficulty of supervision. The extent of the hindrance increases with the number of parcels and with the distances between them. Farm fragmentation is much less serious a problem in Ireland than over much of Western Europe. There is an average of 1·5 parcels per holding, compared with a mean of 6·7 in eight European countries for which data are available (F.A.O., 1971, 113). The proportion of all fragmented holdings having six or more parcels is 2 per cent in Ireland and 32 per cent in the European countries. In Ireland holdings comprising only two parcels account for 72 per cent of all fragmented holdings. The proportion of holdings which is fragmented increased from 11 per cent of the 0·4–2·0 hectares category to 54 per cent of those over 121 hectares, with the average number of parcels per holding increasing from 1·2 to 2·3. However, fragmentation is a more serious problem for the smallholder because of the smaller size of plots and the greater need to make productive use of the land resource.

The percentages of holdings fragmented by county range from 20 in Kerry and Cork to over 40 in Offaly, Carlow, Roscommon, Kilkenny, Sligo and Galway, in which half the holdings are fragmented. There are two main types of farm fragmentation. The most severe form is that resulting from the rundale field system and occurring mainly in districts along the west coast. The separate parcels of small holdings may be greatly intermixed and they are frequently unfenced and without adequate means of communication between them. The degree of fragmentation and intermixture of plots is also quite high in some areas adjacent to midland bogs and in south Kilkenny. The other type of fragmentation is less acute, with larger parcels and less intermixture, but it occurs throughout the country. Much of it is a result of farm enlargement, the land acquired through purchase or inheritance not adjoining the home farm. Such fragmentation cannot be

avoided easily when land comes on the market infrequently, though, in contemplating the purchase of additional land, farmers should give due consideration to distance from their farm and to the future prospects of obtaining land adjacent to or contiguous with it. Some fragmentation is a product of Land Commission schemes in which portions of estates were distributed amongst smallholders in the locality.

The Western Farm Survey indicated a greater extent of fragmentation in all the counties concerned than did the agricultural enumeration, the mean percentage of holdings fragmented being 12 per cent higher (Scully, 1971, 25–6, 30, 186). The difference is in part a result of farms under 6 hectares being omitted from the Western Farm Survey and presumably in part because some fragmented farms were recorded as separate holdings at the agricultural enumeration. Of all farms, 52·9 per cent consist of one block, 29·3 were in two parcels, 10·4 in three, 3·6 in four and 3·8 in five or more parcels. Fragmentation is greatest on farms of 13 to 30 hectares. It is more common on the lowlands than in drumlin, hill or mountain areas. The distance between the two main parcels of land is more than 0·8 km on 53 per cent of fragmented farms and more than 1·6 km on 29 per cent.

Rearrangement of the more fragmented holdings into compact units is an important part of Land Commission activity. Since consolidation schemes were initiated in 1891, more than 22,000 holdings have been rearranged, 10,500 of them since 1945. It is an arduous task because, in addition to the technical difficulties, there are the human problems involved in getting groups of people to agree to such changes on a voluntary basis and in satisfying their varying circumstances and wishes. The inducements offered include creation of more workable farms, enlargement of holdings, better housing and other improvement works on the farms.

There is local diversity in the sizes and shapes of fields but in general fields are larger and more regular in the east and south than in the north and west *(Fig. 3.3)*. This difference results from the greater landlord influence and planning, the larger farms, the greater emphasis on arable cropping and the more level land in the east and south. The small irregular fields of the west reach their extreme development in rocky coastal areas *(Fig. 3.3C)*. There the walls serve not only as field boundaries but also as places to dispose of the large numbers of stones cleared from the land. Field boundaries are usually parallel to or at right angles to the direction of steep slopes, for ease of building. This results in radial patterns in drumlin areas *(Fig. 3.3E)*. A full interpretation of field patterns would necessitate thorough investigation of the complex evolution of the agrarian landscape.

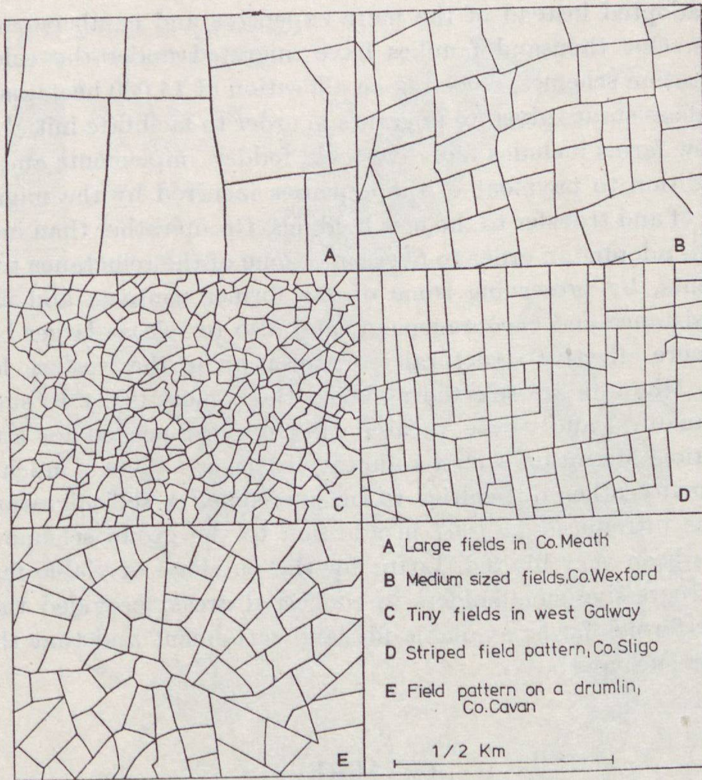


Fig. 3.3. Field patterns

MIGRATION SCHEMES

One of the major obstacles to structural reorganisation in western areas by the Land Commission has been the difficulty of obtaining suitable and sufficient land for farm enlargement and consolidation. Promotion of migration of people from congested areas was adopted as a means of providing such land. Several thousands of farm families have been induced to migrate, both over relatively short distances and also to midland and eastern counties. To supplement migration of individual families, there have been schemes of specially assisted colony and group migration from west to east. During the years 1935–39, colonies each of twenty or more families from the poorest parts of the west were transferred to farms on better land on estates acquired by the Land Commission in the east. Since 1939, a policy of migration of groups of three or four families from the same district

has been adopted instead of the more expensive and cumbersome colony migrations. One thousand families have migrated under the colony and group migration schemes, receiving an allocation of 15,000 hectares of land. The special assistance given to migrants in order to facilitate initial working of their new farms includes fuel, livestock, fodder, implements and ploughing, in addition to payment of the expenses incurred by the migrants on inspection of and transfer to the new holdings. Group rather than individual migration is adopted in order to overcome some of the reluctance to change environments, by preserving some of the former contacts and affording mutual assistance and encouragement, and also to release larger blocks of land for more effective structural reorganisation in the western localities concerned. Migrants are selected as being those most likely to succeed in new surroundings and whose vacated land is most needed for structural reorganisation. Migration is on a voluntary basis, and there is much opposition and many other difficulties to be overcome. A self-migration loans scheme was introduced in 1967 in addition to the group scheme but its impact has been very limited. Loans for the purchase of viable farms are made to progressive smallholders in congested areas, provided that they make their former farms available for land settlement and that these are suitable for such purposes.

CONACRE

Conacre is the letting of land for periods of less than one year, usually for eleven months. In practice the land may be let to the same person for several years in succession but on an annual basis. The origins of this system of land letting on a very short lease are obscure but it was associated with the custom of renting small areas for growing potatoes and grain by landless persons in pre-Famine times. The area let in conacre in 1970 was 338,779 hectares, representing 6·0 per cent of the total area on farms. Holdings with land let comprise 11·0 per cent of all holdings. More than one-half of the holdings are let in their entirety, the unit of letting in other instances being the field. Conacre is let for a specified purpose, 85 per cent of it being for grazing although it seems to have been associated with tillage originally.

Conacre is most common in north and east Leinster and in the northwest of the state, and is rarest in the south *(Fig. 3.4)*. The percentages of the total area of farms let in individual counties range from 3·9 in Waterford to 11·4 in Louth. The prevalence of conacre in Northern Ireland and

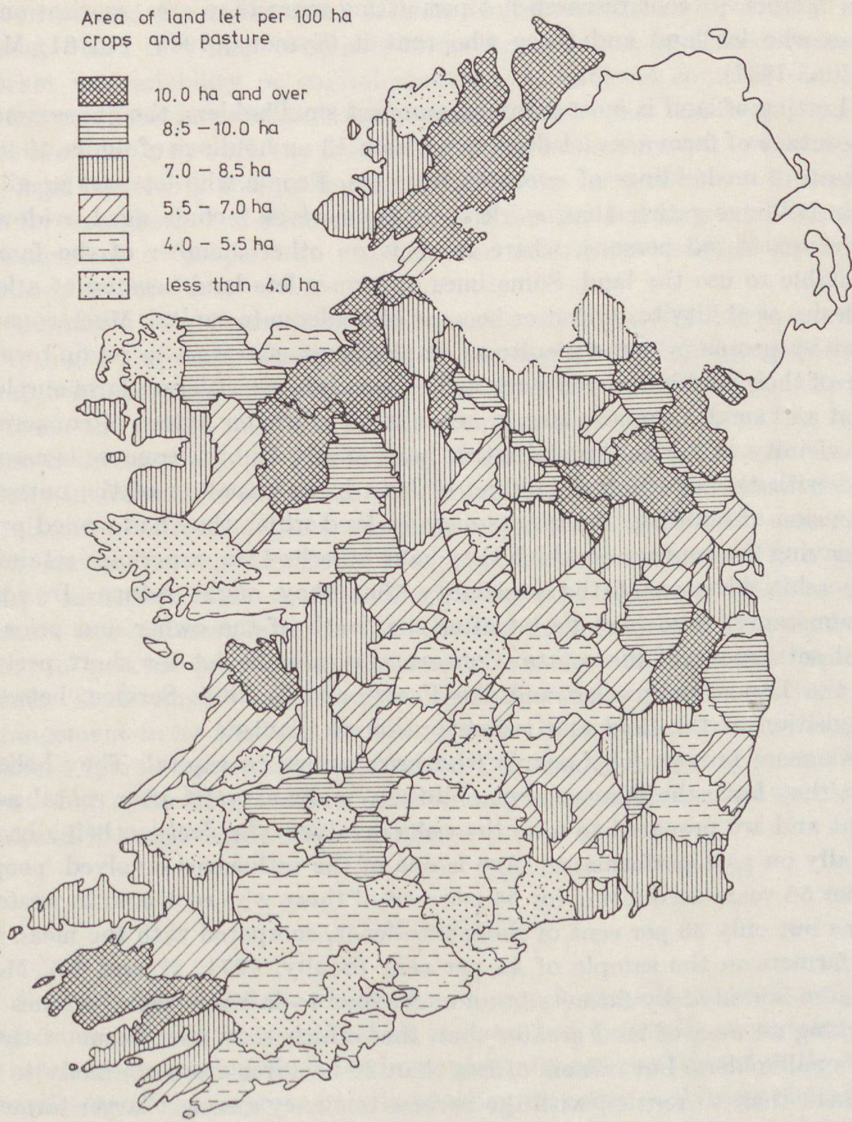


Fig. 3.4. Conacre

adjacent parts of the Republic is probably a result of historical influences, including the tendency for former linen workers to rent land in an effort to increase the effective size of their farms when the domestic linen industry of these areas declined. The spatial pattern is a product of many and com-

plex factors, present research not permitting more than a categorisation of those who let land and those who rent it (Symons, 1963, 176–81; MacAodha, 1967).

Letting of land is most common amongst smallholders, the approximate percentage of farm area let decreasing from 13 on holdings of under 10 hectares to 4 on holdings of over 100 hectares. People who let part or all of their holdings rather than work them themselves include aged, widowed or incapacitated persons, where there is no other member of the family available to use the land. Sometimes an owner lets land because of a lack of desire or ability to work it or because of inadequate capital. Much conacre is let by people in non-agricultural employment who wish to retain ownership of their land but not to work it. The associations with non-farm employment and small farm size largely account for a greater extent of conacre in the vicinity of towns. Around cities, particularly Dublin, conacre is associated with the speculative holding of land in anticipation of the outward extension of building. Emigrants may let land which they had owned prior to leaving the country or which they have inherited since, perhaps retaining ownership because of the possibility that they might return. In some circumstances land may be let after the death of the owner and prior to legal settlement of his estate. Conacre may also be let for short periods by the Land Commission and the Forest and Wildlife Service, between acquisition of the land and redistribution or planting.

Conacre is rented by people who have access to capital. They believe that they have the management ability to make a profit after rental payment and are prepared to take the risks involved, the decision being based usually on past performance. Age is one of the influences involved, people under 50 years accounting for 54 per cent of those who rent land in western areas but only 33 per cent of those who let it, compared with the mean for all farmers in the sample of 44 per cent (Scully, 1971, 27 and 35). Most conacre is rented by farmers in an endeavour to increase their incomes by working an area of land greater than that which they own. Some of them are smallholders, but owners of less than 20 hectares are more likely to let conacre than to rent it, with the reverse tendency amongst larger farmers. Some conacre is also rented by non-farmers, though their employment is usually related to agriculture. Cattle dealers and butchers rent land on which to graze livestock for short periods after purchase. Agricultural contractors or others may rent land on which to grow cash crops.

Conacre is a simple system which serves a useful purpose in introducing some flexibility to the land resource, permitting adjustments in individual farm businesses in response to changes in economic conditions or family

circumstances. It enables some farmers to increase the scale of their businesses, which they may be unable to do through land purchase because of market unavailability or capital shortage. It subjects some of the land to the competitive process. Conacre has a social value in allowing people who are unable to work the land to derive an income from it, while retaining legal ownership and continuing to live in the farm residence. It ensures use for some land that otherwise might lie derelict and in general transfers management to people who are likely to avail more fully of the land's productive potential.

Because of the demand for land, conacre rents are often disproportionately high. They may absorb much of the capital available, especially on small holdings, depriving other purposes of investment. In some instances at least, the outlay might be better spent on improvements on the home farm. Sometimes adjoining land may be rented but use of conacre usually results in fragmentation of the area being farmed. Another disadvantage in relation to farm management is the insecurity and uncertainty associated with annual renting, hindering planning. Land deterioration is a great defect associated with conacre. The person who rents the land has only a short-term interest in it, so that there is little incentive to apply fertilisers, to practise proper crop rotation or to undertake long-term improvements. These improvements are more likely where there is an informal arrangement to let the land for several years in succession, as may happen between family relatives or neighbours. The incidence of land mismanagement and some of the other defects associated with conacre would be lessened if longer leases were permitted.

COMMONAGE

Commonage is land on which two or more farmers have grazing rights. The commonage may be upland or lowland but is usually mountain, bog or other rough grazing. Such land was generally not partitioned at the time of enclosure of the improved land, retaining its communal usage characteristics from early times. The land and grazing are generally owned jointly by a group of shareholding farmers in the locality, though in some instances ownership of the land is still vested in a former landlord. Each shareholder has the right to graze a certain number of livestock, measured in units termed 'collops' in the south and 'soums' in the north. Shares may or may not be equal.

The extent or spatial distribution of commonage have never been

assessed accurately on a national scale. Its distribution probably varies inversely with the percentage of crops and pasture (see *Fig. 4.1*), as it is included in the 'other land' category. Commonage is most widespread in upland areas, especially in the west. Communal grazing rights are held by 13 per cent of western farmers, the proportions being much higher in counties Galway, Mayo, Kerry and Donegal than elsewhere (Scully, 1971, 28).

Commonage is a useful supplement to the meagre land resources of the predominantly small farms in the areas where it occurs. It is evident that this potential is being underused. Only 28 per cent of western farmers with joint grazing rights are considered to make full use of their commonage and 30 per cent make no use of it (Scully, 1971, 29). Factors accounting for underuse by individual farmers include inadequate lowlying land on which to grow fodder and to winter the livestock, distance of commonage from the home farm, lack of capital, the non-commercial nature of the farm, the age of the farmer and disinclination to make the necessary effort. Some of the disadvantages associated with commonage are the complicated sharing arrangements, disputes over rights, lack of land improvement, difficulty of livestock management and spread of disease among animals.

Fuller use of much commonage would be greatly facilitated by subdivision amongst the shareholders. Joint ownership has been lessened by purchase of shares and through inheritance. The Land Commission undertakes partition and development work on application if the commonage is associated with uneconomic holdings and it is considered to be potentially productive. There has been little subdivision. All shareholders of a commonage often do not favour partition, the dissenters sometimes being farmers who are using more than their proper shares of the grazing rights. Although grants to defray part of the costs are available, there is substantial capital expenditure involved in fencing, liming and fertilising. Fuller use could be made of those commonages which merit subdivision if partition were undertaken as part of general farm development plans for those farmers concerned.

4. LAND USE AND IMPROVEMENT

There has never been a land use survey of the Republic of Ireland but casual observation of the landscape and the available statistics indicate the intricacy of the pattern. Pastoral usage dominates but the proportions of the different land uses vary spatially, almost all occur to some extent in every part of the country and there is considerable intermingling of land uses.

The major distinction in the Irish land use statistics is between 'crops and pasture' and 'other land'. Crops and pasture correspond with improved agricultural land and occupied 4,829,200 hectares in 1972, representing 70·1 per cent of the total area of the state. The 2,059,900 hectares of all other land included bare rock, barren mountain, moorland, bog, forest, marsh, water, roads, buildings, etc. The distinction between the two major categories is not always clear, mainly because of the difficulty of differentiating precisely and consistently between improved pasture and rough grazing. The standards adopted may vary between enumerators in different years and in different areas, so that detailed temporal and spatial comparisons of statistics must be made with caution.

After establishment of the state, crops and pasture were first enumerated separately in 1925, when 4,956,400 hectares were recorded. Although there was some fluctuation, the trend was downward to 4,676,000 hectares in 1945. A subsequent gradual but continuous expansion in improved land was more than offset by abrupt decline in the period 1957–60, to an alltime low of 4,545,800 hectares. Thereafter the area of crops and pasture increased by 283,400 hectares to the 1972 level, an increase of 6·2 per cent. Much of the fluctuation in area has occurred along the moorland edge, with evidence of former cultivation beyond the present limit of improved land being common.

Improved agricultural land is unevenly distributed *(Fig. 4.1)*, the proportion of total area by county ranging from 38 per cent in Donegal to 95 per cent in Meath. Most of the lowlands of the east are farmed, with the proportion of improved land generally decreasing westwards. The largest gaps correspond with upland districts, especially those of the west

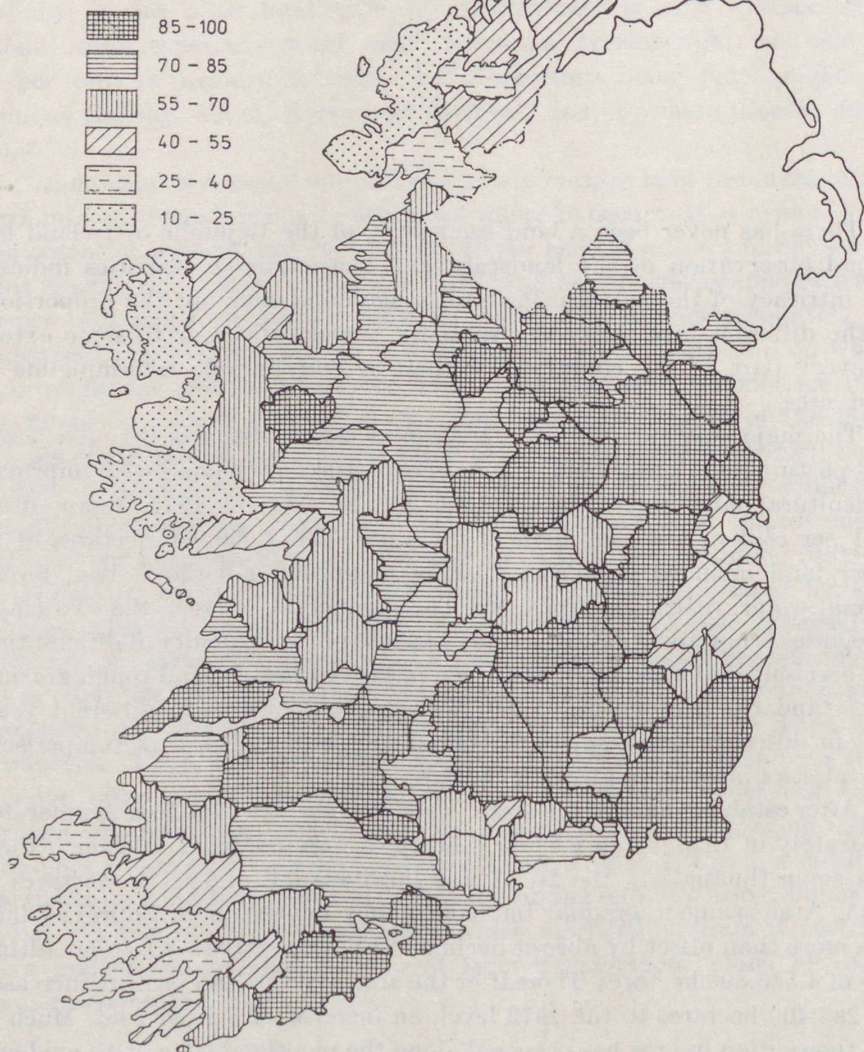


Fig. 4.1. Improved agricultural land

and the Leinster Chain. The upper limit of improved land is not always clearly defined and it varies greatly with physical conditions and the extent of human effort; it is much higher in the east than in the west but is generally below 250 metres. Lowland peat bogs interrupt the improved land in the midlands, especially in Offaly and north Laois, and in the west.

Being a composite category, the use of other land is very varied but there are few statistical data. Agricultural use includes the area devoted to buildings, yards, roadways and field boundaries on farms and the extensive area of rough grazing. The proportion of other land used for rough grazing is probably more than one-half, mainly bog, heath and rough grassland vegetation of very variable quality. It is generally of low nutritional value and has a short growing season, affording meagre grazing for much of the year. Grazing quality deteriorates rapidly with altitude and is very poor on bogland. Along rivers such as the Shannon, there are tracts of lowlying grassland which can be used only for short periods during the summer and dry weather. Despite its deficiencies, rough grazing is a valuable supplement to the limited amount of improved land available in some areas. It is shared with uses such as recreation, water catchment and peat cutting for fuel. There has been a loss of rough grazing to forestry which is concentrated on land of low quality, the proportion of total area occupied by forest and woodland having increased from 1 to 4 per cent during the last fifty years.

The use of much other land by farmers, combined with the high proportion of the total area devoted to crops and pasture, indicate the major role of agriculture in Irish land use.

TILLAGE

Tillage or arable crop production comprises the cultivation of cereals, root and green crops and horticultural crops (cf. Chapter 5). Tillage occupied 10·6 per cent of the area of crops and pasture and 7·4 per cent of the total area of the state in 1972. The minor role of arable farming in Irish land use is largely a result of the extent to which physical, market and traditional forces favour grassland and livestock production. The physical difficulties are most evident in the ways in which the climate hinders cereal cultivation; the cloudy and moist conditions retard proper ripening, they result in a high moisture content in the grain so that artificial drying is often necessary, they hinder sowing and harvesting operations and they promote disease and the growth of weeds. The usual human response has been to

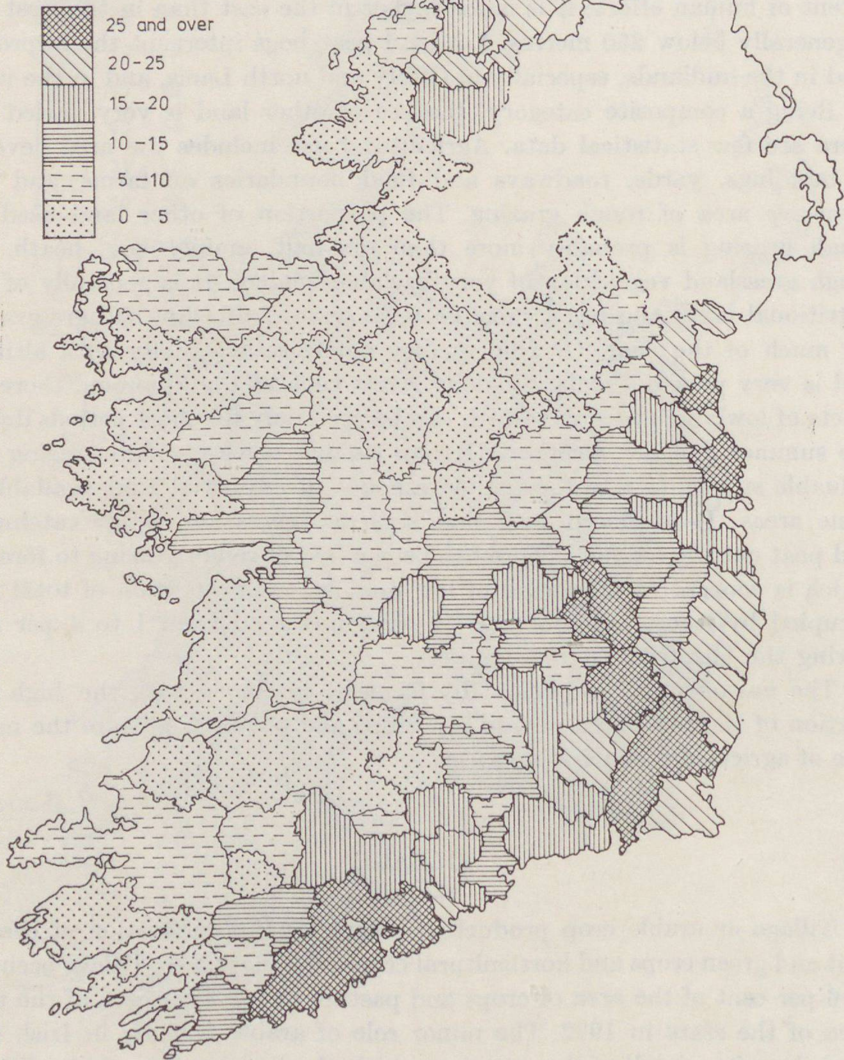


Fig. 4.2. Tilled land

place a small emphasis on arable crops, with a traditional opposition towards tillage.

There is a distinct spatial pattern in the role of tillage in agricultural land use *(Fig. 4.2)*. The distribution is largely a southerly and easterly one. An extensive area with over 15 per cent of the land tilled occupies the maritime counties from south Cork to Louth, with an inland extension through Carlow and Kilkenny to south Kildare, Laois and parts of Tipperary and Offaly. These counties have 80 per cent of the total tilled land. The only concentration outside Leinster and Munster is in east Donegal. Elsewhere tillage is of minor significance, with the two areas of lowest value occurring in northern counties and to the north and south of the Shannon Estuary, where less than 5 per cent of the improved land is tilled.

The spatial distribution of tillage is a product of many influences, including the physical factors of relief, drainage, soil and climate, and human factors such as farm size, availability of capital and machinery, labour, access to markets, historical influences, social conditions, local practices and government measures. The distribution of tillage is the sum of the distributions of its component crops, the effects of the many influences on farmers' decisions varying between the individual crops. The main arable crops will be treated separately in Chapter 5 but the cultivation of many of them has certain requirements in common and it is possible to identify the principal influences affecting the distribution of tillage as a whole.

Rugged relief, steep slopes and thin, stony soils hinder cropping in upland areas, especially in the west. Lowlying, flat land which is badly drained or waterlogged is also unsuitable, as in parts of the midlands and the drumlin belt. Undulating relief affords good drainage, as in south Cork, Wexford and east Donegal. Soils of medium to light texture are preferred because they require less cultivation, though they are workable on more days, and they promote earlier growth and ripening of crops than those of heavy texture. The lowest tillage densities are on gleys. The acidity of many western soils is inimical to most crops. Climate is an important influence; in the drier and sunnier east, crops ripen better, they are less subject to disease and harvesting is easier than in the west, while growth potential is greatest in the warmer south. The east and south have a considerable balance of advantage with regard to physical influences and the effect on the spatial distribution of tillage is reinforced by certain human factors. Landlord influence, which was strongest in the east and south, played an important role in the initiation of commercial arable farming. A tradition of tillage has a strong bearing on present patterns because farming practices change slowly,

skills have been acquired through experience and there is considerable capital investment in equipment. Greater mechanisation makes arable cultivation increasingly better adapted to large farms and fields, both of which are more prevalent in the east and south. The major urban markets and processing facilities are also located in these areas, which thus have the advantage of market accessibility.

GRASSLAND

Grass is by far the most important crop and combines with hedgerows to give much of the Irish countryside its predominantly green appearance. Improved grassland occupied 89·4 per cent of the crops and pasture and 62·7 per cent of the total area of the state in 1972. It is used almost entirely for feeding cattle, sheep and horses, mainly as pasture for grazing, with 23 per cent being mown in the summer and conserved as hay or silage for winter fodder. Grass is the cheapest food for these animals under Irish conditions.

The importance of grassland in Irish land use derives mainly from those influences which discourage tillage. The mild and moist conditions, affording a long growing season with no marked deficiency of water at any time, are very favourable towards grass growth. Ireland has considerable climatic advantages over other European countries in grass production. The drainage and soil conditions of many areas encourage pastoral usage. Access to markets for livestock and the traditional importance of livestock in the farm economy are major influences. The possibility of minimising labour inputs by devoting the land to grass is of great significance to some farmers.

Grass occupies more land than all other crops combined in every part of the country but there is some spatial variation in its significance. The distribution of grassland is complementary to that of tillage *(Fig. 4.2)*. Grassland as a proportion of improved land varies by county from 72·6 per cent in Wexford to 98·7 per cent in Leitrim, the range in rural district values being from 63·1 per cent in north Dublin to 99·4 per cent in west Cavan. Although temporary grassland is not distinguished separately in the statistics, its distribution is probably similar to that of tillage because of the practice of rotating grass with arable crops. Otherwise, pasture renewal is rare, so that much of the grassland could be described as permanent. Some of the land has not been ploughed or reseeded within the memory of the owners.

The physical potential for grass growth varies with the nature of the

climate, soil and relief (see *Fig. 2.3*). Temperature conditions are most favourable in the south and are better in coastal than in inland areas, because of the longer growing season and the greater accumulated temperature. Growth is restricted to some extent by the summer moisture deficit of the east and southeast. This is most likely on light soils, though over the country as a whole the diminution in productivity because of impeded drainage on heavy soils is a much more significant factor. On wet, cold soils grass growth is delayed in spring and the effective grazing season is further limited by the likelihood of poaching. The period and amount of grass growth diminish with altitude; at 1,000 metres growth occurs between May and August and total production is only about one-sixth that at sealevel.

The traditional and predominant method of providing winter fodder is by drying grass to make hay. Haymaking is a hazardous practice in the wet and cloudy Irish climate; unfavourable weather often results in a great lengthening of the process and in serious losses. The protraction of haymaking harms the quality of the hay, which deteriorates as the grasses mature and with the amount of weathering, it necessitates extra labour inputs and it extends haymaking into late summer and early autumn when the drying power of the atmosphere declines greatly. The most suitable month for haymaking is June, when there is greater probability of two or more consecutive days of dry, sunny weather and the quality of the grass has not begun to deteriorate. More use could be made of opportunities in June, together with promotion of earlier grass growth through the use of fertilisers and by closure of meadows to grazing livestock sooner in spring. Increased mechanisation of haymaking has enabled farmers to lessen the time taken. In recent years there has been a considerable increase in the baling of hay, prompted mainly by its labour-saving advantage over the traditional making of haycocks. Difficulties associated with baling include the dependence of many farmers on hired machinery, with the problem of getting it at the optimum time, and the fact that much hay deteriorates in quality because it was baled when too moist or subsequently left too long in the field. Because of the nature of haymaking and inadequate use of fertilisers, much Irish hay is of very inferior quality, being particularly low in protein.

Only one-sixth of fodder is made in the form of silage, though during the period 1963–72 the quantity increased from 0·4 to 5·5 m. tonnes and the number of farmers making silage rose from 3,400 to 28,300. The making of silage has a considerable advantage over haymaking under Irish climatic conditions because the grass is stored when moist and green, so that operations can proceed in dull or unsettled weather. Grass can be ensiled

at the leafy stage, when its feeding value is highest, though there is the flexibility of doing this at any stage of the growing season. Silage making is more mechanised and faster than haymaking, the potential for labour saving being particularly great when self-feed arrangements are adopted. Factors contributing to the increased production of silage include: realisation on the part of farmers of the value of silage as a nutritious winter fodder; greater understanding of the techniques of making it; the availability of forage harvesters and state grants towards their purchase; a greatly increased number of silage contractors, now used by more than half the farmers who make silage; the possibility of using plastic sheeting to cover silage. Factors deterring some farmers include the capital costs of machinery and silos, rough or wet land not suited to the machinery, distance of fields from the farmyard, confusion about the techniques involved, its lesser bulk than hay, the labour involved in hand feeding of silage, deterioration in silage unused at the end of the season, conservatism and objections against the odours and effluent associated with silage.

The proportions of grassland conserved as fodder by province in 1970 were: Ulster, 23·8 per cent; Munster, 23·1 per cent; Leinster, 20·7 per cent; Leinster, 20·7 per cent; Connacht, 19·2 per cent. The two areas in which values were highest are to the south and north of the Shannon Estuary and from south Leitrim to Monaghan, both areas where there is little tillage and dairying is a major enterprise. The proportion of grassland mown is low in much of the west and, although the difficulties of haymaking are most acute there, silage production is less common than in other parts of the country.

Despite the climatic advantage of mild winters, the fodder situation in Ireland is very serious, supply being inadequate in quantity and quality. There has been some recent expansion in the area of grass mown, to 978,700 hectares in 1972, but this is little more than the area conserved fifty years ago. The average annual production of 5·55 tonnes of hay per hectare during the 1960s was the same as the yield at the beginning of the century. Yet grazing livestock densities have been expanding, particularly during the period 1960–72 when there was an increase of 22 per cent, aggravating the fodder supply situation. There is sufficient to provide only maintenance diet for most stock and during some winters animals become emaciated and some even die. An increase of about one-half in fodder production is desirable.

Grass is conserved predominantly for use on the farm, only about 7 per cent of hay production being sold. Rye grass is grown for seed as a cash crop on 3,500 hectares. One-half of the area is in County Monaghan

and 79 per cent in Ulster, with much of the remainder in north Leinster. This distribution is an extension into the Irish Republic of a practice which occurs more widely in Northern Ireland.

Although grassland is the basis of the Irish farm economy, its productivity is far below optimum. There has been a tendency on the part of farmers to regard grass as a natural product which grows luxuriantly under Irish conditions and requires little or no attention. A greater awareness of the low level of production and the extent to which improvement could contribute to higher farm income has spread only slowly. There is a wide variation in productivity, with some farmers achieving a high standard of grassland management but the general level being very low. The amount of growth and the length of the growing season could be increased through greater application of fertilisers. Adoption of more controlled grazing would increase the efficiency of grass usage. Fodder scarcity often results in overgrazing in spring which diminishes subsequent grass growth and fodder production, perpetuating the cycle of grassland depletion, fodder shortage and animal malnutrition. The widespread outwintering of cattle results in poaching damage to land not suited to the practice. Many pastures are ill-drained and infested with weeds.

LAND RECLAMATION

A significant contribution to Irish agricultural output can be made through improvement of marsh, bog and hill land which is either not being used or has very low productivity. In lowlying areas, drainage is the major requirement. The installation of an adequate drainage system is a prerequisite to successful reclamation of peatland, followed by application of fertilisers and treatment of trace element deficiencies. The greatest potential on bog is for the production of grass, especially under the climatic conditions of the west. There the livestock carrying capacity of the land can be increased fifteen-fold through the establishment of a grass sward, though because of poaching and fluke problems when grazed, winter fodder production might be the best use of much reclaimed bogland, complementing summer grazing on unimproved land. Provided that an adequate layer of peat is left at the base, cutaway bog has considerable agricultural potential. Experiments on cutaway midland basin peats have demonstrated their productivity under grass and a wide range of arable crops, especially vegetables, provided there is adequate use of fertilisers and weeds are

controlled. The basin peats have a much greater potential for development than the blanket peats of upland and western areas.

A normal procedure in the reclamation of hill land is burning of the wild vegetation, ploughing and levelling of the land surface, cultivation with rotovator or discs, stone picking, application of fertiliser and sowing of grass. Deep ploughing is necessary where there is a hard pan, in order to break up the impervious layer and to mix the soil and subsoil. In areas of thin drift cover over limestone, as in north Clare and east Galway, the need is mainly for boulder and scrub removal. Although most hill land vegetation is dominated by heather, gorse and bracken, a small proportion is composed mainly of grasses and it requires only fertiliser application and proper livestock management. Where a nucleus of the better species of grass is not present, surface reseeding is desirable. The provision of adequate fences and shelter belts is an important part of hill land improvement. Because of slope, climatic and vegetation characteristics, together with accessibility to good lowland, hill land reclamation presents less severe difficulties in the east and southeast than in the west of the country.

Farmers have for long used practices such as periodic burning of heather grazing and cultivation of peaty soils but there was little land reclamation from the establishment of the state until after World War II. Substantial improvement since then has been effected mainly under two state schemes, the Arterial Drainage Programme and the Land Project. These schemes have contributed to the increased productivity of some land which already had been returned at the enumeration as improved land and to extension of the area of crops and pasture. Reclamation of formerly unimproved land has exceeded abandonment of improved land which has occurred in places. During the period 1960–72, there has been a reduction of 12 per cent in the area of other land, the provincial percentages being Leinster 18, Munster 13, Connacht 10 and Ulster 9.

Although there had been some previous work, arterial drainage has been done mainly under the Arterial Drainage Act, 1945 by the state and at its expense. The river basins concerned have been mainly those of tributaries of the Shannon, including the Inny, Brosna, Deel and Feale, and others such as the Corrib, Moy, Maine and the Boyne which is in progress. The 33 schemes completed and the 10 in progress incorporate 176,000 hectares of land requiring drainage and 57,000 hectares of bog. In addition to the deepening, widening and straightening of 57,000 kilometres of river, 610 kilometres of embankments have been constructed to protect lowlying areas, principally along the Shannon and its estuary and also on

the south Wexford coast. The principal objective of arterial drainage is to improve the drainage of agricultural land and it is estimated that work has been completed on nearly half of the area which might benefit from such improvement. There has been no comprehensive cost-benefit analysis of arterial drainage but it was anticipated that the programme could not be justified on the basis of economic considerations alone but that there are important social and other non-monetary benefits.

The Land Project was initiated in 1949 with the objective of encouraging individuals and groups of farmers, through the provision of advisory and financial assistance, to improve the output capacity of underproductive land which had a worthwhile potential and could be reclaimed at an economic cost. It incorporated field drainage, watercourse construction and improvement, hill land reclamation and the removal of scrub and boulders from other land, together with supplementary schemes for fencing and fertilising. The Department of Agriculture estimated in 1948 that about 1·6 m. hectares required drainage and reclamation, a figure which was probably conservative. The area which has been improved under the Land Project is 0·9 m. hectares. Because of the physical conditions in the country, particular attention has focused on land drainage, the main problems encountered being seepage and springs, impervious soil and high water-table, together with existing systems of old drains (Galvin, 1966–71). Tile drains have been used on nearly three-quarters of the drainage work, with some open and stone drains. Particular difficulties have been encountered on the impermeable gley soils but the best results have been achieved through a combination of shallow gravel drains and mole drains drawn across main tile drains. The provision of correct and adequate drainage is of great importance. Problems associated with land reclamation include the development of suitable technology, the high costs to the state and to farmers, evaluation of the benefits, and the reluctance of many farmers to adopt improvement measures and to maintain reclaimed land in good condition.

FERTILISERS

Most Irish soils had a very low nutrient status until recent years. This position resulted from the heavy loss of nutrients through leaching, combined with their removal in harvested crops, and the fact that fertiliser application was far below that of most countries of Western Europe. There had been a long period during which there was a moderate degree of fertil-

ity depletion, the rate accelerating during World War II. Subsequent changes in farm practice have counteracted this imbalance. In 1972 2rish farmers spent £30·8 m. on lime and fertilisers, representing an average expenditure of £6·43 per hectare of crops and pasture. State subsidies amounted to £7·9 m.

The application of lime has a very important role in neutralising soil acidity, improving the fertility and structure of soils and making land more responsive to manures. Prior to the introduction of subsidies under the Ground Limestone Scheme in 1951, the use of lime was less than 0·1 m. tonnes per annum. Applications increased rapidly to 1·24 m. tonnes in 1957–58, though declining to 0·62 m. tonnes in 1960–61, since which there has been a general upward trend to 2·02 m. tonnes in 1972–73. It has been estimated that the annual loss of lime is about 1·5 m. tonnes, an amount which was not exceeded by applications until the late 1960s. Despite the delivery of 25 m. tonnes under the Ground Limestone Scheme, about 40 m. tonnes are needed to bring Irish soils up to a satisfactory lime status. Recommendations to farmers aim at building up the lime content of the soil and then maintaining this by regular dressings.

Applications of lime have been very unevenly distributed spatially, 62 per cent of deliveries being accounted for by the seven leading counties, comprising Cork, Wexford, Tipperary, Waterford, Wicklow, Kerry and Donegal. Application per hectare of improved land in 1972–73 ranged from 0·07 tonnes in Leitrim to 0·96 tonnes in Wexford, with a mean of 0·42 tonnes. Application rates are highest in the tillage areas of the south and east and in Donegal, with a very high correlation between arable farming and lime use (Brogan, 1971, 3). Land used for tillage crops, especially sugar beet and barley, is heavily limed but rates of application on grassland are very low, with old pasture in particular receiving little lime. It is unfortunate that many of the areas in which applications are lowest are western districts with acid soils where the need is greatest.

Commercial fertiliser application was extremely low until the 1950s but subsequently increased in response to a state campaign to promote greater usage, aided by the introduction of subsidies on phosphate in 1958 and potash in 1961. Consumption in 1957–58, expressed in tonnes of the major nutrients, was: nitrogen, 18,300; phosphorous, 27,400; potassium, 44,200. By 1972–73, consumption had increased to: nitrogen, 131,800 tonnes (27 kg/ha crops and pasture); phosphorous, 91,700 tonnes (19 kg/ha); potassium, 155,400 tonnes (32 kg/ha). Since the nutrient status of the soil was low, very high growth increments were achieved per unit of fertiliser applied. Diminishing returns were obtained as the fertility of the land

was built up but there is still considerable scope for increasing net farm income through greater use of fertilisers. In addition to manufactured fertilisers, farmyard manure is used, principally on root crops and some grass for conservation, a little slurry is spread on land and seaweed is applied on a limited scale in some coastal districts.

The use of fertilisers varies greatly with the particular crop, region and farm size concerned (Murphy and Heavey, 1969). Some crops, such as sugar beet and early potatoes, are overfertilised, whereas others, particularly hay and permanent pasture, are inadequately fertilised. Farmers feel that fertilisers are more needed by arable crops and that they are a more productive input than on grassland, with attitudes affected by the value of output, usage on pasture being greater on dairy farms than on drystock farms. In 1967, nearly all of the tilled land was fertilised, together with 87 per cent of the silage, 66 per cent of the hay, 35 per cent of the pasture and 2 per cent of the rough grazing. More than two-fifths of pastures in much of Leinster and east Munster received fertiliser but only about one-fifth in Connacht, Longford and Westmeath. With predominantly pastoral usage and limited application of fertilisers to this grassland, western areas have very low levels of fertiliser use. Despite the greater need for high output per unit area, expenditure on fertilisers per hectare is less on small than on large farms.

MECHANISATION

Farm mechanisation has brought about a major revolution in the methods of using Irish land during recent decades, though the level of mechanisation is much lower than in some countries. The tractor is the most widespread and most used of machines, performing a wide range of tasks, so that the growth in numbers is indicative of general trends in mechanisation. Few tractors were used in the 1920s and 1930s, the number in 1939 being 2,067. After World War II, the use of tractors increased substantially, numbers reaching 13,569 in 1950, 43,697 in 1960 and 84,349 in 1970. The numbers of combine harvesters in these three years were 366, 4,301 and 6,275, and milking machines 2,386, 10,455 and 35,175 respectively. Forage harvesters and balers increased from 690 and 1,652 in 1960 to 6,956 and 8,305 in 1970. In addition to the growth in numbers, there has been a trend towards the use of more powerful and efficient machines. Factors retarding the rate of mechanisation include the difficulty of mecha-

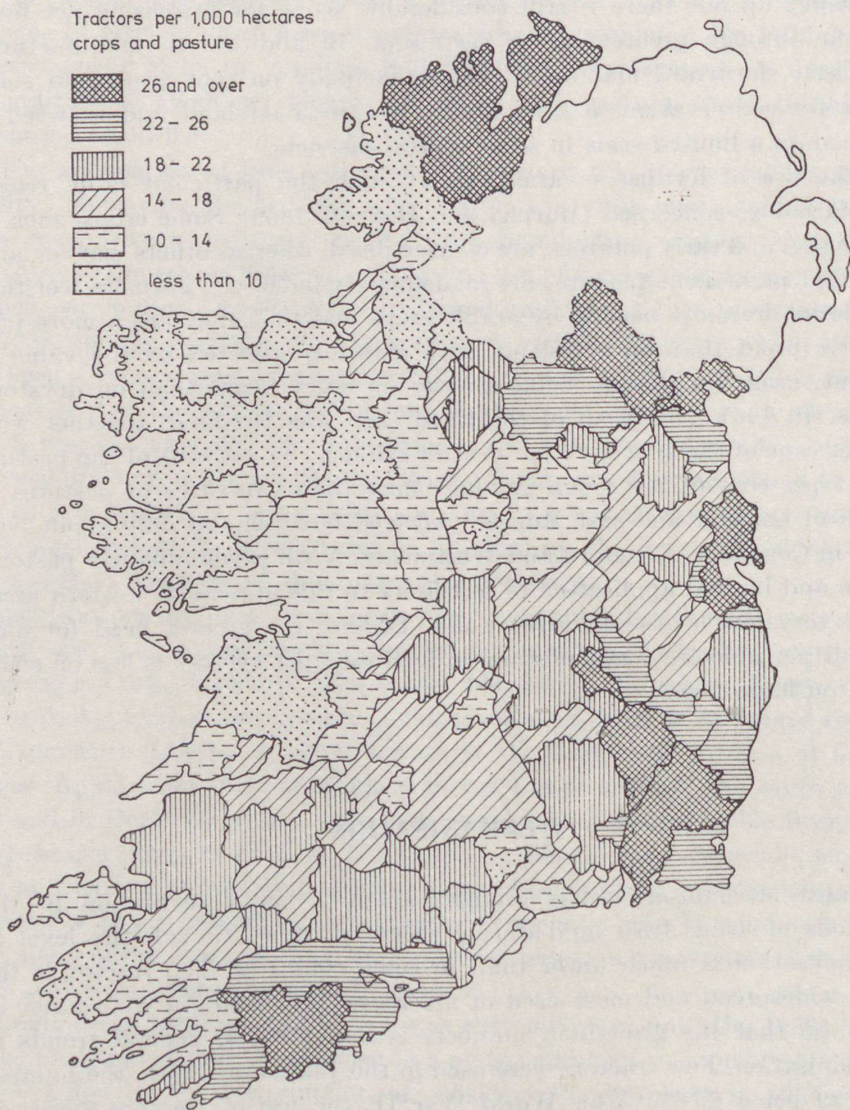


Fig. 4.3. Tractors

nising many farm tasks, especially in livestock production and horticulture, the small size of farms and the capital costs involved.

Although there are regional variations in the size of tractors and in the amount of work which they do, their distribution is an indicator of the spatial pattern of farm mechanisation *(Fig. 4.3)*. Tractor densities are

high in the tillage areas of the east and south and of north Donegal, where there is much cultivating and harvesting work. However, the highest densities do not occur in the most intensive tillage districts, probably because of greater efficiency of use in these areas. There is less work for tractors in grassland farming systems, particularly where drystock predominate. However, densities are quite high in some pastoral districts, principally in the eastern part of the drumlin belt and to the south of the Shannon Estuary. The high level of ownership in most border areas seems to be related to the situation in Northern Ireland, where the density of tractors is more than twice that of the Republic of Ireland and from which some used tractors are imported. In 1960 there were 3 tractors per 100 holdings under 12 hectares and 96 per 100 holdings over 81 hectares. The level of mechanisation tends to be low on small farms and those with capital scarcity, combining in places with difficulties due to relief and small field size to account in part for the low densities in much of the west. The pattern of mechanisation at any time reflects the nature of the innovation diffusion process. Adoption tends to occur first in the east and in areas where the farm enterprise concerned is most concentrated, with parts of Ulster often acquiring the innovation at a relatively early stage. Diffusion westwards occurs, with a considerable time-lag before western districts reach their maximum adoption rate. The distribution of an individual machine is obviously related to that of the farm enterprise in which it is used, so that four-fifths of combine harvesters occur in Leinster and Cork but two-thirds of milking machines are in Munster.

Mechanisation has helped to make possible a considerable reduction in labour requirements and an increase in labour productivity, speeding up many farm operations and lessening the amount of hard work and tedium. One substantial benefit to agricultural land use has been the release to other farm purposes of about 300,000 hectares formerly used to feed the working horses now replaced by tractors. However mechanisation has been inadequately planned on many farms and some are undoubtedly overmechanised.

There has been a considerable growth in agricultural contractor services and some farmers share machines. Such arrangements enable fuller use to be made of machinery and are particularly beneficial to the small farmer, lessening capital outlay and giving access to machinery which the farmer might not otherwise have. Competing interests in having the machinery when the weather is favourable are a particular disadvantage under the uncertainty of Irish conditions but there is much scope for extension of contractor services and sharing arrangements.

TECHNOLOGY AND LAND VALUE

Developments in agricultural technology have altered the farmer's assessment of land quality, particularly with regard to the relative values of light and heavy soils. Low inherent nutrient status and acid conditions were major limiting factors in the use of well-drained medium and light soils. Now their requirements can be accurately determined and deficiencies remedied through application of lime and commercial fertilisers. As control of the chemical status of soils has increased, physical characteristics have become the main limiting factors. These are most acute on the wet, heavy soils, particularly with regard to poor drainage and weak structure. When there was abundant labour, attention could be given to these defects more readily, as in ridge and furrow cultivation. The structure of these soils deteriorates under the impact of modern heavy machinery, there are problems of wheelspin and sinking, machinery cannot be used early in spring, the number of days on which the land can be worked is limited and cultivation costs are higher. Although machinery is now available to cultivate the more intractable soils, their workability is much lower than the lighter types. They are much less versatile in terms of the alternative uses to which they are suited, offsetting their greater inherent fertility as compared with lighter land. The system of valuation for land taxation purposes has not altered in accordance with the changing assessment of land quality, being based on valuations made in the first half of the nineteenth century, so that many heavy soils are rated disproportionately highly relative to lighter varieties (Lee and Haughton, 1968).

5. ARABLE CROP PRODUCTION

The growing of arable crops is very much subordinate to grass and livestock production in the agriculture of the Republic of Ireland. The role of tillage varies spatially but only 10·6 per cent of the improved land is occupied by arable crops (cf. Chapter 4). In 1972 arable crop products accounted for 14 per cent of gross agricultural output and less than 5 per cent of the value of agricultural exports.

The downward trend in tillage resumed after World War I and continued after formation of the state, so that the area under arable crops declined from 702,300 hectares in 1922 to 576,300 hectares in 1932. This trend was reversed in the period 1933–36, as a result of the encouragement given by the government to arable farming and difficulties in the livestock trade, but much of the gain had been lost by 1939. Under a compulsory tillage order during World War II, the tillage area increased to a peak of 1,038,900 hectares in 1944, the highest recorded since 1872. Subsequent decline was steep and continuous to 694,900 hectares in 1951, after which the area fluctuated. A further period of continuous decline in the period 1959–66 was again followed by fluctuations in the extent of tillage. In 1972 the area under arable crops was 509,800 hectares, the smallest ever recorded in the agricultural statistics.

Except under the pressure of wartime conditions and strong government measures, there has been a general tendency for the tillage area to decline. The principal influences have been market considerations, the effect of decline in the farm population as a labour force and consumers of food, and physical difficulties with associated risk in the growing of some crops. Recent price trends have favoured livestock production, the percentage increases in price indices in the period 1960–72 being 101 for livestock and 70 for livestock products, as compared with 40 for crops. Changing consumption patterns have affected the relative demands for livestock and crop products. Several successive years of unfavourable weather contributed to diminished cropping during the early 1960s. The areas devoted to individual crops vary from year to year, depending on market prices relative to other crops and enterprises, government measures and weather conditions.

An important influence in land use trends is the fact that a reduction in crop area may be partially or wholly offset in terms of output by increased yield per hectare. Although crop yields fluctuate substantially from year to year, depending especially on weather conditions, a long-term upward trend is recognisable. The average annual produce of arable crops in starch kilogrammes per hectare for decennial periods has been: 1920–29, 1,900; 1930–39, 2,308; 1940–49, 2,011; 1950–59, 2,334; 1960–69, 2,736. The only setback was during the 1940s, when fertilisers were in scarce supply and cropping extended onto less productive land and farms. Increasing yields reflect the success of measures taken to improve productivity, including the introduction of new crop varieties, higher application of fertilisers, the use of new methods of disease, pest and weed control, and greater mechanisation of production. Crop yields compare favourably with those of other Western European countries but there is scope for substantial further improvement. There are considerable spatial variations in productivity, reflecting physical conditions and management practices, but data on these are inadequate. The mean annual total produce of arable crops in the state during 1960–69 was 1,578,000 starch tonnes, 28 per cent above that of the 1920s, but 14 and 3 per cent less than production in the 1940s and 1950s respectively. The volume of crop output in 1972 was 110 per cent greater than that in 1938–39 and 27 per cent greater than in 1960, attributable to improved yields and increases in the proportion of produce marketed.

Although there has been a considerable reduction in the tilled area, arable crop production offers advantages to farmers where physical conditions are favourable. The low capital requirements are an attraction, investment being particularly small when machinery is hired and seeds and fertilisers are obtained on credit until the harvest. Crops need less constant attention than livestock, a factor in leisure time considerations. Gross margins per hectare in cash cropping compare favourably with dairying and are much higher than in cattle and sheep production. Cash crop byproducts can be used in animal feeding and arable fodder crops play an important role in livestock production. Fixed resources of labour and machinery on livestock farms may be more fully utilised through the inclusion of arable cropping in the farming system.

A classification of arable crops according to use is not possible because an individual crop may be used for different purposes, perhaps part being fed to livestock, part consumed by the farm household and part sold as a cash crop. Sales may be for direct consumption or for processing, with the product being consumed by humans or by livestock or incorporated into an inedible commodity. The threefold classification adopted in this

book comprises cereal crops, root and green crops and horticultural crops, accounting for 73·0 per cent, 24·5 per cent and 2·5 per cent of the tilled area respectively. These categories are similar to classes distinguished in the agricultural enumeration, except for the transfer to the horticultural group of peas and beans from grain crops and vegetables from root and green crops.

The classification resembles but is not exactly comparable with that on an agro-technical basis adopted for Poland by Kostrowicki and Szczęsny.* Cereals correspond with the Polish extractive or exacting crops, which deplete soil fertility and constitute bad fore-crops for subsequent cultivations. Root and green crops and horticultural crops together are similar to the Polish category of intensive crops. They require greater outlays of labour and capital but the structure and nutrient content of the soil are improved by their cultivation, so that they are good fore-crops. The third Polish category, structure forming or restorative crops, comprising mainly leguminous varieties, is represented in Ireland only by peas and beans which occupy 0·6 per cent of the tilled land. Fruits are distinguished separately from arable crops in Poland, constituting a perennial crops group.

CEREAL CROPS

In 1972 cereals occupied 372,100 hectares, comprising barley 67·6 per cent, wheat 18·3 per cent, oats 14·0 per cent and rye 0·1 per cent. The areas devoted to individual crops and their relative importance varied considerably over the preceding 50 years *(Fig. 5.1)*. Oats had been the dominant cereal, occupying 55 per cent of the area as recently as 1950. Their diminished importance has been mainly a result of the replacement of oats by feeding barley, but was also associated with the decline in the numbers of horses and farmyard poultry, for both of which it was an important feedstuff, and with the lessened role of oat products in the human diet. Expansion in barley has been mainly for feeding purposes; growth has been 142 per cent in feeding barley and 25 per cent in malting barley since the two categories were separately recorded in 1958. The comparative advantage of barley relative to oats increased with the introduction of high yielding varieties, realisation of its superior yield and feeding properties, growth of feedstuff compounding, control of feed grain imports, the establish-

* J. Kostrowicki and R. Szczęsny: *Polish agriculture; characteristics, types and regions*. Akadémiai Kiadó, Budapest, 1972, 38—51.

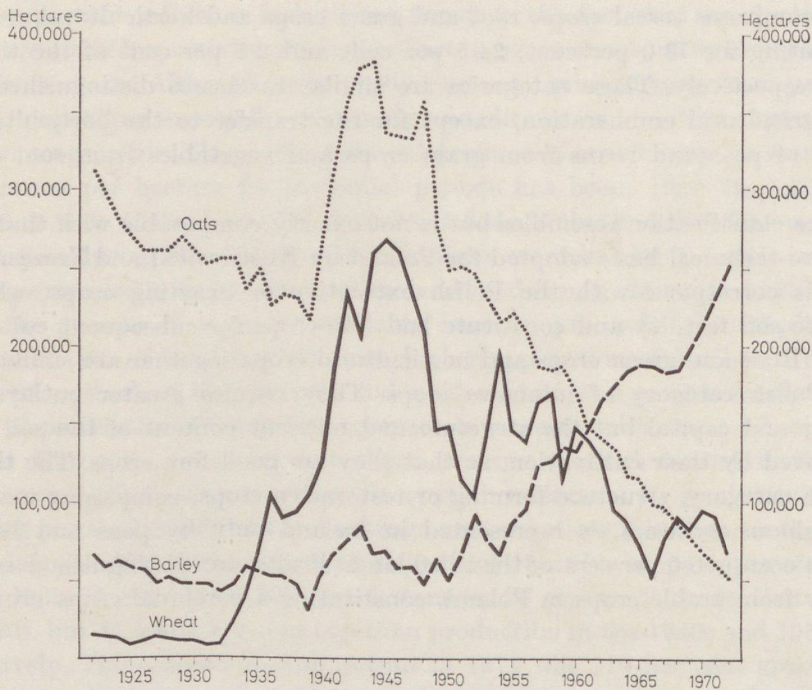


Fig. 5.1. Trends in cereal crop areas

ment of minimum price levels, greater use of lime and fertilisers, and increased mechanisation to which it is more amenable than oats. Almost all wheat requirements had been imported but, following the adoption of protection in the early 1930s and during wartime conditions, the area rose steeply to a peak of 268,100 hectares in 1945. There was subsequent decline but with considerable fluctuations, domestic requirements being more than satisfied in the years of highest production. Although wheat offers greater profitability than other cereals, relative price movements have been in favour of barley, there are greater harvesting and disease risks because it ripens later than barley, and it has greater soil and rotation demands. Gross margins per hectare in 1966–69 were: wheat, £96·9; malting barley, £70·9; feeding barley, £55·4; oats, £40·3 (Heavey and Hickey, 1973, 171–8).

Individual cereals differ in the extent to which they are marketed and in the uses to which they are put. Sales off farms in 1972 were 239,000 tonnes of wheat, 748,000 tonnes of barley and 34,000 tonnes of oats. Wheat is

almost exclusively a cash crop, sold to the flour millers who blend it with imported wheat in the approximate ratio of two parts to one. Only when the grain is of unmillable quality is it used as a livestock feedstuff to any extent. Malting barley is grown on contract for malsters, brewers and distillers. Of feeding barley production, 70 per cent is sold off the farm, constituting about one-half of the grain incorporated in compounded feedstuffs. Oats are used primarily as fodder on the farm, with only one-fifth of production being marketed, for animal feedstuff, oatmeal milling and seed. Import requirements of animal feedstuffs are about 500,000 tonnes, comprised principally of maize, milo and oil cakes and meals. Demand for compounded feedstuffs is expanding, present consumption of 1·1 million tonnes being 55 per cent by pigs, 24 per cent by poultry and 21 per cent by cattle. Cereal straw is used as livestock bedding material and to some extent as fodder.

WHEAT

Wheat is highly concentrated in the east of the country *(Fig. 5.2)*, 80 per cent of the total area being in Leinster, with Wexford as the major producer. It is more strongly influenced by climate than are most crops, growing best in that part of the country which has the lowest rainfall and where summers are also relatively sunny and warm. Because of the long growing season of wheat, there are major difficulties in areas of high and frequent rainfall, with sowing delayed in spring and autumn weather conditions resulting in disease risk and harvesting problems, with a greater probability of the grain being unmillable. Wheat is also intolerant of the soil acidity in western areas. It is associated with good quality land and does better than other cereals on heavy textured soils, as in County Meath. Farm size has a bearing on wheat distribution, as production is more closely associated with the larger units, thus reinforcing the tendency towards an easterly distribution. In 1960 wheat was grown on 17 per cent of all holdings but on 48 per cent of those over 61 hectares; in Leinster the percentages were 40 and 74 respectively. The average area grown per holding was 2·9 hectares, the highest for any arable crop. About 15 per cent of the crop is grown on conacre, the practice being most common in north Leinster.

Wheat as a percentage
of crops and pasture

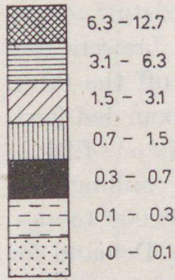


Fig. 5.2. Wheat

BARLEY

Malting barley occupies 22 per cent of the land devoted to barley. Its importance is quite localised; 70 per cent of the total is in a belt comprising Wexford, Kilkenny, Carlow, south Kildare, Laois, Offaly and north Tipperary, with south Cork as the other main producer. This pattern is largely attributable to the exacting ecological demands of malting barley, the crop being favoured by a dry and sunny climate, and deep, well drained loam soils of uniform texture and structure, with an adequate lime content. Only in areas where environmental requirements are fulfilled, are good yields of high-quality grain obtained. The physical assets of the barley growing areas were supplemented by locational advantages with the establishment of maltings, breweries and distilleries in and adjacent to them, but with the rationalisation of manufacturing units, movement of grain is now over greater distances. The established skills of farmers in the traditional growing areas are of considerable importance, as a high level of management is particularly desirable in the production of malting barley. It was grown on 6·3 per cent of holdings in 1960, with an average of 2·6 hectares per holding. Its density is considerably greater on large farms but this tendency is not so marked as in wheat production. The spatial distribution of malting barley is relatively fixed, with fulfilment of requirements by contract growers in the existing production areas.

The distribution of total barley is largely a function of that of the feeding varieties *(Fig. 5.3)*. Feeding barley is more widely distributed than either wheat or malting barley, a result of its less exacting ecological requirements and of comparative advantage. Although it is a crop of the east and south, it is in competition with the more profitable wheat and malting barley for the best cereal land, so that it is of lesser significance than would otherwise be expected in those areas where the other crops are of greatest importance. Cork is the major producing county, with 28 per cent of the total. There barley is better adapted to the higher rainfall than is wheat, as it matures earlier and is not so susceptible to diseases. The even greater precipitation further west is detrimental to satisfactory growth and harvesting of barley, climatic conditions being worst along the coast, where the frequency of strong winds increases liability to flattening of the crop. Barley is intolerant of the soil acidity of western areas. Its minor role in the west may be attributable partly to greater resistance to change by the western farmer; he has been slower to experiment with barley as a substitute for the traditional oats. In 1960 feeding barley was grown on 20·0 per cent of holdings, with an average of 1·5 hectares per holding.

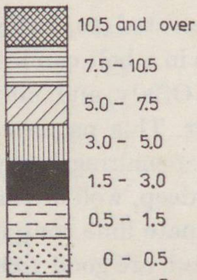


Fig. 5.3. Barley

OATS

Oats are the most widely grown cereal, being present on 61 per cent of holdings in 1960 and having a dispersed spatial distribution *(Fig. 5.4)*. The areal pattern is a product of the interplay of physical, economic, political, social and historical factors. In the east and south, oats are in competition with the more profitable wheat and barley, so that a very small proportion of the tilled land is devoted to them. Oats are less demanding than the other cereals in terms of soil quality, dryness and sunshine, growing well under moist, cool conditions. Their comparative advantage is thus greatest in upland districts and in the north and west, where their production is a major feature of arable farming. There is a guaranteed price for good quality oats grown in western areas. Because of smaller farms and lower level of mechanisation, the western farmer is less concerned than his eastern counterpart with the fact that harvesting of oats is less easily mechanised than that of wheat or barley. Holdings under 20 hectares had 42 per cent of the oats area in 1960, as compared with 28 per cent of all cereals. The average was only 1·0 hectares per holding, reflecting the fact that much of the oats is grown as a feed crop for use on the farm. Marketability is greatest in Donegal, which has the largest area of oats, succeeded by Galway, Cork and Mayo. Human consumption of oat products has been traditionally important in Ulster.

ROOT AND GREEN CROPS

In 1972 root and green crops occupied 130,800 hectares, comprising potatoes 33·7 per cent, sugar beet 26·0 per cent, turnips 23·4 per cent, mangels and fodder beet 7·5 per cent and others 9·4 per cent. The decline in root and green crops has been greater than in cereals, production was less affected by wartime conditions and the year to year variation in area has been lower. The proportion of tilled land under root and green crops decreased from 43 per cent in 1922 to 24 per cent in 1972. Also improvements in yields per hectare were proportionately less than in those of cereals, the increases between the 1920s and the 1960s being 46 per cent and 71 per cent respectively. Root and green crops accounted for 62 per cent of arable crop starch production in the 1920s and 44 per cent in the 1960s.

Root and green crops grow well in Ireland, not being affected by cloudiness and humidity to the same extent as cereals. They provide a valuable break in crop rotations, having a beneficial effect on cereal production.

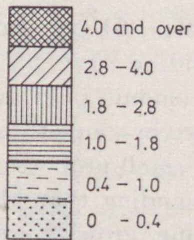


Fig. 5.4. Oats

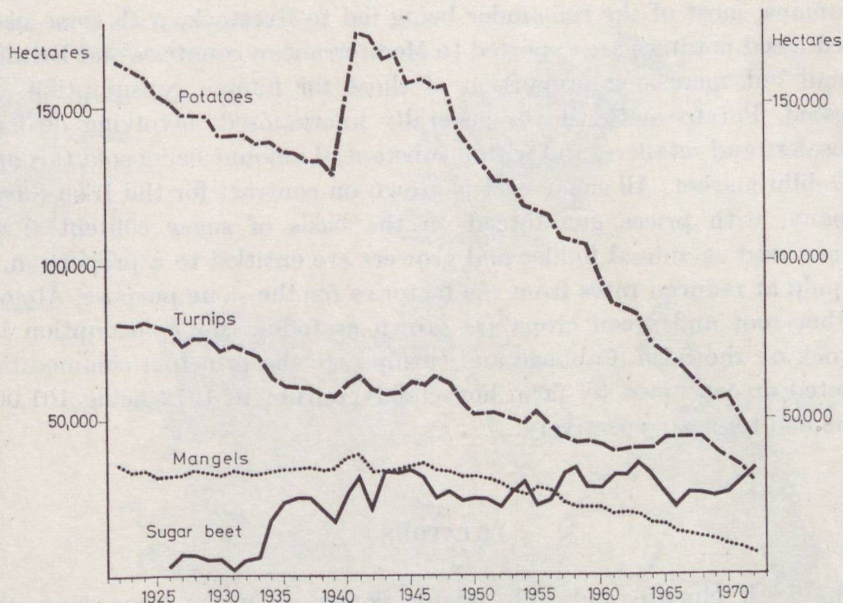


Fig. 5.5. Trends in root and green crop areas

Yet the high labour requirements of root and green crops make them unattractive to many farmers, though this input has been greatly reduced by precision sowing of sugar beet and turnips, use of monogerm beet seed which reduces the need for thinning of crops, adoption of chemical weed control and greater mechanisation of harvesting.

The area under potatoes has been in almost continuous decline, with the major exception of the 1940s; the area in 1972 was only 27 per cent of that in 1922 *(Fig. 5.5)*. This trend is attributable to the decline in the number of consumers and in per capita consumption, to diminished use of potatoes in livestock feeding and to labour considerations. The establishment of a protected sugar manufacturing industry in 1926 and its expansion in the 1930s led to the development of sugar beet growing. Fluctuations in the area since the 1950s have been dependent mainly on factory requirements, which are related to domestic consumption and world sugar prices, on weather conditions and on farmers' attitudes towards the crop. The 60 per cent decline in other root and green crops since 1922 has resulted mainly from their replacement as livestock fodder by grass, barley and compounded feedstuffs, and from labour considerations.

Output of potatoes and sugar beet was 1,113,000 and 446,000 tonnes respectively in 1972. Only one-third of total potato production is consumed

by humans, most of the remainder being fed to livestock, with some used as seed. Seed potatoes are exported to Mediterranean countries and Britain. A small but increasing proportion of those for human consumption are processed. Potato marketing is generally unorganised, involving dealers, wholesalers and retailers, and with a substantial amount being sold through the Dublin market. All sugar beet is grown on contract for the Irish Sugar Company, with prices guaranteed on the basis of sugar content. Beet tops are used as animal fodder and growers are entitled to a proportion of beet pulp at reduced rates from the factories for the same purpose. Almost all other root and green crops are grown as fodder for consumption by livestock on the farm. Cabbage and turnips are the principal commodities marketed or consumed by farm households, output in 1972 being 101,000 and 38,000 tonnes respectively.

POTATOES

The Irish climate and soils favour potato growing, apart from the susceptibility to potato blight which can now be controlled. The highest yields are obtained under cool and humid summer conditions; an adequate supply of moisture during the growing season being essential. Climatic conditions in the west are favourable, though more sunshine would be beneficial and excessive moisture prior to harvesting increases the disease risk. Soil relationships are of less importance than climate, though the best yields and quality occur on deep, well-drained soils of light to medium texture; yet potatoes grow satisfactorily over a wide range of soil types, peat soils being used to advantage in the west. Maximum yield is attained under more acid soil conditions than for any of the other crops.

Ecological conditions make possible the spatial pattern of potato growing but they by no means explain it *(Fig. 5.6)*. The crop is widely distributed, with 0·5–2·0 per cent of the improved land in most areas being under potatoes. Production is largely for local consumption, a tendency encouraged by the fact that potatoes can be grown practically everywhere, by the large quantities required and by the high transport costs on such a bulky commodity. The generally subsistence basis of production is reflected in the fact that potatoes were grown on 77 per cent of holdings in 1960 and on 93 per cent of those with tillage, proportions higher than for any other crop; the average area per holding was only 0·4 hectares. The proportion of the tillage area which they occupy is markedly higher in the north and west. There the density of rural people per unit area of agricultural land is greater

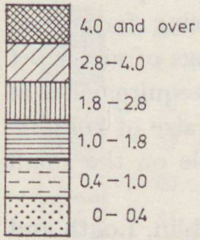


Fig. 5.6. Potatoes

and potatoes are probably a more important element in the diet. Farm size is an important consideration. Potatoes are the only crop in which there is a continuous diminution in density with increasing farm size; from occupying 55 per cent of the ploughed land on holdings of under 0·4 hectares, to 4 per cent on those of over 121 hectares. The requirements of farm and household do not increase in direct proportion to size of holding, while the substantial labour input is more readily available on the small farm.

Commercial production of ware potatoes is mainly in Dublin, Louth and adjacent parts of Meath and Monaghan, together with Donegal. Much of of the supply to the Dublin market comes from north Leinster. Potatoes for processing at Tuam are grown in Galway, though the bulk of supplies comes from other parts of the country. Nearly 1,500 hectares of early potatoes are grown, coastal areas being favoured because of climatic and soil considerations, with the earliest output from the south. The principal suppliers are Dublin, Cork, Wexford and Wicklow, with smaller quantities from parts of Waterford, Kerry, Galway, Mayo and Sligo. Production of seed potatoes is favoured by lower temperatures, so that the aphids which transmit virus diseases are less likely. Donegal is the major supplier but seed potatoes are also produced in Mayo and Galway.

SUGAR BEET

The spatial distribution of sugar beet is quite distinct, with a high degree of concentration in a relatively small number of rural districts *(Fig. 5.7)*. The pattern is related to variations in the suitability of the physical environment. The nature of the soil has an important effect on crop productivity; the optimum types being deep, friable, well-drained loams, relatively free from stones and with a higher lime content than that needed by most crops. Good yields may be obtained on heavy soils but lighter varieties are favoured because they usually afford better quality crops, less tare and easier working. Yield and sugar content are highest along the south coast where there is early growth and substantial insolation, decreasing northward with diminishing temperature and sunshine.

Sugar beet is most popular in those areas where there is a long tradition of arable farming, some of the districts being those with the highest density of tillage. Proximity to such areas was one of the factors considered in the siting of the sugar factories, because of the established tillage skills and the fact that sugar beet would fit conveniently into their arable rotations.

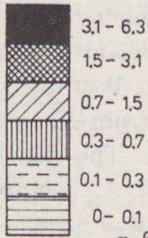


Fig. 5.7. Sugar beet

Once established, factory location became a significant influence on distribution of the crop, though diminished by the subsidising of transport costs by the Irish Sugar Company. Although the factories at Carlow, Thurles, Mallow and Tuam correspond with general areas of production, their imme-

diate vicinities are not the major source districts. In County Cork, beet is most important on the light, well-drained soils of the south coast tillage zone and not in the vicinity of Mallow; the important producing area in south Wexford is a substantial distance from its factory outlet at Thurles. Little sugar beet is grown to the north of a line from Dublin Bay to Clew Bay; the tillage areas of Louth and Donegal are distant from factories and temperature and sunshine conditions are unfavourable. The density of sugar beet is relatively uniform on farm size categories over 12 hectares, reaching a maximum on those of 20–40 hectares. The crop was grown on 9 per cent of holdings in 1960, with an average of 1·1 hectares per holding.

FODDER ROOT AND GREEN CROPS

Fodder root and green crops are grown mainly in the tillage districts of central and south Leinster and of east and south Munster, more than one-half of the total being in Leinster *(Fig. 5.8)*. Elsewhere Galway is the major producing county. In the tillage districts, soil and climatic conditions are suitable, farmers are disposed towards and equipped for arable crop production, and fodder root and green crops fit conveniently into the arable rotation, affording a break from cereals. There is little fodder crop production in the northern half of the country, even in the tillage districts of Louth and Donegal, probably because of the greater role of potatoes in these arable areas. Fodder crop densities tend to be greatest on holdings of about 20 hectares, declining on farms of smaller and larger size. The spatial distribution is affected by variations in the form of livestock production and by farmers' attitudes towards animal feeding.

The spatial distributions of individual root and green fodder crops differ but it is difficult to explain these patterns adequately. Influences include differing physical requirements of individual crops, the incidence of certain diseases, varying suitability for different types of livestock, labour and machinery considerations, farmers' preferences and assessments of the relative feeding values of the different crops, traditional influences, and market outlets for some of the turnips and cabbage which is sold. Turnips account for more than half of the total fodder root and green crops. Over 60 per cent of the crop occurs in a belt stretching across country from Wexford to east Galway. This corresponds with the main zone of malting barley, the growing of turnips and their grazing by livestock having a beneficial effect on subsequent barley crops. Turnips are much used as

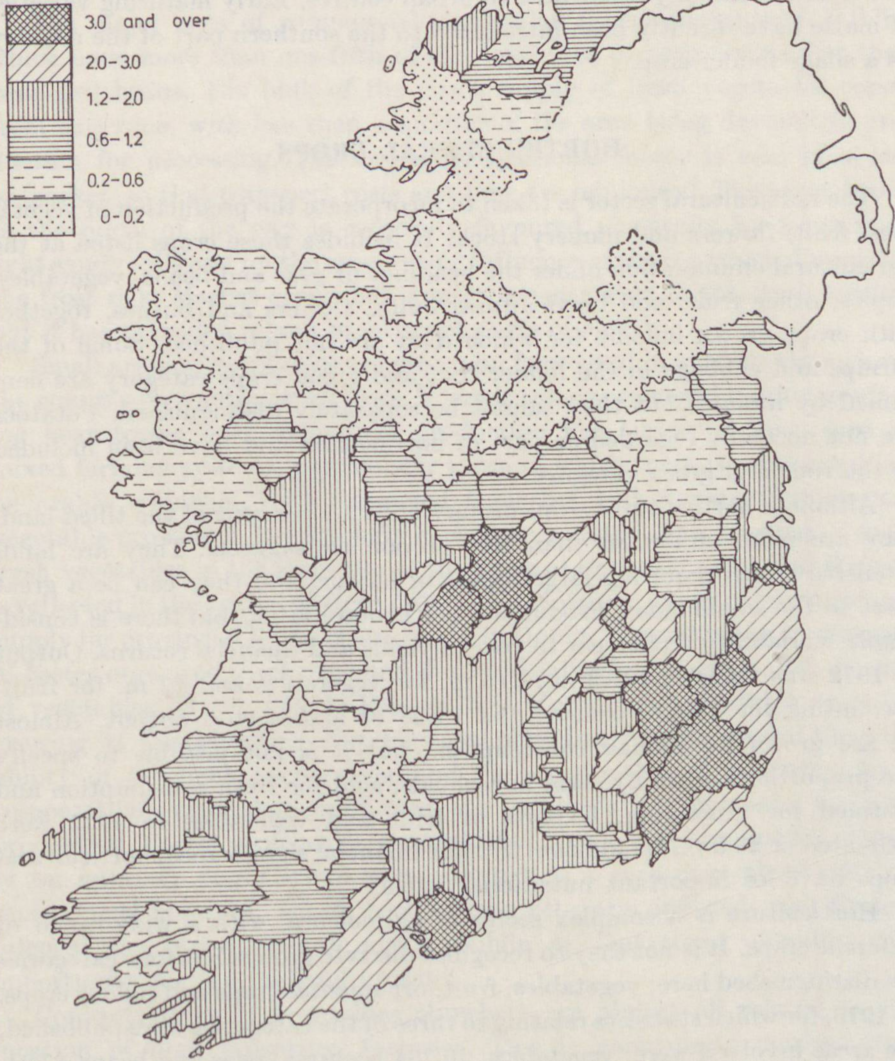


Fig. 5.8. Fodder root and green crops

fodder for sheep. Mangels and fodder beet have some similarities with turnips but their distribution is more westerly, 40 per cent of the area being in Cork and Galway. The brassica forage crops, kale and field cabbage, have a fragmented spatial pattern, bearing no relationship to the distri-

bution of all tillage. They tend to be associated with liquid milk supply farms and commonly occur near to urban centres. Early maturing varieties of maize have recently been introduced to the southern part of the country as a silage fodder crop.

HORTICULTURAL CROPS

The horticultural sector is taken to incorporate the production of vegetables, fruit, flowers and nursery stock. It includes those crops listed at the agricultural enumeration under the headings of peas and beans, vegetables, apples, other fruit, and horticultural bulbs, flowers and bushes, together with crops grown indoors for which data are not published. Some of the turnips and cabbage in the fodder root and green crops category are consumed by humans but they cannot be separately distinguished. Potatoes are not normally regarded as part of horticulture and have been included in the root and green category.

Although horticultural crops occupy only 2·5 per cent of the tilled land, they are more important than this proportion suggests. They are land-intensive crops, requiring large inputs of labour, and they can be a great asset to the smallholder. Production per hectare is high but there is considerable variability from year to year in yields and financial returns. Output in 1972 was valued at £12 m., £10 m. for vegetables and £2 m. for fruit, accounting for 18 per cent of the value of arable crop output. Almost all are grown for human consumption, but it is not possible to specify the proportions eaten by farm households, sold for fresh consumption and destined for processing. Exports of fruit and vegetables in 1972 were estimated at £6·8 m. In addition to their financial significance, horticultural crops have an important nutritional value.

Horticulture is a complex sector of agriculture, with a wide range of different crops. It is not easy to recognise discrete groups but four categories are distinguished here: vegetables, fruit, ornamental crops and indoor crops. In 1970, for which statistics relating to three of the categories were published, the areas involved were: vegetables, 10,794 hectares (peas and beans 4,291, other vegetables 6,503); fruit, 3,367 hectares (apples 2,219, other fruit 1,148); ornamental crops, 639 hectares. There are nearly 200 hectares under glass. Inadequacy of data makes comprehensive treatment of trends in the areas devoted to horticulture and its component sectors impossible. During the 1960s, there was an expansion in vegetable production associated with the establishment of processing plants but the area under fruit contracted.

The major area of commercial production is the environs of Dublin, which have more than one-fifth of the total area of vegetables other than peas and beans. The bulk of the city's supply of fresh vegetables comes from this zone, with less than a quarter of the area being devoted to production for processing. The dominant locational factor is ease of access to market, so that transport costs and time are minimised. The coastal zone to the north of the city is especially favoured physically by medium to light sandy soils and by the moderating influence of the sea which diminishes the frost risk. Market gardening is most concentrated in the Rush locality but it has extended inland to adjacent parts of Meath.

Small areas of vegetables are grown on farms and in gardens throughout the country on a subsistence basis. There is some specialised market gardening near towns but commercial production has largely become part of mixed farming systems, particularly those in which there is some emphasis on arable cropping. With improved transport and increased processing, vegetable growing is less strongly consumer oriented. The growing of some fresh vegetables in the vicinities of the cities of Cork, Limerick and Galway is reflected in the spatial pattern *(Fig. 5.9)*. However, much of the vegetable supply for provincial towns is purchased in Dublin, a result of the advantages of better organised marketing and more specialised production. The density of vegetables on the Dingle Peninsula in Kerry is attributable to onion growing at Castlegregory. Experimental plots in the 1930s proved the suitability of the light, sandy soils, and the organisation of marketing by a co-operative society has reinforced the locality's pre-eminence in onion production. Carrot growing is concentrated in the Athlone district, largely on cutaway bog. Carrots were adopted as a cash crop about 1950 to replace seed potatoes, which had become eel-worm infested; root fly had infected the carrot crop of north Dublin at that time, providing the opportunity for the midland growers.

Concentrations of vegetables elsewhere are almost all related to the location of food processing factories. This is particularly marked with respect to green peas for freezing and canning because of their highly perishable character; rapid transit from field to factory is important, so that the time interval between cutting and processing may be minimised to ensure retention of quality. The crop is concentrated in close proximity to factories in Dublin, Athy, Carlow, Midleton, Mallow, Limerick and Banagher. Production is principally on large holdings, the extent to which harvesting has been mechanised favouring large farms and fields. These

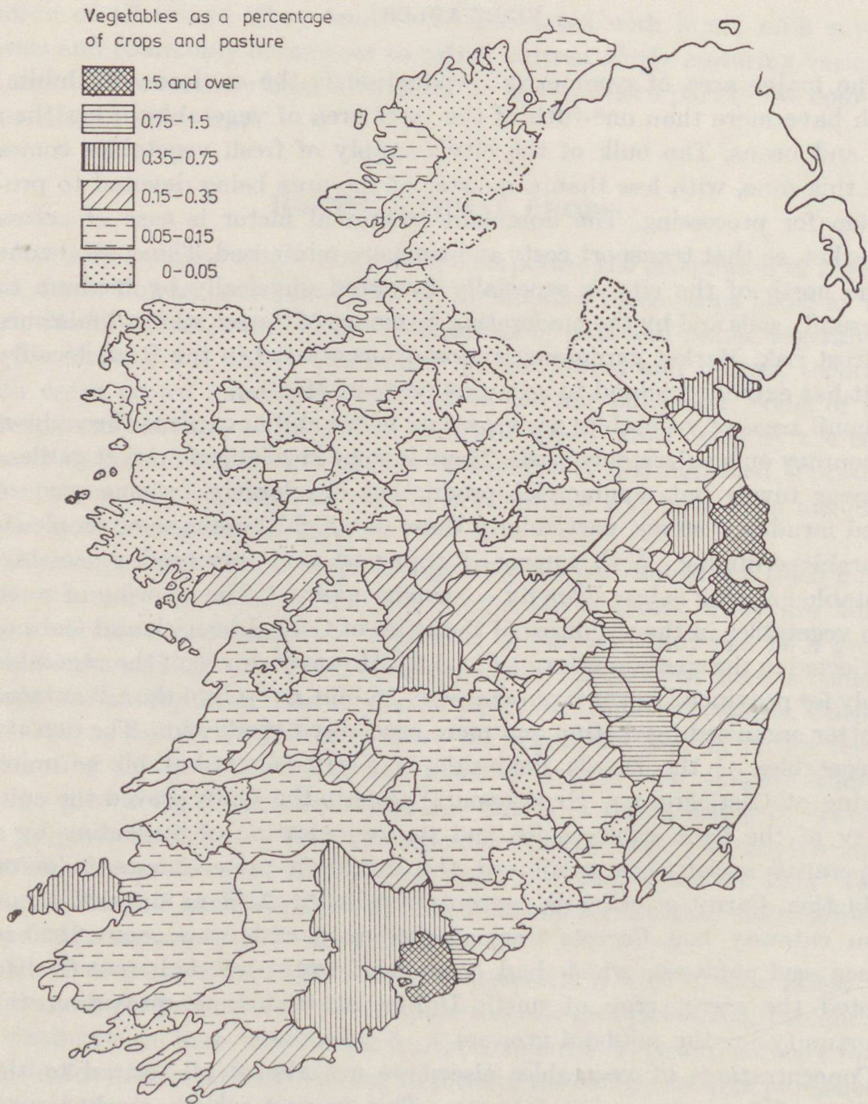


Fig. 5.9. Vegeta bles

factories also process other vegetables, with production in the same general areas, though less concentrated. The two major areas of vegetable growing are in Carlow, south Kildare and east Laois, and in east and south Cork, together accounting for more than one-half of all vegetables grown outside Dublin. Predominance of these areas can be attributed at least in part

to the fact that vegetable processing became associated with the factories of the Irish Sugar Company, to the readiness to adopt vegetable growing on the part of farmers who had traditionally grown arable crops and sugar beet in particular, and to general physical suitability of the districts concerned. Some vegetables are grown in west Cork to supply a factory in Skibbereen and in southwest Donegal for a plant at Glencolumbkille, though the latter has also to draw raw materials from a substantial distance. Most vegetables are grown on good quality land with medium to light soils.

FRUIT

Fruit growing is located mainly in the east and south *(Fig. 5.10)*, in the areas of tillage farming where physical conditions are more favourable and there is access to urban marketing and processing outlets. Apples are the most widely distributed fruit but many orchards are not commercial producers. The main orchard districts, with more than one-quarter of the total area, are in the Suir valley of south Tipperary and south Kilkenny, and in the lower Blackwater valley and around Dungarvan. There is a long history of apple growing in the area and Anglo-Norman settlers may have initiated the industry (Leister, 1962, 292). Although no part of Ireland is ideal for orchards, this district is favoured by the nature of the soils, by the topography which affords shelter and allows air drainage, and by proximity to a cider factory at Clonmel and a co-operative packing station and pomology research centre at Dungarvan. Dublin and adjacent parts of Meath are next in importance, with orchards also of significance in Wexford, east Cork, north central Limerick, Louth and in the vicinities of Athlone and Killarney.

Strawberries are the main type of soft fruit but blackcurrants, raspberries and gooseberries are also grown. Production in the Dublin locality is for fresh consumption and processing but elsewhere it is almost exclusively for processing, principally in jam manufacture and canning. More than half the total production is in two main areas, in Wexford, chiefly the Enniscorthy district, and in Dublin and east Meath. Soil and climatic conditions are advantageous in Wexford, where production began during World War II when imports of fruit pulp ceased, but fruit is now exported to Britain. There are significant areas of soft fruit in south Kildare, attributable mainly to two large growers who supply Dublin jam factories, and in Louth and Monaghan, for local processing. There are small quantities in the vicinities of Cork and Waterford cities.

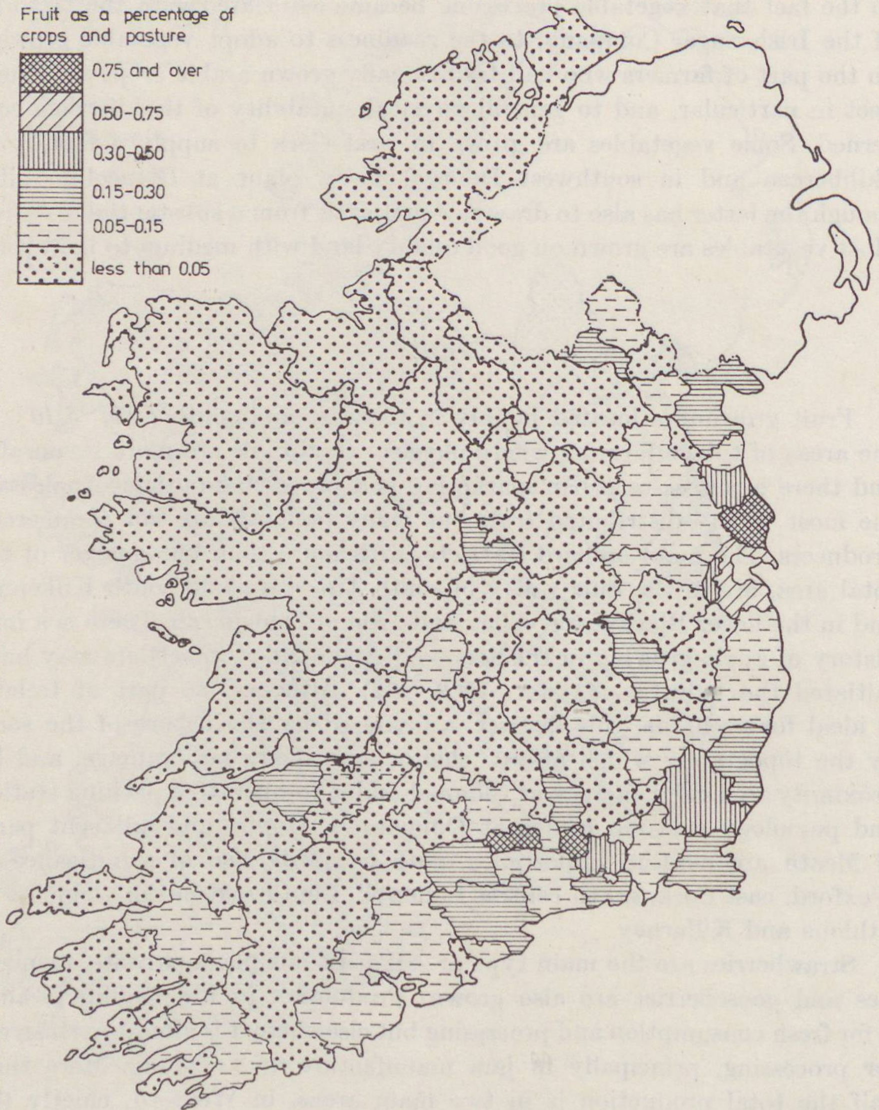


Fig. 5.10. Fruit

ORNAMENTAL CROPS

An urban orientation is evident in the distribution of horticultural bulbs, flowers and bushes, with one-fifth of the total in County Dublin and significant areas in the vicinities of Cork, Waterford and Limerick.

There is some production in Wexford and Wicklow and in west Cork, where the mild climate is favourable. The spatial pattern is patchy, with individual growers having a significant effect because of the small total area involved.

INDOOR CROPS

Some vegetable, fruit and ornamental crops are grown in buildings, representing the most intensive form of cultivation with very high capital and labour inputs. Glasshouses are the most common form of building, with increasing use of plastic structures. Tomatoes dominate in glasshouse production but substantial amounts of lettuce, cucumbers, flowers, potted plants and other crops are also grown.

The Dublin region is by far the most important area in tomato production, with County Dublin having 52 per cent of the total area under glass and an additional 10 per cent occurring in adjacent rural districts of Meath, Kildare and Wicklow. Access to market is an important factor, together with association with the established horticultural industry of the area. Other producing districts include east Cork, north Monaghan, north Kerry, north Louth, Wexford, east Wicklow and Galway. Although the environment is controlled, climatic factors have a bearing on profitability, affecting growth and heating costs. The southeast is favoured by insolation amounts and the south by temperature conditions.

There are 10 hectares of mushroom cropping area. There are about 30 growers but seven farms account for 80 per cent of production. Location is mainly in Dublin, Kildare, Wicklow and Meath, and in Monaghan, Tipperary and Cork. Access to domestic and export markets and supplies of stable manure are important locational considerations.

CROP COMBINATIONS

Rarely does a farmer grow only one crop and in all rural districts there is a variety of crops. This is partly because of realisation of the desirability of crop rotation in order to maintain soil fertility and reduce disease risk, supplemented by the economic advantages to be derived from diversification. It is in part a result of the differing purposes for which individual crops are grown, as cash crops, in order to feed livestock and to satisfy household demands for varied foods. In addition to considering the individ-

ual crops of farms or areas in isolation, they may be regarded as constituting component parts of tillage systems. The nature of a system is indicated by the combination of crops grown.

Relationships between the different crops grown influence the spatial distributions of individual members of crop combinations. The alternation of cereal and root crops on the same land affects areal patterns. The competition between malting and feeding barley and between feeding barley and oats are important crop interrelationships. Sugar beet was adopted in the traditional tillage areas, making it difficult to determine to what extent its present distribution is a result of this association with tillage practices and to what extent the pattern is physically controlled. Such examples demonstrate the need to determine the character and distribution of crop combinations, in order to understand better the geography of the component crops. Furthermore, the crop combination is in itself an integrative reality which requires definition and distributional analysis.

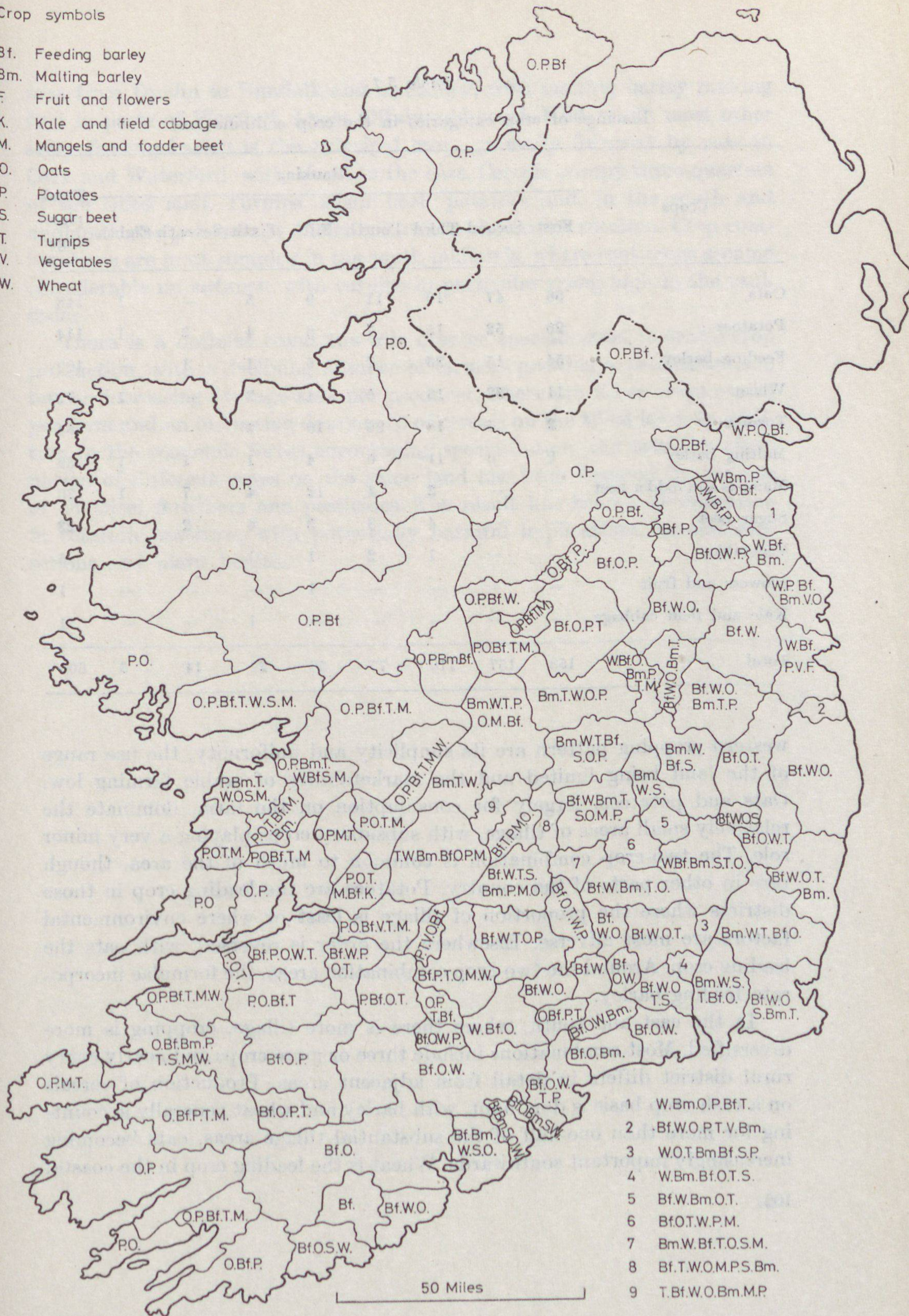
The least squares method of quantifying crop combinations on a rural district basis was used on the 1965 crop area data and is described in *Appendix B*. The best fit crop combinations range from monoculture to eight-crop combinations, the numbers of individual categories being: 1 one-crop, 47 two-crop, 33 three-crop, 21 four-crop, 27 five-crop, 15 six-crop, 9 seven-crop and 5 eight-crop combinations. The frequency of occurrence of the different crops in the ranked placings is shown in *Table 5.1*. The importance of oats and feeding barley is indicated by the fact that one or other ranks first in 110 of the 158 rural districts. Oats are the most widely distributed crop, being included in the crop combinations of all but ten rural districts. Potatoes follow oats in terms of total placings, though they are ranked first in only 26 rural districts, reflecting the role of potatoes as a subsidiary crop. Only six crops achieve first or second placings, four of them cereals (oats, feeding barley, wheat and malting barley) and two root crops (potatoes and turnips).

There is a complex spatial pattern of crop combinations *(Fig. 5.11)*. The crop symbols are listed according to ranked importance, with contiguous rural districts having the same crop combination being grouped together. The most striking feature is the distinction between the northwest and the eastern and southern parts of the country. An obvious line of demarcation extends from Galway to Dundalk, with features of the northwest repeated in parts of Clare and Kerry. The distinctive characteristics of the north-

⟶

Fig. 5.11. Crop combinations

MAGYAR
TUDOMÁNYOS AKADÉMIA
KONYVTÁRA


Crop symbols
Bf. Feeding barley
Bm. Malting barley
F. Fruit and flowers
K. Kale and field cabbage
M. Mangels and fodder beet
O. Oats
P. Potatoes
S. Sugar beet
T. Turnips
V. Vegetables
W. Wheat
O.P.Bf
O.P.
P.O.
O.P.Bf.
W.P.O.Bf.
O.P.Bf.
W.Bm.P.
O.Bf.
O.W.Bf.P.T.
O.P.
O.P.
O.P.Bf.
1
O.Bf.P.
W.Bf.
Bm.
Bf.O.W.P.
O.Bf.P.
Bf.O.P.
W.P.Bf.
Bm.V.O.
O.P.Bf.W.
O.P.Bf.T.M.
Bf.W.O.
O.P.Bf
Bf.O.P.T
Bf.W.
P.O.Bf.T.M.
W.Bf.
P.V.F.
O.P.Bm.Bf.
W.Bf.O.
Bm.P.
T.M.
Bf.W.O.Bm.T.
Bf.W.O.
Bm.T.P.
P.O.
Bm.T.W.O.P.
O.P.Bf.T.W.S.M.
Bm.W.T.P.
O.M.Bf.
2
O.P.Bf.T.M.
Bm.W.T.Bf.
S.O.P.
Bm.W.
Bf.S.
Bf.O.T.
O.P.Bm.T.
W.Bf.S.M.
O.P.Bf.T.M.W.
Bf.W.O.
P.Bm.T.
W.O.S.M.
Bm.T.W.
Bm.
W.S.
P.O.T.Bf.M.
Bm.
Bf.W.Bm.T.
S.O.M.P.
9
5
Bf.W.O.S.
P.O.T.M.
Bf.T.P.M.O.
8
O.P.M.T.
Bf.O.W.T.
P.O.T.M.
P.O.Bf.T.M
T.W.Bm.Bf.O.P.M.
6
W.Bf.Bm.S.T.O.
7
Bf.W.T.S.
Bm.P.M.O.
Bf.W.O.T.
Bm.
P.O.T.
M.Bf.K.
Bf.W.Bm.T.O.
P.O
O.P.
Bf.O.T.W.P.
P.O.Bf.V.T.M.
Bf.
W.O.
Bf.W.O.T.
3
Bm.W.T.Bf.O.
P.O.
Bf.P.O.W.T.
Bf.W.P.
O.T.
P.T.V.O.Bf.
Bf.W.T.O.P.
Bf.W.
Bf.
O.W.
4
Bf.P.T.O.M.W.
Bf.W.O
T.S.
Bm.W.S.
T.Bf.O.
Bf.W.O
S.Bm.T.
O.P.Bf.T.M.W.
P.O.Bf.T
P.Bf.O.T.
Bf.W.O.
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T.S.M.W.
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Bf.O.W.
O.P.M.T.
Bf.O.W.
T.P.
W.Bm.O.P.Bf.T.
Bf.O.Bm.S.W.
O.Bf.P.T.M.
Bf.O.P.T.
Bf.Bm.S.O.W.
Bf.Bm.
W.S.O.
2 Bf.W.O.P.T.V.Bm.
3 W.O.T.Bm.Bf.S.P.
Bf.O.
4 W.Bm.Bf.O.T.S.
O.P.
5 Bf.W.Bm.O.T.
Bf.
Bf.W.O.
6 Bf.O.T.W.P.M.
O.P.Bf.T.M.
7 Bm.W.Bf.T.O.S.M.
P.O.
Bf.O.S.W.
O.Bf.P.
8 Bf.T.W.O.M.P.S.Bm.
50 Miles
9 T.Bf.W.O.Bm.M.P.

Table 5.1.

Placings of crop categories in the crop combinations

Crops	Ranking								Total placings
	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	
Oats	56	47	19	11	9	5	—	1	148
Potatoes	26	52	15	7	6	4	3	1	114
Feeding barley	54	15	25	7	6	1	1	—	109
Wheat	11	32	15	6	4	3	—	1	72
Turnips	2	5	18	26	10	3	—	—	64
Malting barley	9	6	11	6	4	1	1	1	39
Mangels and fodder beet	—	—	2	4	12	4	7	1	30
Sugar beet	—	—	4	8	3	6	2	—	23
Vegetables	—	—	1	2	1	1	—	—	5
Flowers and fruit	—	—	—	—	1	—	—	—	1
Kale and field cabbage	—	—	—	—	—	1	—	—	1
Total	158	157	110	77	56	29	14	5	606

western cropping pattern are its simplicity and uniformity, the use range of the land being limited and the marketability of arable farming low. Oats and potatoes, largely for consumption on the farm, dominate the relatively small areas of tillage, with subsidiary crops playing a very minor role. The two-crop combination is common to much of the area, though rare in other parts of the country. Potatoes are the leading crop in those districts where the proportion of tillage is least or where environmental factors are most adverse. Elsewhere the order is reversed, with oats the leading crop. Around the two-crop combination areas, the formulae incorporate feeding barley.

In the east and south, where there is more tillage, cropping is more diversified. Most combinations include three or more crops and nearly every rural district differs in detail from adjacent areas. Production of cereals on a cash-crop basis is dominant, with barley and wheat generally accounting for more than one-half of the substantial tillage areas, oats becoming increasingly important southwards. Wheat is the leading crop in the coastal

area from Dublin to Dundalk and in Carlow, with malting barley ranking first in parts of Wexford, Laois, Offaly and south Kildare. In most other areas feeding barley is the principal crop, generally followed by oats in Cork and Waterford, with wheat in the east. Cereals occupy three-quarters of the tilled land. Turnips, sugar beet, potatoes and, in the south and midlands, mangels occupy the root break in the arable rotation. Crop combinations are most complex in the south midlands, where root crops assume considerable importance, with turnips in particular rising high in the rank order.

There is a definite trend towards greater specialisation in arable crop production, with a declining number of farmers growing a particular crop but an increasing average area per producer. There are fewer crops grown per farm and an increasing dominance of cereals on the tilled land. In addition to the economic forces encouraging specialisation, the need for alternation of different crops on the same land has been lessened by the use of chemical fertilisers and pesticides. The result has been a deterioration in rotation practices, with potentially harmful implications for soil conditions and plant health.

6. LIVESTOCK ENTERPRISES

The pastoral character of land use indicates the predominance of livestock in the agricultural economy of the Republic of Ireland. In addition to the large areas of pasture and hay, 60 per cent of the tilled land is under crops which eventually provide food for livestock, whether consumed on the farm or sold to other farmers, merchants or feedstuff compounders. Thus 96 per cent of the improved land is used directly or indirectly to support livestock. In 1972 livestock and livestock products accounted for 85 per cent of gross agricultural output and about 95 per cent of the value of agricultural exports. The orientation of Irish agriculture towards livestock production is a consequence of topographic, soil, climatic, historical, economic and social factors, the humid, temperate climate and access to the British market for livestock products being of paramount importance.

Some livestock are kept on almost every Irish farm and they are of vital importance in the rural economy in all parts of the country. The majority of farmers keep more than one type of animal but there are marked spatial variations in the emphasis placed on the different livestock enterprises. Although there are some interrelationships between these enterprises, separate treatment is most satisfactory in this chapter, followed by a consideration of livestock combinations.

LIVESTOCK CATEGORIES AND UNITS

Absolute numbers of animals are an inadequate basis for comparison of the relative importance of the different categories of livestock, as the various types and ages of animal differ greatly in size and requirements. The most satisfactory method of equating the different categories is on the basis of feed consumption, in terms of livestock units. A system suited to Irish conditions and based on estimated dry matter intake, as indicated by physiological body weight, was developed by Attwood and Heavey (1964). The detailed series of coefficients presented by these authors has been simplified and adapted to the agricultural statistics for the purpose

of this book. The units refer only to grazing livestock (cattle, sheep and horses) and, as no equivalents for pigs and poultry in an Irish context are available, those used by Coppock* were adopted, with slight modifications to suit the Irish agricultural statistics. The two sets of coefficients combined comprise all livestock now recorded at the agricultural enumeration.**

Six categories of livestock, with corresponding enterprises, are recognised: cows, cattle, sheep, horses, pigs and poultry. The relative importance of these types in different years is indicated in *Table 6.1.* The spatial pattern of the role of each category in 1965 is shown in *Figures 6.4, 6.9, 6.13, 6.15, 6.17* and *6.19*, the class intervals on each map being measured in the same proportions of the standard deviation about the means, so that there might be some uniformity and comparability between the six maps (Gillmor, 1970b, 589). Problems of definition arise only in relation to cows and cattle. Breeding stock (bulls, milch cows and heifers in calf) can be grouped together under the heading of cows, bulls constituting less than one per cent of the total. The remainder are other cattle or dry cattle, usually simply termed cattle. This grouping reflects but is not a direct indicator of the relative importance of the dairy and beef enterprises. Dairy and beef stock are not recorded separately in the agricultural statistics, so no clear distinction can be made. The milk of some of the cows is used exclusively in the rearing of calves and some of the female dry stock are being kept as replacements for the dairy herd.

The total number of livestock units in the Republic of Ireland has been almost static until recent years. Fluctuations have occurred, usually with a time-lag after the responsible stimulus. There were 4·9 m. units at the establishment of the state in 1922 but with diminishing prices the number declined to 4·5 m. in 1925. Expansion to 4·8 m. had occurred by the early 1930s in response to the efforts to improve the livestock industry and to promote exports. There was a setback during the economic difficulties of the 1930s and World War II, with lows of 4·4 m. in 1938 and 4·35 m. in 1948, the smallest value recorded in the history of the state. After a slight

* J. T. Coppock: *An agricultural atlas of England and Wales.* Faber and Faber, London, 1964, 213.

** Livestock unit equivalents used: bulls, cows, heifers in calf 1·00; other cattle aged two years and over 1·00; other cattle aged one to two years 0·67; other cattle aged less than one year 0·33; rams, ewes 0·20; other sheep aged one year and over 0·16; other sheep aged less than one year 0·10; working horses 1·50; other horses 1·00; boars 0·25; sows, gilts in pig 0·50; other pigs 0·14; poultry under six months 0·005; other poultry 0·02.

Table 6.1.

Percentage distribution of total livestock units by category of animal in selected years, 1922–72

	1922	1930	1940	1950	1960	1970	1972
Bulls, cows, heifers in calf	28·9	27·9	29·1	29·2	28·8	34·1	36·0
Other cattle	40·6	37·5	37·2	43·0	44·8	45·6	44·8
Sheep	8·9	11·3	10·2	7·8	13·3	11·0	10·7
Horses	13·5	13·0	13·8	11·8	6·3	3·0	2·4
Pigs	3·4	4·0	4·1	2·4	3·5	3·8	3·6
Poultry	4·6	6·3	5·6	5·7	3·4	2·4	2·4
Total livestock units ('000)	4,919	4,775	4,607	4,694	4,950	5,637	6,000

recovery, numbers were quite stable and were still at 4·7 m. in 1958. In 1960 the number of livestock units first exceeded the value recorded in 1922 and the 5·0 m. mark was passed in 1963, since which there has been substantial expansion. A growth of 21 per cent occurred in the period 1960–72, at the end of which the 6·0 m. value had been attained. Recent growth has been related to government financial support and other promotion, better market outlets and a general improvement in the standard of Irish farming, including greater use of fertilisers. Changes in the relative importance of the different categories of livestock have occurred, as indicated in *Table 6.1.*

MILK PRODUCTION

All forms of milk production are included in this section, both commercial dairying and use of milk on the farm. Of total milk production, about 64 per cent is sold for manufacturing, 17 per cent consumed as whole milk and 19 per cent fed to livestock. Commercial dairying is practised on one-third of all holdings. Off-farm sales, valued at £114 m., accounted for 24 per cent of the value of total gross agricultural output in 1972. About 45 per cent of production is exported. Dairy products contributed 16 per cent

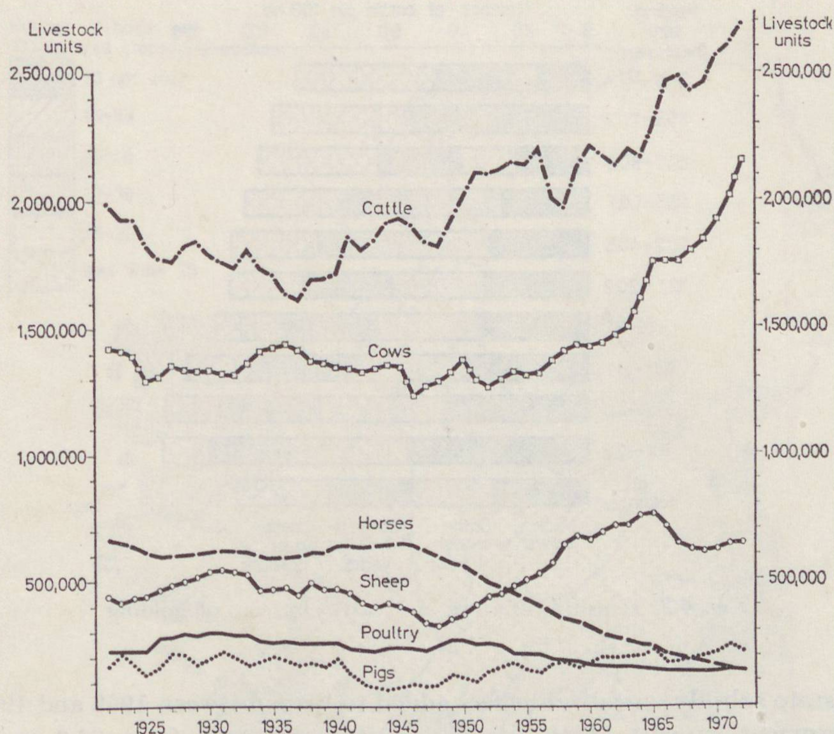


Fig. 6.1. Trends in livestock unit numbers

of total agricultural exports, being valued at £41 m. Milk production is the second enterprise in importance after the cattle industry in terms of livestock units, output and exports. In addition the cows provide the calves on which the cattle industry is based and cows culled from the dairy herd contribute to beef output. Thus milk production is a major and essential component of Irish agriculture.

Despite the importance of dairying, the number of milch cows fluctuated around 1·25 m. from the 1920s until the 1960s *(Fig. 6.1)*. Growth began gradually in the late 1950s and both cow numbers and also milk output increased by 48 per cent in the period 1960–72. In 1972 there were 1·89 m. milch cows and 2·16 m. livestock units in the breeding herd. Milk prices increased substantially and the market for cattle and beef expanded during this period, with expectations by farmers of further improvements under E.E.C. conditions. There was very active promotion of dairying by the government, the advisory service and the mass media, including payment

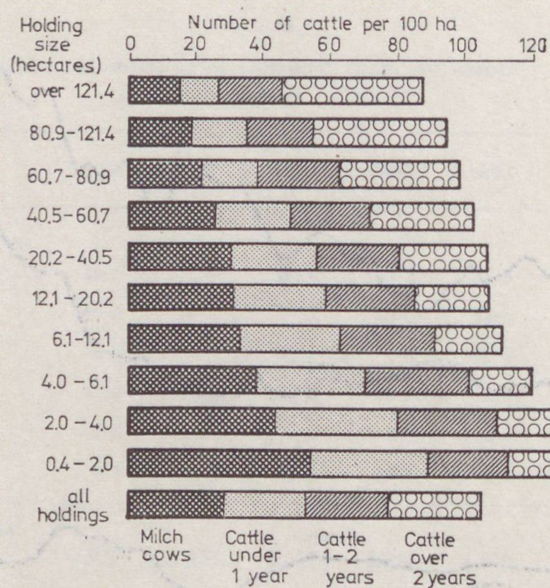


Fig. 6.2. Densities of cows and cattle by size of holding

of a state subsidy on calved heifers added to herds between 1963 and 1969. Government support of the dairy industry increased from £2·3 m. in 1960–61 to £29·8 m. in 1971–72, when it amounted to 28 per cent of total expenditure in relation to agriculture. Farmers were attracted by the regularity and stability of income and the fact that returns per hectare are higher than in the other major enterprises, compensating for the large capital and labour demands of dairying.

In 1960 milch cows were kept on 80 per cent of holdings. The average number of animals on these holdings was 5·5, with 84 per cent of herds comprising less than 10 cows. The density of cows diminishes with increasing size of holding *(Fig. 6.2)*. Even on very small farms one or more cows are usually kept, supplying the farm household with milk. Dairying is attractive to the smallholder because of the high return per unit area which it offers and the labour requirements are readily supplied. However, the economic advantages of large herds are very apparent, especially with respect to labour productivity. Although numbers have increased since 1960, the small size of herds is a major problem of Irish dairy farming.

The physical conditions of climate and soil in Ireland are very favourable towards competitive milk production based mainly on grass, with low housing and feeding costs. Although improvements have been made, farm-

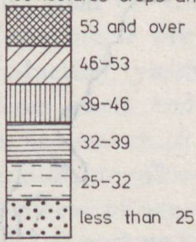


Fig. 6.3. Milch cows

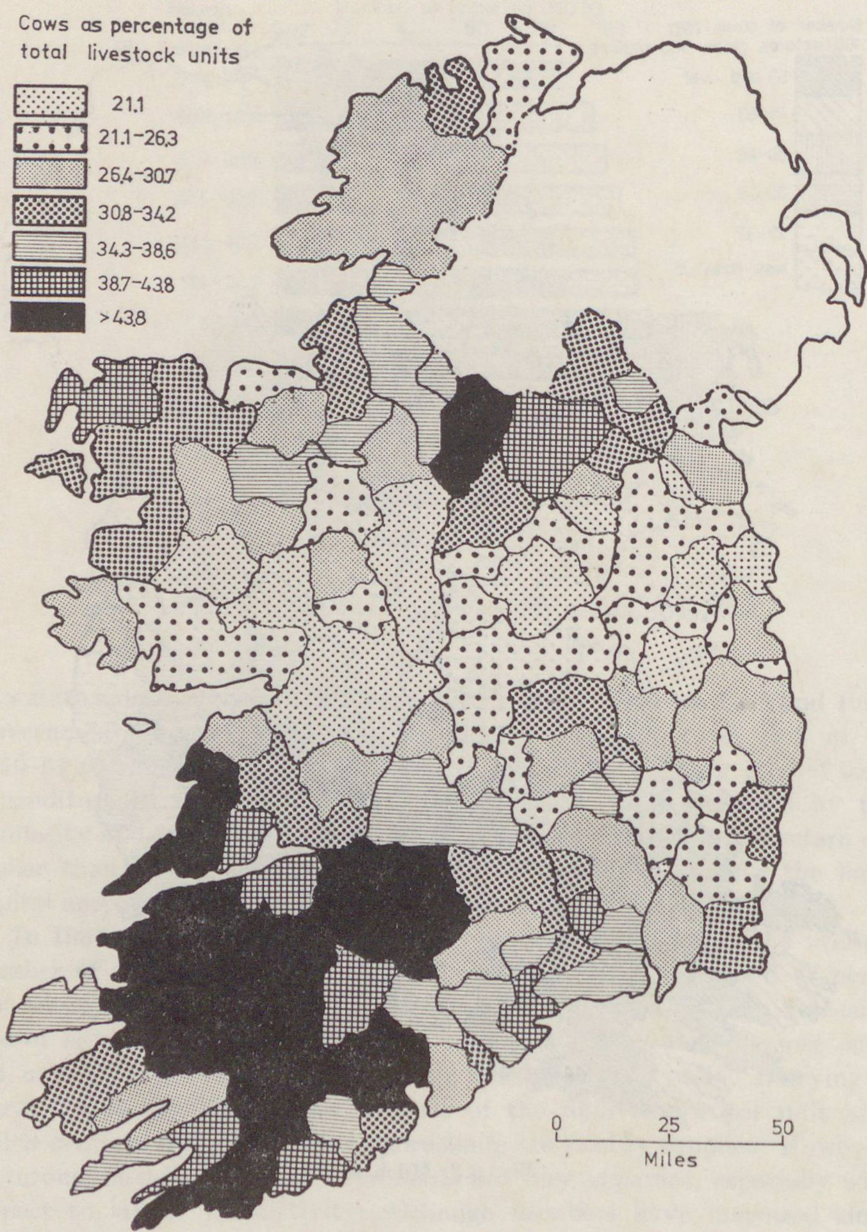


Fig. 6.4. Role of cows in livestock production

ers have not exploited these natural advantages to the full. The average milk yield per cow is about 2,500 litres per annum, much lower than that of the major world dairy producers. Even with an emphasis on low-cost production, yields could be substantially increased through breeding of better stock and improved nutrition, in addition to the higher returns per hectare which would result from proper grassland management. Another handicap to efficient dairying is the inadequate structural quality of many cowbyres in use, though the number of modern layouts incorporating a milking parlour is increasing.

Although cows are kept on most farms, there are pronounced spatial variations in their density and in their role in the livestock economy (*Figs 6.3* and *6.4*). The most notable features are the major concentration of cows in the southwest and to a much lesser extent in some northern areas, with their relative unimportance elsewhere. The average number of cows per herd in 1960 ranged from 2·7 in Galway and Mayo to 12·1 in Limerick. The spatial pattern is related to the varying emphasis placed on dairying and to variations in the orientation of milk production towards industrial supply, liquid consumption and livestock feeding.

MANUFACTURING MILK SUPPLY

The production of milk for manufacturing is both the most important sector of the industry and also that in which there has been greatest growth. During the period 1960–72 the volume of output increased by 62 per cent and there was a sevenfold growth in the value of dairy product exports. Expansion occurred mainly through increased size of herds on existing supply farms. It was also in part a result of a limited extension of dairying into most counties outside the two traditional creamery supply regions, which include Munster and County Kilkenny in the south and the counties from Sligo to Monaghan in the north. The number of creamery suppliers reached a peak of 111,700 in 1968, declining to 89,300 in 1972. Many farmers ceased commercial dairying because of uncertainty as world butter surpluses increased and especially because of the introduction of a beef cattle incentive scheme in 1969 under which headage payments are made on cows not in commercial dairy herds. This tendency was greatest amongst the smaller producers and in the non-dairying regions, contributing to the fact that in the period 1968–72 the average number of cows per supplier increased from 9·0 to 11·6 and average sales from 20,600 litres to 28,600 litres.

Manufacturing milk supply is highly seasonal, the June peak exceeding the January low by more than ten times. The majority of cows calve in spring, produce milk cheaply from summer grazing and have minimum output and requirements of food during winter. There is a northward progression in the times of peak calving and milk output related to the grazing season.

It is not easy to explain the spatial pattern of manufacturing milk supply. In the core area of the southwest and the drumlin belt of the north soils are heavy, with substantial growth of grass in summer but being wet and soft in winter, so that seasonal milk production is a logical land use system and there are difficulties in developing alternative enterprises. The role of dairying tends to diminish outwards as soils become lighter and drier. The high humidity and precipitation are favourable and the southwest has the advantage of a longer grass growing season. Farmers have exploited this comparative physical advantage by concentrating on milk production. Inadequacy of water supply has hindered dairy development in east Galway. Historical influences and a long tradition of dairying are probably important. Access to the Cork Butter Market, which was one of the largest butter exchanges in the world in the eighteenth and early nineteenth centuries, and the provisions trade through southern ports are certain to have facilitated development in the southwest. The more ready acceptance of the co-operative movement in the two regions concerned than elsewhere in the late nineteenth century was a contributory factor. The medium and small farm size structures are incentives to dairying. In many areas of small holdings dairy development is impeded by an unfavourable upland environment, farm fragmentation which hinders milking arrangements, poor housing and inadequate capital to provide it, high age structure of the population and the unavailability of local market outlets. Elsewhere other enterprises are favoured.

In dairy product manufacture efforts are being made to diversify production and to rationalise the number and distribution of creameries. The industry traditionally relied almost exclusively on butter manufacture but, although two-thirds of the milk is still made into butter, there has been a substantial growth in the output of other products, notably cheese and also chocolate crumb and dried milk. Only 2 per cent of manufacturing milk is used to make butter on the farm and production has declined sixfold during the last decade, being a laborious and uneconomic task. Rationalisation aims at a high degree of centralisation of activity to replace the 157 central manufacturing creameries and 444 cream separating stations which operated in the early 1960s but progress has been slow.

LIQUID MILK PRODUCTION

Production of milk for liquid consumption increased by 7 per cent during the period 1960–72, to 620 m. litres. Sales are dependent on the domestic market because of perishability and transport costs. Per capita consumption has been almost static, so that output is related to population growth. One-third of the milk is consumed on the farm of origin, the requirements of dense rural populations accounting in part for the numbers of cows in some western small farm areas.

Commercial liquid milk production is oriented towards urban markets. One-third of sales are by producer-retailers, mainly in small towns. This form of trade was once dominant, with production concentrated in very close proximity to the towns and town dairies within the city important in the instance of Dublin. The pattern has altered with modern transport and the distribution of pasteurised milk by wholesalers. The Dublin supply area is statutorily defined as comprising Counties Dublin, Louth, Meath, Kildare and Wicklow, with adjacent parts of Westmeath, Offaly, Carlow and Wexford. Uniform prices are paid throughout the area, so that producers in County Dublin lost their locational advantage and they are being affected by the outward expansion of the city and increased labour difficulties. The county's contribution to the total city milk supply decreased from 28 to 14 per cent between 1960 and 1972. The Cork milkshed is much more compact, the bulk of supply coming from within 15 km from the city.

Liquid milk trade farms differ in certain respects from those supplying creameries. They tend to have a larger milk output, related to greater area, more specialisation and higher cow yields. A higher price per litre is paid than for industrial milk and it varies seasonally in order to compensate for the extra feeding of cows necessary to ensure a relatively constant supply of milk throughout the year. Calving is much less seasonal than on creamery supply farms, with a substantial amount in autumn.

MILK FEEDING TO LIVESTOCK

Traditionally separated milk from butter manufacture was returned by creameries to farmers and used in calf and pig rearing. As manufacturing diversified, an increased proportion of whole milk was purchased by the manufacturers but substantial quantities of skim milk are still used in livestock rearing. Most creamery suppliers retain calves in excess of those females needed as dairy herd replacements and some purchase additional

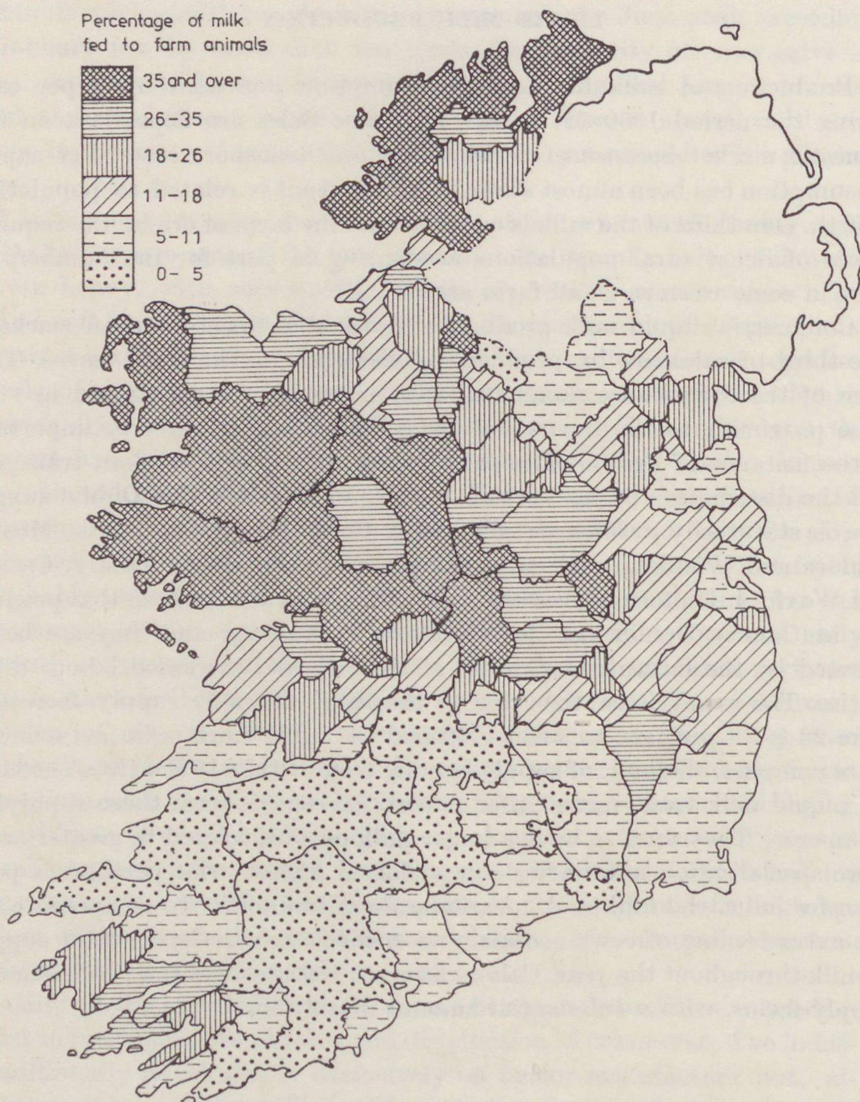


Fig. 6.5. Bucket feeding of milk to livestock

calves. Retention is less common on liquid supply farms, where skim milk is not available. Increased amounts of milk substitutes are now fed to calves.

Much whole milk is used in calf rearing; nearly one-fifth of the milk produced was bucket fed to animals and one-fifth of the cows were suckling

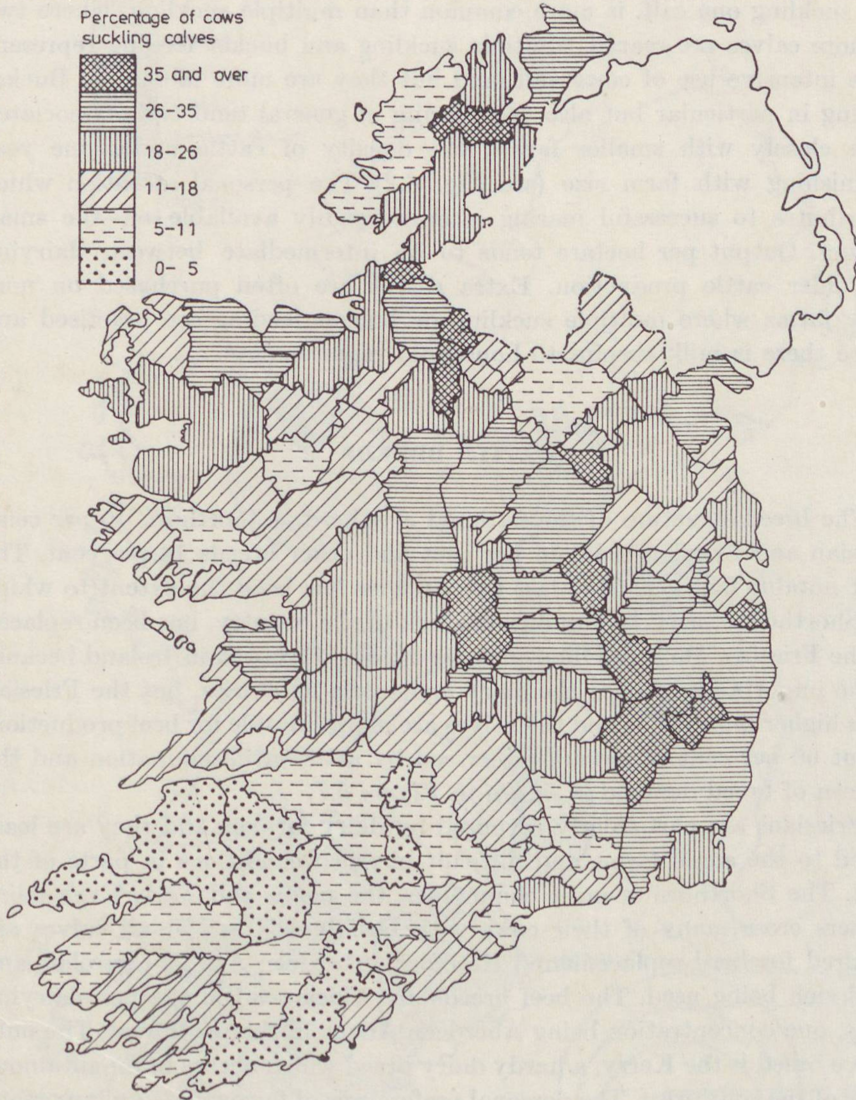


Fig. 6.6. Suckling

calves in June, 1970. The use of whole milk is proportionately greatest in areas where there is little commercial dairying, so that the spatial pattern contrasts with the distribution of cows (*Figs 6.5* and *6.6*). The distribution of bucket feeding is more westerly than that of suckling which is favoured in areas of large holdings and arable farming. Single suckling, with each

cow suckling one calf, is more common than multiple suckling, where two or more calves are reared. Multiple suckling and bucket feeding represent more intensive use of cows and land but they are more laborious. Bucket feeding in particular but also calf rearing in general tend to be associated more closely with smaller farms, the density of cattle under one year diminishing with farm size (see *Fig. 6.2*). The personal attention which contributes to successful rearing is most readily available on the small holding. Output per hectare tends to be intermediate between dairying and older cattle production. Extra calves are often purchased on non-dairy farms where multiple suckling or bucket feeding are practised and where there is milk surplus to household requirements.

CATTLE BREEDS

The breed structure of the national cow herd is Shorthorn 40 per cent, Friesian and Friesian cross 46 per cent and other breeds 14 per cent. The most notable feature of the last two decades has been the extent to which the Shorthorn, formerly foundation stock of the country, has been replaced by the Friesian. Both are dual-purpose breeds, favoured in Ireland because of the importance of both the dairy and cattle industries, but the Friesian gives higher milk yields and the calves are more suitable for beef production. About 60 per cent of cows are serviced by artificial insemination and the pattern of breed demand is shown in *Figure 6.7*.

Friesians are particularly favoured by dairy farmers and they are least suited to the small farms and difficult physical conditions in parts of the west. The Shorthorn is most common in the north and west. Even dairy farmers cross many of their cows with beef breeds as not all calves are required for herd replacements, Hereford, Aberdeen Angus, Charolais and Fleckvieh being used. The beef breeds are widespread in the non-dairying areas, one concentration being Aberdeen Angus in the northwest. The only native breed is the Kerry, a hardy dairy breed which occurs in mountainous areas of the southwest. The personal preferences of farmers are an important factor in the choice of breeds.

CATTLE

Cattle production has traditionally been the most important sector of Irish agriculture. In 1972 cattle accounted for 44·8 per cent of total livestock units and the output of 1,677,000 animals was valued at £197 m., 41 per

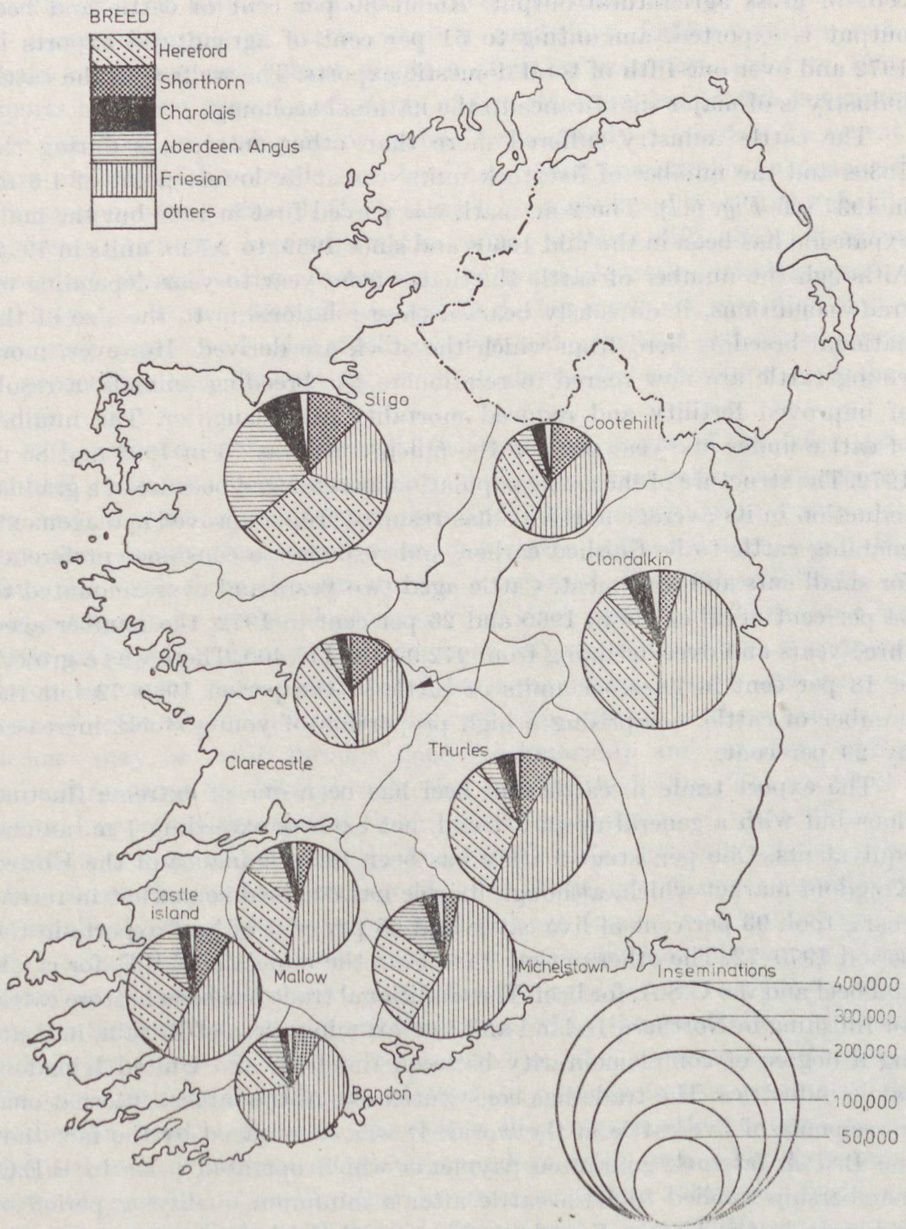


Fig. 6.7. Cattle breed demand by artificial insemination area, 1972

cent of gross agricultural output. About 80 per cent of cattle and beef output is exported, amounting to 51 per cent of agricultural exports in 1972 and over one-fifth of total domestic exports. The welfare of the cattle industry is of major significance to the national economy.

The cattle industry suffered more than other enterprises during the 1930s and the number of livestock units was at its lowest point of 1·6 m. in 1937 (cf. *Fig. 6.1*). The 2 m. mark was passed first in 1950 but the main expansion has been in the mid 1960s and since 1969, to 2·7 m. units in 1972. Although the number of cattle fluctuates from year to year depending on trade conditions, it obviously bears a close relationship to the size of the national breeding herd from which the stock are derived. However, more young cattle are now reared in relation to the breeding animals, a result of improved fertility and reduced mortality and slaughter. The number of cattle under one year old per 100 milch cows was 76 in 1922 and 86 in 1972. The structure of the cattle population has changed because of a gradual reduction in its average age. This has resulted from improved management, enabling cattle to be finished earlier, and response to consumer preference for small cuts and lean meat. Cattle aged two years and over amounted to 34 per cent of all cattle in 1960 and 26 per cent in 1972, the number aged three years and over declining from 272,900 to 177,400. There was a growth of 18 per cent in livestock units of cattle in the period 1960–72 but the number of cattle, comprising a high proportion of young stock, increased by 29 per cent.

The export trade in cattle and beef has been one of extreme fluctuations but with a general upward trend, net exports exceeding 1 m. animal equivalents. One persistent feature has been the dominance of the United Kingdom market which, although its role has declined somewhat in recent years, took 93 per cent of live cattle and 68 per cent of beef exports in the period 1970–72. The other outlets have been the mainland E.E.C. for cattle and beef and the U.S.A. for beef. The traditional trade has been in store cattle for finishing in Northern Ireland and the fattening areas of Britain, indicating a degree of complementarity between the Irish and United Kingdom cattle industries. The trade has constituted one of the largest international movements of live cattle in the world. It was encouraged by the fact that the British fatstock guarantee payments which operated prior to E.E.C. membership applied to Irish cattle after a minimum qualifying period of residence in the United Kingdom, from which Irish farmers derived substantial indirect financial benefit. However, the high degree of dependence on a single market has had inherent disadvantages and the trade has been one of fluctuating fortunes. It has been subject to varying influences and

uncertainties in Britain, such as political measures, foreign competition, the domestic supply of cattle, weather conditions, fodder supplies, outbreaks of disease and labour disputes affecting transport. Prior to 1950 exports had been almost exclusively of live store and beef cattle but since then the beef processing industry has been greatly expanded. In recent years exports of live cattle and beef have been comparable in terms of animal equivalents, though fluctuating with trade conditions and subsidy payments. Although beef exportation is not without difficulties, it offers certain advantages to the country over the live cattle trade, including greater stability, less depreciation of the product during transport, retention of the manuring capacity of older stock, employment provision and added value in processing and the supply of byproducts for subsidiary manufacturing.

Although the cattle industry is the dominant sector of the Irish agricultural economy, it is an extensive farming system with lower returns per hectare than in other enterprises and great variability in income. It may seem strange that most farmers participate in the industry, especially when the small farm size structure is considered. Physical suitability, so that cattle can be produced on almost any land, and the ready demand for cattle and beef in Britain are important influences. Tradition is a major factor, as cattle have dominated Irish agricultural history and farmers have an established familiarity with cattle and liking for them. Adequate incomes may be made through good stockmanship and prudent buying and selling, some combining production with cattle dealing. The uncertainties and opportunities appeal to the gambling instincts of some. There is a certain prestige attached to the keeping of cattle, especially good quality advanced stock, and to being a good judge of animals. There is a tendency for smallholders to follow the practices of large farmers and landholders in other occupations. Input costs are low and the small labour requirements appeal in particular to large, part-time and aged farmers and those with fragmented holdings. Others are also attracted by the small effort involved and Geary (1956–57, 27) has commented on the consequent deleterious effect of cattle on the Irish rural mentality. Many farmers choose cattle production because for various reasons they regard other enterprises as unsuited to their circumstances. Others adopt cattle as a subsidiary enterprise, to graze jointly with other livestock or to use rotational grassland and arable byproducts, so that cattle form a part of many different farming systems. Farmers keep cattle for very varied reasons but accurate assessment of the financial returns is difficult and non-economic influences are important.

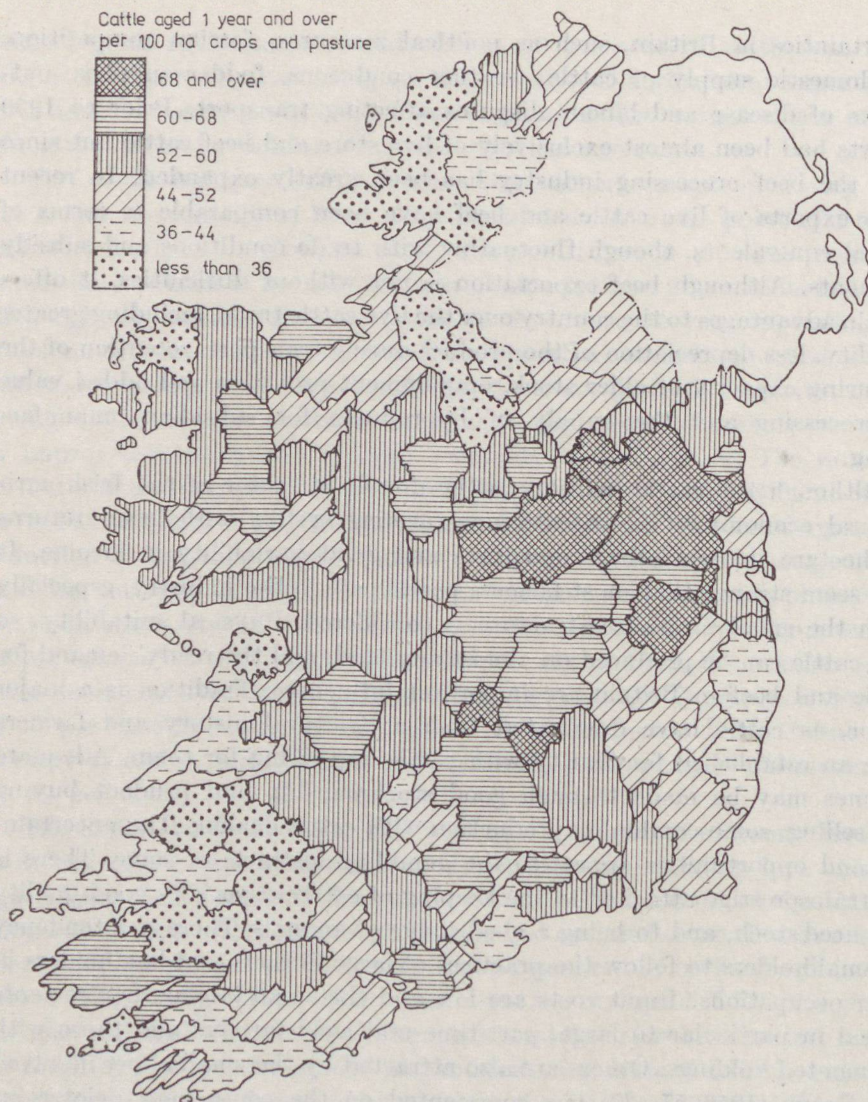


Fig. 6.8. Cattle

Although cattle are kept on most farms and in no rural district do they account for less than one-quarter of livestock units, there are considerable spatial variations in their density and importance (*Figs 6.8* and *6.9*). Production systems vary greatly between different parts of the country, between individual farms in the same area, and even at different times and between different animals on the same farm. The stages of breeding, rearing

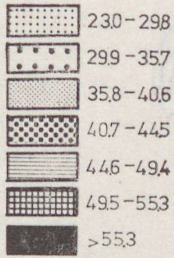


Fig. 6.9. Role of cattle in livestock production

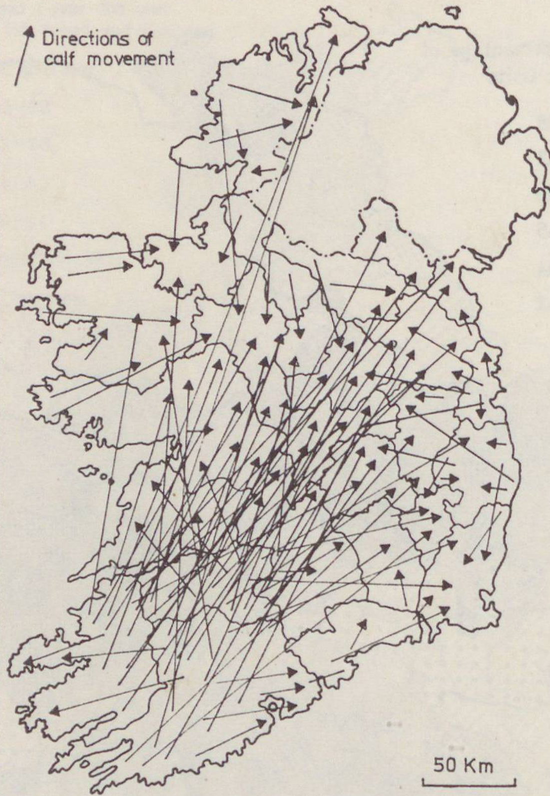


Fig. 6.10. Movements of calves

and finishing may be recognised but distinctions are rarely clear. Farmers buy and sel cattle depending on prevailing trade conditions and their own fodder and financial circumstances, as well as in accordance with planned production systems. However, there is an overall general tendency for different farms and areas to concentrate more on certain stages of the production process than on others. This is evident when the densities of cattle by size of holding and by area are compared with those of cows, indicating a transfer of some cattle from the farms and places where they were born (see *Figs 6.2, 6.3* and *6.8*).

Influences involved in the movement of cattle include physical conditions, farm size, farm economy and the ultimate destination of the stock. Land of low quality is suitable for the rearing of young animals but fertile grassland is required for efficient fattening and quick turnover of forward cattle is possible. Cattle more advanced than the calf stage thrive when transferred to land of better quality. There is a movement of stock from

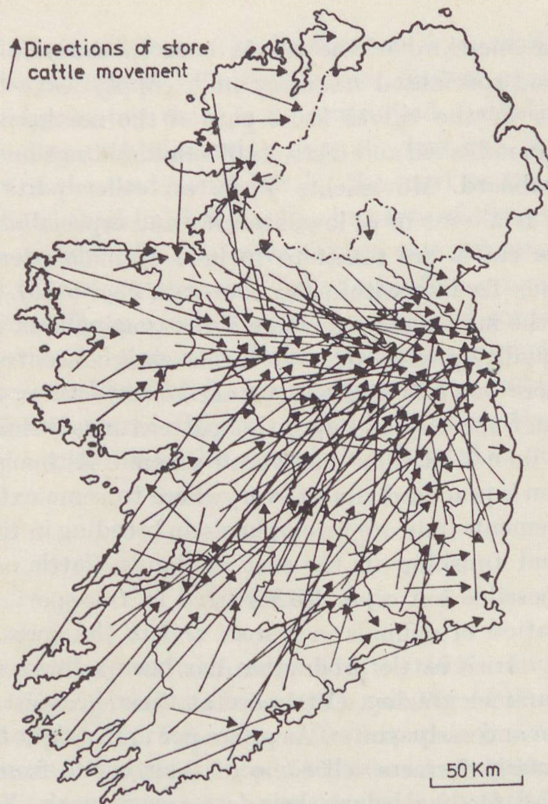


Fig. 6.11. Movements of store cattle

smaller to large farms, becoming more pronounced as the animals get older (cf. *Fig. 6.2*). Advanced cattle are more suited to large than small holdings because of the low output per acre, small labour requirements and the substantial capital investment in such animals. Calf sales often occur on dairy farms, though practices range from sale of all progeny to substantial intake, depending on the emphasis placed on dairying. There is a movement of cattle to arable farms for winter feeding. Finally, there is transport of stock from farms to the places of slaughter and export, mainly in the east of the country and along the Northern Ireland border, with the major focus on Dublin.

Some cattle are born and fattened on the same farm, many are transferred from one farm to another in the same locality and there are substantial movements of stock between different parts of the country. The general patterns of calf and store cattle movements are representative of the latter (*Figs 6.10* and *6.11*). The major source of calves is the dairying area of the

southwest; over one-third of the calves born in the core district of high cow densities and specialised creamery milk supply leave the area. About 10–20 per cent of the calves leave part of the northern creamery area, the inner Dublin milkshed and districts of smallholdings on poor land along the western seaboard. Movements focus on other parts of the country where dairying is absent or of low intensity and especially on the west and midlands. Store cattle are taken to include animals over 1 $^{1}/_{4}$ years old going for further feeding within the country *(Fig. 6.11)*. The focus upon which many of the movements converge is the grazing area of the midlands, with its high quality grassland, large farms and concentration on cattle production. There one-half of the cattle aged two to three years originated outside the area. Superimposed upon this pattern are subsidiary movements, many of which do not fit into the overall scheme. Although each stage of cattle production is practised almost everywhere to some extent, the general pattern of movements indicate an emphasis on breeding in the south, rearing in the west and finishing in the east midlands. Cattle movements make specialisation possible but costs are incurred in transport and marketing, in the deterioration of animals in transit and in the spread of disease.

Traditionally Irish cattle production has been a low-cost system based primarily on summer grazing. Cattle are at their heaviest and peak sales occur in autumn and early winter. As prices per unit weight tend to be lowest at that time, many farmers sell some of their cattle from June onwards before prices fall too far below their late spring peak. Young cattle are usually housed during winter, being fed on hay with some roots and occasionally cereals. Wintering practices vary greatly in relation to older stock. Most are outwintered, receiving some hay to supplement whatever pasture is available. They just maintain weight over the winter but, as they grow during this time, they lose condition, wastefully living in part off their flesh. A small proportion of land is used primarily or solely for wintering cattle. This winterage is typically on dry, thin soils over limestone and is most common in the karstic Burren area of northwest Clare. Heavier land is subject to poaching by the treading of cattle, damaging the surface and delaying grass growth in spring. Seasonal price trends, loss of condition and damage to the land have encouraged an increased number of farmers to provide shed and yard accommodation. Low-cost housing and a moderate level of feeding can effect considerable improvements. Nutrition is on a higher plane in the tillage districts, where much greater amounts of fodder crops and arable byproducts are fed and housing is much more common. Spring sales of stock in these areas help to lessen the seasonality of Irish cattle output which is a disadvantage in processing and marketing.

Farmers sell their cattle on the land, at auction marts and at fairs. The stock may be purchased by other farmers, dealers, exporters, butchers or meat factory agents but there is no centralised marketing agency. The major change in livestock marketing over the last two decades has been the replacement of the traditional fair by the mart as the principal place of sale. At the fair, which is still popular in parts of the west, animals are sold by private treaty. Most farmers favour sale by auction at a mart where they feel that there is more likely to be free competition amongst prospective buyers. There are 140 auction marts and some rationalisation is desirable in parts of the country. Fairs occurred at a much larger number of centres but were seldom held more than once per month, as compared with weekly sales at marts. Selling on the land offers the advantages of convenience and avoidance of the commission charged at marts.

SHEEP

The number of sheep units increased in the 1920s but this trend was reversed during the depression of the 1930s and World War II, with a low of 320,000 in 1948 (cf. *Fig. 6.1*). Thereafter expansion was almost uninterrupted until the attainment of a record 756,000 units in 1965. The subsequent decline occurred despite demand for mutton and lamb, though the wool market was less favourable. Sheep suffered from competition for land by cows and cattle, there was little state support, though a mountain lamb subsidy scheme had been introduced in 1966, and there was a general feeling of dissatisfaction within the industry. The trend has been reversed since 1970, stimulated by a hogget ewe subsidy initiated in 1969 and improved market conditions. The 643,600 sheep units recorded in 1972 were 10·7 per cent of total livestock units. In 1960 sheep occurred on 30 per cent of holdings, with an average of 49 animals per holding.

Output from the sheep sector in 1972 was valued at £20·1 m., 4·2 per cent of gross agricultural output. The 1·6 m. sheep and lambs were the principal product, sales of 7,482 tonnes of wool accounting for only one-tenth of the total value. In response to consumer demand, an increased proportion of output over the last two decades has been in the form of lambs and young lighter hoggets, rather than more mature and fatter stock. Much of the wool is exported and about 30 per cent of the sheep and lamb output. Some store sheep and lambs are exported for fattening in the United Kingdom but the principal trade is in carcase lamb and mutton

consigned to Britain and France. Sheep are sold at fairs, at marts, on the land and direct to factories, and wool is purchased by 270 registered buyers.

Sheep densities differ greatly and the role of sheep in the livestock economy varies spatially to a greater extent than that of any other category (*Figs 6.12* and *6.13*). They are particularly important in the farm economy of mountain and hill areas, where they have a comparative advantage over other enterprises which are more adversely affected by the environmental conditions. Sheep can negotiate rugged topography, withstand the climatic elements and exist on the poor quality grazing more satisfactorily than other livestock. They provide extensive usage of large areas of rough grazing. Densities are highest on the Leinster Chain, which provides more satisfactory grazing than the exposed western mountains. On the lowlands sheep are important adjacent to the Leinster Chain, from which some of the stock are derived, on the fertile land of east Leinster and in particular on the limestone land of southeast Connacht. There the dry conditions are favourable to sheep and the scarcity of water is not a hindrance to production, so that sheep farming has been traditional in the area. In contrast, there are few sheep around the Shannon estuary, in the drumlin belt and on ill-drained soils elsewhere, as they do not thrive so well and are subject to fluke disease and lameness caused by footrot. If these problems could be solved, sheep would offer an advantage over cattle in that because of their lighter weight they would cause less physical damage to heavy land and so could be permitted a longer grazing season. The percentages of holdings with sheep in 1960 ranged from 5 in Limerick to 62 in Galway.

Gross margins per hectare in sheep production are much less than in dairying but tend to be higher than in most forms of cattle production. Some farmers are deterred by the fact that they require greater attention than cattle, especially at lambing time. Capital needs are very low, with minimal housing, equipment and feedingstuffs, and risks are spread over a large number of animals. Worrying by dogs can be a hazard near to towns and fencing is inadequate on some farms. Sheep tend to be associated with large farms to a greater extent than any other livestock except cattle over two years old. Specialised sheep farms are rare on the lowlands but sheep can add to profitability through rotational grazing with other livestock, acting as scavengers, improving the land and more fully utilising the vegetation. Farmers' decisions are often strongly influenced by personal attitudes towards sheep.

Sheep production systems vary but there is a basic stratification between upland and lowland. Wicklow Cheviot sheep predominate on the Lein-

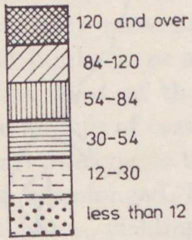


Fig. 6.12. Sheep

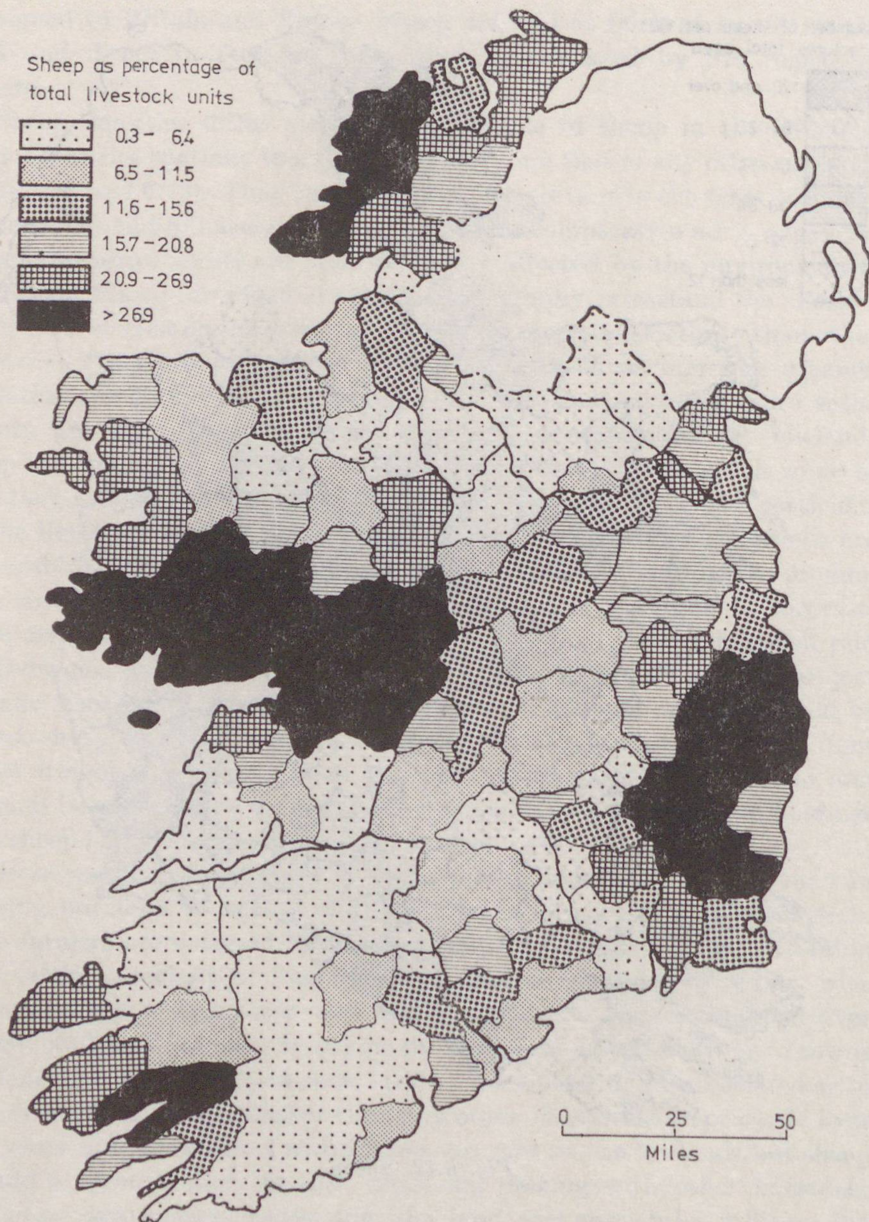


Fig. 6.13. Role of sheep in livestock production

ster Chain; on mountains and hills elsewhere flocks are mainly of the even hardier Blackface Mountain breed. Because of the physical difficulties, mortality rates are high, ewes are undernourished, lambing rates are low and lambs grow slowly. The weaned lamb crop averages about 70 per 100 ewes. Most of the ewe lambs are required as replacements, so that sales are mainly of cast ewes and male stock. After about four breeding seasons, draft ewes move to the foothills and adjacent lowlands where their breeding life is prolonged. They are mated with lowland breeds, especially the Border Leicester, yielding Half-breed and Greyface stock. Wether lambs are sold to lowland areas from August to October for further feeding. A much smaller proportion than formerly is retained as older wethers, principally because of the changed demand of meat consumers and lower prices for wool. During winter, stock are often moved to the lower parts of farms. In the Wicklow Mountains there has been a traditional transfer of ewe lambs and some breeding ewes to winter pasture, especially in east Kildare and Carlow, but this is an expensive practice and has declined. The low winter carrying capacity, because of small areas of improved land and scarcity of fodder, is the major factor limiting flock size on many upland sheep farms. Alleviating remedies would include enlarged areas of improved land through acquisition or reclamation, production of more and better fodder and provision of simple housing. The incentive to improve mountain grazing through fertilising, liming and fencing is lacking in many places because of common ownership and the fact that the hills are undergrazed in summer.

Breed structure and production systems are much more varied on the lowlands. Breeding stock include draft Blackface Mountain and Wicklow Cheviot ewes, together with Galway, Border Leicester, Suffolk, Oxford Down and their many derivatives. The Galway is a native lowland breed, concentrated in County Galway and adjacent parts of Roscommon, Mayo and Clare, but quite widespread in North Tipperary, Offaly, Westmeath and Meath because of the general eastward movement of breeding and store stock to better land and larger farms. On the lowlands lambing occurs earlier in spring than in the uplands, the lambing percentage may be twice as high, there are fewer losses and fattening is possible. Fattening is most important on good quality land, with breeding flocks and store production being proportionately more common in poorer areas. The most profitable system is early fat lamb production to avail of the high prices prevailing in April and May. Lambs are born in January and February, with both ewes and lambs being hand-fed. Such costs are kept to a minimum in the production of mid-season fat lamb, with lambing in March and April, growth occurring with grass, and sales being from June to September.

Expansion in fat lamb production has contributed to Leinster's share of the national sheep flock increasing from 33 to 38 per cent between 1960 and 1972. In the tillage districts many farmers purchase store lambs in autumn which are fed over the winter and sold as fat hoggets in spring. Folding or grazing of the turnip crop in situ is common on dry land in the south midlands and southeast. Concentration of lamb and sheep slaughtering in the second half of the year is now much less marked than formerly.

Extensive, low cost production of sheep in small flocks is characteristic of Ireland. Some farmers are introducing grazing control, production of quality fodder, provision of simple housing and greater intensification. However, there has been a reluctance to adopt new management techniques and improvements in sheep farming have been less general than in other farm enterprises.

HORSES

There has been a great decline in the number of horses, associated with the mechanisation of transport and farm work and with the decrease in tillage. When there was substantial arable farming in 1945 and a scarcity of oil products, there were 464,500 horses and they accounted for 14 per cent of total livestock units. Subsequent decline has been uninterrupted, to 112,100 animals and 2·4 per cent of the livestock units in 1972, releasing a substantial amount of land for other purposes. Horse numbers comprised 68,200 working horses, 19,500 thoroughbred horses and 24,400 other horses and ponies. Although the decline in working horses has continued, there have been recent substantial increases in the other categories. These are associated with rising incomes at home and abroad, growth in competitive horse sports and other recreational riding and expansion of the tourist industry. Horses were kept on 50 per cent of holdings in 1960.

In 1972 3,651 bloodstock and 12,915 other horses were exported, valued at £9·7 m. and consigned principally to the United Kingdom. Imports, valued at £5·2 m., were largely of bloodstock. Horseflesh worth £1 m. was exported, almost all to France and Belgium. Irish horses have a long-established international reputation for conformation, speed, stamina, versatility and temperament. These qualities seem to be related in part to the conditions of soil, climate and grass, with mainly outdoor rearing on limestone pastures which contribute to bone formation and body building. Other factors are the genetic characteristics of the horses, the measures taken to improve quality and the traditional skills of those associated with the industry.

As working horses comprised 69 per cent of the animals and 77 per cent of the horse livestock units in 1970, the total distribution patterns are mainly a function of their location (*Figs 6.14* and *6.15*). However, some horses included in the working category are also used for other purposes, mares being kept for breeding and animals being used for recreational purposes, as in association with tourism in the Killarney district. Working horses are kept in particular on the smaller farms, densities diminishing with increasing size of holding. They occur mainly in the western half of the country. They are used in grass conservation and tillage operations, the carriage of milk to creameries and general farm transport. Working horses are rare on tiny holdings along parts of the western seaboard where manual operation is still common because of rugged terrain, the small amount of work per farm and scarcity of land and capital.

Thoroughbred horses are mainly on stud farms though some are kept on ordinary farms. Studs are usually quite specialised, with horse breeding and rearing dominant and cattle kept as scavangers in the system of pasture management because of the selective grazing of horses. Stud farms are most common in the Dublin region, 44 per cent of thoroughbreds being in Counties Kildare, Meath and Dublin, with a further 26 per cent in Tipperary, Cork and Limerick. Location factors seem to be land and pasture type, farm size, access to Dublin and traditional, military and social influences. The major centre of the bloodstock industry is in the vicinity of the Curragh in central Kildare, where there is a large expanse of common, open, dry land suitable for exercising horses, associations with the army and a long equestrian tradition and reputation.

Other horses are kept for hunting, show jumping, pony trekking, horse-drawn caravans and general pleasure riding, either by the owner and his family or for hire. There is a substantial number in the vicinity of Dublin city, used by the urban population, those with riding interests in surrounding rural areas and tourists. One-fifth of other horses are in Dublin and contiguous counties and three-fifths in Munster, Wexford, Kilkenny and Galway. The best show jumpers and hunters are produced by crossing mares of the Irish Draught type with thoroughbred stallions. The famous Connemara pony breed has developed in the rugged environment of west Galway. It is a compact, hardy, agile and docile animal, with considerable versatility. Breeding of non-thoroughbred horses is mainly on farms where one, two or more mares are kept, often on rough land. They can afford a useful supplementary income but a traditional liking of horses and interest in them, together with prestige influences, are important factors in the horse industry.

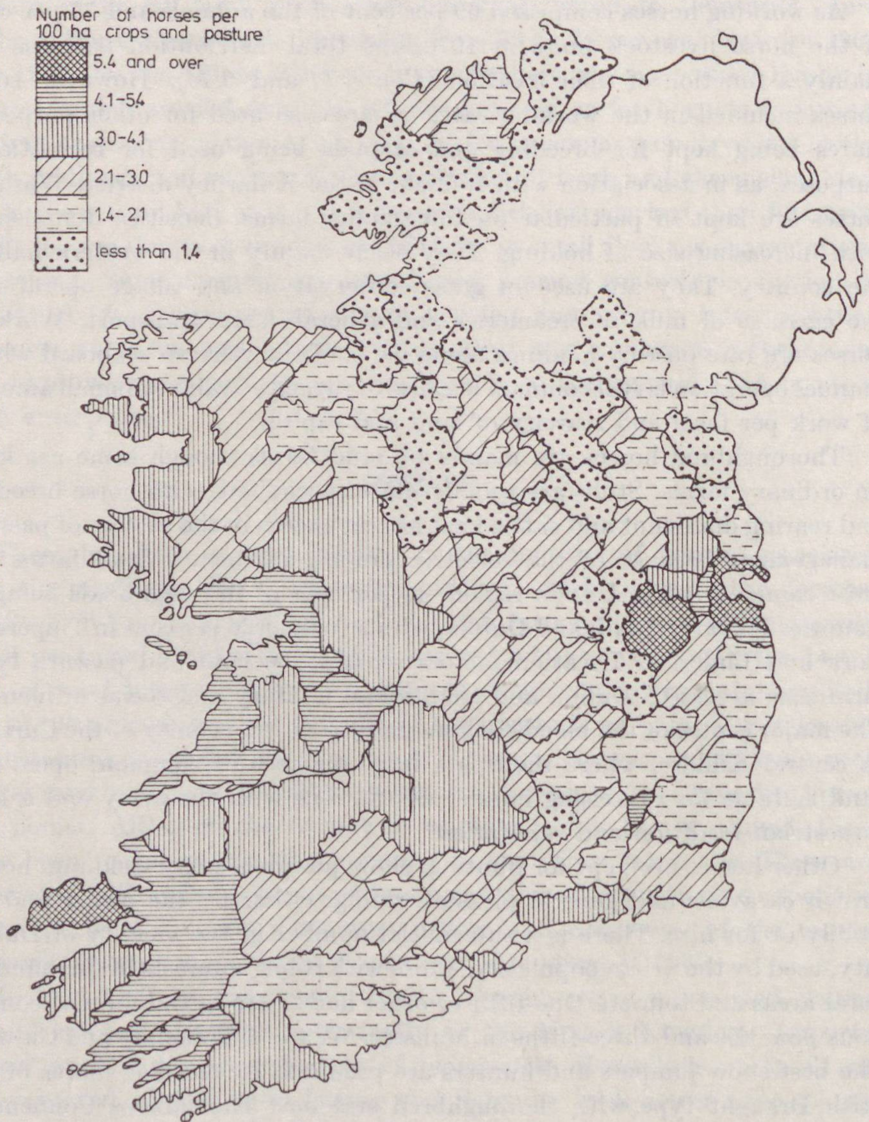


Fig. 6.14. Horses

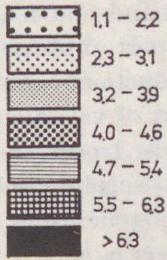


Fig. 6.15. Role of horses in livestock production

PIGS

Pig numbers fluctuate in response to changes in demand and market prices, availability and costs of feedstuffs, government support, profitability of other enterprises and farmers' attitudes towards pig production. Numbers can be expanded and contracted quite rapidly, the extent of variations in prices and numbers from year to year having characterised past trends. High prices encourage expansion in numbers, resulting in surplus production and depressed prices, followed by curtailment of pig numbers and subsequent scarcity. This pig cycle tended to repeat over about a four years period but has been less pronounced in recent times. Fluctuations are effected in part by changes in pig numbers on farms which continue production and in part through the action of some small producers who have no great commitment to the industry but enter and cease production with the varying conditions of the trade. Apart from short-term fluctuations, the most distinctive features of the trend in pig numbers have been the major curtailment of production during World War II, with a low of 381,000 pigs in 1944, the sustained expansion during the early 1960s to a peak of 1,266,000 animals in 1965 and, after an intervening decline, the record number of 1,322,000 pigs in 1971 (cf. *Fig. 6.1*). Recent difficulties have resulted mainly from unfavourable pig price to feedstuff price ratios.

The 217,636 pig units in 1972 comprised 3·6 per cent of all livestock units and the proportion has generally been 2–4 per cent. Because of the more rapid turnover and shorter production cycle than in grazing livestock, pigs are proportionately more important in terms of gross output and farm income. The record output of 2,246,000 pigs in 1972 was valued at £48 m., 10 per cent of total agricultural output and the third most important livestock enterprise after cattle production and dairying. Almost half of production was exported, amounting to 57,500 tonnes and 7·5 per cent of the value of agricultural exports. Shipment was mainly to Britain, with some pork consigned to Portugal and Italy. There are 35 slaughtering and curing premises, with excess capacity and wasteful raw material supply patterns. Traditionally production was dominated by Wiltshire sides of bacon but efforts at product diversification are being made and the output of pork and processed pigmeat has expanded substantially.

Profitable pig production necessitates substantial throughput because of small margins per animal. Substantial organisational changes are occurring in the industry. Traditionally pig production was dominated by small producers for whom it was a minor enterprise in a mixed farming system. In 1960 pigs were kept on 38 per cent of holdings, 75 per cent of them having

less than 10 animals and the average being 8·1 pigs per holding. Of those keeping sows and gilts, 45 per cent had only one animal and a further 30 per cent had two. The subsequent trend has been towards fewer producers and larger herds. There has been a considerable reduction in the number of farmers who had one or two sows and those who kept pigs only during the summer months, with an increasing share of output from holdings on which pigs are a primary or secondary source of income.

Other requirements for profitable pig production include suitable housing, good conversion rates of feed to pigmeat, productive breeding stock and skilled management. Most pigs are kept wholly indoors, though some sows may be let out between weaning and farrowing. A high proportion of the houses are of poor or moderate quality, being suitable only for summer use. An increasing proportion of producers are providing specialised housing but this involves considerable investment. Traditionally pigs were almost scavengers, being fed largely on byproducts and unsaleable material from other farm enterprises and on household waste, skim milk and potatoes being important items of diet. Many farmers still produce their own feed, mainly skim milk and barley, but purchased feedstuffs dominate. Feed amounts to almost 80 per cent of costs in commercial pig production. Changes in housing and feeding practices have lessened the seasonality of production, which was characterised by peak slaughterings in August to October. Considerable improvements have been made in the pig stocks but there is much scope for further advancement. The breed structure of the national herd of sows and gilts is: Large White 39 per cent, Landrace 36 per cent and cross breeds 25 per cent. Labour requirements are substantial, so that pig production offers the smallholder the opportunity to utilise available labour to increase substantially his output and income, with limited demands on his land resources. Pig densities are greatest on holdings of under 2 hectares but are high on those of up to 40 hectares, diminishing on larger farms.

Three general systems of pig production may be distinguished: breeding, fattening and combined breeding and fattening. Although retention of pigs on the farm tends to offer greater stability of income, most farmers prefer to concentrate their efforts on either breeding or fattening. Breeders rear bonhams until they are 10–12 weeks old, when they are sold to fatteners. Most of this transfer occurs between farms in the same locality but there is a tendency towards proportionately greater emphasis on fattening in the south, principally Limerick, north and east Cork, Waterford and south Tipperary, and in the vicinity of Dublin. Fattening has become more highly concentrated with the establishment of 15 large co-operative pig fattening

units and intensive private concerns during the last fifteen years. The co-operative stations provide assured outlets at guaranteed prices for the bonhams of breeder members. Transfer of pigs between the different producers and to the factories was traditionally effected through fairs and by dealers. The introduction of auction marts, increased contract arrangements and selling groups, and purchase by the factories on a graded basis rather than by liveweight have added greater stability to marketing and an incentive to improve quality.

Although the distributions of cows and pigs are not identical, there is some areal association between creamery milk supply and pig production (*Figs 6.16* and *6.17*). The relationship developed because of the use of skim milk in pig production and, although this is now of much lesser importance, a tradition of pig keeping developed. Dairying and pig production can be combined conveniently on the same farm. The highest pig densities are in west Cork, Cavan and Monaghan, creamery supply areas of small farms. Growth since 1960 has been higher in Ulster than elsewhere, perhaps related to a major development of pig production which has occurred in adjacent Northern Ireland. Pigs are of some significance in the southeast, where barley is available locally for feeding. Pigs are kept in and adjacent to Dublin city, many of them in backyards and gardens and fed in part on swill. Access to the city market is an additional factor but factory locations seem to have little bearing on the spatial distribution of pigs in Ireland.

Few pigs are kept over much of the midlands, where most of the large farmers are not interested in the enterprise. Although pigs are not exposed to the rigours of weather, there are few in upland areas. There is little production in the west, especially in the areas where farm size is smallest, though pigs could provide much needed income on the small holdings. Handicaps include the shortage of capital for housing, the high costs of feedstuffs which must be brought from the east of the country though some measures to equalise transport charges exist, and the age structure of the population. Where there is no tradition of pig production, there is a lack of familiarity and technical knowledge relating to pigs and even a dislike of them and the trouble which they entail. In parts of Ireland there is an assumed social stigma which associates the keeping of pigs with poverty.

POULTRY

After a peak in 1929, the number of poultry livestock units was depressed during the 1930s and World War II. There was some degree of recovery in the late 1940s, when feedstuffs were more readily available and there was

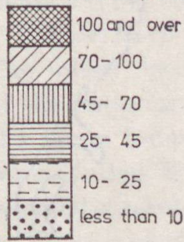


Fig. 6.16. Pigs

market demand for poultry products in Britain. The trend was then reversed, with almost continuous decline from the 268,000 units in 1950 to 131,000 units in 1969. The proportion of total poultry units accounted for by poultry has been reduced to 2·4 per cent. In 1972 there were 11,733,800 poultry

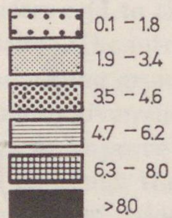


Fig. 6.17. Role of pigs in livestock production

in the state, comprised of ordinary fowl 92·9 per cent, turkeys 4·3 per cent, ducks 1·7 per cent and geese 1·1 per cent.

There have been major changes in the poultry industry since 1950. The initial decline in poultry numbers can be attributed largely to loss of the important export trade to Britain, where there was subsidisation of the home industry, depressed prices and eventual sufficiency of supply from United Kingdom producers. Even after the Irish industry became oriented almost exclusively towards the domestic market, to which there were no imports, poultry numbers continued to decline. This has been largely a result of increasing productivity, so that an expanding annual output is achieved in relation to the number of birds kept at any one time. In the period 1960–72, the number of poultry units decreased by 16 per cent and egg output by 20 per cent but the quantity of poultry meat produced increased by 203 per cent. With diminishing egg consumption and greatly expanded demand for poultry meat, the emphasis in production has changed. Meat accounted for 29 per cent of the value of output in 1960 and 50 per cent in 1972. The combined output of 25·7 m. birds and 673 m. eggs in 1972 was valued at £20 m., 4·2 per cent of total agricultural output. Exports of poultry were valued at £1·3 m.

Increased efficiency in fowl production has been mainly the result of a trend towards large scale production units under land and capital intensive management systems in buildings with controlled environments, together with the breeding of better birds and improved feeding. Amongst laying fowl flocks, there was a widespread change from free range to deep litter systems and then to battery cages. In 1972 there were 226 flocks of over 500 birds, with a total capacity of 1·9 m. hens. One producer in east Wicklow supplies one-third of the eggs consumed in Dublin. Commercial layers are principally Rhode Island Red and White, White Leghorn, Light Sussex, Barred Plymouth Rock and their hybrids. Chickens are reared largely as broilers, output of which increased from less than 1·5 m. in 1960 to 21 m. in 1972. There were 284 year-round producers, of whom 251 had plant capacities of 2,000 birds or more. The four largest units produced two-thirds of the total. Almost all the broilers are of the Cobb and Pilch breeds. The egg and broiler producers purchase chicks from 84 hatcheries, which in turn get the eggs from 438 supply farms. Fowl production has become much more highly industrialised than any other livestock enterprise, with specialised concerns accounting for the bulk of output. There is much contract production and integration within the industry.

Fowl were traditionally kept in free range farmyard flocks, usually attended by the women of the household. In 1960 they occurred on 78 per

cent of holdings, with an average flock size of 46 birds. The density of poultry diminishes rapidly with increasing size of holding, association with small farms being greater than in any other category of livestock. Because of the much greater and increasing efficiency of large scale intensive units, the prices of poultry products remained constant or declined, and created considerable economic pressures for the owners of free range flocks and especially the small commercial producer. There was a great decline in fowl numbers on such farms, though some still produce eggs for local sale. A few fowl are kept on many holdings, acting almost as scavengers and supplying part of the household requirements.

Changes in the organisational structure of fowl production have resulted in major locational shifts within the industry. Traditionally fowl were part of mixed farming systems in the small farm areas of the north, west and southwest. In 1952 Donegal, Cavan, Longford, Connacht, Clare, Kerry and Cork had 63 per cent of the national fowl flock, by 1972 this area's share was 32 per cent. Monaghan is the only area of traditional production in which growth has occurred. Broiler production there was initiated by the employees of a feedstuffs compounding firm and there has subsequently been a high degree of concentration of the modern industry within the county, which had 20 per cent of the national flock in 1972. These large production units have been established mainly in the more prosperous east of the country and parts of the south, where there is more capital and enterprise, closer access to markets and lower costs of feedstuffs. Some are owned by people who were not formerly associated with agriculture, while the decline of farmyard flocks has meant the loss of a significant source of income on small western farms. With increased concentration of poultry onto fewer specialised holdings, the spatial distribution pattern becomes more patchy and is less satisfactorily represented by choropleth maps (*Figs 6.18* and *6.19*).

The trend towards large production units has affected turkeys but to a lesser extent than fowl. Many farmers still rear birds for the major Christmas market but the large producers are endeavouring to promote demand throughout the year. Broad-breasted white turkeys have replaced the American bronze variety. The major producing counties are Cork, Limerick, Monaghan, Kildare and Galway.

Commercial demand for ducks and geese is small, so that the traditional pattern of production prevails. The single exception is a large-scale producer of ducks in north Monaghan, accounting for the fact that the county had 36 per cent of the national duck flock in 1972 but only 2 per cent in 1960. Farmyard flock numbers are largest in Galway, Donegal and Mayo. Geese

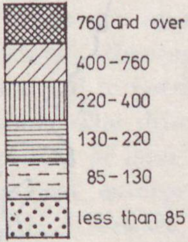
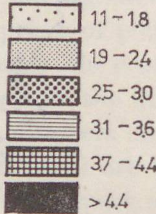


Fig. 6.18. Poultry

have been traditionally popular in Galway and Clare, where 37 per cent of the national flock is concentrated, with substantial numbers in adjacent parts of Mayo, Roscommon, Offaly, Laois, north Tipperary and Limerick.

Poultry as percentage of total livestock units



0 25 50
Miles

Fig. 6.19. Role of poultry in livestock production

LIVESTOCK COMBINATIONS

There are important relationships between the various categories of livestock, affecting the proportions of different animals kept on individual farms and in particular localities and influencing their broad spatial distributions. The different categories compete with one another for available resources of land, labour and capital, with the demands on land by the farmyard enterprises of pigs and poultry being much less than those of grazing livestock. Where there is a very strong emphasis on one enterprise, the others have minor roles and an expansion of one may result in contraction of others. There are also complementary relationships between livestock enterprises. These may derive from the benefits of mixed or rotational grazing of animals, as with sheep and cattle on hill land and horses and cattle on stud farms, with their differing grazing habits giving more uniform and fuller usage of the herbage than if only one type is kept. The dairy and beef enterprises are very closely related, with dairy herds being a major source of calves for the cattle industry and interpenetration between the two enterprises occurring on many farms. Dairying provides part of the feed requirements of pig production and the two enterprises are often combined on the same farm, resulting in their areal association. Because of the interfarm movements of cattle, sheep and pigs, there is interdependence between farms locally and regionally.

Only a small proportion of farms specialise in one type of animal to the exclusion of all others and each category of stock occurs in every part of the country. Livestock combinations for rural districts were derived by the least squares method based on the 1965 livestock unit data *(Appendix B)*. There are 86 two-animal combinations, 71 three-animal combinations and 1 four-animal combination. The relative importance of the different livestock is indicated by their ranked placings in the 158 rural districts *(Table 6.2)*. The dominance of dry cattle and cows is obvious, both occurring in the livestock combination of every rural district, with dry cattle being ranked first in 73 per cent of all districts. Horses and poultry are never sufficiently important to be included in the livestock combination.

Two-animal combinations prevail in the interior of the state along a north-south alignment, with three-animal combinations on the margins and especially to the east and west *(Fig. 6.20)*. Cattle are the leading category of livestock throughout most of the state, being surpassed by cows in Munster and in a much smaller area in the north and by sheep only in west Donegal, parts of central Connacht and three districts along the Leinster Mountains. Sheep are added to the dry cattle and cows combinations in

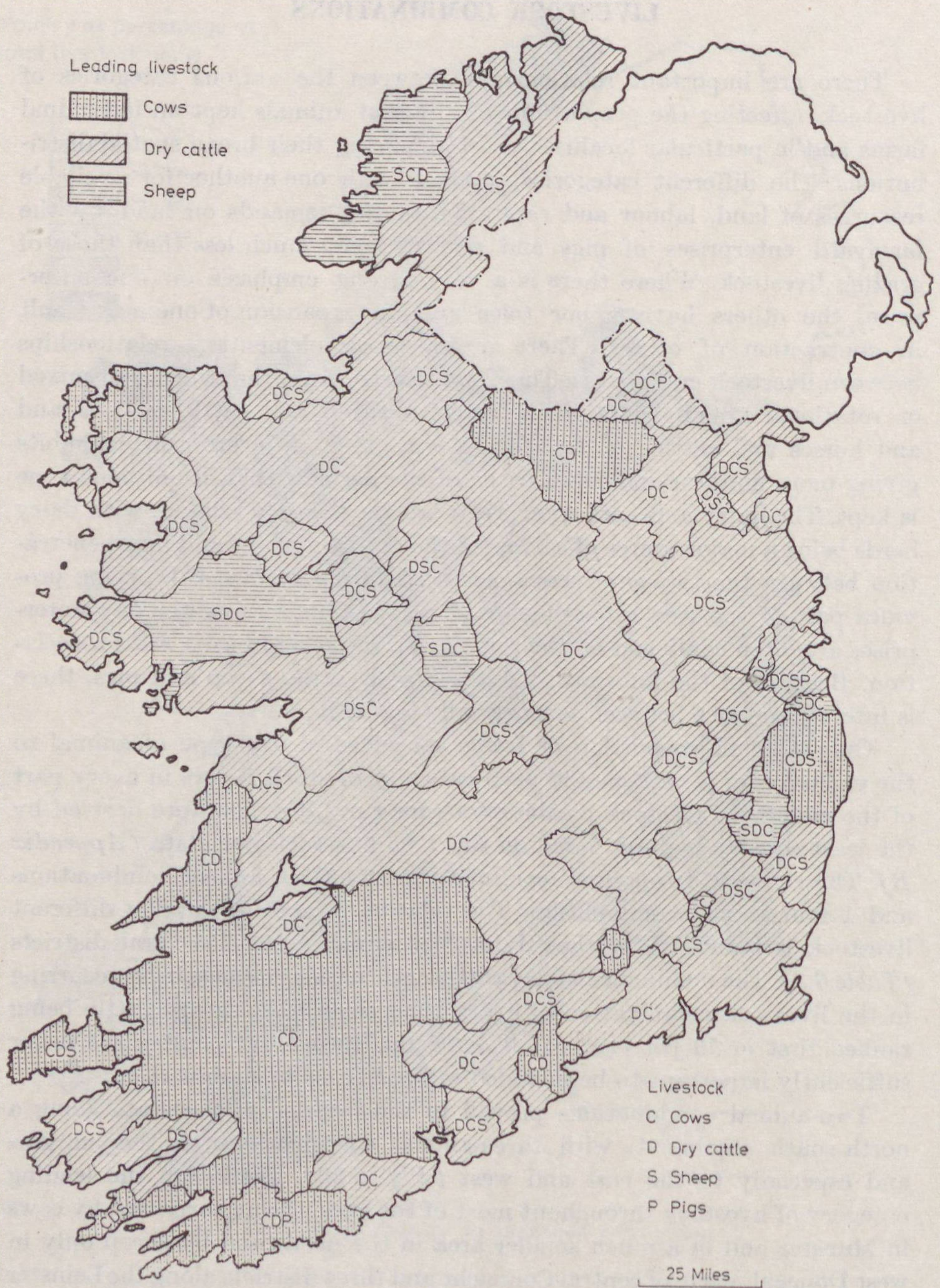


Fig. 6.20. **Livestock combinations**

Table 6.2.

Placings of livestock in the livestock combinations

Livestock	Ranking				Total placings
	First	Second	Third	Fourth	
Dry cattle	115	40	3	—	158
Cows	34	104	20	—	158
Sheep	9	14	44	—	67
Pigs	—	—	5	1	6
Total	158	158	72	1	389

east Leinster, south Connacht and mountainous areas. Where cows are the leading category, sheep in association are infrequent, resulting in part from the contrasting physical requirements of the two animals and in part from farmers' belief that where sheep are kept with cows milk yields suffer because of the close grazing habits of sheep. Where sheep are the leading livestock, there is always a three-animal combination.

The varying emphases on dry cattle and cows are an important aspect of the spatial pattern of livestock combinations. These two categories accounted for 74 per cent of all livestock units in 1960 and 81 per cent in 1972; the trend has been towards even greater dominance of these sectors. With increasing specialisation in livestock production, fewer categories of animal are being kept, so that livestock combinations have become simpler at the levels of both individual farm and also rural district.

7. REGIONAL FARMING PATTERN

Individual agricultural characteristics and enterprises have been considered separately in preceding chapters. Their spatial patterns were usually described, often with the assistance of choropleth maps, and attempts to explain these distributions were made. As an alternative to choropleth mapping, trend surface analysis might be employed, having been suggested by Tarrant (1969) as a quantitative technique which emphasises continuity of spatial change in agricultural characteristics, with the objective of separating large-scale gradients from smaller, local gradients. Tarrant used trend surface analysis to show the distributions of crops and pasture, cereal crops, dairy cattle and agricultural labourers in the Republic of Ireland. Both approaches have much in common and have been concerned with individual aspects of agriculture, giving no direct indication of the totality of farming in any area. The concern in this chapter is with integration of component parts of agriculture, in particular with type-of-farming patterns.

Agricultural geographers and agricultural economists in many countries have given much attention to the classification and regionalisation of types of agriculture but there is much divergence of opinion about the utility of such work and the methodology which should be employed in the complex task. The main objective for many researchers is to provide a framework to assist description and analysis of the pattern of farming but there is often an additional hope that the work will be of value in relation to agricultural planning and development. Individual enterprises do not exist in isolation, so that there is merit in considering overall types of agricultural production. Yet generalisations about causal influences can be made more readily when considering individual enterprises than in the context of complex multiple-feature farming systems. Inadequacy of available data and techniques greatly hinder the definition and delimitation of agricultural types. A major attempt to overcome some of the difficulties is being made through the work of the International Geographical Union Commission on Agricultural Typology, established in 1964 to review the principles, criteria and methodology of agricultural typology, in an effort to develop a scheme for world

agriculture which would also serve as a framework for studies at national, regional and local levels.

Development of an agricultural typology for Ireland is hindered by the nature of Irish farming, the inadequacy of available data and the dearth of studies which have been made on a regional or local basis. Farming in most parts of the country comprises mixed livestock production with some tillage, most enterprises being represented to some extent in each area. Regionalisation attempts involve recognition and delimitation of the generally gradual spatial variations in the emphases placed on the component parts of this agricultural type, a more difficult task than if distinct regions with clearly defined and contrasting farm systems occurred. The extent and complexity of local variations further complicate delimitation of broad regional patterns.

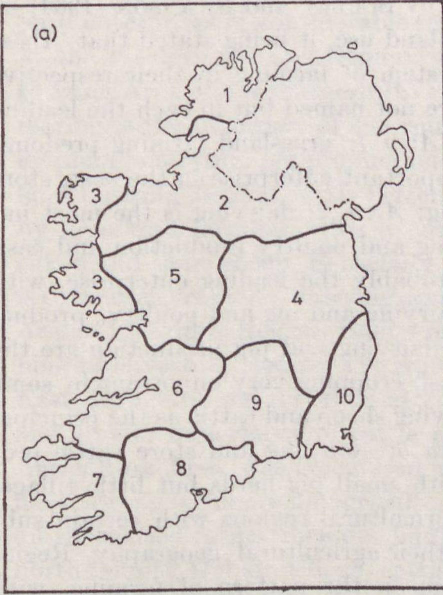
Investigation in this chapter is limited to a review of regionalisation attempts which have been made and a portrayal of areal patterns in the structure of agricultural output. Treatment is largely descriptive, as efforts to explain the spatial distributions of component features of Irish agriculture have been made in preceding chapters.

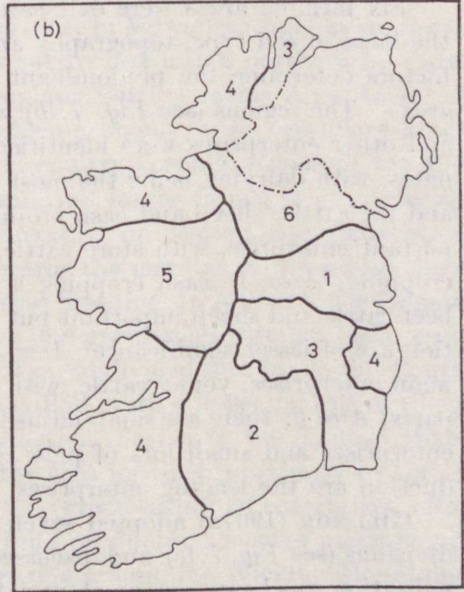
RECOGNITION OF AGRICULTURAL REGIONS

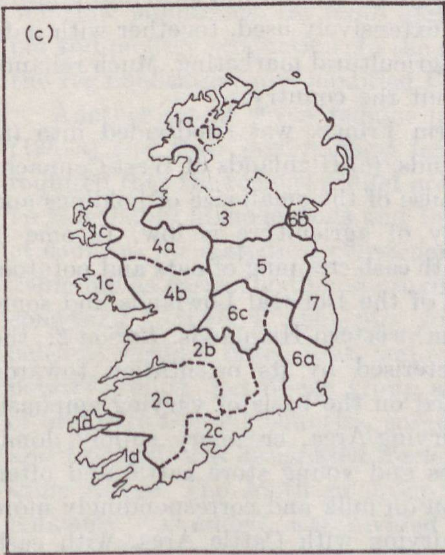
Although regional differences in Irish farming have long been recognised, the first delimitation of agricultural regions was by Stamp (1931, 54–60). His set of regions was based on the physical structure of the country because of the conviction that the physical divisions correspond closely with agricultural regions, each having a distinctive pattern of farming. The Central Plain, with cattle and some sheep, horses, dairying and arable farming, was subdivided into a Central Triangle, a Western Fringe and a Southern Area. To the east, he distinguished the Cattle-Sheep Region of the North-East, the Wicklow Mountains Sheep Region and the Wexford Uplands Arable Region. The other divisions were the South-Western Dairying Region and the Mountains of the North-West. That physiographic character rather than farming type was the main criterion is indicated by the fact that, although Stamp recognised the existence of a southern dairying belt, he divided it between two separate regions, the Southern Area of the Central Plain and the South-Western Dairying Region which was confined within the physical limits of the Parallel Ranges and Valleys of the South-West.

One of FREEMAN's major contributions to the study of Irish agricultural geography was a regionalisation of the country (Freeman, 1945). He delimited ten named regions (see *Fig 7.1a*) and outlined the characteristics of each. *Region 1.* The Highlands and Lowlands of Donegal: mixed farming prevails in the east, with subsistence farming in the west; *Region 2.* The Drumlin and Drift Belt: mixed farming, with young store cattle and dairying; *Region 3.* West Mayo and West Galway: subsistence farming widespread; *Region 4.* Central Lowland — east section: grazing and fattening, with dairying near Dublin and a mixed farming area in the south; *Region 5.* Central Lowland — west section: grazing and fattening of cattle in the east, sheep rearing in the west and dairying throughout the region with farms smaller and more mixed than in the preceding region; *Region 6.* Clare, Limerick and North Kerry: primarily dairying on medium-sized farms, with some subsistence farming towards the west; *Region 7.* Kerry and West Cork: mixed farming, with sheep, store cattle and dairying; *Region 8.* The Valleys and Uplands of Cork: store cattle, dairying, sheep farming and tillage; *Region 9.* The Suir, Nore and Barrow Basins: mixed farming, with arable crops, store cattle, dairy cows, pigs, poultry and sheep; *Region 10.* The Southeastern Uplands and Lowlands: mixed farming predominant, with dairying near Dublin, cattle, sheep and arable crops. The regional names suggest the role of physical divisions and administrative boundaries in delimitation, added to which were variations in farm size and rural population density. Freeman's field knowledge of Irish farming patterns was probably a major factor in regionalisation.

For the purposes of the National Farm Survey 1955–56—1957–58, which was undertaken with the objective of obtaining financial and other data from a representative sample of 1,174 farms, the state was divided into three regions with differing types of farming. The East and Midland Region was taken as Leinster, except County Kilkenny, together with Roscommon and Galway east of the River Corrib (Central Statistics Office, 1961). Mixed cattle farms comprised 39 per cent of the sample in this region, with 33 per cent mixed crop farms and the majority of the remainder mixed dairy farms, principally with subsidiary cash crops. The South Region corresponded with Munster and County Kilkenny. Dairy farms accounted for 85 per cent of the sample, principally mixed dairying with and without cash crops but with one-seventh being classified as mainly dairying. The North and West Region comprised the remainder of the state. There 31 per cent of the sample were regarded as subsistence farms and 27 per cent were mixed cattle, the majority of the others being mixed dairying without cash crops.







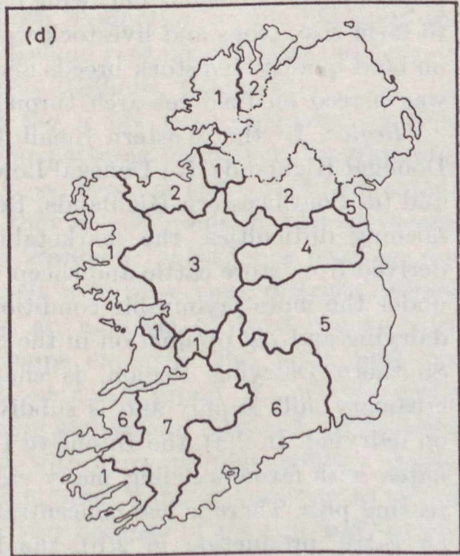


Fig. 7.1. Agricultural regionalisation schemes
(a) T. W. Freeman, (b) J. J. Scully and E. R. Swanson, (c) D. A. Gillmor, (d) M. Ross

Six farming areas were delineated by SCULLY and SWANSON (1964) on the basis of soil type, topography and land use, it being stated that "these factors determine the predominant system of farming in their respective areas". The regions (see *Fig. 7.1b*) were not named but in each the leading and other enterprises were identified. *Area 1*: grassland farming predominates, with dairying being the most important enterprise in the east, store and fat cattle, sheep and cash cropping; *Area 2*: dairying is the most important enterprise, with store cattle, pig and poultry production and cash cropping; *Area 3*: cash cropping is probably the leading enterprise, with beef cattle and sheep important but dairying and pig and poultry production are of lesser significance; *Area 4*: dairying and pig production are the main enterprises, young cattle, with cash cropping very important in some parts; *Area 5*: there are small farms having sheep and cattle as the principal enterprises and small lots of pigs; *Area 6*: dairying and store cattle production are the leading enterprises, with small pig herds but little tillage.

GILLMOR (1967a) adopted seven agricultural regions with certain subdivisions (see *Fig. 7.1c*) and discussed their agricultural geography. Regionalisation was based on areal variations in the pattern of farming, with physiographic divisions not being employed. Agricultural statistics relating to farm size, crops and livestock were extensively used, together with data on land quality, livestock breeds and agricultural marketing. Much reliance was placed on field research throughout the country.

Region 1: the Western Small Farm Fringe, was subdivided into (a) Donegal Highlands, (b) Donegal Lowlands, (c) Highlands of West Connacht and (d) Southwestern Highlands. Because of the small size of holdings and farming difficulties, the marketability of agriculture is low. Income is derived from store cattle and sheep, with cash cropping of oats and potatoes under the more favourable conditions of the Donegal Lowlands and some dairying and pig production in the Southwestern Highlands. *Region 2*: the Southern Dairying Region, is characterised by its orientation towards creamery milk supply and is subdivided on the basis of varying emphasis on dairying. In 2(a), the Intensive Dairying Area, creamery supply dominates, with farmers selling many calves and young store cattle and often rearing pigs. There is less concentration on milk and correspondingly more on cattle production in 2(b), the Dairying with Cattle Area, with cash cropping increasing eastwards. Farming is even more mixed in 2(c), the Dairying with Tillage and Cattle Area, though there are localities with a greater emphasis on dairying. In *Region 3*, the Northern Dairying Belt, farms are smaller than the predominantly medium-sized holdings of the south and dairying is combined with the rearing of store cattle, with farm-

yard enterprises of considerable importance in Monaghan and Cavan. *Region 4*: the Western Grazing Region, was subdivided into a northern (a) Cattle Grazing Area and a southern (b) Sheep and Cattle Grazing Area. Livestock rearing is the mainstay of the small-farm economy, with subsidiary arable cropping, dairying, pig production and poultry keeping. *Region 5*: the Midland Grazing Region, with better land and larger farms, is characterised by grassland farming, with a concentration on rearing and fattening of cattle and some sheep. Especially towards the margins of the region, there is some cash cropping, dairying and horse breeding. In *Region 6*, the Leinster Arable-Livestock Region, tillage plays important roles through cash cropping and livestock feeding. The region was subdivided into (a) Arable South-East, (b) Louth and (c) Midland Tillage Belt, with a lessening role of tillage and greater importance of cattle production. *Region 7*: the Eastern Mixed Agriculture Area, was recognised as the area in which proximity to Dublin has a strong influence on agriculture. The great variety of enterprises, often on specialised farms, includes liquid milk production, market gardening in north County Dublin, tillage, cattle rearing around the Wicklow Mountains, cattle rearing and fattening on the lowlands, hill sheep farming on the Wicklow Mountains, fat lamb and sheep production on the lowlands and pig and poultry production. In the all-Ireland context of a later publication, the regionalisation was modified slightly (Gillmor, 1971a, 101).

Another set of seven regions (see *Fig. 7.1d*) was recognised by Ross (1969a) and their predominant farming patterns identified. Programming required that the regions should not exceed seven or eight, that they should be reasonably homogeneous and that they should preferably be aggregates of counties for statistical convenience. *Region 1*: subsistence farming, was delimited as corresponding approximately with those rural districts deemed congested (Attwood, 1961–62). From an analysis of 1960 county agricultural income data, four major groups emerged, two milk, pigs and poultry groups, one tillage group and one cattle group. A northern group of intensive farming counties, comprising Monaghan, Cavan, Leitrim, Sligo and Donegal, was designated *Region 2*, with dairying, pigs, poultry, cattle, some tillage. The southern group, being the Munster counties to which Kilkenny was added, was divided in two because of its size and heterogeneity. Rural districts with below average levels of tillage were allocated to *Region 7*, dairying without cash crops. The other districts formed *Region 6*, dairying and cash crops. Eight tillage counties of Leinster became *Region 5*, crops mixed. The cattle group was divided in two on the basis of output level, soil type and farming pattern. North Longford and those parts to the west of the Shannon were designated *Region 3*, cattle and sheep

mixed. South Longford, Westmeath and Meath formed *Region 4*, older cattle and livestock on larger farms than Region 3. Ross indicated that his regionalisation could be regarded as a refinement of the three regions of the National Farm Survey and that it vindicated the survey classification.

Precisely the same three regions as those of the earlier National Farm Survey were adopted for the Farm Management Survey 1966–69, so that the results of both might be amenable to comparison (Heavey and Hickey, 1973, 184). Farming systems were distinguished on the basis of enterprise contributions to farm output and the regional distribution of sample farms by system of farming is shown in *Table 7.1.* Creamery milk supply systems

Table 7.1.

Distribution of Farm Management Survey farms by region and by system of farming

System of farming	East and Midland Region	South Region	North and West Region	All regions
Mainly creamery milk	24	148	44	216
Creamery milk and tillage	15	46	13	74
Creamery milk and pigs	13	44	28	85
Liquid milk	19	5	2	26
Mainly drystock	109	52	103	264
Drystock and tillage	95	29	31	155
Hill sheep and cattle	4	19	45	68
All systems	279	343	266	888

predominate in the South Region, with mainly drystock farms of subsidiary importance. Elsewhere mainly drystock farms are the leading category, followed by drystock and tillage in the East and Midland Region and by hill sheep and cattle and mainly creamery milk in the North and West Region.

*

The different regionalisation schemes were based on varying criteria, though the bases of delimitation have not always been stated. Some used external or exogenous characteristics, particularly the physical environment, others were more logically based on the internal or endogenous

characteristics of agriculture and a combination of both was sometimes adopted. The production orientation of farming as indicated by the leading enterprises was generally stressed but all included other criteria such as land quality, farm size, level of marketability and labour force. Although the agricultural statistics provided a quantitative element in some of the schemes, all were strongly subjective. Because of the somewhat arbitrary nature of any such classification, it is not surprising that the sets of regions differ. Yet there are important common elements in all of the regionalisations, reflecting the major spatial characteristics of Irish agriculture. The attributes of the core areas are much more important than the specific locations of regional boundaries though these are drawn as lines somewhere. No author suggested that regions were homogeneous or that boundaries marked abrupt changes in the spatial ordering of agriculture, gradations between types being more common. The differences between the core areas are a distinct feature of Irish agriculture and are often visibly expressed in the landscape.

TYPE OF FARMING

It is not possible to present a comprehensive quantitative regionalisation based on the totality of Irish agriculture as sufficient data and adequate methodology are not available. Such a scheme might or might not provide a more real picture of the regional pattern of agriculture than existing regionalisations but the procedure would be more objective and repeatable. The aim of this section is limited to investigation of spatial patterns of type of farming, which is the orientation of agricultural production as indicated by the relative importance of the different farm enterprises. Although investigation is quantitative, many subjective decisions concerning the data, techniques and procedures used were involved, so that no method can be regarded as completely objective.

METHODOLOGY

If the purpose of a study were to explain the areal distribution of farm systems, it would be highly desirable that there should be investigation at the level of the individual farm, the unit of decision making and operation in agriculture. It might then be possible to develop a typology of farm

types and to delimit type-of-farm regions. Such is beyond the scope of the present study: the nature of farm systems is inadequately understood, insufficient data are available, there is no official farm-type classification, access to the individual holding returns of the agricultural enumeration is not granted to the private researcher and a very large number of farms would have to be sampled in the field as an adequate basis for a national investigation. Available statistics on a rural district basis are resorted to, while recognising that they indicate only the aggregate of the farm systems practised on individual holdings which differ to varying degrees from one another. The patterns portrayed may be referred to as type-of-farming rather than type-of-farm and they serve as a basis for description of the areal orientation of Irish agricultural output.

In order that the relative importance of farming enterprises may be compared, it is necessary to have some common measure of crop areas and livestock numbers. The conversion factor might assess enterprises in terms of an input or output, measured in either physical or monetary terms, with labour requirements and value of output being the two main alternatives adopted by researchers. Most workers have used labour needs, measured in standard man-days, as the index of importance, justifying the choice because of convenience, the more ready availability of labour data and the extent to which money values change. It was decided not to use labour in the present study because it measures enterprises in terms of only one input of diminishing importance, no satisfactory system of man-day requirements for use in Ireland is available, standard values assuming equal efficiency throughout the country would have to be used, there would be labour allocation problems, as between the cattle and dairy enterprises, and labour gives no indication of the disposal or purpose of the crop or enterprise, as with respect to fodder crops and horses.

The principal objection usually made to use of money as the common measure is that farm prices are more ephemeral than labour requirements. However, the ratios between the prices of the different agricultural products vary less than absolute prices and it is relative values that are important in the present context. Thus a comparison of the percentage distribution of total agricultural output amongst the different enterprises in 1970 with the means of the five years 1968–72, in brackets, indicates that the output values for one year may be quite representative of a longer period: arable crops 18·7 (17·8), milk 24·6 (25·4), cattle 33·0 (33·6), sheep 4·5 (4·8), horses 1·0 (1·2), pigs 12·5 (11·9) and poultry 5·6 (5·4). Also the structure of agricultural output responds to changes in the prices for different products prevailing and anticipated.

It was decided that money should be the common index though it did present certain difficulties and it is not claimed that the solution is ideal. The economic aspects of agriculture could then be emphasised and enterprises measured in terms of their economic significance, the most important consideration for Irish farmers. A major advantage of using a financial index is that data on a county basis have been published (Ross, 1972, 27–30) and access to additional unpublished data, relating in particular to individual crops, was granted by Ross. The most recent county data available refer to the year 1969. It was possible to obtain for each crop and livestock category county values of gross agricultural output, being sales off the county farm plus consumption in farm households. The methodology of county estimation has been described by Ross (1971, 24–57; 1972, 26–33). Standard gross output values per hectare and per livestock unit for individual crops and livestock in each county were then computed, using the county output data and the agricultural statistics for 1969 but substituting 1970 figures in a few instances where 1969 statistics were unavailable.

Gross margin, being gross output less the direct costs such as fertiliser, seed and feedstuffs incurred in the production of a particular enterprise, may be regarded as a more meaningful measure of the importance of an enterprise than is gross output. Gross margin indicates the contribution an enterprise makes to the agricultural economy by representing the value added by farming, so that it is nearer to the ideal concept of net income or profit which cannot be computed because of the problem of allocating common costs. It was decided to use gross margins although data are less readily available and the methodology is necessarily more complex. Data in the Farm Management Survey (Heavey and Hickey, 1973) were used to compute the percentage of gross output to which gross margin amounted for each of the major crops and livestock. In the absence of Farm Management Survey data, the percentage for horses was taken to be the mean of the values for the other grazing livestock, that for poultry was derived from Nix* using the mean of egg and broiler production, and those for horticultural crops were obtained from Hickey (personal communication). The use of gross margin rather than gross output standards did not greatly affect the relative positions of most enterprises, the percentages for all crops and livestock other than the farmyard enterprises being within the range 63–83. The percentage for pigs was 35·7 and for poultry 13·3, as direct costs are high and gross output values would give an exaggerated

* J. Nix: *Farm management pocketbook*. Wye College, University of London, 1972.

impression of the importance of these enterprises. The gross margin percentages were applied to the county standard gross outputs previously computed, to give county standard gross margins. Nationally uniform percentages had to be employed, despite the existence of regional variations in farmers' use of direct cost inputs, but within a particular area the effect of these differences on inter-enterprise comparisons would be diminished and the deficiency is much less than if national standard gross outputs had to be used. For each county, the 1969 standard gross margins were multiplied by the numbers of crop hectares and livestock units for 1970, the year of the last complete agricultural enumeration, to derive gross margin totals for each of seven farm enterprises and for the aggregate agricultural production of the county. The percentage distribution of county totals amongst the individual enterprises was computed.

The county standard gross margins were used with the agricultural statistics on a rural district basis to apportion gross margin values amongst the rural districts and to investigate the structure of agricultural production at this level. For each rural district, the numbers of crop hectares and livestock units were multiplied by the appropriate county standard gross margins to derive gross margin values for individual enterprises. These values were summed to give the aggregate gross margin value for the rural district and the percentage contribution of each enterprise was calculated. The use of county standards is least satisfactory in counties such as Cork and Donegal where there are marked intracounty variations in the nature and efficiency of agricultural production but the defect would be much greater if national standards had to be employed.

COUNTY STRUCTURE

The county gross margin values and their apportionment amongst seven agricultural products are shown in *Figure 7.2*, the enterprises being arranged in a clockwise direction from the top of each circle in order of decreasing importance. Cattle production is the leading enterprise in fifteen counties, with dairying foremost in five southern counties and Monaghan, and arable crop production first in five eastern counties. The most dominant counties with respect to these three enterprises are Dublin in arable crops (64 per cent), Westmeath in cattle production (57 per cent) and Limerick in dairying (55 per cent). Only in three other counties, Longford, Leitrim and Roscommon, is more than one-half of total value contributed by one product, cattle in each instance. Sheep are most significant in the agriculture of

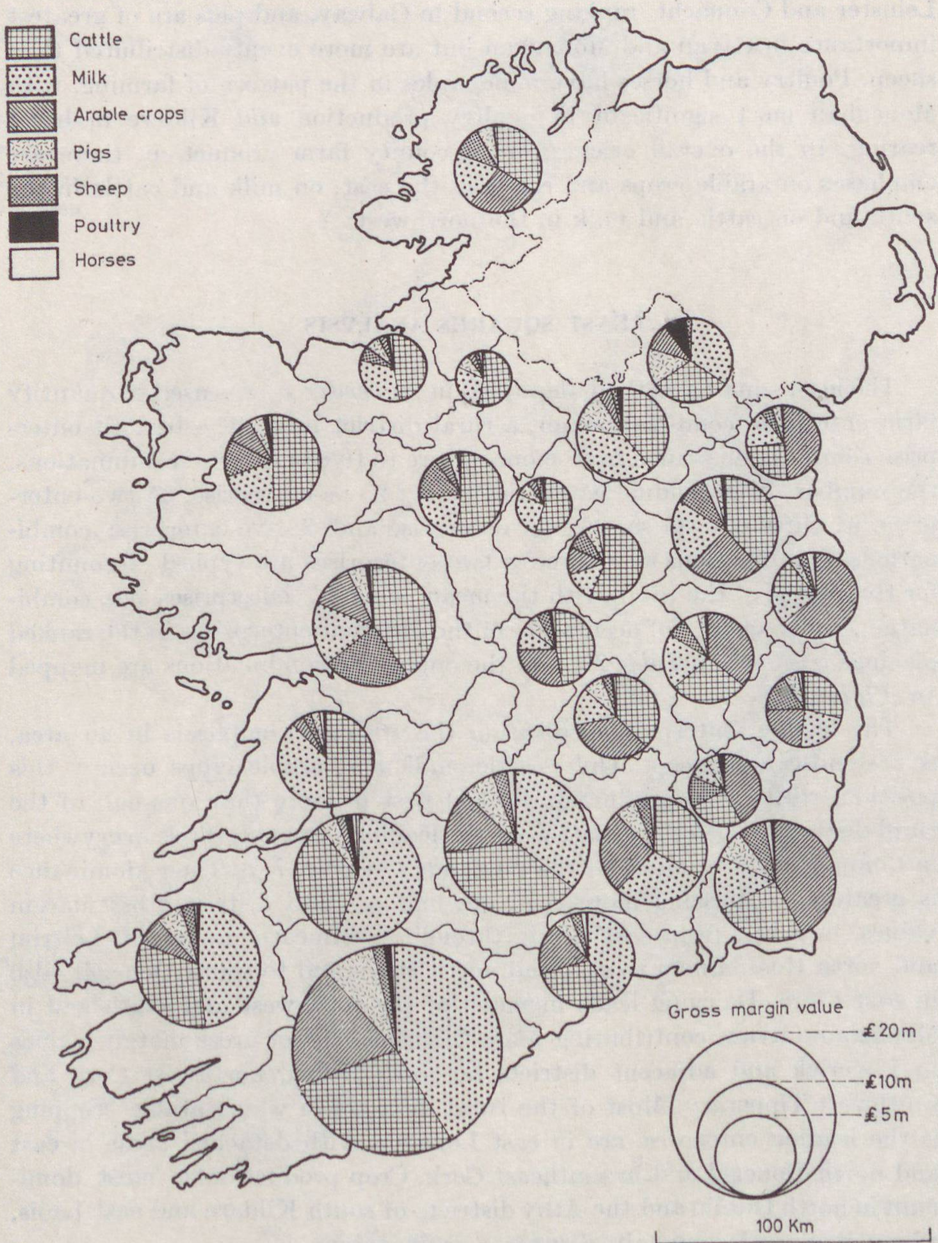


Fig. 7.2. The structure of gross margin values by county

Leinster and Connacht, ranking second in Galway, and pigs are of greatest importance in Cavan and Monaghan but are more evenly distributed than sheep. Poultry and horses have minor roles in the pattern of farming, with Monaghan most significant in poultry production and Kildare in horse rearing. In the overall orientation of county farm production, there are emphases on arable crops and cattle in the east, on milk and cattle in the south and on cattle and milk in the northwest.

LEAST SQUARES ANALYSIS

The least squares method, described in *Appendix B*, was used to quantify farm enterprise combinations on a rural district basis. The best fit enterprise combinations range from monoculture to five-enterprise combinations, the numbers of individual categories being: 2 one-enterprise, 65 two-enterprise, 67 three-enterprise, 22 four-enterprise and 2 five-enterprise combinations. Combinations with three or two enterprises are typical, accounting for five-sixths of the total, with the mean being 2·7 enterprises per combination. The frequency of occurrence of the different enterprises in the ranked placings is shown in *Table 7.2* and the enterprise combinations are mapped in *Figure 7.3*.

The leading enterprise, indicating the strongest emphasis in an area, is a significant concept. Only cattle, milk and arable crops occupy this position, with cattle production ranked first in more than one-half of the rural districts *(Table 7.2)*. Cattle are the leading farm enterprise everywhere in Connacht and in much of the midlands (see *Fig. 7.3*). Their dominance is greatest, comprising more than one-half of rural district gross margin values, in a belt from east Offaly through Westmeath, Longford, Leitrim and north Roscommon to east and north Mayo and to south Donegal, also in east Clare. Dairying leads in much of the southwest and south and in Monaghan-Cavan, contributing more than one-half of gross margin values in Limerick and adjacent districts in north Kerry, northwest Cork and southwest Tipperary. Most of the rural districts in which arable cropping is the leading enterprise are in east Leinster, with detached areas in east and north Donegal and in southeast Cork. Crop production is most dominant in north Dublin and the Athy districts of south Kildare and east Laois, where it exceeds one-half of gross margin values.

In the areas where cattle production is the leading enterprise, the largest tract of uniform farming type is in north Connacht and Longford, with dairying the second enterprise. The simple cattle-milk two-enterprise com-

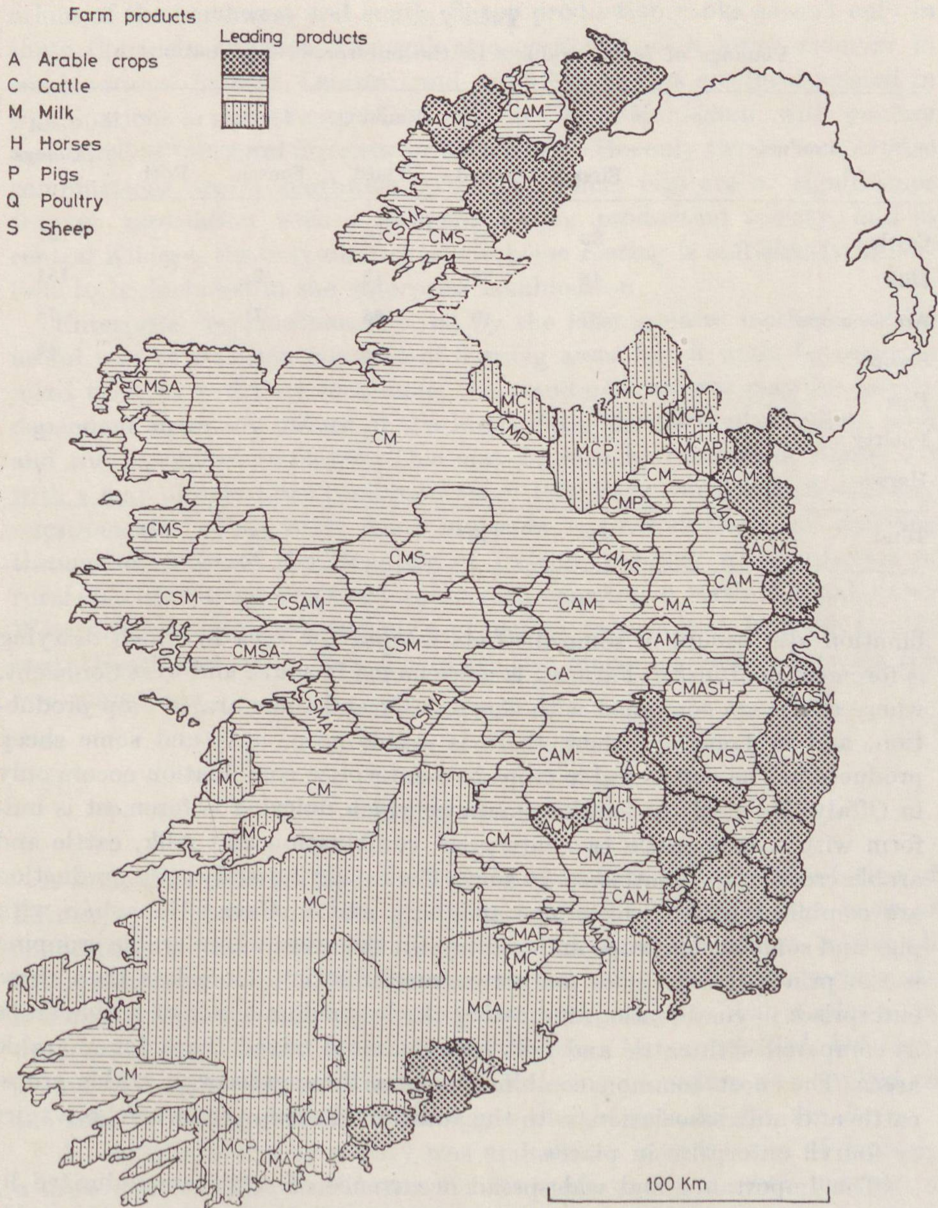


Fig. 7.3. Enterprise combinations

Table 7.2.

Placings of farm products in the enterprise combinations

Products	Ranking					Total placings
	First	Second	Third	Fourth	Fifth	
Cattle	83	68	6	—	—	157
Milk	48	58	42	3	—	151
Arable crops	27	19	25	7	—	78
Sheep	—	11	9	8	—	28
Pigs	—	—	9	4	1	14
Poultry	—	—	—	2	—	2
Horses	—	—	—	—	1	1
Total	158	156	91	24	2	431

bination also occurs in some districts around the area in which dairying is foremost in Munster. Farming is more mixed in south and west Connacht, where cattle are combined with sheep, milk and some arable crop production, and in Leinster, where there is arable crop, milk and some sheep production. The cattle-arable crops two-enterprise combination occurs only in Offaly. Much of the southern area in which dairying is foremost is uniform with a milk-cattle two-enterprise combination and milk, cattle and arable crops in the southeast. In south Cork dairying and cattle production are combined with arable crops and pigs, and in Cavan-Monaghan with pigs and some arable crops and poultry. In the areas where arable cropping is the principal enterprise, only two rural districts have less than three enterprises in combination, indicating the lower dominance of arable crops as compared with cattle and milk and the more mixed character of arable areas. The most common combination is a three-enterprise arable crops, cattle and milk association, with the addition of sheep production as a third or fourth enterprise in places.

The importance and widespread occurrence of cattle are indicated by their presence in the combination of every rural district except the arable crop monoculture of north Dublin. Milk production is absent from the combinations of only six other rural districts, located in the midlands from Carlow to Westmeath. Arable crops are most common in the combination of eastern districts and are notably absent from the two-enterprise assoc

ations of the northwest and south. Sheep production ranks second only in south Connacht and west Donegal, also occurring as a lower member in combinations in east Leinster and west Mayo. Pigs are incorporated in combinations in part of south Cork and in Cavan-Monaghan, with poultry associated in two rural districts in Monaghan. The only two five-enterprise combinations are in southwest Wicklow, where pigs are of significance through association with a co-operative pig production society, and in central Kildare, the only district where horse rearing is sufficiently important to be included in the enterprise combination.

Enterprise combinations derived by the least squares method are one useful way of representing type-of-farming areas but it must be borne in mind that, as with any technique, the resultant patterns may be greatly dependent upon the nature of the input data, the particular indices used and the procedure employed. This may be seen by comparing *Figure 7.3* with a map of enterprise combinations in 1960 based on standard man-day requirements.* The latter map indicates a predominance of dairying throughout most of the Republic of Ireland, together with instances of rural districts having single-enterprise cash cropping in north Donegal, north Wexford and south Cork and pig and poultry monoculture in north Louth, north Meath and south Cork. There are also many similarities between the two maps.

CLUSTER ANALYSIS

A somewhat different approach to the classification and delimitation of farming-type patterns is the grouping together of areas on the basis of similarities in the production orientation of their agriculture taking all enterprises into account. Cluster analysis was adopted for this purpose, as it seeks to separate unit areas into clusters or groups so that similarity in production orientation is maximised within, but minimised between, groups. An agglomerative hierarchial clustering procedure was applied to the Irish county and rural district gross margin data *(Appendix B)*.

A cluster analysis by county was undertaken with the aim of deriving a broad generalised classification for the state having a small number of groups. The clustering sequence is shown in the dendogram drawn from

* J. R. Tarrant: *Agricultural geography*. David and Charles, Newton Abbot, 1974, 143.

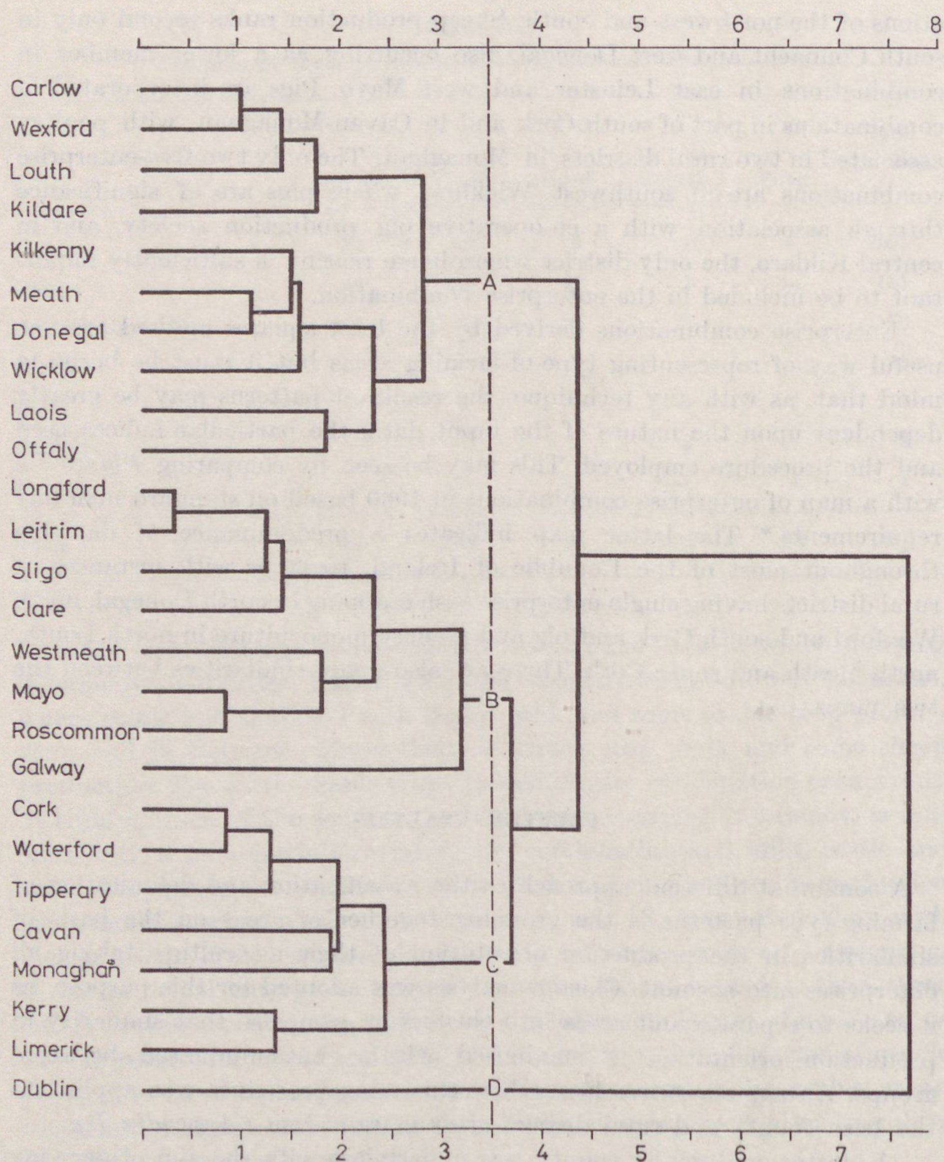


Fig. 7.4. Dendogram for county cluster analysis

the computer output *(Fig. 7.4)*. Longford and Leitrim are the most similar counties, followed by Mayo-Roscommon and Cork-Waterford. Dublin is the most dissimilar from the remainder of the state, not grouping with the other counties for a considerable distance after they had merged. At the

similarity distance of 3·5 there are three clusters, with Dublin unclassified at this stage. These groups have similarities with the provincial division of the state, giving some support to use of the provinces as statistical areas in certain instances *(Fig. 7.5)*. Group B corresponds with Connacht, with the addition of Clare from Munster and Longford and Westmeath from Leinster. Ulster is divided between group A (Donegal) and group C (Cavan-Monaghan).

Group A, composed of ten counties, is oriented towards arable crop and cattle production, contributing nearly two-thirds of the total gross margin value, with subsidiary dairying *(Table 7.3)*. It is composed of two sub-groups, that including Carlow, Wexford, Louth and Kildare in which arable cropping is the leading enterprise, and the remaining counties in which cattle production is foremost. In group B cattle production accounts for almost half of gross margin value and there is dairying with subsidiary sheep production. Galway, with a greater emphasis on sheep and arable crop production, is least like other members of the set. Group C is composed of those counties of the south and Monaghan in which dairying is the leading enterprise, together with Cavan in which cattle exceed milk by 0·2 per cent. Cattle production ranks a strong second in the group, with subsidiary cash cropping. Pig and poultry production are more important and sheep and horses of less significance than in any of the other groups. Arable cropping is dominant in Dublin, with subsidiary dairying and cattle production.

Table 7.3.

Production orientation by type-of-farming group, counties

Group	Percentage of total gross margin							Enterprise combination
	Arable crops (A)	Milk (M)	Cattle (C)	Sheep (S)	Horses (H)	Pigs (P)	Poultry (Q)	
A	32·85	19·05	31·95	7·82	1·67	5·57	1·08	ACM
B	7·86	23·89	48·59	12·66	1·00	4·99	1·01	CMS
C	12·84	42·66	31·90	2·22	0·90	8·09	1·39	MCA
D	63·69	13·06	12·85	3·08	2·85	3·54	0·94	A
State	19·50	30·59	34·83	6·21	1·19	6·52	1·16	CMA

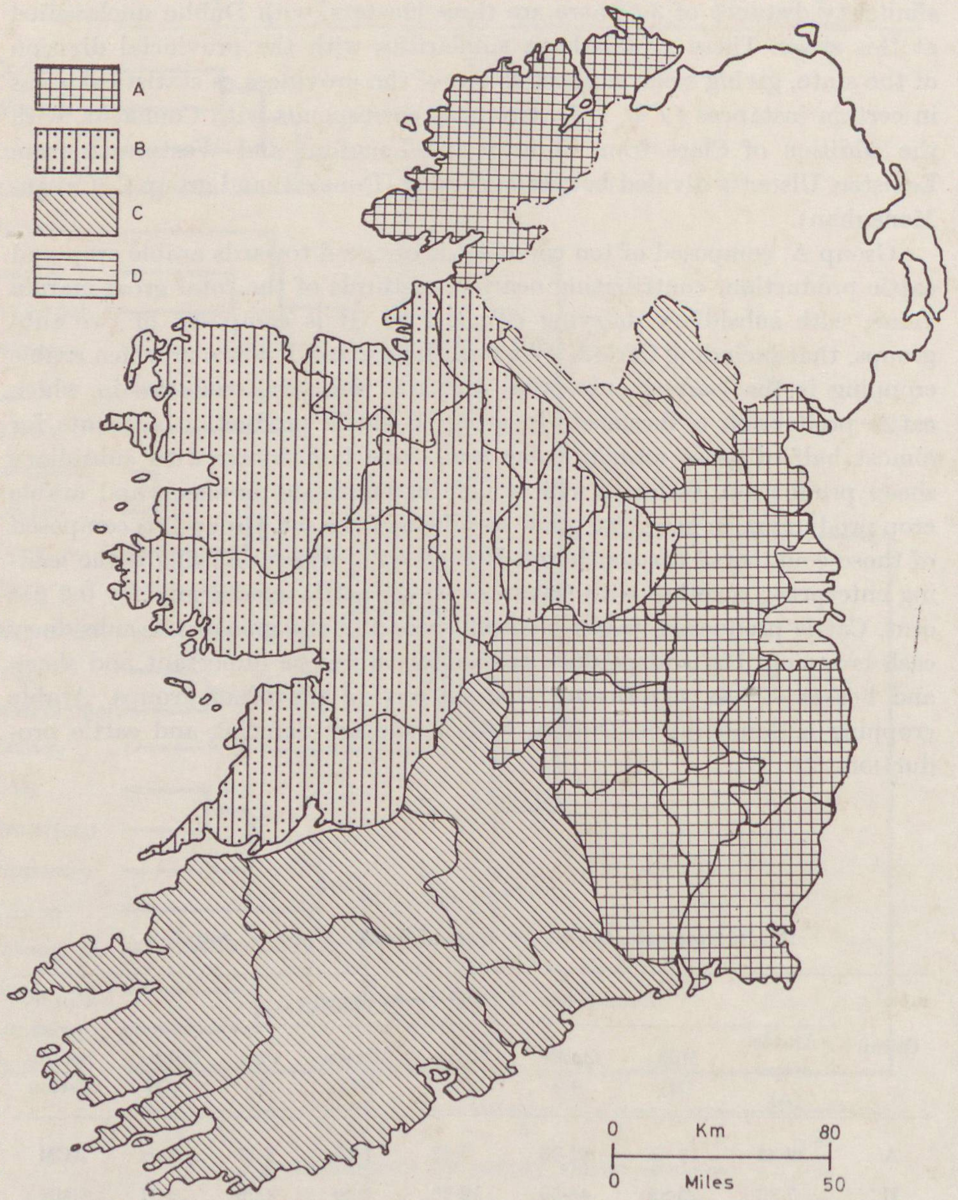


Fig. 7.5. County type-of-farming clusters

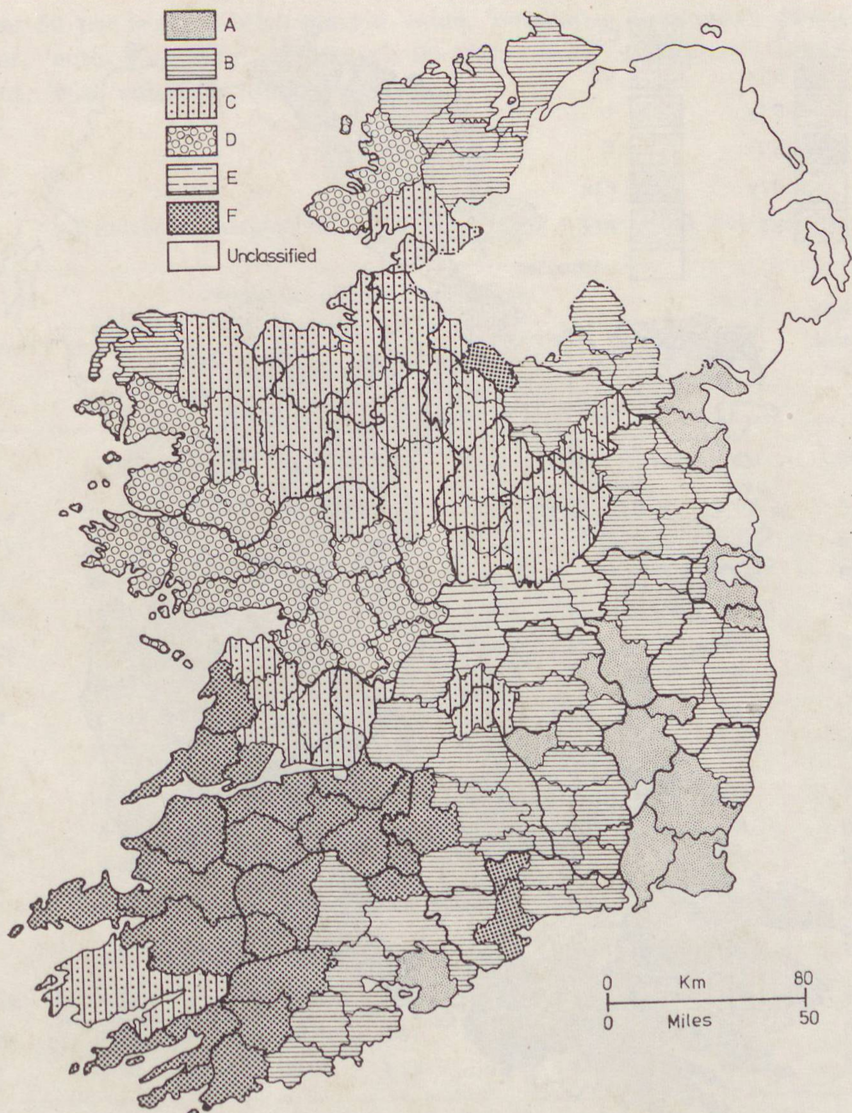


Fig. 7.6. Rural district type-of-farming clusters, six-group stage

Cluster analysis by rural district affords a more detailed classification of farming-type patterns. For purposes of delimitation, clusters were recognised at three fusion levels, a twelve-group fusion stage at 2·0 similarity distance, a nine-group fusion stage at 2·25 and a six-group fusion stage at 3·0. The gross margin structure and enterprise combination classified by

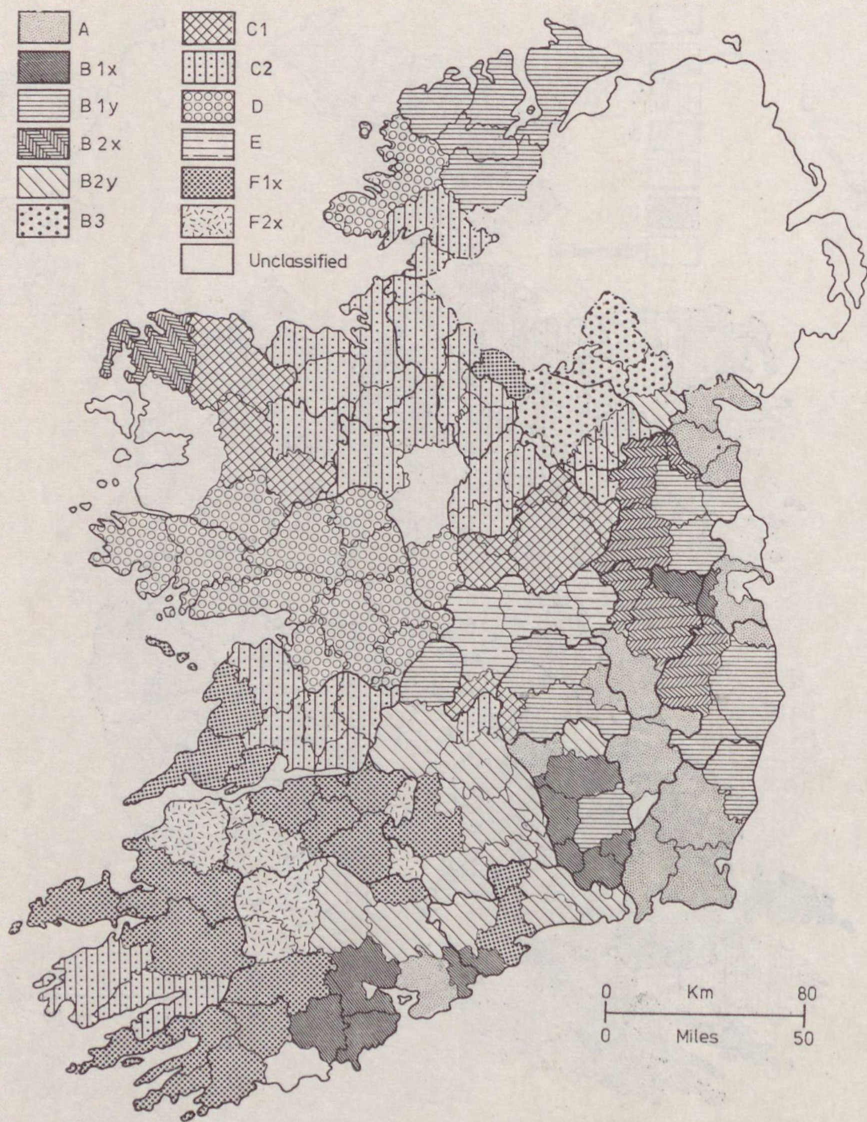


Fig. 7.7. Rural district type-of-farming clusters, twelve-group stage

the least squares method is given for each group and subgroup in *Table 7.4*. The clusters at the six-group and twelve-group stages are mapped in *Figures 7.6* and *7.7*. In order that the types of farming may be described consistently, the following enterprise terminology is used in this section:

over 50 per cent of gross margin value, 'enterprise dominant'; 40–50 per cent, 'enterprise very important'; 20–30 per cent, 'enterprise'; 10–20 per cent, 'with subsidiary enterprise'.

Table 7.4.

Production orientation by type-of-farming group, rural districts

Group	Percentage of total gross margin							Enterprise combination	Specialisation index
	Arable crops (A)	Milk (M)	Cattle (C)	Sheep (S)	Horses (H)	Pigs (P)	Poultry (Q)		
A	47·27	15·05	23·50	6·33	1·31	5·61	0·92	ACM	0·31
B1x	27·10	33·57	28·03	2·40	1·04	6·91	0·95	MCA	0·27
B1y	30·80	19·71	32·71	8·33	1·30	5·92	1·24	CAM	0·25
B1	29·19	25·75	30·67	5·75	1·19	6·35	1·11	CAM	0·25
B2x	18·94	24·47	37·31	10·92	4·30	3·33	0·72	CMAS	0·25
B2y	15·75	37·50	35·53	3·06	1·24	6·29	0·63	MCA	0·30
B2	16·63	33·90	36·02	5·24	2·09	5·47	0·65	CMA	0·28
B3	6·46	36·76	33·53	0·68	0·32	15·50	6·73	MCP	0·28
B	21·79	30·40	32·78	4·90	1·44	7·18	1·50	CMA	0·26
C1	10·07	17·16	54·23	10·03	1·13	6·44	0·94	CM	0·35
C2	5·29	30·52	51·08	5·53	0·77	5·79	1·03	CM	0·36
C	6·82	26·24	52·08	6·97	0·88	6·00	1·00	CM	0·35
D	10·62	16·72	40·80	25·32	0·88	4·55	1·12	CSM	0·27
E	29·77	9·82	46·96	5·54	1·07	5·39	1·45	CA	0·33
F1x	6·28	49·25	33·29	1·86	1·10	7·43	0·79	MC	0·36
F2x	3·85	59·07	26·40	0·61	0·98	7·53	1·55	MC	0·43
F	5·65	51·81	31·50	1·53	1·07	7·45	0·99	MC	0·38

Group A

Arable cropping very important, cattle production, with subsidiary dairying. This group is fragmented, the main areas being a zone from south Wexford to south Kildare and all of Louth but with other rural districts around Dublin, in northwest Kilkenny and in southeast Cork. It is the only cluster in which arable cropping is the leading enterprise, its value being

twice that of cattle production and three times that of the third ranking dairying. Group A is quite homogeneous, remaining the same at the three fusion levels and being the last cluster to join with the rest of the state. Prior to that it links with the previously unclassified rural districts in south Carlow and north Dublin, the latter being the district most unlike all others in the state. The ultimate group occupies 10 per cent of the state's agricultural land but contributes 38 per cent of the gross margin value of arable crops.

Group B

Cattle production, dairying and arable cropping. This group tends to be interposed between areas where arable cropping is very important and those where cattle production or dairying are dominant or very important, occurring in east Ulster, Leinster and east Munster. Occupying 36 per cent of the state's agricultural land, B is the largest and most diverse group. The group and its subgroups are the only clusters in which the leading enterprise does not contribute more than 40 per cent of gross margin value.

Group B results from the fusion of clusters which at the twelve-group stage occur as five subgroups (see *Fig. 7.7*). Subgroup B1y is distinguished by the fact that arable cropping's rank and percentage of gross margin are higher than in the other four clusters and those of dairying are lower, the orientation being cattle production and arable cropping, with subsidiary dairying. It occurs mainly in rural districts of Leinster contiguous with group A areas, together with north and east Donegal. Subgroups B1x and B2y are largely in Munster and Kilkenny and have a milk-cattle-arable crops enterprise combination. The emphasis on arable cropping is greater in B1x which, occurring in Kilkenny and south Cork, is nearer to the cropping end of the arable to dairy farming transition. There are similarities between the gross margin structures of B2y and B3, except for the transposition of arable cropping and pig production as subsidiary enterprises to dairying and cattle production. Subgroup B3 is notable for the significance of the farmyard enterprises, pigs being twice and poultry four times as important as in any other cluster. It is confined to Cavan-Monaghan, where milk production is more important than elsewhere outside the southern dairying districts and it resembles these districts in the lack of sheep. It remains separate at the twelve-group and nine-group fusion stages, subsequently merging with B2. Subgroup B2x has cattle production and dairying, with subsidiary arable cropping and sheep production, being a four-enterprise combination. It represents a grazing belt in Leinster, with cattle, sheep and horses more important than in the other B clusters and contribut-

ing more than one-half of gross margin value. With regard to minor enterprises, B2x is distinguished from all other groupings in the country by the significance of horse rearing and the lack of pig and poultry production.

GROUP C

Cattle production dominant, dairying. The second largest of the groupings occupies an extensive contiguous area from Westmeath and east Cavan to north Mayo and south Donegal, together with detached areas in north and east Clare, south Kerry and the Roscrea locality. The group is formed by the fusion of clusters C1 and C2 between the nine-group and six-group stages. C2 represents the extension over a large area of a farming type which has considerable uniformity and simplicity, with more than four-fifths of gross margin value accounted for by cattle and milk. In the C1 areas of east Mayo and Westmeath cattle production is even more dominant and the role of dairying is much less but sheep production and arable cropping attain subsidiary status. The central Roscommon part of C1 is unclassified at the twelve-group fusion stage.

GROUP D

Cattle production very important, sheep production, with subsidiary dairying and arable cropping. It is a contiguous area in south Connacht, together with southwest Donegal. The group remains constant at the three fusion levels, except for the addition of southwest Mayo between the nine-group and six-group fusion stages. The characteristic which most distinguishes the group is the significance of sheep production, its share of total gross margin being two and a half times that in any other cluster and four times the national mean. Lowland sheep farming predominates in the east of the area and mountain sheep farming in the west.

GROUP E

Cattle production very important, arable cropping. It is the smallest of all the clusters, being confined to Offaly, but it is a distinct grouping, remaining the same at the three fusion stages. It is the last of the three groups in which cattle production is dominant or very important and which together occupy Connacht and west Leinster, with extensions into some adjacent parts of Munster and Ulster. Dairying's contribution to gross margin value in E is less than in any other cluster and it is the only grouping in which dairying is not included in the enterprise combination, which is a unique cattle and arable crops two-enterprise association.

GROUP F

Dairying dominant, cattle production. The group occupies a large contiguous area in west and central Munster, with detached occurrences in central Waterford and west Cavan. It is the second last of the groups to fuse with the rest of the state. Group F is pre-eminent in milk production, contributing 35 per cent of the national gross margin value in dairying from 18 per cent of the state's agricultural land. Milk and cattle account for 83 per cent of its gross margin value, an even greater dominance by the leading enterprises than in the other two-enterprise combination groups, C and E. Although pig production is far behind, it is the third enterprise and contributes a greater share of gross margin value than in the other five groups. The contributions of arable cropping and sheep production are less than in the other groups. At the twelve-group fusion stage, F2x is a separate subgroup formed of rural districts in which the characteristics of F are even more accentuated. The dominance of dairying is greater than that of the leading enterprise in any other cluster, cattle are less significant than in F1x and arable cropping and sheep production are almost absent. The production orientation of F1x is similar to B3, except for a greater emphasis on dairying in F1x and less on pig and poultry production.

DEGREE OF SPECIALISATION

Some indication of the extent of areal specialisation in farming has been given through the different analyses of gross margin structure. An index to measure degree of specialisation in the study of world agricultural typology has been suggested by Kostrowicki.* The index would have a maximum value of 1·00 if the entire production were contributed by one enterprise and, where seven enterprises are being considered, the minimum value would be 0·14 if production were equally distributed amongst the seven. The degree of rural district specialisation is shown in *Figure 7.8*. There are two main areas of above average specialisation, in northwest and central Munster and in north Connacht and northwest Leinster. The index values for type-of-farming groups are given in *Table 7.4*, the order of decreasing specialisation being F, C, E, A, D and B. F2 is the most specialised of the

* J. Kostrowicki: *The typology of world agriculture, principles, methods and model types.* International Geographical Union Commission on Agricultural Typology, Warsaw, 1974, 25 and 74. The index of degree of specialisation was calculated by squaring and summing individual products' shares of total production, given unit value.

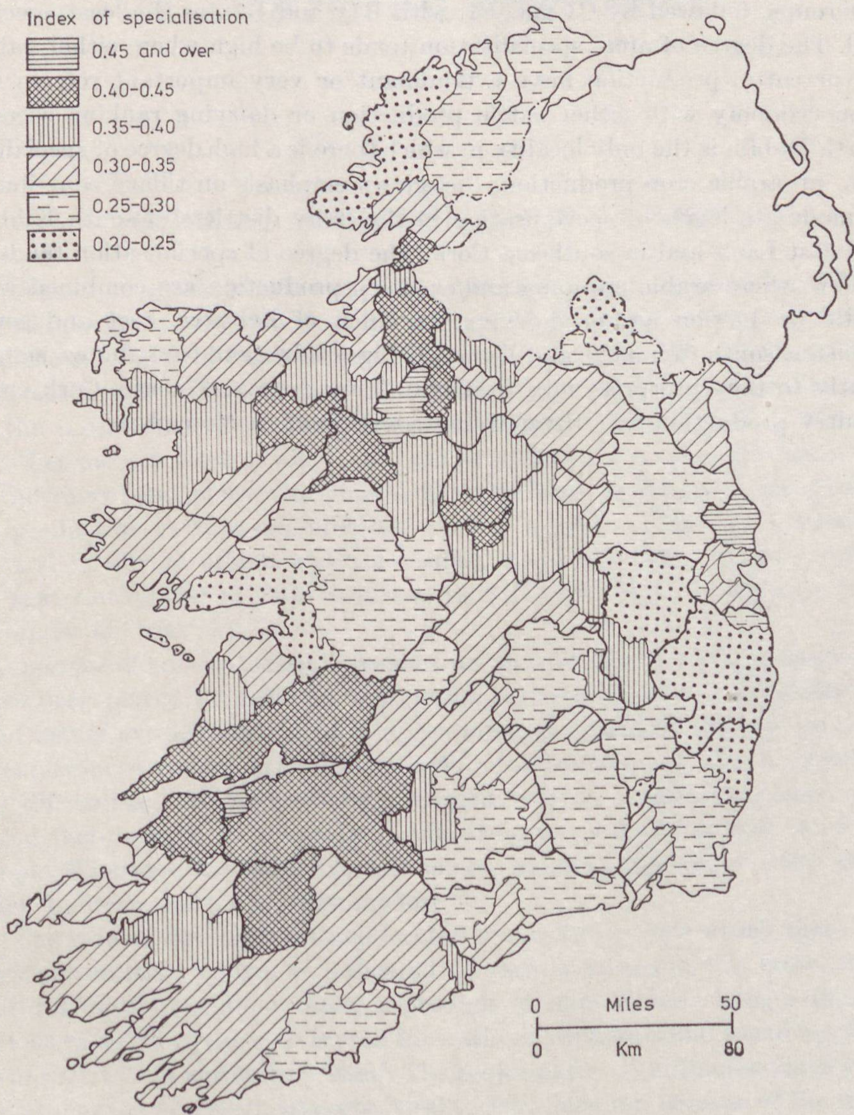


Fig. 7.8. Degree of specialisation in farming

subgroups, followed by C1 and F1, with B1y and B2x as the least specialised. The degree of areal specialisation tends to be high where either dairying or cattle production have a dominant or very important role in the farm economy with either cattle production or dairying ranking second. North Dublin is the only locality in which there is a high degree of specialisation in arable crop production, though an emphasis on tillage contributes to moderate levels of specialisation in the Athy districts of south Kildare and east Laois and in southeast Cork. The degree of specialisation tends to be low where arable cropping and/or sheep production are combined with cattle production and/or dairying, in much of Leinster, east and south Munster, south Connacht and Donegal. Pig production contributes significantly to the enterprise mix in Cavan-Monaghan and south Cork, with poultry production as a diversifying constituent in Monaghan.

8. AGRICULTURAL DEVELOPMENT

NATIONAL AGRICULTURAL PERFORMANCE

Persistent characteristics of Irish agricultural development have been the failure to make the most of the very considerable potential which exists and the slow rate of improvement. Many observers at different times have contrasted the prevailing level of achievement with the possibilities, one of the most often quoted commentaries being that of Holmes (1949, 8):

> "Let me say, first of all, that there is no area of comparable size in the northern hemisphere which has such marvellous potentialities for pasture production as Eire undoubtedly has . . . In some of the same counties, and in all the others which I visited, I saw hundreds of fields which are growing just as little as it is physically possible for the land to grow under an Irish sky."

In assessments of the possible reasons for this situation, varying emphases have been placed by different individuals on factors such as the history of land tenure and the associated struggle, modern agrarian structure, political circumstances, economic conditions within the country and abroad, marketing difficulties, capital scarcity, predominance of a cattle economy, and social factors such as emigration, education levels and the nature of the people. Whatever the causative influences, progress for almost forty years after Independence was very modest.

The rate of development accelerated about 1960, since which there has been substantial change, as indicated at various places in this book. Agricultural development has been a product of interrelated changes in conditions external to the country, in the national economic and social environment and within agriculture itself. The major external influences have been the promotion of export markets, vital to Irish farming because of the small size and limited growth of domestic consumption, and the prospect of accession to the European Economic Community. Growth of prosperity in the non-agricultural sector of the economy affected farming in that it resulted in a rise in the value of labour, in income expectation and in alternative employment opportunities. There has been a considerable substitution of capital for labour in the agricultural production process, related to major advances in farming technology. A substantial increase

in the volume of output was achieved, with larger scale of operation, greater specialisation in production and more emphasis on the market rather than the farm family as consumers. There was unprecedented growth in applied agricultural research, in the advisory services and in the impact of the mass media, with an increasing level of acceptance and adoption of innovations by the farming community. Farming is progressively more integrated into the economy and is increasingly regarded as an economic activity rather than a way of life, though progress is very unevenly distributed amongst individuals and regions.

The return on resources of land and labour is still quite low, though Irish agriculture is efficient by the world average standard. During the period 1960–72, gross output per hectare increased by 33 per cent in real terms and gross output per person employed by 107 per cent, productivity growth rates which were higher than at any time in history. The increases in net output were 15 per cent and 79 per cent respectively. The substantial improvements in labour productivity resulted from increased total output, a diminishing labour force, the adoption of new technology and a greater capital to labour ratio. In 1972 the values of gross and net output per hectare were £99 and £78 respectively, the values per person being £1,790 and £1,408. It is not possible to compute comparable data relating to the productivity of capital but it is certain that there have been decreasing returns to the increased resource input. With regard to short-term capital inputs of fertilisers, feedstuffs and seeds, the volume of gross output per unit of farm materials used diminished by 39 per cent in the period 1960–72 and net output by 47 per cent, a consequence of the transition to more capital-intensive production. Greater efficiency in the use of resources could contribute substantially towards increased farm incomes.

The £305 m. income arising in agriculture in 1972 largely represented income to farm families, only 8 per cent being wages and salaries. The income arising per person was £1178, an increase of 255 per cent on the 1960 value of £332. The principal components in income growth, with percentage changes 1960–72 given in brackets, were: increased state expenditure in relation to agriculture (+329 per cent); decline in agricultural employment (−32 per cent); increased volume of net agricultural output (+22 per cent); increased market prices for farm produce (+83 per cent). State expenditure increased from 21 per cent to 37 per cent of the income arising in agriculture. Comparison of the 255 per cent growth in per capita agricultural income with an increase of 88 per cent in the consumer price index indicates that farmers made substantial gains in real income terms. Yet agricultural incomes have tended to lag behind those in other sectors

of the economy, though it is not possible to quantify the disparity in a reliable and meaningful way.

Family farm incomes vary considerably by size of holding and by farm enterprise, as indicated by three-year means recorded in the Farm Management Survey (Heavey and Hickey, 1973) *(Table 8.1)*. Returns tend to be lowest on small holdings and on cattle and sheep farms. Even within individual categories there are great differences in income, related to variations in factors such as management level, soil type, market accessibility, labour supply, capital availability and livestock productivity.

Table 8.1.

Family farm income per family labour unit (£), 1966–69

Farm system	Farm size (hectares)						All sizes
	2·0–6·1	6·1–12·1	12·1–20·2	20·2–40·5	40·5–80·9	80·9+	
Creamery milk	305	298	427	633	827	1081	562
Creamery milk and tillage	–	279	598	878	1159	1072	863
Creamery milk and pigs	–	490	552	637	1214	819	695
Liquid milk	–	–	566	654	1377	–	912
Drystock	139	257	331	433	549	912	379
Drystock and tillage	118	222	415	706	1001	1446	751
Hill sheep and cattle	100	153	162	279	235	432	239
All systems	217	278	414	619	904	1025	543

If the amount of farm work necessary to provide full-time employment for one man working in an efficient manner is taken as the lower limit of viability, it has been estimated that only 44 per cent of farms are viable, 22 per cent are farm businesses with a reasonable potential for reaching this standard and 34 per cent have a basic economic organisation which is unlikely to provide more than part-time employment (Department of Agriculture and Fisheries, 1970b, 23). The average family farm incomes in 1967 of the viable farms were over £1,250, the potentially viable farms were over £500 and the non-viable farms were less than £200 per farm. The proportions of total farm output accounted for by the three categories were 69 per cent, 14 per cent and 17 per cent respectively. There is a large

number of holdings on which the income is less than the minimum statutory wage of an agricultural labourer, with no return on capital investment or management. It is obvious that the earnings of many farmers are insufficient to provide them with the basic necessities and comforts of life.

Irish government policy in relation to agricultural development has been strongly conditioned by the importance of agriculture in the national economy and by the extent of emigration over the history of the state. The objectives of policy were specified in the *Third programme economic and social development 1969–72*: (1) to increase efficiency in the production, processing and marketing of farm products; (2) to ensure that agriculture makes the highest possible contribution to the economic and social progress of the nation; (3) to ensure that farmers who work their land fully and efficiently share equitably in the growing national prosperity and that a reasonable relationship is maintained between farm incomes and incomes in other occupations; (4) to improve the structure of agriculture and strengthen the economic and competitive capacity of the viable family farm; (5) to aid the smaller and more economically vulnerable farmer to secure an acceptable level of income; (6) to improve the conditions of access to external markets for agricultural exports.

Agricultural progress will depend in part on the measures taken by government but also on the nature of farmers' responses to prevailing opportunities, on market accessibility and prices and on the efficiency with which ancillary industries service the agricultural sector. The principal way in which most farmers can increase their income is through greater farm efficiency in the use of available resources. This is a prime aim of agricultural research and education and it is attainable in the context of more adequate farm management and planning. Productivity in the utilisation of grassland is of fundamental importance in Irish agriculture; Lee and Diamond (1972, 26) estimated that the 1970 national total of 5·4 m. grazing livestock units could be increased to 8·7 m. at an input of 48 kg nitrogen per hectare and to 10·3 m. units at 230 kg per hectare. Despite the substantial decline in the farm population, there is still considerable underemployment in Irish agriculture. Greater economies of scale can be achieved through an intensification of production with increased output and through the enlargement of small farms in a programme of structural reform. There are also benefits to be gained through group farming arrangements, giving the small farmer the possibility of increasing efficiency in production and marketing, with more rational use of labour and machinery, in addition to improved leisure opportunities. Farmers are now taking a more active interest in their produce beyond the farm gate but the level of co-operative organisation

could be greatly increased. Farm production must continually adapt to modern market requirements and there is vast scope for improvement in marketing organisation and promotion. The processing industries could be improved and rationalised, with a greater proportion of agricultural output being processed to increase the value added to it and the benefits to the economy.

In formulating public policy with respect to agricultural development, important decisions have to be taken concerning the level of government expenditure and its allocation amongst different sectors of agriculture. These decisions have to be made in the context of the economy as a whole, while assessing the needs of different sections of the farm community and balancing economic and social objectives. The necessity to increase agricultural efficiency must not hide the urgent need for income support measures to counteract the extent of rural poverty amongst that section of the farm population which has a low level of commercialisation. Such social measures should be devised within an environment which is favourable towards progress of the commercial sector. Agricultural development policy should not be viewed in isolation but in the context of comprehensive rural socio-economic development programmes, designed to improve the level of social services and amenities in rural areas and to provide alternative employment opportunities for those who wish to leave agriculture or to become part-time farmers.

Irish agriculture is undergoing considerable change, both in the character and combination of its resources and also in the pattern of its output. Recent trends have been outlined in this book and they provide an indication of future developments but a simple extrapolation of trends is an inadequate basis for projecting prospects. This is partly because of the changed environment resulting from accession to the E.E.C. in 1973 with the transitional period of five years. At present there is much emphasis on implementation of E.E.C. directives on farm modernisation, farmer retirement, socio-economic advice and disadvantaged farming areas. The aim of these directives is to constitute an integrated programme for agricultural development but it is not yet possible to evalute their suitability and effectiveness in the Irish context. Prediction of future developments would be rendered even more difficult by the present world situation, uncertainty with regard to developments in the non-agricultural sector of the Irish economy and the absence of any national plan to replace that which expired in 1972. Whatever the future may hold, it is important that the challenge of change should be faced and the process effected with the minimum harm to those involved.

Pronounced spatial variations in productivity and income are a feature of Irish agriculture. Disparities are evident from regional income data in the Farm Management Survey (Heavey and Hickey, 1973). Mean income data over three years, in the sequence of South Region, East and Midlands Region, North and West Region, were: (a) family farm income per adjusted hectare: £40·5, £33·4, £25·6; (b) income per family labour unit: £698, £555, £283; (c) family farm income per farm: £848, £638, £290. The variation in performance within regions was greatest in the South Region and least in the North and West Region.

Data derived from Ross (1972) could be used to map farmers' income on a county basis, as has been done for 1965 (Gillmor, 1971b). In order to reveal more detailed patterns of productivity variations, county agricultural output data were combined with the agricultural statistics for rural districts to derive gross margin values, as outlined in Chapter 7. Estimated land and labour productivities as indicated by gross margins are shown in *Figures 8.1* and *8.2*, the data necessary to relate output to capital investment not being available. The contrasts in productivity in the east and south as compared with the west and northwest are evident, the range and diversity being greater in labour productivity than in land productivity.

The spatial patterns of productivity are the outcome of a great complex of variables, the principal influences probably being land quality, farm size, farm enterprise, livestock and crop productivity, capital investment, accessibility to inputs and markets, labour supply, and varied social and personal factors. The importance of inherent land quality differences is indicated by the fact that the livestock carrying capacities of the best soils are estimated to be twice those of the least productive soils; actual land productivity variations are substantially greater but physical differences must account in part for the low output levels prevailing in the west and north. Farm size and farm labour density have an important bearing on labour productivity, reflected in the correspondence between *Figures 2.4, 3.2* and *8.2*. Output per person is very low in the small farm areas where there is still a large and underemployed labour force, estimated to have been twice as large as required in Connacht and Ulster in 1960 (Department of Agriculture, 1962, 42). Output per hectare is also low, reflecting in part the agricultural orientation, with a strong emphasis on cattle and sheep production. The predominance of drystock accounts in large part for the low land productivity in much of north Leinster but labour productivity

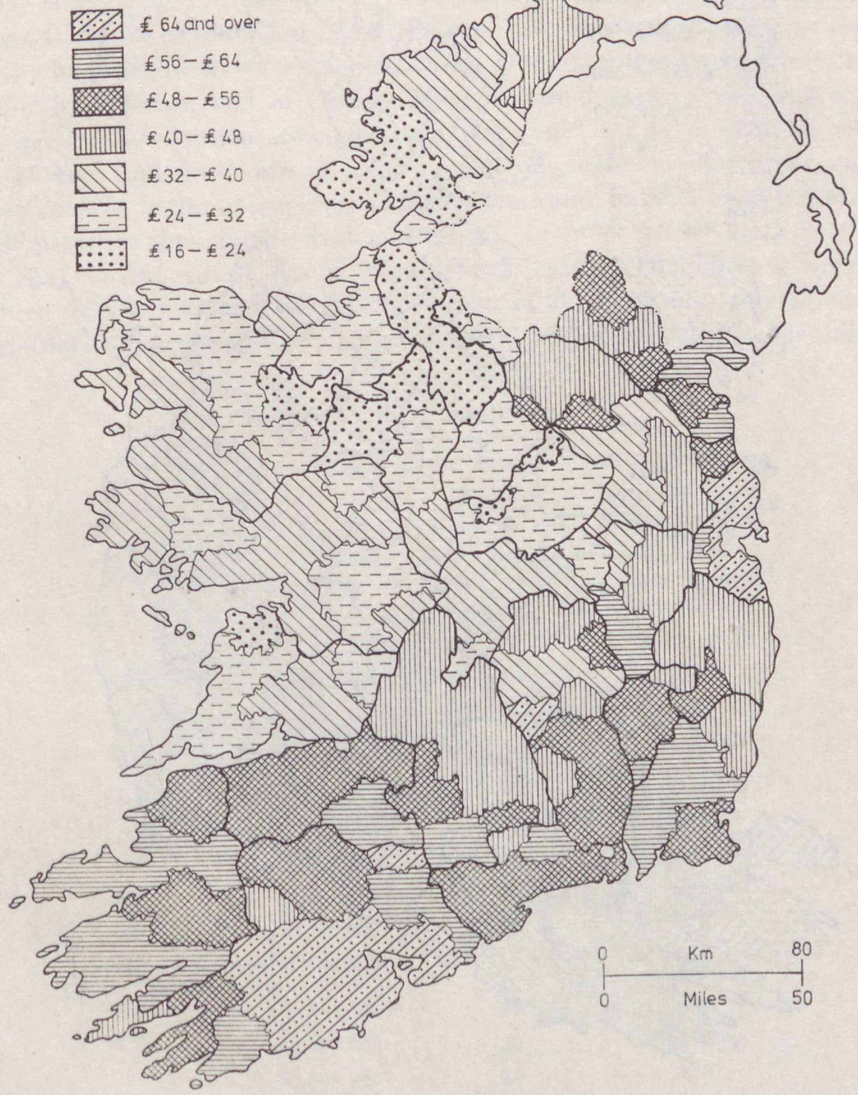


Fig. 8.1. Land productivity

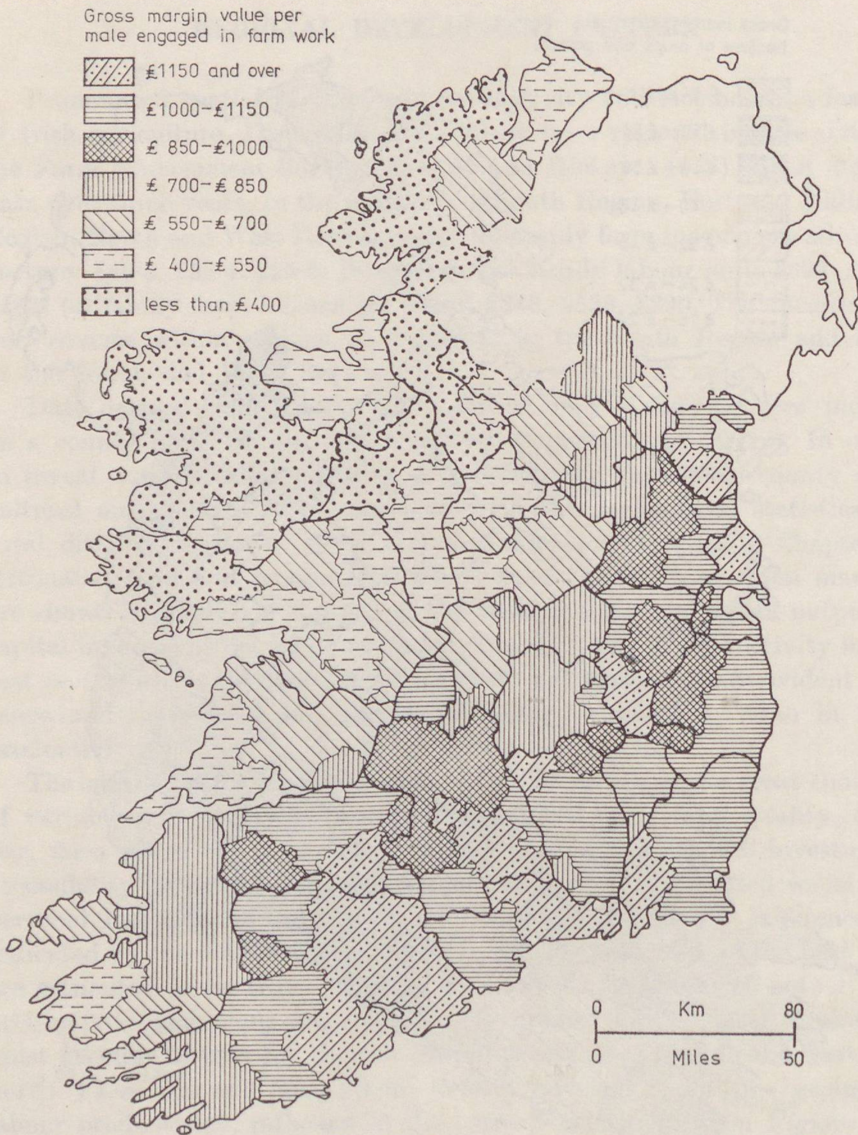


Fig. 8.2. Labour productivity

is higher than on the small farms of the west. In contrast, high land productivity is associated with dairying and arable crop enterprises, especially where these are combined, as in south Cork. Intensive enterprises contribute to the high productivity levels of County Dublin, where horticulture is of major importance, and of County Monaghan and east Cavan, where pig and poultry production are significant. High land and labour productivity in the east and south are in part a result of greater capital investment, easier access to input supplies and markets, and more favourable social circumstances than in the west and north.

The marked differences in productivity between the type-of-farming groups *(Table 8.2)* indicate the influence of farm system, though other variables such as land quality and farm size are also reflected in the values

Table 8.2.

Gross margin values (£) by type-of-farming group

Group	Total gross margin	Gross margin per hectare crops and pasture	Gross margin per male engaged in farm work
A	27,209,000	60	1,172
B1x	17,287,300	58	1,228
B1y	22,400,200	43	799
B1	39,687,500	48	942
B2x	8,921,600	39	780
B2y	23,310,300	50	1,098
B2	32,231,875	46	987
B3	8,272,500	46	710
B	82,390,000	48	932
C1	10,583,500	28	499
C2	22,481,500	29	462
C	33,064,900	29	473
D	14,138,100	34	459
E	3,981,800	32	707
F1x	32,185,900	50	845
F2x	11,341,400	50	907
F	43,527,300	50	860

because of the distinct spatial pattern of the groupings (see *Figs 7.6* and *7.7*). Both land and labour productivity are highest in A, the group most oriented towards arable cropping, and in B1x, where dairying, cattle production and arable cropping have nearly similar roles. Land productivity is quite high in groups B and F but, with a higher labour density, gross margin per person is less in the dairying area. Land productivity is very low in groups C, E and D, where cattle are dominant or very important and succeeded by milk, arable crops and sheep respectively. With a lower density of labour, gross margin per person in E is comparatively high. Not only are incomes low in drystock areas but also they are unstable.

Although problem farms occur in all parts of the country and there are scattered areas of farm difficulty, such as the Wicklow uplands and the midland bog margins, the regional problem in Irish agriculture is largely one of the west and north. The western development region is officially delimited in terms of eleven counties and part of a twelfth, comprising Donegal, Monaghan, Cavan, Longford, Leitrim, Sligo, Roscommon, Mayo, Galway, Clare, Kerry and west Cork. Administration is simplified by the fact that this region forms a contiguous area bounded on the east by a single continuous line. The western development region incorporates 43 per cent of the area of crops and pasture and 53 per cent of farm employment in the state, indicating the magnitude of the problem and the extent to which the retarded development of the region is a burden on the national economy. There has been a comprehensive study of the low farm income problem. in the west by the Department of Agriculture and Fisheries (Scully, 1971).

The development of western agriculture is hindered by many physical economic and social difficulties. The natural resource base is generally inimical, physical disadvantages including rugged relief, inadequate drainage, poor soils and unfavourable climatic features. Most holdings are too small, with inappropriate farming systems, and fragmentation is a problem in parts of the west. Resource productivity is low, farm output is inadequate and there is a substantial subsistence element in the agricultural economy. Because of the small scale of operation and remoteness from supply sources and markets, there is an unfavourable relationship between input and output prices. Farm income on most holdings is very low. There is little capital investment and technical advance has lagged behind other parts of the country. Prolonged emigration of the young and better educated people has deprived the west of potential sources of innovation and leadership. The residual farm population has a high age structure, lacks initiative and organisational ability, and is not adaptable to change, so that traditional modes are important in western society. The number of bachelors, the lack

of successors and the low level of education are features of the population. Household and general social amenities are grossly inadequate. The western farm problem is all the more acute and significant in the context of regional imbalance because of the dominance of agriculture in the economy of the west, with its weak urban structure and inadequacy of alternative employment opportunities.

Recognising the regional development problem, state agencies have adopted a number of measures designed to improve conditions in western agriculture. An important initial effort to promote economic development was made by the Congested Districts Board between 1891 and 1923. Agricultural improvement was effected through encouragement of the use of fertilisers, proper rotations, better seeds and improved livestock, and through the relief of rural congestion by farm enlargement, consolidation and development. Following recommendations made by an interdepartmental committee established to examine the special problems of western agriculture (Department of Agriculture, 1962), three major improvement measures were initiated in 1963–64. County development teams were instituted in each of the twelve western counties with the function of encouraging maximum use of existing public services and stimulating worthwhile new ideas for development, their sphere of activity including farming. Increased subvention was applied towards effecting a substantial expansion in the agricultural advisory service in the west. Under a pilot area development programme, demonstration areas were selected in each of the western counties in order to study local problems, to determine the most effective means of solving them and to stimulate and organise action programmes. Specific measures applied to the pilot areas include intensive advisory assistance, promotion of group effort, supplementary grants for farm buildings and land reclamation, credit provision and co-ordination of the activities of government agencies. In 1965 the Western Regional Office of the Department of Agriculture and Fisheries was established at Athenry, County Galway. There are several spheres in which special assistance is given to western farmers, including livestock improvement, seed supply, floor prices for oats, extra grants for land reclamation and the payment of unemployment assistance to smallholders. In the Irish-speaking Gaeltacht areas there are specific schemes relating to land reclamation, grassland improvement, tree planting, glasshouse tomato production and livestock breeding. In addition to the measures confined to western areas or incorporating a differential in favour of them, certain national schemes apply to the west proportionately more than to the remainder of the state because of the nature of its agriculture. These include in particular the

structural reorganisation work of the Irish Land Commission, the derating of farms of low valuation, grant differentials in favour of small farms, land reclamation schemes and mountain sheep subsidies.

Because of the magnitude and complexity of the western agricultural development problem, clearly there can be no simple and rapid solution. Scully (1969 and 1971) distinguished between the short-term need to help those at present on the land to achieve a better standard of living and the long-term aim of developing a viable agricultural industry, referring to the necessity to reconcile the short-term with the long-term objectives. There is a fundamental need for development programmes and action at both individual farm and also group level. More intensive and efficient farm production and better organised marketing are interdependent elements of development. Education should aim at promoting application of modern farming techniques and at instilling into farmers confidence and desire to succeed. A comprehensive co-operative organisation could play a major role in the provision of inputs at competitive prices, the development of orderly marketing structures and encouragement of the adoption of new techniques. Structural reform, involving the enlargement and consolidation of farms and the provision of access to land for those who are able and prepared to work it, is vital to long-term development. There is a great need to provide more alternative employment for those who wish to leave farming, for some who would otherwise enter farming or migrate and for those who wish to supplement their farm income. The prospects for agricultural development are dependent on conditions in other sectors of the regional economy. The improvement of farming must not be treated in isolation but as an integral and important component of an overall and fully co-ordinated economic and social development programme for the west.

The considerable spatial variations in the nature and productivity of Irish agriculture render the imposition of many uniform national policies inappropriate. Yet state agricultural policy, with the exception of western development measures, is almost completely lacking in a spatial dimension. The regional impacts and policy conflicts of existing and future state programmes need study and evaluation. This applies for instance to the extent to which huge support of the dairy industry has accentuated regional income disparities, with the dairying counties of Waterford, Cork and Limerick ranking amongst the four counties with the highest per capita farm incomes. Sufficient information on the physical resource base and the spatial characteristics of Irish agriculture now exists for regional planning to be initiated. As the subsistence element in farming diminishes, the

opportunity to concentrate production in the most suitable areas increases. In promoting the expansion of individual enterprises, spatial suitability and relationships with regional income patterns should be given due consideration. There is a great need for regional land use planning and agricultural development promotion, as an integral part of the formulation and implementation of comprehensive regional plans, with reconciliation of regional and national goals and policies.

AGRICULTURE AND THE ENVIRONMENT

Discussion of agricultural development must take into account the effects which the means of increasing farm productivity may have on the environment. Environmental change is inherent in agriculture, from the clearance of natural vegetation by the country's first farmers in prehistoric times to the impact which modern chemicals have on the biosphere. The appearance and character of the Irish countryside are largely an outcome of activities associated with farming. Human intervention and change are not inherently harmful but the ability of man to modify the environment is much greater than ever before and modern agriculture is exerting increasing environmental pressures and involving growing costs to the community, with implications for the future welfare of agriculture itself. The increasing intensification and specialisation of agriculture bring great economic benefits but they are based on the use of a growing volume of inputs and application of modern technology, which have many detrimental effects on different components of the environment and result in a greatly simplified but consequently less stable agricultural ecosystem. Those practices which have the greatest impact are principally the application of chemical pesticides and fertilisers, adoption of intensive livestock production methods, silage making, use of more powerful farm machinery, construction of larger farm buildings, reclamation of uplands, arterial and land drainage, and removal of hedgerows.

Because of the comparatively low levels of usage of chemical pesticides and fertilisers and of intensification of livestock production, the contribution of agriculture to environmental pollution is much less in Ireland than in many countries but the effects are increasing significantly. Much attention has focused on the broad-spectrum persistent pesticides, particularly the extent to which their residues are dispersed through the environment and accumulate in higher organisms, and the diminishing efficiency of pest control resulting from development of resistance to pesticides and destruc-

tion of natural predators. Greater use of crop rotation, biological controls and more specific pesticides could be made as alternative means of pest control. There are differences of opinion about the contribution of commercial fertilisers to the increasing levels of nitrate and phosphate in water and the ecosystem but the effects cannot be ignored. Over-application should be avoided and recycling of essential plant nutrients practised to the maximum possible extent. Thoughtful use of chemicals is essential to the wellbeing of agriculture and the environment.

The confinement of increasing numbers of livestock in intensive production units is resulting in pollution problems associated with the accumulation of large quantities of waste material at specific points. Intensive management systems are most common in pig and poultry production but some have been developed for cattle and sheep. Lakes in the north midlands are being seriously contaminated by pig and poultry units through discharge of untreated effluent into water courses and runoff from land. Slurry was regarded by farmers as waste material to be disposed of in the cheapest way possible but increasing costs of fertilisers are prompting greater interest in its nutrient value. Recycling of animal waste can lessen environmental harm but the capacity of the land to take slurry has limits and there must be precautions to avoid runoff from spreading. Unpleasant smells may be a problem, especially near residential areas. The polluting capacity of silage effluent is two hundred times that of domestic sewage, the effects being all the greater because silage making occurs when the diluting power of rivers is greatly reduced because of their low water levels. Much greater control and care are necessary in the siting, design and operation of livestock housing and silage layouts in order to minimise environmental damage.

There are many ways in which modern agriculture can lessen the aesthetic, historic and scientific quality of the rural landscape if there is inadequate appreciation of the need for conservation. Sites and buildings of archaeological, architectural and scientific value have been damaged or destroyed. Wildlife habitats have been impaired by drainage works and land reclamation encroaches upon the upland environment. Modern extensive and tall farm buildings, out of scale with the landscape, are an increasing intrusion in the countryside and may detract greatly from its visual appearance if proper attention is not given to their siting, design, building materials and colour. No thorough assessment of the benefits and costs of hedgerow removal has been made but the main motives include enlargement and regularisation of fields for the efficient use of machinery and controlled grazing, reduction in hedgerow maintenance costs and the

release of land previously occupied by boundaries. Costs include the financial expenditure, the destruction of habitats for wildlife, flora and timber, the loss of shelter and the destruction of an important aesthetic feature of the Irish landscape. Because of the dominant role of grazing livestock, the extent of hedgerow removal in Ireland has been small compared with areas of arable crop farming systems.

Change in Irish agriculture is essential and desirable but change must be controlled in order to minimise the costs to the community as a whole because of deterioration in environmental quality. Proper management of the agricultural resource base must incorporate environmental conservation and not just narrow economic objectives; very often reconciliation of the two goals does not necessitate great departure from long-term maximum profitability. The importance of the role of farmers as guardians of the countryside, as well as producers of food and generators of income, must be fully appreciated in government policy.

APPENDIX A

CROPS AND LIVESTOCK (1922, 1952, 1972)

	1922	1952	1972
		hectares	
CORN CROPS	396,094	443,685	375,100
Wheat	15,464	102,963	68,000
Oats	311,410	247,305	52,100
Barley	66,035	91,186	251,600
Rye	2,864	1,774	400
Beans and peas	321	458	3,000
ROOT AND GREEN CROPS	300,518	243,128	130,800
Potatoes	164,609	125,462	44,100
Turnips	80,532	51,367	30,600
Mangels	35,498	29,344	6,900
Sugar beet	—	21,973	34,000
Other root and green crops	19,879	14,982	15,200
FRUIT	3,717	4,794	3,800
TOTAL CORN, ROOT AND GREEN CROPS ETC.	702,301	696,084	509,800
HAY	883,995	781,836	978,700
PASTURE		3,212,552	3,340,900
TOTAL CROPS AND PASTURE		4,690,472	4,829,400
		number	
CATTLE	4,375,417	4,309,007	6,438,100
Milch cows	1,289,407	1,159,326	1,894,800
Heifers in calf	103,492	88,501	249,800
Bulls	32,659	21,908	15,800
Other cattle 2 years and over	1,060,995	1,161,680	1,121,100
Other cattle 1–2 years	905,303	949,734	1,534,800
Other cattle under 1 year	983,561	927,858	1,621,900
SHEEP	2,794,434	2,856,791	4,260,400
Ewes for breeding	1,231,363	1,164,469	1,873,800
Rams	45,556	41,183	50,500
Other sheep 1 year and over	453,829	442,254	377,300
Other sheep under 1 year	1,063,686	1,208,885	1,958,800

	1922	1952	1972
		number	
HORSES AND PONIES	486,959	341,701	112,100
PIGS	938,059	719,412	1,199,100
Sows and gilts in pig	98,047	83,769	128,900
Boars	1,725	1,615	2,800
Other pigs 3 months and over	838,287	277,824	550,600
Other pigs under 3 months		356,204	516,800
POULTRY	17,246,090	19,378,783	11,733,800
Turkeys		1,535,668	502,700
Geese		674,777	131,900
Ducks		799,002	194,200
Ordinary fowl over 6 months		8,962,765	4,761,200
Ordinary fowl under 6 months		7,324,202	6,143,800

*

The classification of crops and livestock used in this table is that of the official agricultural statistics.

APPENDIX B

QUANTITATIVE TECHNIQUES

LEAST SQUARES COMBINATIONS

Crop, livestock and enterprise combinations were classified on a rural district basis by the least squares method. This technique was devised by Weaver[1] as a statistical method of representing crop associations and identifying the most important crops in areas. He ranked the crops in each area in descending order according to the percentages of the total agricultural land which they occupied. The crops which were most important to the area and typified it lay at the high value end of the set; the problem was to decide objectively how many should be included in the crop combination index. Weaver did this by comparing the observed percentages in each area with a series of hypothetical distributions or models, in which the land would be divided equally among a number of crops. If monoculture were practised, all of the land would be devoted to a single crop; in a model two-crop combination, 50 per cent of the land would be in each of two crops and 0 per cent in all others; in a model five-crop combination, 20 per cent of the land would be in each of five crops and 0 per cent in all others. The model combination to which the observed distribution approximated most closely was taken to represent the area. This was mapped by using symbolic letters to indicate the appropriate crops in the combination. The method was applied to studies of livestock combinations by Weaver, Hoag and Fenton[2] and enterprise combinations by Coppock[3] and it has been used quite widely by agricultural and other geographers.

The least squares procedure used in this book is the version modified by Thomas[4] and described by Hammond and McCullagh.[5] In each rural

[1] J. C. Weaver: Crop combination regions in the middle west. *Geographical Review*, 44, 1954, 175–200.

[2] J. C. Weaver, L. P. Hoag and B. L. Fenton: Livestock units and combination regions in the middle west. *Economic Geography*, 32, 1956, 237–59.

[3] J. T. Coppock: Crop, livestock and enterprise combinations in England and Wales. *Economic Geography*, 40, 1964, 65–81.

[4] D. Thomas: *Agriculture in Wales during the Napoleonic wars*. University of Wales Press, Cardiff, 1963.

[5] R. Hammond and P. S. McCullagh: *Quantitative techniques in geography*. Clarendon Press, Oxford, 1974.

district, for each model combination the differences between the observed percentages of all crops and the corresponding hypothetical percentages were found, squared and summed. In the most accurate approximation possible, the sum of the squares of the differences would be 0, because the observed and hypothetical percentages would be identical. The closest approximation would be the model combination with reference to which the sum of the squares of the differences most nearly approached 0. This best fit combination found by the least sum of squares identified the desired crop combination for each rural district. All the crops and livestock recorded in the agricultural statistics were taken into account in classification. The rank order of crops, livestock and enterprises was adhered to in mapping, rural districts with the same combination being grouped together (cf. *Figs 5.11, 6.20* and *7.3*).

CLUSTER ANALYSIS

Cluster analysis was used to classify rural districts on the basis of the structure of their gross margin values, to indicate type-of-farming areas. Cluster analysis is the term most commonly used for certain numerical classification techniques which seek to separate data into constituent meaningful groups. A rapid growth of interest in this form of taxonomy since the early 1960s has led to a proliferation of procedures and applications, especially in the biological sciences. The field has been comprehensively reviewed by Cormack[6] and Everitt[7] and, with particular reference to geography, by Spence and Taylor[8] and Greer-Wootten[9]. The utility of cluster analysis in agricultural geography was demonstrated in studies in Wales by Aitchison[10] and in Argentina by Winsberg,[11] both using labour

[6] R. M. Cormack: A review of classification. *Journal of the Royal Statistical Society*, Series A, 134, 1971, 321–67.

[7] B. Everitt: *Cluster analysis*. Heinemann, London, 1974.

[8] N. A. Spence and P. J. Taylor: Quantitative methods in regional taxonomy. In C. Board et al. (eds.): *Progress in geography*, vol. 2, Arnold, London, 1970, 1–64.

[9] B. Greer-Wootten: *A bibliography of statistical applications in geography*. Commission on College Geography Technical Paper No. 9, Association of American Geographers, Washington, D. C., 1972.

[10] J. W. Aitchison: *The farming systems of Wales*. Department of Geography, University College of Wales, Aberystwyth, 1970. J. W. Aitchison: *Cluster analysis, regionalization, and the agricultural enterprises of Wales*. Paper read to meeting of Commission on Agricultural Typology, Verona, Italy, 1974.

[11] M. D. Winsberg: Una regionalización estadistica de la agricultura en la Pampa Argentina. *Revista Geografica*, 72, 1970, 45—60.

requirements as the common measure of enterprise importance. Although cluster analysis is a valuable quantitative technique, there are many subjective decisions necessarily involved with respect to the particular procedure chosen, the measure of similarity between groups and the level of grouping adopted, theoretically optimum solutions not being practically attainable.

The computer programme used in the present study was STU3CLUST, a hierarchial grouping procedure, provided by S. Daultrey, University College, Dublin. It is an adaptation of the Clustan program package developed by D. Wishart. The clustering process can most easily be described with respect to the analysis of farming type by county. There was a set of 26 cases, the counties, each measured on seven attributes or variables, the contributions of seven enterprises to total gross margin value. Clustering was done without regard to the contiguity of counties. The 26 original cases were defined as single-member 'groups' and were then reduced in number by a series of 25 step-decisions until they were finally fused into one group. As the method proceeds by successive fusions, it is termed agglomerative. At each step, the two groups which were most alike were joined together, the measure of similarity being the squared distance in seven-dimension Euclidean space. The sequence of clustering is shown graphically in the dendogram drawn from the computer output (cf. *Fig. 7.4*). Having measured each case with the others in a distance matrix, the algorithm first grouped Leitrim and Longford at the least-distance value of 0·333. The group most similar to the new Leitrim-Longford group was Sligo, with which it merged at 1·272 distance, four other fusions having previously occurred. Clustering at levels of increasing generality proceeded in this way, the order of fusion indicating the relative similarity between groups, until Dublin finally fused with a group comprising the other 25 counties at 7·703 similarity distance. The level of classification at 3·5 distance was selected as yielding meaningful groups for delimitation and mapping (cf. *Figs 7.4* and *7.5*).

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