

WEST DONEGAL RESOURCE SURVEY

**Part 4 — Summary, Conclusion and some Development
Proposals for Agriculture**

An Foras Talúntais



WEST DONEGAL RESOURCE SURVEY

Part 4 — Summary, Conclusion and some Development
Proposals for Agriculture

Published by An Foras Taluntais, 33 Merrion Road, Dublin 4

Price: 10/-

December 1969

FOREWORD

The continuing decline in population and the various physical, economic and social problems that beset many of our western counties have concerned people at all levels for more than a century. Various studies of the problems have been conducted from time to time, remedies have been proposed and solutions sought and different approaches have been tried. Considerable national effort and finances are being devoted in various ways in an attempt to overcome the problems but these areas are still largely underdeveloped. The economic, social and cultural well-being of the people of these areas and of the entire nation stands to benefit from any development that can be achieved. Some of the most adverse conditions obtaining in the whole western region of Ireland are those to be found in West Donegal—an area poorly endowed in physical resources and reflecting all the ills of a high rate of emigration, an adverse population structure, an underdeveloped agriculture, low income levels and several other rural problems.

Against this background, the Council of An Foras Taluntais decided that the complex situation prevailing in West Donegal should be examined and appraised in a systematic, scientific manner and, having thoroughly analysed the findings and within the context of modern knowledge and techniques, some models for the agricultural development of the area should be established.

While there was a certain background of experience and information on such problems as emigration and farm resources and income this knowledge was of a general nature, the position in this respect being akin to that for many other areas of the country. There was no precise or co-ordinated information on such matters as the nature, distribution and the best use of different types of land, on present and potential levels of productivity, on norms for grassland output and animal production, on farm incomes, on educational levels or on the social background in the local farming community.

It was felt then that the way in which we, as an agricultural research organisation, could best contribute would be through a comprehensive survey of the agricultural resources of the area. Of course, agricultural improvement is only one of the means of improving living standards in the area. No matter how well developed, agriculture can only support a proportion of the population. Development in agriculture must go along with expansion in tourism, fishing, industry and other enterprises. The findings of the survey, then, will be used not only as a basis for agricultural development but will also be correlated with those of surveys by other organisations in an effort to create an integrated programme of community and general area development.

The carrying out of a sufficiently comprehensive resource survey presented a formidable task demanding the collective efforts of people in a wide variety of disciplines covering the physical, economic and human behavioural aspects. The experience gained on methodology and organisation in the course of a previous resource survey of West Cork was of great value. The report of the present survey will go further than that of West Cork by preparing working plans or operational models, within current economic considerations which would form the basis of the future agricultural

development of West Donegal and of areas with similar problems in the West of Ireland. Surveys such as this are a prerequisite for optimum use of land resources within a framework of economic and social development. While we appreciate that the knowledge provided in the Survey Report is in certain respects incomplete, the primary objectives of the survey in providing a blueprint for the development of the land and the betterment of the people using the land have been largely achieved. It is hoped that the information provided will serve its purpose as a basis for guiding developments towards the future well-being of the entire community.

It is a pleasure to be associated with the highly merited acknowledgement given below to those within An Foras Taluntais and the many outside who co-operated with us in this project. Finally, may I commend the efforts of the Working Party who embarked on and completed this task with such dedication and enthusiasm.

T. Walsh,

Director

PREFACE

The more pronounced rural problems in Ireland are to be found in the western counties. However, the western region is far from homogeneous in the quality of its resources and far from uniform in its rural problems. West Donegal is amongst the most poorly endowed areas in physical resources and one of the most extreme in rural problems.

In order to make a thorough, scientific and systematic appraisal of the situation in West Donegal a comprehensive resource survey was undertaken by An Foras Taliintais (The Agricultural Institute). The survey commenced in 1965 and the field investigations were generally completed by the end of 1967. A Working Party¹ drawn from research staff of the Soils, Plant Sciences, Horticulture and Forestry, Animal Sciences, Animal Husbandry and Dairying and Rural Economy Divisions of the Institute was primarily responsible for the survey. Co-operating agencies at State and local level included: Department of Agriculture and Fisheries, Department of Lands, Department of Social Welfare, Roinn na Gaeltachta, Central Statistics Office, Meteorological Office, Geological Survey, Bord Iascaigh Mhara, Gaeltarra Eireann, An Foras Forbartha, Co. Donegal Agricultural Advisory Services, Irish Sugar Company (Errigal Co-op.), Bord na Mona and Muintir na Tire and other non-statutory bodies. While the main onus for the operation of the resource survey has rested on the working party they in turn have been able to draw on the research resources of the Institute as a whole and to consult the State bodies and personnel engaged in the area and other outside specialists.

The procedure followed in conducting this survey was based largely on experience with a similar type survey of West Cork some years previously. Most of the findings were derived by five methods:

- (a) complete surveys in the field, *e.g.*, soils, ecology, animal diseases;
- (b) farm surveys on a random selection of different-sized farms in the area;
- (c) field experiments, *e.g.*, crop productivity, grassland, horticulture;
- (d) questionnaires to farmers, local groups and others;
- (e) use of existing knowledge on the area, *e.g.*, climatic records, population and other statistics.

With the emphasis on compiling factual information on the physical, economic and social factors of production as a basis for decision-making and planning and with the lack or inadequacy of such information on many facets, survey and experimental projects were necessary. These research procedures were aimed at getting the answers to local problems in their local environment. During the survey the need for further research, mostly of a long-term nature, into certain aspects was brought to light.

¹ The Working Party comprised the following members of the research staff of An Foras Taliintais: E. Attwood,* P. Commins, P. Gallagher, J. Lee, B. Lewis, R. McCarrick, P. McDonnell, W. Murphy, M. Neenan,* D. Poole, Miss M. Prendiville, D. Robinson, V. Vial,* P. Ryan* (Chairman and Director of Survey), Miss O. Daly (Technical Secretary).

*Members of drafting committee of Part IV of the Survey Report.

The principal aims of the survey were:

1. to provide basic, factual information in a systematic manner on the physical, human and economic resources of this underdeveloped area;
2. to ascertain to what extent and by what means the area can provide a good living for a more stable population through agricultural development.

The Resource Survey was confined to the Glenties Rural District of West Donegal. The area comprises approximately 411 square miles (263,000 acres). The Atlantic Ocean forms the southern and western boundaries of the region. The coastline is rugged and deeply indented in places. Some islands occur off the coast; of these Aran Island is by far the biggest. The area has a number of small towns and villages, the most important being Killybegs, Glenties, Ardara and Dunglow.

The findings of the West Donegal Resource Survey are published in four parts covering broadly different aspects of the Survey findings:

Part I —Soils and Other Physical Resources.

Part II —Some Aspects of Production—Crops, Livestock and Fisheries

Part III—Economic, Demographic and Sociological Aspects.

Part IV—Summary, Conclusion and Some Development Proposals for Agriculture.

For their co-operation and assistance, the West Donegal Resource Survey Working Party is grateful to the County Agricultural and Horticultural Advisory Officers and in particular Mr. D. O'Donnell, C.A.O.; Rev. Fr. J.McDyer, Glencolumbkille; Mr. P. Bolger, County Development Officer and to the officers of various other services and organisations in the area.

Special thanks are due to the local people and particularly to the farmers who facilitated the different surveys carried out in the area and without whose co-operation the Resource Survey would not have been possible. Here also the excellent support of the various non-statutory rural organisations in the area is acknowledged.

Grateful acknowledgement is due to the Government Departments and other State Bodies listed above whose personnel so willingly gave their co-operation and help. To those named in the acknowledgements to the previous three parts of the Survey Report we repeat our particular appreciation.

The Working Party appreciates the continued interest, stimulation and guidance of the Director, Dr. T. Walsh, and the excellent collaboration of fellow workers in An Foras Taliintais, not only those making direct contributions but also those who conducted surveys and gave help in other ways. In this regard particular thanks are due to Mr. M. Brannick, and other colleagues in the Rural Economy Division who conducted the farm surveys and to those in the same Division who processed the findings. Finally thanks are due to those who assisted in the preparation of the report and especially Mr. B. Gilsean for his editorial work, Mr. T. Kendrick and Mr. J. Lynch for drawings and maps, Miss A. Davin for typing facilities and Miss O. Daly for general help.

On behalf of the Working Party may I sincerely thank all who helped.

An Foras* Taluntais
December, 1969.

Pierce Ryan.
Chairman, Working Party

CONTENTS

	<i>Page</i>
Introduction	1
Summary of Resource Survey Findings	
1. Soils and other physical resources	1
2. Some aspects of production	5
3. Economic, demographic and sociological aspects	9
Agricultural Development in West Donegal	
1. Background	16
2. Proposed approach	16
3. Land quality classes	18
4. Major considerations underlying proposed developments	20
5. The development of acid blanket peats	22
6. Intensive livestock systems	28
7. Moderate-intensity livestock systems—cattle sheep farming	32
8. Changes in farming population	46
Possibilities for Wildlife Development	49
West Donegal—the Future	54

INTRODUCTION

The West Donegal Resource Survey had two broad aims: (1) to appraise in a scientific manner the basic resources—physical, economic, human and social—of this underdeveloped area with particular reference to agriculture; (2) to examine how these resources could be used to better effect in providing improved living standards for a more stable population. The main findings of the resource appraisal have been presented and discussed in Parts I, II, and III of the Resource Survey Report. Part IV comprises a summary of these, followed by some development proposals mainly concerned with agriculture.

The proposals for agricultural development are in accord with the resources available and with the economic and social conditions currently obtaining in the area. They outline procedures, general scales of operation and costs necessary to bring a farm enterprise to the point of economic viability where it will be capable of surviving and maintaining its competitive position *vis-a-vis* developments in farming and in the rest of the economy generally. They are not intended as an immediate panacea for the socio-economic ills of West Donegal. On the contrary they would only be a basis for developing the agricultural sector and it is strongly emphasised that developments must take place in several other sectors, *e.g.*, tourism, fishing, industry, if the general economy of the area is to be improved. The development approach here is only one of a number of possible approaches and the one to be applied finally will depend largely on what is regarded as the desirable direction and feasible scope of development for the area.

SUMMARY OF RESOURCE SURVEY FINDINGS

1. Soils and other physical resources

A study of the local environment and physical resources included an examination of climate, geology, land forms and soils.

CLIMATE

The climate of West Donegal has many disadvantages: by national standards rainfall is high and frequent, winds are constant and of considerable force at times, the general mildness is marred by a restricted frost-free period and there is less bright sunshine than in most other parts of the country.

Rainfall

Annual rainfall varies from place to place throughout the survey area but the averages for the different recording stations (1951 -64) are within the range of 1,100 to 1,800 mm (43 to 71 inches). It is estimated that at the higher elevations *e.g.*, Slieve League, the average annual rainfall is about 2,500 mm (approx. 100 in.). The north-western portion has at least 140 mm less rainfall in any year than the south and south-east of the survey area. There is considerable variation in rainfall from year to year. The minimum average monthly rainfall occurs in the April-May period and the maximum

in December; the difference on average however, is only about 115 mm (4 to 5 in.). It is obvious that the area has a high proportion of rain days over the year.

Temperature

The average annual temperature for the area is approximately 9°C which is the same as that for Dublin and about 1° less than that for West Cork. January is the coldest month; average temperature in the coastal areas (1950-64) is 5.1°C and inland (1958-64) is 3.7°C. July-August is normally the warmest period; average temperature is 13.9 C. In the period March to October the temperature is about 1°C lower than for most other parts of the country.

Wind

A serious climatic factor in the area is the velocity and frequency of winds. Most of these fall between 1 and 5 on the Beaufort scale with velocities ranging from 1 to 24 miles per hour. Frequencies vary from 24 days in the month for December and February to 29 days in July. Winds of higher velocities (25 mph and over) occur more frequently from September to March with December and January having on average at least one day of such wind. The prevailing winds are from the south and west. The windswept nature of the area is reflected in many of the landscape features *e.g.*, treeless coastal areas and stunted and warped trees and hedgerows inland.

Sunshine

The average duration of bright sunshine for the January-June period is fairly comparable with that recorded in the more favourable areas in the midlands, east and south of the country but for the remaining 6 months it averages approximately 35 minutes per day less. For certain months the average daily hours of bright sunshine recorded over a number of years has been lower at the Malin Head recording station than at any other station in the country.

Relative humidity

Average relative humidity varies from 77% in April-May to 82% in November-December but the variation from month to month never exceeds 5%. Relative humidity in West Donegal, in general, is 5 to 10% higher than that for the midland region of Ireland.

Groundfrost

The average number of frost days per year is variable especially between inland and coastal districts: averages of 102 and 36 days respectively. There is considerable variation from year to year also. January is the month of most frost. The frost-free period in West Donegal varies throughout the area, especially between coastal and inland districts but, in general, compares rather unfavourably with most other western coastal areas and especially those in the south-west, or indeed with the country in general. Near the coast in West Donegal, up to 6 months (May-October) are normally frost-free but inland, in most years, only the month of July escapes. In West Cork by contrast the average annual frost-free period is between 200 (inland) and 300 days (coastal region).

GEOLOGY

The survey area consists of a great variety of rock formations which are overlain in many parts by glacial drift deposits of very mixed origin and constitution.

Solid geology

The area is underlain mainly by acid igneous and metamorphic formations. Granitic rocks form a large part of the region, quartzite formations are also extensive and minor inclusions of pelites, limestone and others are recorded. Two major geological successions, named the Creeslough and the Kilmacrenan Succession, have been distinguished. During the Caledonian orogeny the area underwent decisive structural and metamorphic processes that determined the present strike and morphology of the rocks.

Drift geology

Many obvious features of the landscape are due to glacial activity, *e.g.*, drumlins, moraines, corries, U-valleys. The drift deposits are variable in character, composition and constitution though derived mostly from local rock formations. The deposits seldom assume the character of a true boulder clay as the argillaceous source rocks of boulder clay materials, *e.g.*, schists and shales, are rare in the region; the only real formations of this nature capable of providing boulder clay materials are on the Glencolumbkille plateau. The majority of the drifts are stony and coarse. The thickness of the drifts is very variable in accord with the strongly variable underlying topography. Glacial drift forms the parent material of most of the mineral soils of the area.

Lard forms

The sculpturing of the regional topography was essentially a Tertiary event which was modified by the Quaternary glaciation. The landscape is rugged, extremely variable and strongly dissected. Except in some coastal districts flat land is very rare. Deep valleys, steep slopes and undulating upland expanses are features of the region.

SOILS

The soils of the area have been surveyed and mapped and their relative suitability and use-range for agricultural and forestry purposes defined. The area occupies 411 square miles or 263,050 acres (approx. 105,000 hectares),

Different soils occurring

According to their occurrence on broadly different landscape situations the soils have been divided into three major classes: lowland soils (0-400 feet O.D.); highland soils (>400 feet O.D.) and valley floor soils (mixed elevation). The lowland soils occupy 49.3% (129,755 acres), the highland soils 46.9% (123,250 acres) and the valley floor soils 1.7% (4,379 acres) of the area; the remainder comprises lakes and other "non-land".

Each of these three broad categories is further subdivided into mineral, organic and organic-mineral (complex) soils. Mineral soils comprise 22.5% (29,241 acres) of the lowland and 0.6% (736 acres) of the highland soils; organic soils (mostly raw peats) comprise 53.8% (69,799 acres) of the lowland and 76.6% (94,395 acres) of the highland soils; organic-mineral soils comprise 23.7% (30,715 acres) of the lowland and 22.8% (28,119 acres) of the highland soils. The valley floor soils comprise mineral and organic soils; they are not considered in this breakdown but are included in the description of the entire area that follows.

Over the entire area, mineral soils occupy roughly 13%, organic soils 63% and organic-mineral soils 22%. Each of these categories is broken down into a number of

soils according to more detailed characteristics of the soil profile. Thirty different soils have been segregated, delineated and mapped. The distribution pattern of these is shown on the Soil Map (Part I). The mineral soils include acid brown earths, brown podzolics, podzols, gleys, some man-made soils and sandy coastal soils and sand-dunes. The organic soils are mostly (about 90%) raw, acid, wet peats, the remainder being reclaimed peats. The organic-mineral soils are complexes of organic and mineral (but largely organic) soils together with some lithosols.

Because of the extent of bedrock exposure in the area and its significance in land-use, rocky phases of different soil units were mapped according to three levels of rock exposure: less than 2%; 2 to 10%; >10% rock exposure.

Soil suitability

It is important to know the quality and productive capacity of soils and the alternative uses for which different soils are suitable in order to guide land-use planning and to cope with changing economic and social circumstances and market demands.

The proportion of soils of wide use-range capable of competitively supporting a variety of crop enterprises, including both grassland and forestry, is very restricted. However, some 3% of the area has soils of a moderately wide use-range: these are only moderately to poorly suitable for tillage cropping and meadowing but are suitable generally for pasture and forestry. Almost another 4% of the area has soils of a somewhat limited use-range: these are poorly to very poorly suitable for tillage: moderately and poorly suitable for meadowing; moderately suitable for pasture and moderately but at times poorly suitable for forestry. The remaining soils, comprising some 90% of the area, have a limited to extremely limited use-range: these are largely unsuitable for tillage, meadowing or intensive pasturing and in many cases also, poorly suitable for general grazing or forestry.

Soil drainage

The natural drainage condition of the soils has been examined as this is such an important factor in the agricultural use of land. About 13% of the soils of the survey area have free to moderately free internal drainage; of these, 45% are excessively drained, 25% are well drained and 30% moderately well drained. The remainder of the soils of the area have defective natural drainage varying from poorly drained mineral (gley) soils to wet, virgin peats to waterlogged salt-marsh. In all then, only 13% of the soils are not in need of artificial drainage as a prerequisite to improve productivity and only slightly more than 3% have ideal drainage conditions.

Lime and nutrient status

The soils of the survey area are very infertile by nature. Apart from their physical shortcomings, gross shortages of lime and of both major and minor nutrient elements are widespread. The situation is a reflection of soil type and local climate. Over most of the area, 90% or more of the soils have medium to very low levels of lime and phosphorus and even on the limited tillage areas only 25% of the soils have satisfactory levels. The potassium position is also far from satisfactory with only some 50% even of tillage soils, having adequate levels. Nitrogen is low throughout and is a particular problem on the peats. Trace element deficiencies are widespread: those which are important in agriculture include boron, cobalt, copper, manganese and molybdenum.

2. Some aspects of production—crops, livestock and fisheries

The position with regard to crops, livestock and fisheries in the survey area has been examined.

CROP PRODUCTION

Arable crops

Tillage cropping, as a commercial enterprise, is strictly limited because of disadvantages of climate, poor soil resources, steep slopes and rockiness, small irregular-shaped fields and the scattered nature of good soils. Oats, feeding barley and some roots for animal feed and potatoes mostly for household consumption are grown locally. But there is a general lack of facilities for tillage farming and there are too many adverse factors for the situation to improve. Industrial crops such as flax, hemp and oil crops would be at a disadvantage compared with other areas. The possibilities for cash or even fodder crops will continue to be limited and such cropping need not be expected to contribute substantially to the farm income of the region.

Horticulture

The same limitations as for general tillage cropping apply to horticulture as a commercial proposition in this area. The climate, in association with the exposed nature of the landscape and its adverse soil conditions, makes the area one of the least suitable in the country for many horticultural crops. Prevailing conditions impose particular difficulties in various aspects of crop production *e.g.*, soil drainage, rotation, manuring, weed and disease control, crop varieties, planting and harvesting.

Limited areas support good crops of high quality celery but yields and returns are slightly less than in more favourable parts of the country. Apart from celery, where the acreage has expanded there has been a general decline in the vegetable acreage. In 1964, 172 acres of vegetables were grown for processing; by 1968 the acreage had fallen to about one-third and almost half of this was outside the survey area (E. Donegal). The reduction in acreage of vegetable crops other than celery has been due to poor yields and associated poor nett returns. Soft fruits and orchard crops offer little scope.

Glasshouse cropping can be considered on a limited scale. The highly mechanised, J-acre production unit is regarded as the minimum economic size and the cost of modern glasshouses is high. The remoteness of the area from major market outlets would be a decided disadvantage. Mushroom production might also be considered but again there are limiting factors.

Apart from the physical difficulties of crop production there is the comparative economic disadvantage to growers in this area. Their production costs will be higher, their potential yields lower and transport and marketing more expensive than in the more favourable areas of the country. Besides, there is a lack of appropriate skills in horticulture. The development of horticulture as a commercial enterprise can hardly be justified on economic grounds or on conditions of technical efficiency. The whole trend nowadays is towards highly mechanised systems of crop production on units of 5 to 20 acres and more. Horticulture has been examined solely from an economic standpoint which is the only important issue in a commercial enterprise. The benefit to the area of the social and educational implications of developing horticulture has not been assessed.

Grassland

The most rational agricultural development in this area is undoubtedly in livestock production based on grassland. Vast tracts of blanket peat carry a natural heath vegetation and a large proportion of this land is grazed as commonage at low intensity stocking. Neither manuring nor management is practiced to any extent. Even the better mineral soils are at a low level of grass production for want of better management.

Manurial experiments on the mineral soils have shown that two-to-four fold increases in output and yields in excess of 10,000 (and up to 15,000) lb dry matter per acre are attainable from moderate lime and fertiliser dressings. The potential of these soils is at least as good as that of comparable soils in other parts of the country. They are also equally capable of producing early season grazing in response to the appropriate manuring and management.

There is considerable scope for improvement in yield and quality of the heath grazings also through surface regeneration techniques involving seeding and manuring. Yields of 3,000-4,000 lb/acre of dry matter were obtained but up to 7,000 lb can be expected as the new sward progresses. But the efficient utilisation of these swards is problematic especially where the peats are in the wet, undrained state and incapable of supporting heavy animals or machinery. Drainage, a vital prerequisite to the best use of these grazings, is costly and good management including manuring must be maintained over the years to counter the tendency of these swards to revert to their natural state.

Responses to manuring on the wet meadows on both mineral and peat soils of the area were also encouraging. Yields of 5,000 to 7,000 lb dry matter per acre are equivalent to 2.5 to 3.5 tons of hay per acre on a 10% moisture basis; these are very satisfactory yields.

Roughly 45 % of the entire survey area or about 120,000 acres could be raised to the levels of dry matter production described earlier; of these, about 13,000 acres are mineral soils and the rest are peats. The remaining 55 % of the area could also be improved but steep slopes, rock outcrops, eroding peat and general inaccessibility would render improvement very difficult and economically unrewarding.

Because of the importance of sward composition in improving grass output whether on the mineral or peat soils, a botanical survey of grassland types in the area was completed.

Forestry

The area has very limited potential for forestry. Exposure is such a hazard that even on the restricted areas of good soils, forest establishment and maintenance are real problems. State forests in the area account for only about 5,000 acres at present. Only two species of trees have been found generally suitable for the area: Sitka spruce and a vigorous strain of *Pinus contorta*. Others are possible in limited favourable sites. All land planted so far required extensive preparation by drainage, ploughing and fertiliser application.

A survey of forestry potential reveals that forestry would not be a commercial proposition on about 80% of the area. On the remaining 50,000 acres worthwhile commercial production can be expected from at most half of this area and much of this better land will not become available. The resources of available plantable land are unlikely to support any substantial timber industry within the area itself but in a broader geographical context outlets for the timber would be available.

Apart from the commercial prospects which are very limited, forestry has a vital role in shelter and amenity values in an area like West Donegal and to serve these purposes and for other social reasons, more general afforestation may be well justified.

LIVESTOCK PRODUCTION

Livestock farming

The majority of farms carry cattle either alone or with sheep.

Cattle in the area are mostly Aberdeen Angus or crossbred Aberdeen Angus-Shorthorn or Hereford-Shorthorn. The total number in the 1965 Agricultural Enumeration (C.S.O.) was 17,141 of which 6,654 were cows and heifers-in-calf. The present survey established that the average herd for all-size farms in the area was approximately 5 livestock units comprised of 2 to 3 cows and the remainder mainly calves and cattle under 2 years old. This is much too low for a worthwhile livestock enterprise.

Sheep enterprises in the area in general operate at very low efficiency; flock sizes are small and not well managed. The Scottish Blackface is the main breed kept. Although there were 29,356 breeding sheep recorded in the area in the 1965 Agricultural Enumeration the average flock number for all-size holdings was found in this survey to average less than 30 breeding ewes. Lambing rate is 80-90% but survival rate is very poor.

There are very few pigs throughout the area but some effort has been made recently to promote pig rearing in the Glencolumbkille district. There is little interest in pigs because returns are generally poor on account of the higher cost of both feedstuffs and marketing than in most other areas of the country. Poultry numbers have declined rapidly in recent years.

Farm buildings

Farm buildings are of very poor standard on almost all farms; in fact specialised farm buildings scarcely exist in the survey area. General farmyard facilities *e.g.*, stock pens, dipping tanks, silos, piped water are extremely rare and farm roads are very poor.

Animal feeding

The two greatest limiting factors in livestock production in West Donegal are the extremely low stocking rates and the poor feed situation. In the latter instance the most serious shortfall is in winter and spring when feed supplies are grossly inadequate especially for growing and lactating animals. The mainstay of the winter and spring feed is hay of inferior quality. Analyses of random samples of hay show mean values on a dry matter basis of around 9 % for crude protein (within a range of 5 to 15.5 %) and a starch equivalent of about 37. Most of the hay comes from old meadows harvested late in the season. The other sources of feed are the produce of the limited acreage of oats, which average one-third of an acre per farm, and purchased feed, mainly concentrates, of which the average purchased per farm per annum is about 12cwt.

Almost all of the winter feed is given to cattle. Little provision is made for sheep which seem to get nothing by way of supplementary winter feed in most cases and have to depend on grazing over the entire year. The quantity and quality of the rough grazing is very poor in winter and spring and is unlikely to satisfy even maintenance

requirements of the animals. Winter mortality of ewes and hogget lambs is high; the survey showed losses of 13 and 33% respectively. Only about half of the lambs born reach weaning stage. These heavy losses and the generally low fertility of the breeding ewes are largely a result of the poor winter nutrition. It is difficult to see how the level of nutrition can be improved sufficiently as long as the ewes are left on the hills over winter. If over-wintered close to the farmstead then hay or silage with some concentrates could be provided during the winter-spring period.

To improve the standard of nutrition of the present low stock numbers and to cater for much-needed intensification of stocking, grassland output must be greatly increased and improved conservation practices for hay and silage introduced.

Disease and mortality

Losses in lambs, wethers and ewes are heavy in this area mainly from (a) drowning, predators and other accidents, (b) malnutrition and weather hardships, (c) internal parasites and (d) bacterial and viral diseases. Malnutrition is a major contributor to many accidents and diseases. Braxy is the most common bacterial disease in sheep but is somewhat controlled by routine autumn vaccination of lambs. The most important tick-borne diseases of sheep are louping ill and tick pyaemia. Conditions afflicting sheep to a lesser extent include photosensitisation, ophthalmia, footrot, intestinal tapeworms and "gid" or head-staggers.

Both cattle and sheep are affected by conditions associated especially with grazing *e.g.*, parasitism and irregularities of mineral nutrition. Mortality due to liver-fluke is not unduly high but much unthriftiness and lack of vitality is caused. This is the most important parasitic disease of cattle in the area and is a major risk under the climatic and soil conditions prevailing. Other internal parasites causing problems include gastro-intestinal roundworms and lung worms (hoose). Ticks are the main external parasites afflicting stock. With 90% of the soils of the area very deficient in phosphorus it is to be expected that aphosphorosis is common where fertilisers are not used or mineral supplements fed. Cobalt deficiency in soils and herbage is widespread and unless remedial or preventative measures are taken grazing stock will be adversely affected. Some copper deficiency is also suspected.

There are no specific cattle diseases of exceptional importance. Brucellosis, formerly of low incidence in the area, has been eradicated since 1968 under the Department of Agriculture and Fisheries Eradication Scheme. Louping ill is increasing somewhat in incidence in areas where the disease is prevalent in sheep. Minor occurrences of mastitis, digestive disorders, milk fever, grass tetany and red-water are recorded. Diseases or disorders in horses and pigs are no different or no greater than elsewhere in the country.

FISHERIES

General position

The survey area has a long indented Atlantic coastline and has a number of other sources offish including some salmon rivers. The quantity of sea-fish landed has been increasing in recent years. While the smaller rivers are considered capable of development, the larger Owenea and Gweebarra are relatively well served as far as angling is concerned. Some of the brown trout fishing is capable of improvement. The total value of all fish landed in the survey area has increased from £227,144 in 1962 to £452,770 in 1967: £413,000 of this was from sea-fishing.

Sea-fishing

Apart from the established ports of Killybegs and Burtonport, sea-fishing activities in the rest of the area are mainly confined to part-timers, mostly farmer-fishermen. Seasonal fishing is pursued at all points along the coast and not just in the two main ports. The spring lobster season, the summer salmon season and again lobster fishing in the autumn with winter herring fishing to a diminishing extent, provide full and part-time employment for several of the local families. Fishing methods have improved considerably in recent years. Modernised craft and up-to-date gear are now common. All the small craft are engined and the more ambitious have modern-engined craft ranging in size from 26 to 35 feet in length. The growth of white fishing in the larger ports of Killybegs and Burtonport is of recent origin. The centralisation of activities around growth centres has facilitated the provision of the shore facilities necessary to handle a growing fleet of modern craft.

The size and value of the sea-fishing industry is increasing yearly. The number of men fully employed in sea-fishing varies somewhat from year to year but is in the region of 300 whilst between 400 and 500 are occupied part-time. Besides, the industry provides considerable indirect employment in servicing operations, such as processing and transport. The total number of boats of all sizes operated by full-time fishermen varied between 100 and 120 in recent years and those used by part-timers between 50 and 80. The total capital value of these boats is estimated at £686,000 of which £610,000 is invested in the larger boats. The capacity and capital value of the supporting facilities and installations on-shore are also impressive.

The future for the fishing industry in the district is promising. Salmon and lobster fishing have become big business and the area is close to the most lucrative salmon and shellfish grounds in the country. Killybegs is amongst the premier fishing ports and is due for further expansion, and development of facilities at Burtonport is also planned.

3. Economic, demographic and sociological aspects

ECONOMIC CONDITIONS

Economic background

According to the 1965 Agricultural Enumeration (C.S.O.) there was a total of 4,456 farm holdings over 1 acre in size in the survey area. The following was the breakdown according to size category: 1 to 15 acres, 2,414; 15 to 30 acres, 801; 30 to 50 acres, 483; 50 to 100 acres, 412; over 100 acres, 346. The overall number of holdings is declining; those under 15 and over 100 acres in size are increasing in number. The total labour force in farming, comprised mainly of family labour, is declining.

Of the 263,050 acres in the Glenties Rural District, 75 % was designated "other land" in the 1965 Agricultural Enumeration. The proportion of so-called agricultural land is very limited. Only 2,476 acres were devoted to corn, root and green crops in 1965 and the acreage under crops has been declining sharply over the past 20 years. Over this period also there has been a steady decline in total cattle numbers but sheep numbers have been increasing since 1960. Pig numbers are small and show major fluctuations and poultry numbers have been declining sharply.

Economic structure of agriculture

A survey of a random sample of farms covering different farm size categories provided information on the economic structure of farming in the area.

All farms keep cattle (mainly cows and young followers) but the average herd size is equivalent to only 5 livestock units. Sheep are not kept on all farms and average flock size is approximately 30 breeding ewes.

Family farm incomes are not nearly sufficient to provide an acceptable standard of living from farming. The average annual family income for all farms in the survey samples was £138 and only on farms of over 100 acres in the better hill areas did the income exceed £300—still a poor return for labour, management and capital. Since these figures include the value of farm produce consumed by the family household, cash incomes are poorer still. Farms on average had £16 annual cash income from farming. Gross output of the survey farms in 1965/66 amounted on average to £222 per farm—a very low output figure by any criterion. Direct costs and overheads per farm averaged £82. The gross margin (gross output minus direct costs) per farm averaged £162 in 1965/66 and the gross margin per £1 direct farm expenditure averaged £2.6. In most respects the economic structure of farming in West Donegal compares very unfavourably with the situation on comparable sized holdings throughout the country as shown by more extensive surveys. Under present circumstances the agricultural potential of the area is very weak but West Donegal's greatest comparative advantage may lie elsewhere.

Marketing

Marketing of agricultural products is poorly organised. Even producers of cattle and sheep place little emphasis on gearing production to market demands either in time or in quality of product. Milk, poultry and potatoes are consumed mostly in the home. From the survey it does not appear that the pattern is changing.

LAND TENURE

Although the farmers became owners of their holdings and associated grazing grounds early in the present century almost one-quarter (64,293 acres) of the survey area is held in commonages comprising mountain, bog and rough grazings. There are both lowland and mountain commonages and in all there are 640 separate units. Commonages of 100 acres or less account for three-quarters of the total number but for only one-fifth of the entire commonage area. The largest commonage comprises 2,763 acres, of the total number of commonages, 52% are held by two shareholders and 70% by three or less shareholders, but over 30 farmers may share a commonage in some instances. Commonage may be held by the shareholders as a separate entity or as part of their home farms. Farmers may have only rights of grazing on a commonage appurtenant to their home farms, another party owning the ground or fee simple.

The immediate problem in West Donegal is to determine the commonage which could be partitioned to advantage. The Land Commission has the authority to do this on application but applications have been slow.

DEMOGRAPHIC CONDITIONS

The human population of any area is one of its most important resources. Over time, a population may vary in numerical size, structure and quality mostly reflecting

the interplay of social and economic circumstances and the population trends of the past. On the other hand, the demographic situation at any point in time will influence the expectations for social and economic development. Therefore an adequate knowledge of the demography of an area is basic to an understanding of the current production, commercial and institutional conditions of the community, and of its development prospects.

Trends in population size

There were 18,380 persons in the Glenties Rural District in 1966. In accordance with the national trend there has been a general decline in population during the past century or so. Rather surprisingly, the long-term (1861-1966) population decline in Glenties Rural District was not altogether as severe as in the rest of County Donegal or in the rural areas of the State. In fact it is only since 1926 that the rate of depopulation in West Donegal exceeded those for the other areas. Population decline is proceeding at an increasing rate. With the exception of the years 1946-51 the rate of population loss increased with each intercensal period since 1926, the decline in 1961-66 being the highest relative to the total population of the area since 1861. The 18,380 population in 1966 was about one-quarter less than in 1946. Between District Electoral Divisions within the Rural District, population loss in the 1946 to 1966 period showed extensive differences ranging from 48% in Glenleheen to 6% in Largymore. Only Killybegs Electoral Division showed an increase (8%). The greatest losses occurred generally in the northern half of the area. In marked contrast to the general trends in the Rural District, total town and village population showed a moderate increase (3.2%) in the 1956-66 period with towns of over 500 inhabitants increasing by 4.3%.

Demographic factors in population change

Three demographic factors are relevant in considering changes in population size—number of births, number of deaths and the volume of migration to and from an area. An indicator of the effect of emigration on the population level was obtained by examining the changes over time in the numerical size of selected age groups. Considerable diminution of the number of persons in childhood age groups takes place as these go into the early adult years. Over two-thirds (69%) of all females and slightly less than two-thirds (66%) of all males have left the area by the time they reach their 30's. It is fairly certain that virtually all emigrants have left by the age of 25. There are variations locally in the relative rates of emigration but Ardara, Carrick, Doochary and Dunglow Dispensary Districts are amongst the highest especially in female losses. Comparison with the rest of County Donegal shows that the relative declines are greater in Glenties and the disparity is more pronounced in the case of females. Obviously the survey area has had considerable emigration and population decline for some time.

Population structure

As a consequence of the downward trend in the number of its inhabitants and the high level of emigration in the younger age groups, the population of the survey area is structurally unbalanced. Older age groups are over-represented compared to other areas and even the population of working age (15-64 years) has a comparatively small percentage in the more active ages (15-44 years). The burden of dependency carried by workers is excessively high. For every 100 workers in the area there are 197 others whereas the corresponding figures in the rest of Donegal county and in the State are 147 and 154 respectively. The unemployment rate at 9.6% is high even by our national

standards. Coupled with this is the fact that almost three-fifths of those at work are engaged in agriculture where incomes are relatively low.

Though an excess of males characterises the population of rural areas like West Donegal, the sex ratio there is more balanced than in rural areas generally. This is not solely attributable to the older population of Glenties which would give females greater representation, because the West Donegal sex ratio is more balanced even within selected age groups. Despite the more even population distribution between the sexes higher proportions of the Glenties population remain unmarried than in other areas of the country. Of those aged 55-64 years in 1966. 38.4% of males and 29 of females were single.

SOCIOLOGICAL ASPECTS

A prerequisite to introducing change in any situation is a clear recognition of what has to be changed. Although certain social problems are commonly known to typify areas like West Donegal, these problems are not always clearly identified in the context of their local setting nor are their extent and influence adequately understood.

In the resource survey the more salient sociological aspects of the area were analysed. The study was focused primarily on the family farm household and its social environment but several features of the community's social life and organisation and matters such as educational standards, participation in voluntary community organisations, aspects of social security and standard of household facilities were also examined.

Sociological conditions among farm families

The information here was obtained from field surveys involving a random sample of landholders. Output from farming is low and family farm incomes are poor but about half the households had family members working off the farm. Many of the holdings are vacated or derelict. Fragmentation of holdings is a major structural defect in the farming economy. Forty-five per cent of all holdings over 5 acres are fragmented and of these 47 % are composed of two parcels and 23 % of five or more parts. The degree of fragmentation is somewhat higher than the pattern in the western counties which is high by general standards. With the high proportion of incapacitated persons occupying holdings, with the comparatively old population on the land and with one-third of holders over 50 years still unmarried, many holdings will cease to operate as individual units. These units will become derelict or will form part of larger units, perhaps adding further to fragmentation. Compared with the aggregate rural areas of the State, smaller households are relatively more numerous in the survey area. In West Donegal households of one or two persons represent 42% of the total compared with 34 % in rural areas generally; the average size of household was 3.52 compared with 3.96 persons in rural areas.

Farmers get little or no formal education beyond the compulsory primary school stage. Even participation in adult education courses is low. The available advisory services for farming are not fully used. Two-thirds of those interviewed read a weekly article of agricultural interest in their local paper but farming papers were not widely read. Sixty-two per cent listened to radio programmes on farming while one-quarter watched farming programmes on television.

Proportionately more farmers' daughters than sons left the parental home, and the majority of those who had left home (about 70% for both sexes) had gone abroad. Where farmers' sons were educated beyond the primary level it increased their chances

of working in Ireland. The same was not true for girls where the primary educated could get employment in the country as readily as the post-primary educated.

Little use is made of credit in farming other than short-term credit obtained from a merchant or co-operative and mostly for the purchase of fertilisers. Generally there was a strong aversion to borrowing money on a long-term basis.

Education

The number of pupils attending primary schools in the survey area, as in the rest of County Donegal, has declined steadily since 1951. This is attributable largely to the long-term general decline and structural change in population. Despite declining population, however, secondary and vocational school attendance has increased spectacularly in the period 1951-66. Of course, the previously low participation in post-primary education makes the increases all the more dramatic. It is evident from information on post-primary school-leavers that very few are going into farming. High numbers are emigrating and this trend is likely to continue unless there is a substantial increase in suitable employment.

Social security

State social security services concerned mainly with income maintenance fall into two broad categories; social insurance and social assistance. Social insurance services are contributory in that beneficiaries and their employers contribute along with the State to the cost of these services. Social assistance services, on the other hand, are non-contributory being financed by the State almost entirely from general taxation.

In January 1967 the number of males receiving unemployment benefit under the social insurance service in the Glenties Rural District was 325 or 15.5% of the County Donegal total. This relatively small proportion, however, is no reflection of the level of unemployment in the area. Almost one-quarter (24.7% or 695 persons) of all male unemployment assistance applicants and 30% (734 persons) of small holders' in receipt of unemployment assistance in Donegal county were resident in the survey area. These figures show the substantial unemployment obtaining and the role of social assistance or "dole" in the economic structure of this region. The percentage of applicants for unemployment benefit, unemployment assistance and small holders' assistance, who had either no dependant or only one adult dependant was very high being 66%, 73% and 64% respectively. It is estimated that about 60% of unemployment assistance applicants in the area are over 40 years of age.

Housing and domestic amenities

The data on housing and domestic amenities indicate that the survey area compares favourably with rural areas of the country generally. The possible exception is that of over-crowded dwellings where County Donegal and the Glenties Rural District have a somewhat higher proportion of people living in dwellings with more than two persons per room. The relatively favourable position with regard to domestic amenities means little in real terms as the overall position in rural areas is so poor. These facilities must be expanded rapidly to improve living standards and household comforts and in the interests of tourism and farmhouse holidays.

Voluntary community organisations

There is a wide variety of voluntary organisations covering a broad range of interests and activities in the survey area. Of the 202 voluntary groups located in the area, 39 were inactive. The majority of the organisations were initiated locally and this

together with the fact that almost one-third of the total were organised since 1960 shows that there is increasing awareness of the value of group action in satisfying community needs. Professional and business people tend to be more highly represented in organisations than farmers, relative to respective distribution in the population. The majority of groups catered for older adults. Women had not the same range of choice as men and were in the majority in only 9% of the organisations. The majority of committee members had post-primary education.

Although the primary aims and functions of the various organisations differed there was considerable overlap in activities. The projects on hands between all groups amounted to 309 and were mainly concerned with community improvements, recreational and social activities, fund-raising and economic development work.

OTHER ASPECTS OF THE LOCAL ECONOMY

Because of the contribution that other facets of the local economy must make to the general welfare of the region and because of the close relationship of these to agriculture some of the more significant facets were appraised.

Industry

The survey area is one of limited industrial character. Agriculture, forestry and fishing combined form the largest single industrial category accounting for the employment of 58.7% of the total of 6,432 persons at work in 1966; the corresponding proportion for County Donegal was 48.7%. The second largest source of employment is manufacturing industry but this accounts for only 11 % of those at work. A further 8.6% are engaged in commerce, insurance and finance and the remaining employment is spread over several smaller sectors. Between 1961 and 1966 there were increases in the percentage of those employed in most categories; the exception was in the agricultural group where there was a decline of 11.4%. The largest single employer in the manufacturing industry in the area is Gaeltarra Eireann, a semi-State concern. In 1968 over 300 were employed in their factories and another 150 on home crafts.

The overall employment in the survey area is not good. It is clear that an increase in employment must come mainly in the manufacturing and service industries rather than in agriculture.

Retail distribution

In the underdeveloped rural areas many of the problems which face the small farmer are similar to those facing the small shopkeeper or publican. There are a considerable number of persons involved in retailing in the survey area but for most of them it is not very remunerative. There is little hope of improvement in this sector with the present population structure and the spending capacity of the local people. On the basis of its share of the county population, the survey area has a higher proportion of shops and lower sales, gross margins, wage earnings and numbers employed than County Donegal in general.

Tourism

West Donegal has many cultural, scenic and recreational attractions for the visitor. Yet it has been shown that the area has fewer visitors, be they holidaymakers, tourists

or day visitors, than other parts of County Donegal. To improve the tourism potential, services such as accommodation and sanitation must be extended. The extension of the latter would be especially beneficial in the case of supplementary accommodation in private houses. The road network in the area is adequate for a considerable increase in volume of traffic as it is not used to full capacity at present.

Transport

It is difficult to provide the survey area with an adequate transport system because it is widespread and thinly populated. There are over 600 miles of roads in the area under the care of the county council. Main roads, all of which are surfaced, comprise 112 miles. The remainder are secondary roads the greater proportion of which are also surfaced. County Donegal is among the few counties with no railway and instead is served by no less than three bus companies operating scheduled services both passenger and freight. Heavy freight is carried by regular lorry services.

The costs involved in getting materials and products in and out of the survey area are higher generally than in most other areas of the country. Higher costs of both production and marketing result. For instance feedingstuffs constitute a major item coming into the area as far as agriculture is concerned and Letterkenny is consistently among the higher cost centres for these in the country. Then there is the added cost of transport to destinations in the survey area some more than 30 miles from Letterkenny.

AGRICULTURAL DEVELOPMENT IN WEST DONEGAL

1. The background

The foregoing summary of the resources of the West Donegal Survey area and the more detailed information provided in Parts I, II and III of the Resource Survey Report leave little doubt of the major problems in agriculture in this region. On the basis of this information we now proceed to examine to what extent and by what means agriculture can be improved utilising current technological, economic and social concepts. Of course, agricultural improvement is only one means of raising living standards in West Donegal. With the resource limitations prevailing, we realise that agriculture, no matter how well developed, could only contribute a part of what is needed by way of increased prosperity. Therefore, development must also take place in fishing, industry, tourism and recreation.

Nevertheless, the land, as a major resource, must be used in the best possible manner, either for agriculture, forestry or other purposes. There are suitable tracts of land (see Part I) where agriculture could be developed to play the key role. On the other hand there are areas where development of agriculture or forestry would be neither practical nor economically justified. These areas, however, may have scenic or recreational values which would be assets in amenity development to cater for local and tourist interests. There are also the "grey" areas where conflicting uses will have to be resolved or where in some cases complementary enterprises could be promoted *e.g.* farming-forestry, forestry-wildlife, forestry-recreation.

Even areas with the problems of West Donegal can be developed when approached systematically. It is obvious that systematic resource development starts with rational land use where the different types of land are devoted, as far as possible, to those uses best suited to their character and quality. In this study emphasis has been placed on the appraisal of soil quality and land-use potential as a basis for resource development. This is logical considering the great variety of soils and their wide-ranging, relative capacities for various uses. A blanket approach to development which would ignore differences in physical resources, would not be a good long-term policy. This requires optimum use of land not only for economic (*e.g.* agriculture, forestry) but for social, amenity, and recreational purposes. The allocation of the soil resources of West Donegal to various agricultural purposes and to non-agricultural pursuits according to their capacity to provide for these, is discussed in Section 3 (p. 18).

2. The proposed approach

In considering agricultural development in West Donegal there are a number of options. The following are some of the alternatives:

- (a) The negative approach—not to develop agriculture at all but to allow it to decline and concentrate on other forms of development. This would exacerbate the current social problems and would severely restrain other economic developments due to the absence of a viable agricultural arm and the lack of balance in the overall socio-economic structure of the area.

- (b) To develop existing farming on the limited areas of better mineral and reclaimed peat soils and leave the greater proportion of the region at its present low-intensity agricultural output. This approach would undoubtedly increase output and improve farming conditions but would scarcely maintain the present status *vis-a-vis* the better farming regions. The majority of farmers in West Donegal, because of holdings of inadequate size and structure and of poor physical and economic resources, cannot be expected to compete effectively with more favourably endowed farms elsewhere in the country. The small farms of West Donegal are likely to be at an even greater comparative disadvantage as the agricultural and general national economy continues to advance.
- (c) To develop existing farming on the limited areas of better soils (as for (b)) and devote large areas to forestry. As an economic proposition, forestry as a land-use enterprise in West Donegal offers very limited scope (see Part 2—West Donegal Resource Survey Report).
- (d) Co-operative farming would help to overcome some of the difficulties and would at least give the small farmers the economies of scale and some of the strength of bigger units. However, because of the ratio of labour to other resources this approach *per se* would not resolve the problems of economic viability.
- (e) Part-time farming is another possibility. The main problem would be to find sufficient off-farm employment in the area to cater for this system. As shown later there are limited possibilities for off-farm employment in such areas as fishing, forestry, industry and tourism but more outlets could be developed. It may be argued that part-time farming is only a transitional phase in the movement from the farm to the factory or other employment on a permanent basis but even as such it could serve a useful purpose. With improvement in rural amenities and transport facilities and with a greater appreciation of rural values it may also prove a stable way of life.
- (f) To develop as much of the land as would have reasonable possibilities for moderate to high intensity agriculture, and in the remainder of the area to give priority promotion to land-use enterprises other than agriculture. In this case resource development is based very largely on land-use, taking into account the economic, social, amenity and recreational needs for land.

The last alternative is the most complex and perhaps the most difficult to achieve but its scope is more far-reaching and more long-term than the others. The main emphasis here is on the development of a number of viable farms where soil and other conditions are favourable, farms that can at least keep abreast of economic advancement and living standards in farming in the better areas of the country as national prosperity grows. But this development of a hard core of viable farming units would not preclude developments such as co-operative and part-time farming or forestry; rather, these could be an integral part of the system or a complementary development to it. In practice the integrated approach would offer the best prospects for success.

The key to the proposed approach entails setting norms for viable farm units, taking into account physical factors such as nature of terrain, soils and climate. Size of holding, the farm enterprise to follow and the capital inputs necessary to give a predetermined family farm income would be determined. It is imperative that the system should be geared to generate a target income commensurate with that to be earned by the same endeavour elsewhere in the country. The procedure to follow in improving output and the facilities necessary are outlined. The main emphasis is on livestock farming and the farm enterprise is based on the number of livestock units necessary to provide the target income. Different combinations of stock (cattle/sheep/

pigs) are so designed as to maintain parity of income potential. Capital and operating costs and farm incomes are analysed for the different livestock systems. Finally, calendars of yearly farm operations are given.

The proposed system is a flexible one and could be tailored to meet different norms of development and different income targets. It would allow for expansion of the farm operation, if the industry and ambition of the operator so demands, and for changing living standards. The system could be started on a pilot basis and extended throughout the region over time thus allowing for phased development which in practice would be the most feasible. Various combinations of livestock could be used in the system thus catering for differences in the use capability of the land, for changes in consumer demands, in price supports and economic returns and to a lesser extent for producer preferences.

The proposed approach would require the development of a large proportion of the land currently devoted to low-intensity grazing and at the same time the development of the farming on the larger, more compact blocks of the better mineral and peat soils. In some instances then, an existing farm (in most cases slightly enlarged) on mineral soils or on reclaimed peat-cum-mineral soils would constitute the development unit. In the majority of cases an existing farm would constitute the focal point for a holding enlarged by a tract of improved peatland. In some cases also an entirely new farm would be carved out of the reclaimed and unreclaimed peat if the quality of the peat and the character of the terrain were sufficiently favourable.

The proposals would entail not only land reclamation and development but also extensive structural reform such as land re-allotment and consolidation of holdings. Intensification at farm level would require a high level of operator expertise, the full use of technical knowledge and advice, the development of every facet of co-operation even to the point of fullscale co-operative farming, an increase in capital inputs (and/or reapportionment of current State aid) and a major improvement in several other sectors of the agricultural industry, *e.g.* farm management and marketing.

The number of people engaged full-time in agriculture would be reduced but their enterprises would be much more remunerative; judging from the age structure and succession probability of those already farming in the area, there is bound to be a reduction in numbers in any event. Part-time farming would still maintain some people 'on the land' apart from those farming the viable units full-time and all of those leaving the land entirely would not necessarily be lost to the region: the servicing of several hundred viable farms alone should create employment in secondary and tertiary industries.

3. Land quality classes

The size of holding and type of enterprise required to meet production and income targets are closely related to land quality. The nature of the soils and associated environmental features are highly important. The soils of the survey area, with a few minor exceptions, can be grouped broadly into four land quality classes:

Class M

This class comprises almost all the mineral soils of the area, and some of the better organic-mineral types. It includes well-drained brown earth and poorly-drained gley soils, degraded mineral (podzols) and cutaway peat soils, the better alluvial and more stabilised coastal sand soils. These comprise soil units 1 to 9 inclusive and units 16,

17 and 28 on the soil map (Part I). They occur on variable topography but mainly on lowland or hill and drumlin positions.

Class M constitutes approximately 10% (27,000 acres) of the survey area.

Most of this land is currently farmed at moderate to low intensity. Little more than half of the land class has sufficiently good soils on fairly amenable terrain and in sizeable, compact blocks¹ to support intensive livestock farming on holdings of 50 to 100 acres. The remainder is made up of soils with distinct physical limitations *e.g.*, shallow, rocky, steeply sloping, and small enclaves of better land scattered throughout the other land classes. In the latter instance, especially where these enclaves occur in Class P they are of strategic value in providing lowland for winter keep of hill sheep and cattle in the proposed moderate-intensity farm systems.

Class P₁

The soils here are predominantly organic and mostly unreclaimed peats; the ratio of unreclaimed to reclaimed is approximately 7:1. They occupy lowland and lower slope positions and occur mostly at elevations less than 400 feet O.D. These comprise soil units 10 (peat) and 11 (reclaimed peat) on the soil map (Part I).

Class P_j occupies approximately 26% (69,000 acres) of the survey area.

Already a small proportion (approaching 13 %) of this area is improved 'greenland'², developed in the vicinity of the farmsteads and farmed at a moderate to low intensity; limited tillage is practiced on this reclaimed peat. The remainder of the peats in this class are still in their raw, unimproved state. However, land Class P_i offers the best scope for development after Class M; upwards of two-thirds of this class could be utilised in the proposed moderate-intensity livestock farming systems.

Class P₂

This class comprises predominantly organic soils (mostly unreclaimed peats) with small inclusions (<1%) of poor mineral soils. The soils occupy upland positions mostly at elevations in excess of 400 feet O.D. They comprise units 20 to 24 inclusive on the soil map (Part I).

Class P₂ occupies approximately 32 % (84,000 acres) of the survey area.

Already very small patches of the peats (approximately 6% of the class) have been reclaimed. Large tracts are capable of reclamation to provide improved grazing but the peats in this class are of a more difficult nature and potential 'greenland' would be more difficult to develop than in Class P_v. It is likely, therefore, that not more than one-half of Class P₂ could be incorporated into the proposed moderate-intensity farming systems.

Class R

Comprises vast expanses of outcropping rock, together with skeletal mineral and organic soils, eroding peats, shifting sand-dunes and salt marshes. Except for isolated pockets of better peat or mineral soils, this class is not suitable for agriculture. The class comprises soil units 12 to 15 inclusive and 18, 19, 25, 26 and 27 on the soil map (Part I.)

Class R occupies approximately 28 % (74,000 acres) of the survey area.

¹ Most compact areas of M are in the following districts (See Soil Map—Part I): Ardara-Loughros Beg Bay; Ardara-Glenties; Fintragh Bay-Killybegs-Dunkineely; Teelin Bay-Kilcar-Carrick; Malinbeg-Malinmore; Narin-Portnoo.

² Greenland refers to the limited areas of mineral soils and peats adjoining farmsteads that have been ameliorated and are being used for in-bye grazing, meadowing and tillage.

Other land

The land classes above account for somewhat more than 96% of the survey area. The remaining area includes scattered wet alluvial soils and valley peats (1.25%) and lake areas (2.15%).

Conclusions

These land classes are well—but not strictly—defined categories. For instance, there may be enclaves of soils in Class M that fit the definition of Class R and vice-versa. However, it may be taken that a proportion of Class M land (up to 50%) can be adapted to an intensive livestock farming system. Likewise a high proportion of Class P_i land (up to 66%) and a lesser share of P₂ land (up to 50%) can be adapted to the proposed moderate-intensity livestock farming system. On the other hand the greater proportion (up to 75 %) of Class R land is deemed unsuitable for agriculture and most of the remainder of the class is very poorly suitable.

Let us accept then that most of Class M can be used either for intensive livestock farming or be incorporated into the moderate intensity systems and that two-thirds of Class P_i and one-half of Class P, can be used in the latter systems. This discounts all of Class R, one-third of Class P_j and one-half of Class P₂ as far as even moderate-intensity agricultural development is concerned. This means that not more than 45% of the land of the survey area is worth considering for a moderate to high intensity agriculture and on the greater part of this there are still formidable obstacles to development. Of course, the remaining 55% can still be devoted to low-intensity agriculture as at present or be used more for non-agricultural pursuits in the years ahead.

4. Major considerations underlying proposed developments

The following are some major considerations in the development approach being followed: (a) income to be attained; (b) type of enterprise to follow; (c) size of enterprise to provide the income; (d) size of holding to carry the enterprise.

Income

The first essential is to establish a minimum target income. This income must be well within the capability of the farmer, his holding and his enterprise. It must be attractive enough for people to devote their talents to farming in West Donegal in preference to employment elsewhere. The entire farm unit must be capable of providing a higher income to allow scope for extra endeavour on the part of the farmer and to cater for changes in living standards. The target minimum family farm cash income is put at £800 per annum in these proposals; this does not include the value of farm produce consumed in the home.

Type of enterprise

Notwithstanding the general quality of the soil resources of the area, a number of enterprises have been considered within the broad context of agricultural land-use. The extent to which Land Classes M, P_i or P₂, discussed in the previous section, should be devoted to any of these enterprises would depend on factors such as the ratio of available arable to non-arable land, on the condition of the arable land and on altitude, slope and other land-form features. The following enterprises have been considered:

Dairying (with pigs): Dairying is among the most profitable of farming enterprises in Ireland today. A well-managed herd of about 25 cows averaging 500 gallons per cow, together with calf sales, will yield a gross margin of £1,100-1,200 on the equivalent of 50 acres of good land. Organised dairying requires a high capitalisation, not only for livestock and buildings but for milk handling, collecting and processing. To simply advocate a dairy economy for West Donegal begs the question of the inherent ability of the great proportion of the land (no matter how much improved) to match the requirements of high-energy-demanding dairy stock. And an even bigger question is that of the economic competitiveness of a dairy system *vis-a-vis* the production of beef, lamb, mutton and wool under prevailing soil and climatic conditions. However, this does not preclude the production of milk on a limited number of farms to meet local and tourist demands with the surplus going to a local separating station or to a creamery in the neighbourhood. Development of this enterprise is advocated on the compact blocks of better mineral soils within Land Class M.

In most areas of the country pig production is a valuable adjunct to milk production. Current arrangements for feeding-stuff supplies and pig marketing in West Donegal would have to be greatly improved to lower costs sufficiently to allow pig-raising to become competitive in this area (see Part 2—Livestock Farming and Part 3—Transport).

Specialised pig and poultry enterprises are also examined as possible intensive farm systems in the area. The main advantage of such enterprises is their relatively low dependence on local land supply or quality but there are decided drawbacks also (see Section 6. p. 28).

Beef cattle: The system here would entail a herd of breeding cows producing and raising calves mainly as a source of beef. This is one of the alternative systems advocated for the better areas of Land Classes P₁ and P₂ together with the scattered enclaves of Class M not included in the intensive dairying system. Saleable products from the system would include suckler calves or forward stores. For most of the farms in the survey area, the calves would be the end-point in the system, but where conditions are somewhat better, forward stores could be produced. The survey area is not generally suited to growing the type of grass necessary to produce finished cattle; large inputs of purchased feedstuffs would be needed.

Sheep or sheep plus cattle: Sheep, either alone or with breeding cattle are considered the most suitable enterprise on the greater part of Classes P_a and P₂ (and the associated enclaves of Class M) on which agriculture is advocated. They can utilise the marginal hill and peat grazings during the growing season and be supported in winter largely by conserved fodder off the 'greenland'. Sheep are a viable enterprise when adequately fed and managed; the main saleable products are store or fat lambs, wool and cull ewes.

General tillage including horticulture: As discussed in Part 2 of the Resource Survey Report, the disadvantages are too great in the area to make large-scale commercial tillage competitive. This does not preclude the growing of cereal, root and green crops on a limited scale (using the most favourable locations) to meet local requirements in part.

Forestry: As shown earlier, West Donegal offers little scope for commercial forestry. At the same time afforestation would be a great asset to this area. Ideally, forest

plantations should be integrated with the large grazing tracts envisaged in the proposed farming systems in order to provide, in time, some much-needed shelter. This may mean in most cases a forest plantation layout not conducive to the most economic handling. The added advantage to farming and to the amenity values of the region must be taken into account in assessing the economics of forestry in an area such as this.

Conclusions

The best hope for agricultural development is in livestock farming based on a grassland economy. Except on the more compact blocks of better (mineral) soils where dairying deserves consideration, the emphasis must be on cattle-sheep enterprises based on improved grassland on the better tracts of marginal land. Here, depending on local soil and environmental conditions the livestock enterprise would be all-cattle, cattle/sheep or all sheep. The size of enterprise and the size of holding required to meet the proposed income levels are given in the following paragraphs and operational models for the different livestock systems envisaged are outlined and discussed in Section 6 (p. 28).

Size of enterprise

The size of a livestock-based farm economy necessary to provide a family farm cash income at any given level will be determined by the gross margin per livestock unit and the level of farm overheads. The latter has been estimated at £400 approx. (Table 5, p. 29) so a total gross margin of about £1,200 must be realised per farm to give the minimum target cash income of £800. This does not include farm produce consumed in the home which, if taken at average for the country, would be valued at £100. The family farm income then would be £900. The gross margin per grazing livestock unit³ has been estimated at £44 for dairy cows, £30 for breeding cattle and £17 for sheep. For the dairy enterprise a 27-cow herd or 20 cows plus 6 sows would be needed to provide the required total gross margin. And at these levels of gross margin, the minimum number of livestock units in the cattle/sheep enterprises would be between 52 and 70 per farm depending on the cattle/sheep ratio. The disparity here is largely due to the relative price structures for cattle and sheep at the present time.

Size of holding

The size of holding to carry a livestock enterprise of the size envisaged is determined by a number of factors but principally by the potential stock-carrying capacity of the land. The acreage required will vary from around 50 to 60 acres of the best land advocated for dairying, to 250 acres or more of the vast marginal lands for the moderate intensity livestock systems.

5. The development of acid blanket peats*

With cattle and sheep enterprises based on a grassland economy as the main options in the agricultural development of the area it is obvious that large-scale improvement of the marginal lands, mainly acid blanket peats, is a basic prerequisite. The data

³ A livestock unit is defined as the "average" 10£ cwt cow or its equivalent in other stock (see E. A. Attwood & J. F. Heavey, *Ir. J. agric Res.* 3, 249, 1964).

*This section is taken from a contribution received from Mr. E. Grennan, An Foras Taluntais, Peatland Experimental Station, Glenamoy, Co. Mayo.

presented in this section are a summary of the findings in reclaiming, manuring and managing acid blanket peat at Glenamoy, Co. Mayo; these should be of particular relevance to Land Classes P_x and P₂ in the survey area. These conclusions are the basis for our recommendations and proposals in the succeeding sections.

The reclamation and improvement of the unreclaimed 'upland', as distinct from the potential 'greenland', grazing are discussed first.

Upland grazing—unreclaimed peats

The ultimate aim here is improvement to the stage where 3 acres becomes equivalent to 1 acre of greenland, or where the upland grazing will provide for a stocking rate of somewhat more than one sheep per acre. This may be approached in either of two ways, (a) improvement of the whole area, (b) a more intensified improvement of part of the area and no improvement of the remainder.

Improve whole area: This is very difficult to achieve in practice. The application of limited quantities of fertilisers to the native vegetation will stimulate growth but not sufficiently to achieve the desired yield or quality of grazing. Improvement in botanical composition is desirable—especially the introduction of clover. Some phosphorus, potassium and lime must be applied for clover to establish on the acid peats so it is best to apply a balanced dressing to obtain vigorous clover growth and an improved sward. A 'surface seeding' technique of applying the fertiliser and lime with the seeds has been developed at Glenamoy.

Improve part of area: This seems to be the better approach. On this type of terrain there will always be some rough grazing which will not be improved because of factors such as topography or altitude. These areas provide seasonal grazing, are well liked by sheep, and are often fluke-free when the improved areas may be contaminated; as such they can be used very well in conjunction with the improved grazing. On the 200-300 acres of upland grazing in the proposed holdings in West Donegal the most suitable areas should be surface-seeded (perhaps one- to two-thirds of the area). The recommended lime, fertiliser and seeds mixture for this surface seeding, based on Glenamoy results, is given below.

Surface seeding: A state grant of £8 per acre is available towards the cost of surface seeding, liming and manuring. Table 1 shows materials and costs involved in the initial treatment and in annual maintenance. Costs of the initial treatment are in the range of £9 to £14. The 'minimum' treatment, costing about £9 per acre, gives quite good results and is the general recommendation for the West Donegal holdings. The 'average' treatment, approaching £12 per acre, will be only marginally better than the minimum. The maximum treatment costing about £14 per acre would apply to virgin peats which are being well drained and developed for intensive grazing and for conservation of hay or silage.

Where lime is not applied, basic slag (or ground mineral phosphate at the same rates) can be used for surface seeding. Table 2 gives treatments and costs involved. However, establishment of clover and grass is slower and expected yields lower than where the treatment in Table 1 is used. Costs range from about £6 to £11 per acre. In this case also, the 'minimum' rates, costing somewhat more than £6 per acre, are recommended since the 'maximum' rates, approaching £11 per acre, would be only marginally better.

Liver fluke is a serious problem at Glenamoy where sheep are confined to pastures that have been surface-seeded, limed and fertilised. It is not yet known how far liming

is responsible for the build-up of snail populations. If it can be shown that liver fluke is a less serious problem where no lime is applied, then the treatments in Table 2 should be used for surface seeding but with ground mineral phosphate substituted for basic slag.

Drainage: The grant of £5 per acre (Supplementary Keep Scheme) would apply to drainage improvement. But this small contribution would justify little more than open drains to take off surface water. These shallow, round-bottom drains could be opened with a machine such as the Sesam ditcher. The areas with best natural drainage or sloping ground with good surface run-off should be selected for surface seeding.

The maintenance and usefulness of the improved pasture depend very largely, however, on the effectiveness of the installed drainage. At Glenamoy, well-drained pastures gave 25-30% greater liveweight gain per acre than undrained pastures, due partly to a higher yield of grass but more so to the longer grazing season. If a more intensive drainage system were to be installed in some of these upland grazings in

TABLE 1—Lime, fertilisers, trace elements and seeds mixture for improvement of grazing on acid blanket peat (per acre)

1. *Establishment*

	Minimum treatment		Maximum treatment		Average treatment	
	Quantity	Cost £ s d	Quantity	Cost £ s d	Quantity	Cost £ s d
Lime	1 ton	1 0 0	2 tons	2 0 0	1½ tons	1 10 0
Superphosphate	4 cwt	2 0 0	6 cwt	3 0 0	5 cwt	2 10 0
Muriate of potash	1 cwt	1 0 0	2 cwt	2 0 0	1½ cwt	1 10 0
Calcium ammonium nitrate	1 cwt	1 4 0	2 cwt	2 8 0	1½ cwt	1 16 0
Cobalt sulphate	2 lb	8 6	2½ lb	8 6	2 lb	8 6
Copper sulphate	10½ lb	16 8	20½ lb	1 13 4	15 lb	1 5 0
Total		6 9 2		11 9 10		8 19 6
White clover	2½ b	15 0	2½ b	15 0	2½ b	15 0
Ryegrass	20½ b	2 0 0	20½ b	2 0 0	20½ b	2 0 0
Total		9 4 2		14 4 10		11 14 6

A suitable compound may be used to supply the NPK requirements for the initial surface treatment: e.g. 3-4 cwt/acre of 10-10-20.

2. *Maintenance (per acre)*

3 cwt super or slag \ applied annually at ")
 1 cwt potash /3-4 cwt 1 cost approximately
 or 2-2½ cwt/acre of 0-10-20 cpd—applied annually f £2 per annum
 plus ±1 ton lime every 4-5 years.

3. *Yield*

After establishment, average yield = 50 cwt D.M./acre.

4. *Grazing*

For 3 ewes+lamb/s /acre for the grazing season.

West Donegal the Land Project Grant of £45 to £50 per acre may apply. At the moment the choice of drainage system is between sod drains and slotted plastic pipes, both of which are expensive at the 12-15 feet spacing required for best results (at Glenamoy at least). Using slotted plastic pipes drains cost about 1/6d per yard for materials (1/2d for pipes and 4d for permeable backfill). At a spacing of 5 yards, cost of materials is £70-£75 per acre. It is possible that the Donegal peats are more permeable and that a spacing greater than 5 yards would suffice, thereby reducing the costs. Even still it would be very difficult to justify the drainage cost involved on upland peats used for grazing only. A cheaper type of drain consisting of sand or gravel laid on a strip of polythene now under test at Glenamoy would reduce the cost of drainage to about £30 per acre. The opening of main outfalls would add about £10 per acre to the cost.

A system of shallow open drains is suggested initially with the possibility at a later stage of a more intensive system using gravel drains.

Greenland—mineral soils and peats

The greenland adjacent to the farmsteads is devoted to both grazing and forage conservation. In the vast majority of cases both manuring and drainage are necessary to meet the production and utilisation standards required from these limited in-bye 'greenlands'.

Manuring: As shown in the survey, many of the soils of the greenland areas are low in lime, phosphorus and potassium. A full treatment based on soil tests for each area should be applied initially to make good the shortages. An average dressing required

TABLE 2—Fertilisers, trace elements and seeds mixture for improvement of grazing where no lime is used

1. *Establishment*

Material	Minimum treatment			Maximum treatment				
	Quantity	Cost			Quantity	Cost		
		£	s	d		£	s	d
Basic slag	5 cwt	2	3	0	10 cwt	4	6	0
Muriate of potash	1 cwt	1	0	0	1½ cwt	1	10	0
Calcium ammonium nitrate	—	—	—	—	1 cwt	1	4	0
Cobalt sulphate	2½ lb	8	6		2½ lb	8	6	
Copper sulphate	10½ lb	16	8		10½ lb	16	8	
Total		4	8	2		8	5	2
White clover	1½ lb	11	3		1½ lb	11	3	
Ryegrass	15 lb	1	10	0	15 lb	1	10	0
Total		6	9	5		10	6	5

2. *Maintenance (per acre)*

3 cwt slag, 1 cwt potash; applied annually at 3-4 cwt; cost approximately £2 per annum

3. *Yield*

After establishment, average yield = 40 cwt D.M./acre in 3rd and subsequent years.

4. *Grazing*

For 2-2½ ewes-rams/acre for grazing season.

TABLE 3—Lime and fertilisers for 'greenland'

1. *Initial average treatment (per acre)—depending on soil test*

Mineral soils	Peats
2-3 tons lime	1 i-2 tons lime
3-4 cwt superphosphate	5-6 cwt superphosphate
1-2 cwt muriate of potash	1 i-2 cwt muriate of potash (plus cobalt and copper-see Table 1).

2. *Annual maintenance (per acre)*

Without farmyard manure: 3 cwt superphosphate
1 £-2 cwt potash

Nitrogen: 2-3 cwt/acre for silage and 2 cwt/acre for early grass.

would be 2-3 tons of lime, 3-4 cwt of superphosphate and 1-2 cwt of potash (Table 3). If virgin peats are being developed for intensive use then the initial treatment required would be similar to that shown in Table 1; the 'average' or the 'maximum' treatment could be applied depending on the particular needs.

For maintenance and to provide for a silage cut plus some grazing (without farmyard manure) 3 cwt superphosphate and 1£-2 cwt of potash per acre are required annually. However, if farmyard manure is available it may be used to replace the P/K fertilisers in part, 10 tons per acre being equivalent to 2 cwt of superphosphate and 1 cwt of potash. There would probably be ample manure to dress part of the greenland each year. With or without farmyard manure about 2-3 cwt of nitrogen fertiliser per acre would be applied to all areas for silage. Where early grazing is needed an additional 2 cwt of nitrogen fertiliser would be applied in late March. The fertiliser recommendations for the 'greenland' are summarised in Table 3.

Clover growth on the 'greenland' should be encouraged. Even where the pastures contain only a low percentage of clover in the sward this can be increased by lime and fertilisers alone without reseeding. In many of the poorer soils, however, clover may be virtually absent. Here it is necessary, especially on the mineral soils, to cultivate the surface mat lightly with a disc harrow and surface seed with clover and ryegrass in April. Good management including controlled grazing will then help clover establishment.

Drainage: The greenland will need to be well drained to provide for the 'intensive' use intended. The Land Project grant of £45-£50 per acre would apply to these areas. Some of the mineral soils are naturally well drained but most need some form of artificial drainage. A drainage system should present no unusual problems and would be installed in accord with land project specifications for the individual site. Stone drains, tile drains or plastic pipes could be used.

An intensive drainage system would be required for a high proportion of the 'greenland' peats. Slotted plastic pipes would be used with a little gravel as a backfill around the pipes. Cost of materials would be £70-£75 per acre for 5-yard spacing, and this spacing would probably be required in most cases. A wider spacing may suffice on some of the peaty-mineral soils. Even when drained, these peat soils require careful management as they are still fairly easily poached in spring and autumn especially by cattle. This is due to the low permeability of the blanket peat compared with mineral soils or with some of the cut-over peats in the midlands. However, they

would stand up to a cut or two of silage or to a cut of hay and to some grazing for sheep of light cattle in spring and autumn.

Summary conclusions

The establishment of reasonably good grass/clover pastures on the acid blanket peats is now well documented. The difficulties arise in utilisation. Fluke has become a serious problem at Glenamoy when sheep graze surface-seeded pastures all year round. This problem may be less serious where the sheep have access to unimproved grazings and where they are housed for part of the winter. Improved control measures may emerge to limit the problem also.

We need more information on the 'partial' improvement of the rough grazing without giving the full 'surface seeding' treatment. Could we convert these grazings from a stocking rate of one sheep per 4 to 5 acres to a rate of one sheep per acre by supplying the most deficient element, namely phosphorus? This type of improvement has been overshadowed by the initial spectacular success of surface-seeding, which provides for a stocking rate of three sheep per acre. Perhaps in West Donegal, where 'greenland' but not 'upland' is limiting, the moderate-type improvement on the 'upland' grazing coupled with intensive development of the 'greenland' would suffice to give the desired returns without precipitating the fluke problem.

Drainage continues to be a big problem in the reclamation of the acid blanket peats. How much can we afford to spend on drainage considering the economic returns to be expected from this type of land? If the gravel drains under test are successful they may be cheap enough to make farming on these difficult marginal lands more encouraging. In the meantime the minimum standard envisaged to meet the needs of the farming pattern put forward here is a system of shallow open drains in the 'upland' grazing coupled with intensive drainage of the 'greenland'.

Some relevant state grants

Land Project Scheme (Section A): Grant is j of estimated cost of the work subject to a maximum grant of £50 per acre in western counties and £45 per acre in the remainder of the country. The grant covers work such as field drainage and removal of scrub, rocks and unnecessary fences. Where a soil test indicates the need, lime and fertilisers must be applied and portion of the grant is withheld until this is done. This scheme would apply to the mineral soils and 'greenland' areas set aside for silage in the survey area. It would also apply to raw peats reclaimed and improved for conservation purposes.

Supplementary Keep Scheme: This scheme makes provision for reclamation work, e.g. shallow drains to take off surface water and perhaps some levelling of hummocks. The grant is £ of estimated cost subject to a maximum of £5 per acre. There is a grant also for work such as surface seeding, liming and manuring, along similar lines to that done at Glenamoy. The maximum grant here is now £8 per acre.

Fencing scheme for mountain grazings: Grant is £ of estimated cost of labour and materials with a limit of 15/- per perch offence erected or £12 per acre of land enclosed. For areas less than 10 acres, the grant is £12 per acre while for areas greater than 10 acres the grant is calculated at 15/- per perch. To get maximum benefit from this scheme fields should be 10 acres or more in area. A perimeter fence for 10 acres (in a square area) merits a grant of £ 120 whether calculated as acres enclosed or perches of fence erected.

Fences erected on contract at Glenamoy cost about 4/4d. per yard for materials and 8d per yard for labour, or £1/7/6d. per perch for materials and labour.

6. Intensive livestock systems

Dairying with or without pigs

Only the best soils in the survey area could cater adequately for an intensive farming system based on high energy-demanding dairy stock. Therefore, this system is advocated only on the more extensive and better areas of Class M land which means that some 13,000 to 14,000 acres or 5 % of the entire land in the survey area could be devoted to this enterprise. This would be commercial competitive dairy-farming, producing milk mainly for local consumption and processing. The concentration of dairying on these more suitable areas would not preclude the keeping of the family cow or two elsewhere in the area.

The size of the commercial dairy cow enterprise will be determined by the family farm income to be achieved, the level of overheads, and the gross margin per livestock unit. The projected family farm cash income is £800 (as in the case of the cattle /sheep enterprises to be discussed later), overheads are estimated at £400 and gross margin per cow at £44. Thus if the dairy unit is to be the sole enterprise on the farm, a herd of 27 cows will be required. On the other hand, if a pig enterprise is included which earns a gross margin of £57 per sow then a dairy herd of 20 cows plus 6 sows (or some comparable combination) would provide the projected family income. The capital costs of establishing this operation are given in Table 4 and the farm income and operating costs are given in Table 5.

TABLE 4—Capital costs (£) (excluding land and dwelling) of 'dairy' and 'dairy and pig' unit

	27 cows			20 cows and 6 sows		
	Total	Current grants	Net capital	Total	Current grants	Net capital
Livestock	2,160	—	2,160	1,840	20	1,820
Buildings	1,350	270	1,080	1,250	350	900
Fencing	100	—	100	100	—	100
Drainage	1,500	1,000	500	1,200	800	400
Water	300	200	100	300	200	100
Machinery	1,000	100	900	1,000	100	900
Total	6,410	1,570	4,840	5,690	1,470	4,220

Capital programme: The investment in the all-dairy farm consists of:

- (i) 27 cows at £80 each. Initially cows of only moderate quality, yielding an average of 500 gallons per annum would be purchased. As the farm is developed better quality cows would be the aim.
- (ii) Buildings, consisting of a very simple milking parlour with a yard and a silo for about 180 tons of silage,
- (iii) Fencing costs are not expected to be high but provision has been made for some fencing.

- (iv) Drainage is not anticipated for the whole farm as these units are only considered for the better areas but some drainage and reclamation will be necessary in many cases and provision has been made for 20 acres per farm on average,
- (v) A water supply will be needed in most cases and the sum to benefit from maximum grant has been allowed,
- (vi) Machinery, consisting of tractor, trailer, fertiliser spreader, buckrake, mower (or forage harvester on a shared basis) will be necessary unless reliable contractual services are available.

In the case of the cow/pig farming system, the replacement of 7 cows by 6 sows will reduce capital costs of livestock and buildings and as the acreage involved will be lower, the costs of land improvement are likely to be correspondingly lower.

TABLE 5—Farm income and operating costs

1. 27-cow herd	
<i>Output</i>	£
27 cows x 500 gals milk (sold) per annum (a 2/3d (incl. value of skim) per gallon)	1,519
24 dropped calves @ £18	432
Total	1,951
<i>Direct costs</i>	
A. I. and vet	95
Fertiliser	270
Machinery running costs	160
Dairy and misc. costs	75
Herd replacements (Heifer purchases less sale of culled cows)	150
Total	750
<i>Gross margin</i>	
Total gross margin (£1,951-£750)	1,200
Gross margin per cow	44
<i>Overhead costs</i>	
Machinery depreciation	120
Car and telephone	120
Casual labour	60
Electricity and rates	50
Miscellaneous	50
Total	400
Family farm cash income = £1,200-£400	800
Family farm income (£800 plus £100 for farm produce consumed in home)	900
2. 20-cow herd+6 sows	
<i>Output</i>	£
20 cows * 500 gals § 2 '3d (incl. value of skim per gal.)	1,125
18 dropped calves a £18	324
90 bonhams " £7 (56lb wt ' / 2/6 per lb)	630
Total	2,079

Table 5 continued

<i>Direct costs</i>	
A. I. and Vet	100
Fertiliser	200
Machinery running costs	130
Purchased feed for sows and bonhams	270
Miscellaneous	60
Herd replacements (heifer purchases less sale of culled cows, and one sow replacement a year)	120
Total	880
<i>Gross margin</i>	
Total gross margin (£2,079—£880)	1,200
<i>Overhead costs</i>	
As in 27-cow herd	400
Family farm cash income	800
Family farm income (£800 plus £100 for farm produce consumed in home)	900

On a typical commercial dairy farm, therefore, a 27-cow herd averaging 500 gallons per cow per year should provide the target family farm cash income (£800). To carry this enterprise and to allow scope for expansion of the farm business later the equivalent of 50 acres of the best of Class M land would be required. Considering the general quality of the soils of Class M this will mean a farm of 50 to 100 acres. Almost exclusively, the proposed farm units would be based on existing holdings, in many cases, of course, enlarged and rehabilitated.

Allowing then that dairy farms will be 50 to 100 acres in size and that approximately 13,500 acres of land is available which could be devoted to commercial dairy farming, there could be between 135 and 270 of these farms. Without pigs there would be some 200 of these farms established but with the integration of pigs into the system a figure of approximately 250 farms could be expected. Total milk production would be in the region of 2,700,000 gallons per year and allowing for local liquid milk requirements there would still be ample provision for some processing of milk products. It is not intended that the development of dairying should be an isolated operation within the survey area. Outside the survey area to the west and south-west (Dunkineely-Mount-charles-Donegal) in particular, there are sizeable tracts of mineral soils on drumlin terrain where dairying could be intensified. In fact, development of dairying is already in hand on a pilot scale under the guidance of the local Advisory Services of the County Committee of Agriculture on the outskirts of the survey area.

Specialised pig farming

On page 55 of Part 2 of the Resource Survey Report the reasons are set out why pig farming is not popular in the survey area. These briefly are: (i) the high cost of 'imported' pig rations in West Donegal; (ii) the decline in acreage of locally grown feeds suitable for pigs; (iii) the lack of suitable rearing and fattening accommodation; (iv) the high transport costs of bringing feed into, or transporting finished pigs out of, the survey area.

Nevertheless, farmers with an understanding of modern intensive pig husbandry and the necessary aptitude for this work, could make a comfortable living from pig farming despite these disadvantages.

Taking into account the isolation of the area, the relative lack of local feedingstuffs including milk by-products and the fact that it takes approximately 5 cwt of meal to produce a finished pig, it is necessary to consider the type of pig farming best suited to the area. The alternatives are: (i) to keep sows and sell weaners; (ii) to keep sows and finish all progeny to bacon weight; (iii) to buy in weaners and finish them to bacon weight. The Farm Management Survey of An Foras Taluntais for 1966-67 showed that, for a sample of 181 herds there were considerable differences in earnings between different systems of pig production. Breeding herds producing weaners to be fattened elsewhere had a margin of £34 per £100 gross output: those who fattened their own weaners had £26 per £100 gross output, whereas those who bought in weaners to fatten had only £23 per £100 gross output.

Obviously alternatives (i) or (ii) are better systems than (iii) in terms of economic returns. Besides, in the survey area, system (iii) is hardly realistic since there are insufficient breeding sows in the vicinity to supply weaners.

The I.A.O.S. in recent years has promoted a chain of co-operative pig fattening units throughout the country to cater for the finishing of weaners, coming from farmer suppliers. In the absence of an economic study which would indicate a better alternative we feel this is worth considering also for the survey area. Farmers should be facilitated with loans and technical advice to enable them to set up units of 12 to 20 sows, and a co-operative fattening station should be built in the vicinity of Killybegs. In this way the cereal feedstuffs could be handled through the port and, augmented by the fish-meal locally available, could provide an efficient and fairly cheap feed compound for fattening, and a sow and weaner ration for the breeder-suppliers. Finished pigs could be sold to Letterkenny bacon factory until pig numbers increase sufficiently to warrant a processing factory being established near the fattening station.

Specialised poultry farming

Layers: Ireland is self-sufficient in eggs, export prospects are poor and there is only a limited possibility of any real increase in the present per capita home consumption which at 237 eggs per head (1967) is one of the highest in Europe. It is the level of demand and not want of capital, technical incompetence, poor genetic material or bad management which limits expansion in egg production. Modern egg production is rapidly becoming a vertically integrated industry involving large production units with close financial management ties between producers, provender millers, processors and hatcheries. As these large combines expand they do so at the expense of the small farmyard laying units, which are rapidly disappearing. Were Ireland to join the E.E.C. the situation would not change since West Germany is the only egg importer among E.E.C. members and her imports are already being met. The newly developed and under-developed countries do not offer much promise for large scale imports.

It is, therefore, quite clear that a poultry industry based on layers is not a good economic proposition in the survey area, unless one of the established, integrated combines were to see some advantage in operating out of West Donegal; this is highly unlikely.

Broilers: As in the case of eggs and egg products, Ireland is able to meet the domestic demand for broilers and boiling fowl and the export market is extremely restricted. As with eggs, also, production is in the hands of large combines. In fact, four groups produce more than 65% of the annual output of 11 million birds. Per capita consumption is rising fairly rapidly but this increase is easily matched by expansion in produc-

tion by the big producers. Unless some unforeseen circumstances arise, there is little hope of a comprehensive broiler industry in West Donegal.

Water fowl: Unlike egg and broiler production, there are clear indications that commercial duckling (and to a lesser extent goose) production could be promoted in the survey area. Home produced ducks number some 220,000 annually, and a large proportion of these are produced by one hatchery in Co. Monaghan. Enquiries in the catering trade in Dublin indicate a potential demand for approximately 7,000 birds per week and if we allow the same demand by the provincial caterers, the annual requirement is for about 730,000 birds, to which may be added the requirements of butchers, chain stores and supermarkets.

Crossbred ducks are killed at 7 to 8 weeks of age, just before pin feathering commences when they weigh 7 to 8 lb. They have a food conversion ratio of between 2.5 and 2.8 to 1 and can utilise a high percentage of oils and oil-rich products in the ration. This enables fish oils and fish meals to be fed to give a ration with an energy content of 1,350 to 1,500 cal/lb and a metabolisable energy to protein ratio of 75. With such a ratio, Aylesbury x Pekin ducks will not be too fat at slaughter. Killybegs herring meal could be used in these rations.

Laying ducks, producing eggs for hatching, do not need a lighting regime to regulate egg lay, can be kept in simple non-insulated housing and there are records of some crosses laying over 300 eggs per annum. They are thought to need running water for maximum fertility, but very little research has been carried out on the factors affecting the hatchability of duck eggs.

Feathers are a valuable product of the duckling industry, and the down separated from the primaries is in keen demand. The survey area, with its present cottage industries based on knitting and weaving could readily integrate a new industry, using the feathers for quilting. There is a very steady demand from the military authorities for quilted combat jackets, and an increasing interest in quilted clothing suitable for outdoor sports.

Research at Glenamoy has revealed that lime and fertiliser application to blanket peat results in an alarming build up of snail populations which carry liver fluke. This same phenomenon occurred in Long Island, New York, many years ago to the extent that sheep and cattle could no longer be grazed and duck farming was started as an alternative. It was noted that free-grazing ducks, let out to grass after their early morning lay, were most efficient at detecting and eating the snails, with the result that ruminants were successfully re-introduced. This observation should be borne in mind when utilisation of the raw peats in the survey area is being considered.

7. Moderate-intensity livestock systems—cattle/sheep farming

General considerations

Land-use: A moderate-intensity livestock system based on a grassland economy is advocated for those areas of Class M that are unsuitable for the intensive dairy farming systems and for the better areas of Land Classes P_x and P₂ (see 3. Land quality classes). In considering the nature of the farm enterprise here the latter two land classes are taken together. Apart from elevation, the major differences between the two are that the ratio of 'greenland' to unimproved land is relatively lower in Class P₂ and the areas of P₂ are generally less accessible and more exposed. The higher elevation and the associated climatic and exposure effects, adversely influence the seasonality of herbage growth and grassland productivity generally. In the interest of the most

effective land-use for the area as a whole it is best, in the majority of cases, to combine the two land classes, as otherwise large tracts of the more elevated and less accessible P₂ land would be difficult to use as a separate entity by being cut off perhaps from access to a road or by being too far removed from a parcel of greenland. As shown earlier about one-half of Class M, about two-thirds of Class P_x and one-half of Class P₂, amounting to more than 100,000 acres can be adapted to the moderate-intensity livestock systems.

Family farm income: As for the intensive dairy system the family farm cash income is set at £800 minimum.

Type of enterprise: The livestock systems envisaged offer three alternatives in choice of enterprise: all cattle; cattle/sheep; all sheep.

The all-cattle enterprise would be advocated only on the best areas: those with better than normal peat type on fairly amenable terrain and with better than average 'greenland'. The cattle/sheep enterprise would suit the medium quality areas. Depending on the quality of the land and on market demands various combinations of cattle and sheep could be adopted within the farm enterprise. On the lower quality areas the all-sheep enterprise is the most appropriate.

Size of enterprise: To provide the projected income the minimum size of enterprise would be 52 to 70 livestock units. These could be made up as follows:

- (a) a 40-cow herd plus 12 cow equivalents of followers;
- (b) a 16-cow herd plus 5 cow equivalents of followers with a 250-ewe flock;
- (c) a 420-ewe flock.

Size of holding: The carrying capacity of the 'greenland' under a high standard of management is in the region of 2 acres per livestock unit. To carry the necessary livestock units, therefore, would require 100 to 150 acres of this type of land. This could be made up of 35 acres or a little more of 'greenland' in the case of the all-sheep enterprise, somewhat more than this for limited cattle substitution and up to 50 acres as the enterprise approaches an all cattle unit, with the balance in all cases provided by 'upland'⁴ grazing. The latter grazing area would be roughly between 200 and 300 acres depending on the choice of all-cattle, cattle/sheep or all-sheep. It would need to be of such quality that some 3 acres of it would give roughly the same grazing as one acre of 'greenland' i.e. a carrying capacity of 6 acres per livestock unit over the grazing season. In certain instances, the use of some very poor 'upland' may require an acreage in excess of 300 to supplement the 'greenland'.

The 'upland' would provide seasonal grazing whilst the 'greenland' would produce the conserved winter keep and provide in-bye grazing at certain periods. Because of the climatic disadvantages silage is a better proposition than hay and summer-saved silage is preferable to autumn silage. This, of course, does not entirely exclude autumn silage as even if the dry matter of such material is less than 20%, it would still be a useful feed.

To give silage in June-July the 'greenland' should be shut-off if possible from the previous winter; where grazed in spring and then shut-off it would yield less and would not be fit to cut until July-August. The silage target would be between 170 and 300 tons a year depending on the sheep to cattle ratio.

⁴ Upland here refers to unimproved peatland still carrying native vegetation as distinct from the improved "greenland".

Major prerequisites

Drainage: Drainage needs and procedures have been discussed earlier (Section 5).

Fencing: The 'greenland' would require a perimeter fence and some internal dividing fences to provide about four paddocks. The dividing fences can be variable depending on whether they are intended to contain sheep or cattle; for all cattle one or two dividing fences with an electric fence for controlled grazing would be adequate. The 'upland' would require a perimeter fence and limited dividing fences to allow some control of grazing and herding. The intensity, type, stockworthiness and cost of fencing will vary with the circumstances of each holding and its chosen enterprise. Wooden stakes for fencing would be available from state forests in the Ards-Ballybofey area. A diagrammatic lay-out is shown in Figure 1. This very symmetrical lay-out would need approximately 8,500 yards of fencing but sharing the boundary fences would reduce the individual commitment by about 2,500 yards.

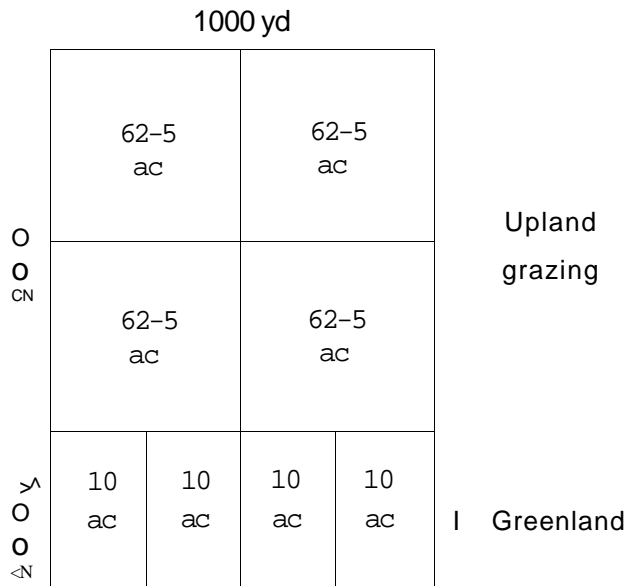


Fig. 1—Diagrammatic layout of required fencing

Grassland output: Almost all the soils of West Donegal are very poor in native lime and nutrient status and this is especially true of the peats (See Part I—West Donegal Resource Survey Report). In the course of the survey, experiments were conducted on pasture responses to manuring. The results, given in Part 2—West Donegal Resource Survey Report, show the very spectacular responses that can be achieved on most of the soil types tested.

The reclaimed mineral and organic soils of the 'greenland' should respond sufficiently to lime and fertilisers to provide dry matter returns in the range 3,000 to 10,000 lb per acre per annum: a good minimum target figure would be 5,000 lb/acre. At this level of production, even allowing for utilisation losses, the carrying capacity of a livestock unit per 2 acres set as a general standard for the quality of the 'greenland' could be attained, and in many cases, bettered.

Dry matter return per acre is a key factor in production and is the very foundation of the grass/livestock farming systems put forward here. Main dependence for dry matter production on an intensive scale is on the 'greenland', so main emphasis on manuring to give maximum returns is also here. After liming and manuring to requirement at the initial improvement stage, a general annual fertiliser dressing would be applied to half the 'greenland' area (Table 3). Farmyard manure and 2 cwt per acre of nitrogenous fertiliser would be applied to the other half. The order would alternate from year to year. To provide early grazing prior to closing off for silage a dressing of 2 cwt of N fertiliser would be necessary in late March.

Only limited manuring of the unimproved uplands is envisaged. These areas comprise mainly wet, raw peats and for some years would be expected to provide no better than low to moderate intensity grazing. This would be a major improvement on their present performance and, of course, they would continue to improve with better use. The improvement of such peats, including their lime and fertiliser requirements, is discussed earlier (Section 5 and Tables 1 and 2).

Before a more refined fertiliser formula can be advocated in a farm system such as envisaged here, more information is needed on the effects of lime and fertilisers on sward composition and nutritional quality and on animal parasite build-up under improved conditions, in the local environment. Experience at the Peatland Experimental Station at Glenamoy under rather similar environmental conditions, has shown, all too clearly, that to confine grazing stock to limed and manured reseeded pastures on peatland leads to build-up of liver-fluke infestation of alarming dimensions. From this point of view, in addition to the very questionable economics of full-scale manuring of these raw peats in the early years of amelioration, very judicious manuring is advocated. Besides, with the emphasis on intensification on the 'greenland' the build-up of parasites is likely to increase here and the necessity to maintain the 'upland' as free as possible becomes all the more important.

Housing: Housing for stock and storage space for silage (together comprising a feed-lot for winter) is required for each farm. There are suitable designs available for a low-cost system based on an open-plan arrangement allowing for easy feeding and management. The system will be sufficiently flexible to take cattle or sheep.

Although the ratio of sheep to cows may be 6:1 for the purposes of calculating equivalent livestock units, the ratio of building area required is not in similar proportion. For the all-cow enterprise the approximate requirement would be 11 building units (each unit holding 4 cows) as against 35 units (each unit housing 12 sheep) in the case of the all-sheep enterprise. To fit more than 12 sheep per unit would be too congested especially if lambing takes place in the pens. For the mixed cattle-sheep enterprise, the building unit requirements would vary between these extremes depending on the cattle/sheep ratio.

Roads: Existing farm roadways will need to be renewed in most cases and additional roads installed to cater for farming operations. These would be unsealed (gravel) roads the cost depending on ground conditions and standard needed.

Shelter: Shelter would certainly be a great asset to the farmsteads and also to the 'upland' grazing. Exposure is a serious problem in West Donegal and full development of farming, even on the limited areas outlined, requires shelter. On a broad basis large forest blocks would help but for more intensive local shelter each farm would need to carry some shelter-belts. The work at Glenamoy has shown that with proper fertiliser use, trees can be established on the raw acid peats and the stand at the top of

the Glengesh Valley is evidence that trees for shelter purposes could be established even on partially eroded peat in the survey area.

Machinery: The minimum requirements in large machinery to service the operation of one of these livestock farms would be, tractor, trailer, fertiliser spreader, mower and buckrake (or forage harvester on a shared basis). Here again there must be flexibility. A cheaper tractor with a mower and buckrake will suffice on the firmer terrain. A buckrake will not work on the peats: here a forage harvester could be substituted for the mower and buckrake.

Alternatively the various operations could be done by contract hire provided the facilities for this were available locally. The annual cost of hiring would be about equivalent to the depreciation charge and running costs of the machinery on a farm basis. A major advantage of hiring would be the saving in capital investment.

Water supplies: Where not laid on for household and farmyard needs, including drinking for livestock during winter, water supplies will need to be provided.

Bedding: The provision of bedding will be difficult and expensive, since there is little straw available locally. There is the possibility of 'importing' straw from East Donegal. Some bracken will be available locally and near the coast coarse sand could be used. Rushes and coarse grasses will be found in some localities. However, in certain cases one must budget for alternatives to the local resources, and these add greatly to the input costs. Slatted floors for sheep, allowing 10-12 sq feet per head, will cost 2/6 per sq foot in timber (to last 3 years) or 4/- per sq foot on concrete. Baled moss peat costs £2 per sheep per winter and straw if available would require 2-3 cwt per sheep per winter amounting to approximately 10/- per head.

Capital costs

A breakdown of capital costs showing total outlay, amount to be recouped from current Government grants and the net capital outlay is shown in Table 6; the three different livestock systems *viz.*, 'all cattle', 'all sheep' and 'cattle/sheep' are compared. The net capital outlay for the 'all cattle' system is £6,600, for the 'all sheep' system, £7,710 and for the 'cattle/sheep' system £7,280. This means an initial investment of around £7,200 per farm (over and above all state grants) to make a viable farming enterprise. The capital outlay on reclamation, drainage, fencing and surface regeneration, will vary somewhat depending on the terrain and soil conditions but with information on the latter now available these operations can be costed more precisely at local level.

The capital investment programme has been drawn up on the assumption that the land was available or would be made available in the size units already discussed, but that the farm would not have been improved, nor would it have been stocked. It is assumed that a dwelling of reasonable living standard would be available for the farmer and his family: where this was not the case additional funds would have to be available to provide a suitable house.

TABLE 6—Capital programme

Alternative systems	40 cows			420 ewes (+10 rams)			16 cows & 250 ewes (+ 6 rams)		
	Total outlay	Current grants	Net capital	Total outlay	Current grants	Net capital	Total outlay	Current grants	Net capital
Livestock	2,400	—	2,400	2,600	—	2,600	2,500	—	2,500
Buildings (open house for stock and a silo)	690	40	650	1,600	40	1,560	1,270	40	1,230
Roads @ £1 per linear yd.	500	100	400	500	100	400	500	100	400
Fencing @ 4s per linear yd.	1,200	800	400	1,200	800	400	1,200	800	400
Drainage, lime, fertiliser & overseeding of 40* acres of "greenland" @ £75 per acre	3,000	2,000	1,000	3,000	2,000	1,000	3,000	2,000	1,000
Limited drainage on 200 acres of "upland" @ £7 10s/ac	1,500	1,000	500	1,500	1,000	500	1,500	1,000	500
Manuring & overseeding of 100 acres of "upland" @ £10/ac	1,000	800	200	1,000	800	200	1,000	800	200
Water (piped to dwelling & feedlot) ...	300	200	100	300	200	100	300	200	100
Machinery	900	—	900	900	—	900	900	—	900
Sheep and cattle handling facilities	100	50	50	100	50	50	100	50	50
	11,590	4,990	6,600	12,700	4,990	7,710	12,270	4,990	7,280

*"Greenland" on average is about 40 acres.

The main investment items are as follows:

Livestock (a) For the all-cattle unit

	\pounds	
40 cows x $\pounds 60$ per cow	=	2,400

(b) For the all-sheep unit

420 ewes and hoggets (d $\pounds 6$)	=	2,520
10 rams (a $\pounds 8^5$)		80

2,600

(c) For the cattle/sheep unit

16 cows (a $\pounds 60$ per cow)	=	960
250 ewes and hoggets @ $\pounds 6$	=	1,500
6 rams @ $\pounds 8$	=	48

2,508

Buildings: Open type buildings for stock, including a silo are considered adequate.

The approximate cost per enterprise would be as follows (See 'housing', p. 35):

All-cattle enterprise: $\pounds 40 \times 11 = \pounds 440 + \pounds 250$ (open silo)⁶ = $\pounds 690$

All-sheep enterprise: $\pounds 40 \times 35 = \pounds 1,400 + \pounds 200$ (open silo) = $\pounds 1,600$

Cattle/sheep enterprise: $\pounds 40 \times 26 = \pounds 1,040 + \pounds 230$ (open silo) = $\pounds 1,270$

At present no grant is payable on the type of housing envisaged. The maximum grant payable on an open silo is $\pounds 40$, so the totals cannot be reduced by more than this figure.

Roads: The type of roads considered adequate has been discussed earlier (See 'Roads p. 35). It has been estimated that 500 yards of roads would be required on average per farm. At $\pounds 1$ per linear yard and with an assumed grant of 20% the net cost would be $\pounds 400$.

Fencing: Fencing costs and relevant state grants have been discussed (Section 5, p. 27) and the approximate fencing requirements of a farm unit are set out earlier in this section.

	\pounds	
6,000 yd @ 4/- per linear yd	=	1,200
Grants		800
Net investment		400

Land reclamation and manuring: The drainage and reclamation requirements including manuring and reseeding of both the 'greenland' and 'upland' have been discussed (Section 5).

For the 'greenland' the scheme undertaken would be commensurate in cost with the maximum grant of $\pounds 50$ per acre under the Land Project so that it would require a total expenditure per acre of $\pounds 75$ to include drainage, lime, fertiliser and overseeding. This would apply on average to 40 acres.

⁵ Allowing for premium of approx. $\pounds 8$.

• A covered silo (6 tons/cow) (5 $\pounds 18-20$ per animal would increase costs considerably.

Limited drainage of about 200 acres of 'upland' is envisaged. At £7 10s an acre (less grant of £5) the net cost would be £2 10s/acre. Manuring and overseeding of 100 acres @ £10 an acre (less grant (*a* £8/acre) would be sufficient at the start.

Water: It is assumed that an investment of £300 to avail of the maximum grant of £200 for water to dwelling and farm building is sufficient to provide this where required.

Machinery: The machinery requirements have been outlined earlier in this section (see Machinery, p. 36).

	£
Tractor	500
Trailer	100
Fertiliser spreader	50
Mower	100
Buckrake	40
Electric fence and wire	30
Miscellaneous	80
	900

Farm income and operating costs

The livestock enterprise is adjustable between all cattle, all sheep and combinations of cattle and sheep since the system is based on a given number of livestock units and designed to roughly maintain parity of income potential. The best example to show the breakdown of income and running costs is the combination of 16 breeding cows and a 250 ewe flock (Table 7). The derivation of income for the all-cow and all-sheep enterprises respectively are shown in Tables 8 and 9.

TABLE 7—Farm income and operating costs (16 cows and 250 ewes)

<i>Cattle—16 cow unit</i>	£
<i>Output¹</i>	
Sales—14 ten-month-old cattle @ £50 each	700
2 cull cows @ £50	100
	800
Total sales	800
Purchase of 2.5* breeding heifers-in-calf <i>n</i> £65	162
	638
Output	638
Total output (£638 plus beef cow subsidy (14 X £12))	806
 <i>Direct costs:</i>	
A. I. (16 cows <i>a</i> 25/-)	20
Vet. and med.	25
Fertilisers ³ (<i>f</i> of hill fert.)	55
Silage ⁴ 107 tons @ £1 ton	107
Feed purchased for 15 calving cows (4 tons molasses £ 18/ton)	72
Other direct costs (mineral licks, marketing etc.)	45
	324
Total costs	324

TABLE 7 continued

Gross margin from cows (£806—324)	482
G. M. per cow	30 approx.
<i>Sheep—250 ewe-flock</i>	
<i>Output'</i>	
Sales: 193 lambs g £3 5s. ⁵	627
Wool—250 fleeces / 12 -	150
Barren and cull ewes—44 @ £3	132
Subsidy of £ 1 per head on 248 lambs and 50 hoggets	298
Total sales	1207
Purchase of 3 rams § £8 (allowing for premium of approx. £8)	24
Total output	1,183
<i>irect costs:</i>	
Fertilisers (§ of hill fert.)	110
Vet. and med.	50
Silage 105 tons a £1	105
Purchased feed (7 tons oats (§ £25 per ton)	175
Other direct costs	35
Total costs	475
Gross margin from sheep (£1,183—475)	708
Gross margin per L. U. of sheep	17 approx
<i>Derivation of family farm income</i>	
Total gross margin: Cattle £482	}
Sheep £708	
<i>Overhead costs:</i>	
Depreciation of machinery	75
Share of car and telephone	120
Casual labour	80
Electricity and rates (farm share)	50
Miscellaneous	50
	375
Family farm cash income=£1,190— £375	£815
Family farm income = £815 plus £100 of farm produce consumed in home	£915
<i>Physical output programme</i>	
<i>Cattle</i>	
16 breeding cows (plus 5 cow equivalents of young stock)	
At 90% calving rate=14.5 calves born (one or two cows in alternate years fail to breed)	
At 3% calf mortality (birth to sale)=0.5 on average or one calf lost every 2 years.	
{ Therefore 14 calves for sale annually	
{ Also for sale 2 cull cows	
To replace 2 cull cows and to allow for one cow death in every 2 years (or 0.5 a year on average)—2.5 heifers-in-calf are bought in annually.	

TABLE 7 continued

Sheep

200 ewes	
50 hoggets (25% flock replacement rate)	\ replacement
55 ewe lambs (10% loss in ewe lambs to hogget stage)	f stock
Mate 250 ewes and hoggets	
Less 20 barren ewes and hoggets = (8 %barren)	
230 ewes and hoggets to lamb	
At lambing percent of 130 = 300 lambs born	
Less 30 (at 10% loss to weaning)	
= 270 weaned lambs	
Less 67 ewe lambs retained for flock replacement (at 25 % replacement rate)	
=203 lambs for rearing to sale	
Less 10 deaths weaning to sale (5 %)	
	193 lambs to be sold plus 44* barren and cull ewes

Fertiliser programme

20 acres of "greenland" < i 3 cwt superphosphate and 1 \ cwt of potash per acre (See Section 5, Table 3)	60
40 acres of "greenland" 5 2 cwt N per acre (for silage cut)	90
	150
80 acres of "upland" (per year) (§ £2 per acre (See Section 5, Tables 1 & 2)	160

Where nitrogen for early grazing is applied on say one or two paddocks of the "greenland" the cost would have to be offset mainly against a reduction in the fertiliser application on the "upland".

Feeding programme

Silage

(a) 16 cows from mid-Oct.—end of April n 75 lb/head/day	
16 75 X 200	
—————=107 tons	
112: 20	
(b) 250 ewes and hoggets from end of January to mid-May 5 9 lb head/day	
250x9x105	
—————=105 tons	
112x20	
Total	=212 tons

Costs

	£
Fertilisers on "greenland"	150
Machinery repairs and fuel 5 £1 15./acre	70
	220

220
Cost per ton of silage=—=£1 approx.

Hand feeding

(a) 15 calved cows n 4 lb of molasses per head per day for 145 days	
15-4x145	
—————=Approx. 4 tons @ £18/ton	£ 72

TABLE 7 continued

(b) 250 ewes and hoggets § 1£ lb oats per head per day for 42 days	
250x3x42	
— — — = 7 tons (2 £25/ton)	175
20x2x112	

¹ See p. 40, "Physical output programme".

² Two and three in alternate years or average of 2.5 a year.

³ See p. 41, "Fertiliser programme".

⁴ See p. 41, "Feeding programme".

¹ The ewe lambs sold off the farm would be eligible for the ewe-hogget subsidy in the following year and because of this should fetch a higher than average price.

⁶ Barren and cull ewes calculated as follows: Of the 67 ewe lambs for replacement some 5% die before weaning leaving 64 entering the flock as hoggets. Of the barren and cull ewes and hoggets to be replaced, 20 are barren (" 8% barren) leaving 44 non-barren culls of which after deaths, 55% on average are saleable=24 non-barren culls.

TABLE 8—Farm income and operating costs (420 ewes and hoggets+ 10 rams)

Derivation of family farm income

Gross margin per livestock unit of sheep (see Table 7)	17
G. M. for 420 ewes and hoggets or 70 livestock units of sheep	1,190
Overhead costs (see Table 7)	375
 Family farm cash income	 815

Physical output programme

Mate 420 ewes and hoggets	
Less 34 barren (§ 8% barren)	
=386 ewes and hoggets to lamb	
At lambing percent of 130 = 502 lambs born	
Less 50 (g) 10% loss to weaning)	
=452 lambs weaned	
Less 113 ewe lambs retained for flock replacement (@ 25% replacement rate)	
=339 lambs for rearing and sale	
Less 17 deaths weaning to sale (5% loss)	
= 322 lambs for sale —74 barren and cull ewes	

TABLE 9—Farm income and operating costs (40-cow unit)

<i>Derivation of family farm income</i>	£
Gross margin per cow (see Table 7)	30
G. M. for 40 cows	1,200
Overhead costs (see Table 7)	375
 Family farm cash income	 825

Physical output programme

40 breeding cows (plus 12 cow equivalents of young stock)
At 90% calving rate = 36 calves born
Calf mortality (birth to sale) @ 3%=1 calf
Leaving for sale—35 calves
Also for sale—4 cull cows
6 heifers-in-calf bought in annually to replace 4 culls and 2 deaths

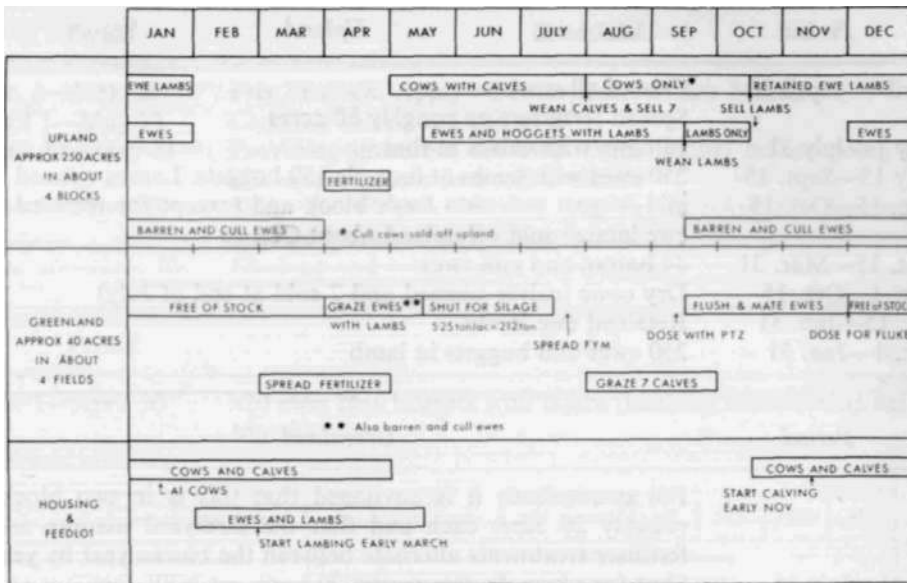


Fig. 2—Operational Calendar—cattle/sheep unit

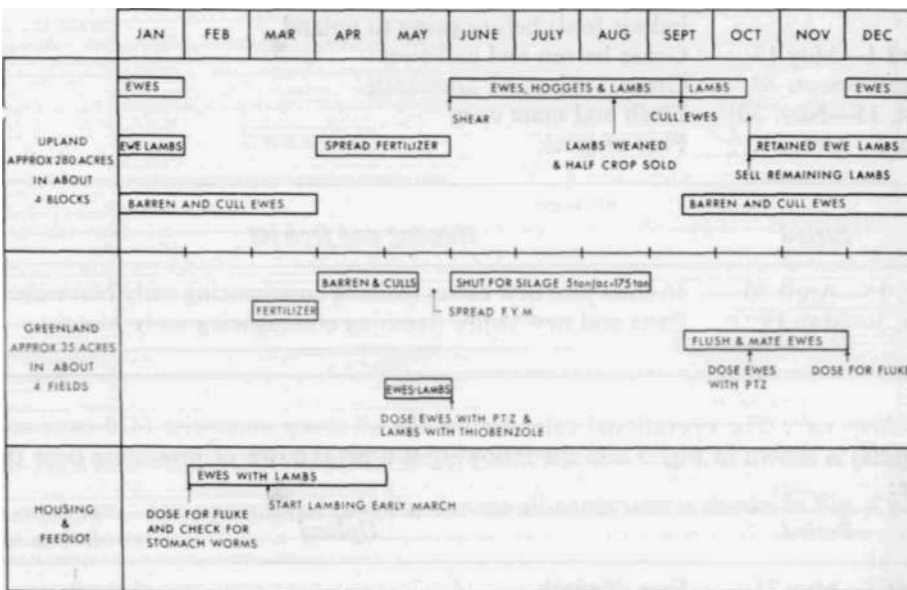


Fig. 3—Operational Calendar—all-sheep unit

Calendar of yearly stocking

Cattle/sheep unit: Taking into account the availability of grazing in the upland and greenland, the production of silage on the greenland and the necessity for indoor feeding over a longer than normal winter period (due to climatic, soil and growth conditions) both cattle and sheep are rotated over the farm (see Fig. 2) as follows:

<i>Period</i>	<i>Upland</i>
April 1—April 30	Free of all stock Spread fertilisers on roughly 80 acres
May 1—July 31	16 cows with calves at foot
May 15—Sept. 15	250 ewes with lambs at foot plus 50 hoggets. Lambs weaned mid-August put onto fresh block and (except for retained ewe lambs) sold off upland about Oct. 15
Sept. 15—Oct. 15	
Sept. 15—Mar. 31	44 barren and cull ewes
Aug. 1—Oct. 15	Dry cows (calves weaned and 7 sold at end of July)
Oct. 15—Jan. 31	Retained ewe lambs
Dec. 1—Jan. 31	250 ewes and hoggets in lamb

<i>Period</i>	<i>Greenland</i>
	For convenience it is envisaged that this is in two blocks roughly 20 acres each and that the farmyard manure and fertiliser treatments alternate between the blocks year by year
Jan. 1—July 15	Shut for silage. In this period 20 acres get NPK fertiliser and the other 20 acres get N fertiliser and later farmyard manure
April 15—May 15	One paddock for green feed for ewes and lambs (whilst still on indoor feed) before going to upland
April 1—May 15	Graze barren and cull ewes
Aug. 1—Sept. 30	Graze 7 calves on aftermath
Sept. 15—Nov. 30	Flush and mate ewes
Dec. 1—Dec. 31.	Free of stock

<i>Period</i>	<i>Housing and feed-lot</i>
Oct. 15—April 30	16 cows plus new calves (calving commencing early November)
Feb. 1—May 15	Ewes and new lambs (lambing commencing early March)

All-sheep unit: The operational calendar for the all-sheep enterprise (420 ewes and hoggets) is shown in Fig. 3 and the following is a breakdown of procedure over the year:

<i>Period</i>	<i>Upland</i>
April 1—May 31	Free of stock Spread fertilisers on roughly 80 acres
June 1—Sept. 15	Carrying ewes, hoggets and lambs. Lambs weaned mid-August half of crop sold directly, the rest put on to fresh block and (except for retained ewe lambs) sold off 'upland' about Oct. 15
Sept. 15—March 31	Carrying 74 barren and cull ewes
Oct. 15—Jan. 31	Carrying 113 retained ewe lambs
Dec. 1—Jan. 31	Carrying ewes and hoggets in lamb

<i>Period</i>	<i>Greenland</i>
Dec. 1—Mar. 31	Free of stock. Apply NPK fertilisers in late March
April 1—May 15	Carrying barren and cull ewes
April 30—May 31	Providing greenfeed for ewes (with lambs) before going to hill—some indoor feed still available
June 1—Sept. 15	Shut for silage—176 tons cut in July-August—farmyard manure spread in early June
Sept. 16—Nov. 30	Flushing and mating ewes and hoggets

<i>Period</i>	<i>Feedlot</i>
Feb. 1—April 30	420 ewes plus hoggets with lambs (lambing commencing early March)

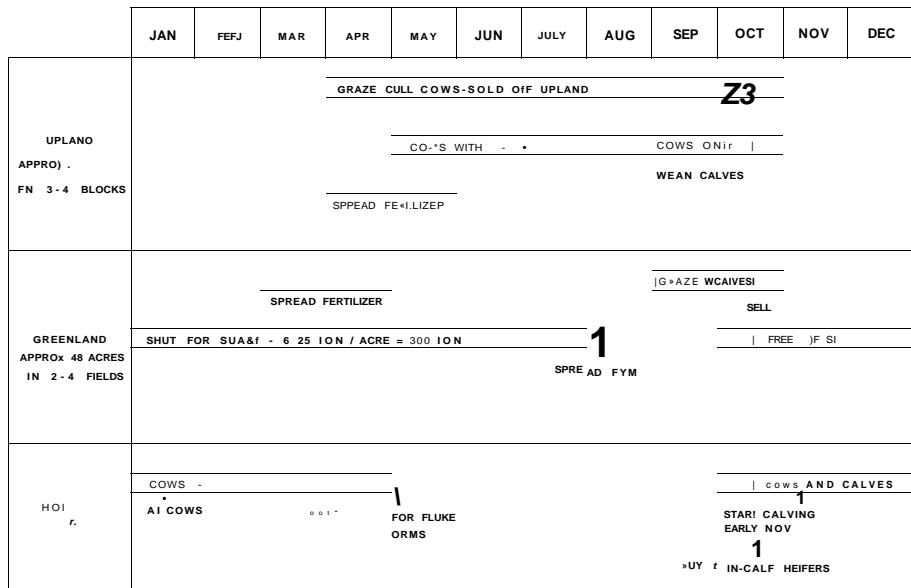


Fig. 4—Operational Calendar—all-cattle unit

All cattle unit: The operational calendar for the all-cattle unit is shown in Fig. 4 and runs as follows:

<i>Period</i>	<i>Upland</i>
Oct. 16—Mar. 31	Free of stock
April 1—Oct. 15	Grazing 4 cull cows (sold off upland)
April—May	Spread fertilisers on roughly 80 acres
May 1—Aug. 31	40 cows with calves (35 calves weaned end of Aug., half moved to 'greenland' and half sold directly from 'upland')
Sept. 1—Oct. 15	Grazing dry cows alone

<i>Period</i>	<i>Greenland</i>
Oct. 16—July 31	Shut for silage—300 tons cut July
March—April	NPK fertiliser applied
Aug. 1—Aug. 31	Shut and spread farmyard manure
Sept. 1—Oct. 15	Graze 18 forward calves for sale mid-October

<i>Period</i>	<i>Feedlot</i>
Oct. 16—April 30	Cows and calves—cows starting calving early November

Summary conclusions

As moderate-intensity farming enterprises, three alternative livestock systems based on a grassland economy have been put forward. The least demanding in terms of land quality is the 'all-sheep' system. Where the upland peat is of somewhat better quality and where the 'greenland' is better able to provide the winter keep and periodic in-bye grazing needed, then a proportion of breeding cattle can be introduced. In rare instances, where better than average 'upland' is combined with up to 50 acres of good quality 'greenland', then the 'all cow' enterprise would give the best returns. Here, however, if a dairy industry is developed locally, the temptation at this point in time might be to devote 'greenland' of such quality to a dairy herd rather than breeding stock and use the 'upland' for casual, low-intensity grazing by dry cows and followers.

As shown earlier, roughly two-thirds of Class P₁, one-half of Class P₂ and one-half of Class M or approximately 46,000, 42,000 and 13,500 acres respectively (somewhat in excess of 100,000 acres) could be adapted to this moderate-intensity livestock farming in West Donegal. At roughly 250 acres per farm there could be around 400 viable units established.

8. Changes in farming population

Some aspects of agricultural re-organisation and changes in farm structure to suit the lines of development suggested in the West Donegal area are likely to cause concern. Foremost amongst these perhaps will be the reduction in the number of people engaged fully in farming. In 1965 there were 3,486 males engaged in agriculture (see West Donegal Resource Survey Report—Part 3—Economic Background) in the Glenties Rural District; this is likely to have fallen to about 3,000 at the present time. Setting up some 250 farms in an intensive livestock system and some 400 in a moderate-intensity livestock system means using 45 % of the land area, but all of the better agricultural land, to support 650 farms. At an average labour requirement (including casual) of 1½ men (and youths) per farm, this would mean an active farming population of around 1,000. At the same time many of the existing 3,000 people engaged in farming are elderly and it is anticipated that these people will continue to occupy their homes. The actual reduction in total farming population is therefore likely to be much smaller than the apparent reduction.

However, the whole question of the farming population in West Donegal must be treated realistically rather than emotionally. Two questions arise. Should an area like West Donegal have as many holdings as exist at present; they are there by historical

accident and not by economic design. In a modern economy would the area be able to cater adequately, from farming alone, for as many people as depend on it to-day. The number of holdings is declining in any case due to a series of circumstances not peculiar to West Donegal alone. Should we not plan then to meet this change and to cater for its local implications, both immediate and long term ?

The number, size and economic viability of farm holdings in any area are greatly influenced by the quality of the physical resources available. By comparing West Donegal with an area fairly similar in size but much superior in soil resources, *viz.* County Carlow, the imbalance between the soil resources and number of holdings in the former region becomes all the more apparent.

West Donegal has a total area of 411 sq. miles (263,050 acres), Carlow has 346 sq. miles (221,540 acres). The landscape features and climatic conditions in the latter are more favourable for general agriculture and the soils,⁷ the very basis of production, are far superior to those in West Donegal. If we consider the soils of both regions under three broad quality classes, (a) soils with a wide use-range, capable of competitive production in a variety of farm enterprises, (b) soils of somewhat limited use-range, these have certain problems (mainly physical) that have to be overcome in attaining competitive productivity, (c) soils of restricted to very restricted use-range; these are capable of improvement but not to the point of being competitive because of high reclamation costs and the poor inherent productivity of the soils themselves. In County Carlow 67 % of the soils have a wide use-range, 4 % have a somewhat limited use-range and 28% have a restricted to very restricted use-range (1 % are unclassified). In West Donegal less than 1 % of the soils have a wide use-range, 6% have a somewhat limited use-range and 90% have a restricted to very restricted use-range (3% of the area is not classified). Therefore, of the soils of Co. Carlow some 71 % have a moderate to high capacity for the economic production of a wide range of agricultural commodities compared with 7 % in West Donegal.

The total number of holdings exceeding one acre in 1965 was 3,101 in Co. Carlow and 4,456 in West Donegal. The distribution according to size of holding is shown in Table 10.

TABLE 10—Total number of agricultural holdings exceeding 1 acre in 1965

Size of holding (acres)	Co. Carlow	Glenties R. D.
1-15	724	2,414
15-30	422	801
30-50	557	483
50-100	776	412
Over 100	622	346
Total	3,101	4,456

Source: C.S.O. Agricultural Enumeration, 1965.

⁷ Soils of Co. Carlow by Conry, M. J. and Ryan P., 1967, An Foras Taluntais, Dublin.

Notwithstanding the ten-fold difference in the proportion of good quality soils, County Carlow has approximately nine holdings per square mile compared to eleven in West Donegal. Of the holdings in Carlow, 37 % are under 30 and 55 % are under 50 acres in size; in West Donegal 72% are under 30 and 83 % under 50 acres in size. This means that the proportion of holdings under 30 acres in West Donegal is roughly twice that in County Carlow. If we take soil quality—a basic prerequisite to productivity—into account, the chances of a small farm in Carlow being on good land is 10 times greater than in West Donegal. Moreover, many of the farms under 30 and even under 50 acres in Carlow are not guaranteed economic viability. Therefore, in appraising the situation in West Donegal it must be recognised that for general farming and particularly in livestock (which suits the area best) some reduction in the number of holdings to allow for consolidation and enlargement is inevitable. The order of magnitude of farm sizes suggested in this report is based on soil quality, a target family farm income and a predetermined number of livestock units to yield the desired income. If lesser returns from full-time farming or part-farming come to be accepted, then the farm operation can be scaled down accordingly.

We agree with those who wish to maintain the rural population. We do not think that this necessarily means keeping the present numbers engaged in farming. The Third Programme—Economic and Social Development 1969-1972 has this to say (p. 44-45), 'In the long run the only real solution to the problem of farms which cannot be made to provide a reasonable livelihood lies not in agriculture alone, but in the comprehensive development of rural areas through the expansion of industry, tourism, afforestation, fisheries, etc. The approach has the advantage of helping to maintain the rural population'. This is particularly applicable to areas like West Donegal, where as we have shown the number striving to make a living from the land far outruns the inherent productivity of the land.

POSSIBILITIES FOR WILDLIFE DEVELOPMENT*

INTRODUCTION

In considering the possibilities for agricultural development in West Donegal it has been shown that only 45 % of the land of the area has any real potential for intensification of agriculture. Of the remaining 55 % some will continue to support low-intensity grazing but the greater proportion will gradually fall into disuse unless it can be devoted to purposes other than farming. Most of this inferior land is not capable of supporting forestry as an economic enterprise (See Part 2—West Donegal Resource Survey Report) but afforestation for social and amenity purposes would be justified on a limited scale. Where the terrain and other conditions suit, the possibilities for amenity and recreational facilities must be seriously considered. With the ever-growing needs of our own people and of the tourists who come to visit us for leisure pursuits, these expanses of unspoiled open countryside may have a great deal to offer. In this regard lake and river fishing, pony trekking, nature trails and wildlife are distinct attractions. In this section the possibilities for wildlife development are considered.

DONEGAL SURVEY

A preliminary survey was made in County Donegal to investigate the possibilities of wildlife in the agriculturally unproductive areas of the county. Although a more detailed ecological survey would be needed to show the full picture, it is obvious that the highlands, which in general comprise the least productive agricultural land, in many cases would be ideal for wildlife, and particularly for red deer. Mallard are more of a problem, because the acid lakes support little plant life. Resident snipe are not numerous in Donegal but there are indications that the birds breed in the area.

RED DEER

Historical

From 12th and 13th century literature it would appear that the red deer was present in most parts of Ireland. The Blue Stack Mountains in Donegal are mentioned as having held a particularly large deer population. That the lowlands held deer is suggested by several finds of the remains of large antlers, like those of present-day park deer, which are only found on deer which feed off lush vegetation.

*This section is based on a contribution by Mr. B. W. H. Stronach and Mr. P. J. O'Hare, An Foras Taluntais.

Potential

The only fenced red deer forest in the British Isles is the Glenveagh Estate in Donegal. Here there is a population of approximately 1,000 deer which is too big a number for the 20,000 acres of the estate. From time to time holes appear in the fence and deer escape; these continue to live quite happily in the country around the deer forest. An estimated 200 deer are living at present within a radius of 30 miles mainly to the west and south of the estate.

Deer are known to be in the areas B and C on the accompanying map (Figure 5). Between both areas there are approximately 50 animals. Area C is continuous with Glenveagh (Area A) so it would not be difficult to translocate more deer into this area. Area D holds between 100-150 animals but it is possibly the best grazing in the region and could be stocked more heavily than any of the other areas. Areas E and F have vast expanses of quiet, undeveloped country where deer would not be disturbed: however, neither area has any deer at present. Attention should be initially given to developing deer in areas C and F and then extend to areas D, E and B in that order. Area F lies within the confines of the West Donegal Resource Survey and local community leaders are keen on this type of development. Area C is an estate which the owner is eager to develop as a tourist attraction.

Fencing

In order to make a deer enterprise productive it is essential to have some control on the movement of the herd, so that at any given time the number of deer would be known. In this way cropping on a sustained yield basis could be carried out and the meat harvested. For best results then, the deer areas would have to be fenced. The fencing required would need to be 6 feet high and consist of 9 strands of wire.

The cost of this kind of fencing is high. Experience on the Glenveagh Estate would indicate a cost of approximately £1 per yard including labour and materials. The total fencing required for area C would be 9 miles and for area F, 11 miles approximately. Further fencing to create holding areas for the deer during the initial 6-9 months would also be required, but enough fencing to enclose 100 acres in each place would suffice for this. The total cost of peripheral fencing then would be £16,000 approximately for area C and £18,500 for area F. A further £2,000 would be required in each case for 9-metre grids where roads run through the fence and for water supplies in the holding areas. In general an initial investment in the region of £20,000 would be required in each of these two areas.

On a cost-benefit basis Area F is particularly suitable as only a comparatively short fence is required to confine a large area since on three sides the area is surrounded by the sea (Fig. 5). The total area which could be devoted to deer is about 50,000 acres and this would carry at least 1,000 to 1,500 head. Experience in Scotland has shown that it is advantageous to keep small numbers of sheep on the deer range as they eat some plants which are unpalatable to the deer thereby improving the sward and increasing the carrying capacity of the range for deer. Therefore, the introduction of deer to the hill and mountain grazings under a good management system need not mean any significant reduction in the present sheep numbers grazing these areas.

Deer as an economic resource

To date little costing has been done to measure the true productivity of deer ranching but over the past season at Glenveagh approximately 20% of the deer herd was harvested and the venison was sold ex-Dublin to a Swedish firm for 6/2d a pound. This is an excellent price but with increased supplies the price will naturally fall to

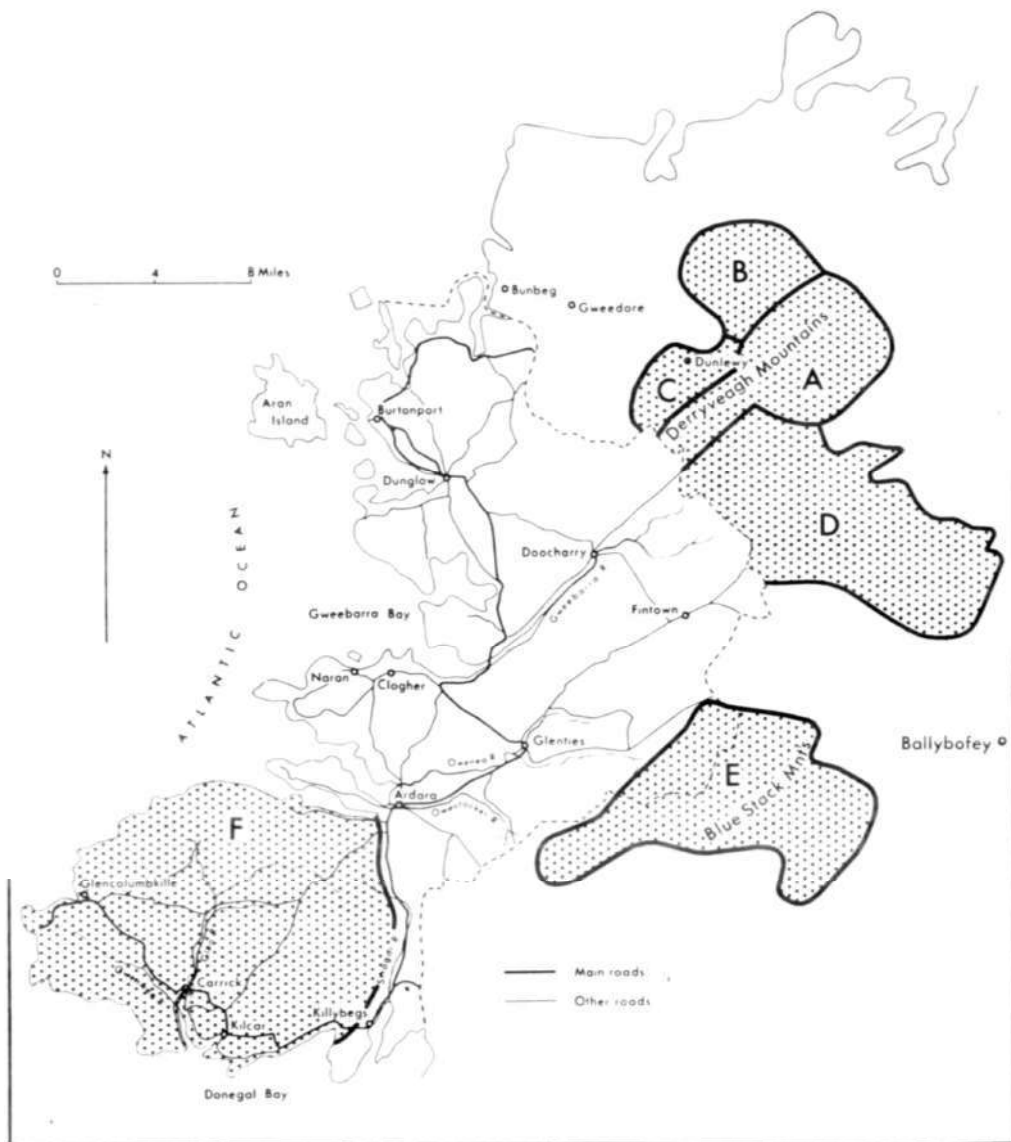


Fig. 5—Possible areas for development of red deer

perhaps 4-5 shillings per pound. There is a good demand for venison in Germany, France, Belgium, and Sweden and there is no reason why the home demand could not be cultivated.

The main return would be from deer-hunting as a pastime. At Drysdale in Yorkshire a scheme is under way to develop this aspect of the enterprise where tourists would pay up to £400 per beast, the exact amount depending on the size, weight and shape of the trophy. These are very high charges but even if the hunters were to pay £100 per beast the return would still be high. The benefits could be transmitted also to local farmers who would share in the deer enterprise on a co-operative basis. There would be full or part-time employment for a number as stalkers and guides. Undoubtedly the presence of deer and the added opportunity for the hunter would greatly enhance the tourist attractions of West Donegal thus benefiting hotel and other business and the local community generally.

A more detailed ecological study ought to be carried out before implementing these preliminary recommendations. In any area newly-planted by deer careful management is required until the herd becomes fully productive; during this period it is best to entrust the responsibility to those with the necessary expertise and research experience. The deer would not be productive for some years after the areas are stocked so that no income would be forthcoming for at least 10 years. The rate of return would be governed by the initial number of animals planted and the level of management practiced.

MALLARD

There is only a small resident population of mallard in Donegal as the lakes are very acid and provide very little plant growth. From experiments to date in this country it would appear that the resident mallard population is controlled, not by the food supply, but simply by the amount of cover available on the lakes for brooding their young and for the subsequent moulting period.

In order to increase the population for restocking purposes it would be necessary to adjust the pH in the acid lakes to promote more lavish plant growth. To start with, experiments should be carried out on selected lakes to monitor the effect liming and perhaps some major and trace elements would have on plant life and the local ecosystem in general. The most suitable area for this experiment would be in the vicinity of Dunglow, where the local fishing association would gladly make two lakes available. There are two lakes in area F (Fig. 5) which could be included also and later used for restocking purposes.

SNIPE

The resident snipe population is small, but there were indications that these birds were breeding locally as several young birds were seen and 'drumming' snipe were observed on a number of occasions. A very suitable snipe habitat was examined near Narin in West Donegal (see Soil Map—Soil type 19—West Donegal Resource Survey Report—Part I). This salt-marsh area already carries snipe and would be ideal as a pilot research area on snipe management. Several valley bottoms (see Soil Map—Soil type 30) were visited and found to hold snipe. These areas might be developed by increasing feed resources with a view to attracting more snipe in the winter months.

GROUSE

Donegal, famous in bye-gone days for grouse shooting, can rarely, even on the few managed shoots, boast more than one bird per 50 acres. This contrasts strongly with the best grouse moors in Scotland which carry one bird to 2 acres. The key controlling factor, according to the Grouse Research Unit of the Nature Conservancy in Scotland is the available quantity and quality of the common ling heather (*Calluna vulgaris*). Given an adequate amount of this, then good management can increase the grouse populations.

The most urgent requirement is increased heather per unit area. West Donegal lies in a much heavier rainbelt than the east of Scotland where their best grouse moors occur and so could not be expected to be as productive. However, drainage and small amounts of fertiliser will help increase quantity and quality of heather. Control of sheep grazing is essential on managed grouse moors. A study area of about 400 acres should be established—200 acres for scientific experiment and 200 acres for control. At the base of Slieve League near Lough Agh in West Donegal there is an area suitable for this work.

PHEASANT

The Eley Game Advisory Station Annual Review, with reference to pheasant management in the West of Scotland, has particular relevance to West Donegal. The young conifer plantation in the vicinity of Lough Agh could be developed to assess the feasibility of Scottish findings in this area.

OTHER WILDLIFE ATTRACTIONS

There are places around the coast of Donegal which hold particularly large concentrations of nesting sea-birds in the spring and early summer. It should be a great tourist attraction, especially to keen ornithologists and nature-lovers if there was some organised means of taking people to tour the areas concerned. Of particular interest are the cliffs at Tormore which lie just north of Glencolumbkille. If it were possible to have a regular boat service to this area in the breeding season and to the other interesting places, such as Rathlin O'Birne Island where eider ducks nest, it would be a boost to local activity and income. A complete survey of this very interesting coast-line would probably reveal further attractions and set the basis on which to plan tourist facilities. It is becoming more popular nowadays to study and photograph wildlife than to shoot it, and here is a field which is open for development in West Donegal.

CONCLUSIONS

From this short survey it would appear that the wildlife potential of West Donegal is promising especially when taken with the surrounding territory. Red Deer development offers the biggest scope in terms of land-use and returns but also involves the highest investment initially. One of the great advantages of wildlife is the attraction it offers outside the normal tourist season.

A detailed survey, as a basis for drawing up a research and development programme is essential before steps are taken to carry out any of the projects outlined here.

WEST DONEGAL—THE FUTURE

THE DEVELOPMENT OF AGRICULTURE

The main purpose of the West Donegal Resource Survey was to assess the extent to which agriculture as a sector of the economy of the area could be developed. Other sectors were examined in so far as they impinge on or support agriculture. It is obvious that agriculture alone cannot maintain the area or its people at the economic and social standards that we have come to accept as desirable in our modern society. It is obvious too that agriculture in its present form of largely subsistence-type farming cannot be improved adequately without significant changes in the structure and economic capacity of the farms in the area. The farm enterprise in the vast majority of cases at present is grossly inadequate to provide an acceptable standard of living for the farm family.

A number of options for the development of agriculture have been spelled out earlier in this report (pp. 16-48). The alternatives are not in all cases mutually exclusive; on the contrary there is a place for full-time, part-time and co-operative farming. Our proposals for the full-scale, viable farming operations only account for 45% of the total land area of the region. A flourishing agricultural sector in itself will provide considerable local employment in contract work, servicing and agriculturally-based industry. We have attempted to set forth the structural framework, the form and size of farm operations and the investment needed to meet the requirements of a target family farm income. The standards outlined are geared to the factors of production peculiar to the area which were objectively and systematically appraised in the course of the resource survey.

In making our proposals we are not advocating future policy or criticising current policy on development in West Donegal or other under-developed areas of the country. As a research team which has examined the resources of an area in detail we are presenting an estimate of the order of magnitude of physical and financial inputs to bring farming there into the realm of actual economic viability. In devising the alternative farming systems set out earlier in this report we have been optimistic perhaps as to the degree to which modern technology and structural reform could be applied generally in the agriculture of West Donegal. This has been done in the light of the evident need to bring about a fundamental agricultural revolution if family farm incomes are to be brought up to and maintained at a reasonable level. We have not, however, set out to give a precise blueprint of the way to economic salvation for the rural community, but rather to show as clearly as possible the magnitude of the task of agricultural development as we see it.

We see three basic requirements for the development of a viable farming system:

- a) a very substantial run of capital per farm—about £7,000 over and above £5,000 from state grants.
- b) a high level of technical and managerial ability on the part of the farmer.
- c) a reform of the pattern of land-holding to permit the development of units large enough to give a farm output of £1,500 to £2,000 per unit.

These requirements in turn give rise to three immediate reactions:

1. If invested in trustee stocks, £12,000 could give a higher return than the projected family farm cash income, with none of the labour, management and uncertainty which would be involved in the farming operations proposed. However, the expenditure of this large sum of capital per farm can be compared with the current levels of expenditure in establishing migrants on new holdings by the Land Commission. At current costs of at least £ 150 per acre for good land and with the costs of providing a dwellinghouse and minimum farm buildings and the expenditure on some fencing and roads, the total cost to the Land Commission of providing a new holding for a migrant is likely to be in the region of £10,000. The items included in the costs of providing a new Land Commission holding and those in the farm units suggested here are different; the former includes the costs of land and dwelling which are not included in our proposals whilst we have made provision for working capital in livestock, machinery and such like but not for land and dwelling.
2. The level of technical management expertise required for the successful operation of one of the proposed farm units could give a higher reward in a more vigorous social environment in the agriculturally richer areas of Ireland; the basic talents required could also give more remunerative returns if devoted elsewhere in the economy. However, the provision of opportunities for more people to run their own farms at an income level which, while not high by current national standards, would at least provide for a reasonable standard of living, will increase the total number in viable employment in the country.
3. A reform of the land-holding system could create major social difficulties for many of the farmers and their families who are at present living in the district. However, it must be recognised that the land-holding system will be changing in the future and that this will provide an opportunity for developing a national pattern of viable holdings without necessarily disturbing the present landholders.

These remain very complex arguments and cognisance must be taken of them in considering the future role of agriculture in areas such as West Donegal. Yet we are convinced that unless radical measures along the lines set out earlier in this report are adopted, the agriculture of West Donegal will continue to decline. As living standards in the rest of the community rise further, the present subsistence level of farm incomes will become increasingly unacceptable, especially to the younger members of the farming community.

THE DEVELOPMENT OF OTHER SOURCES OF INCOME AND EMPLOYMENT

In considering sources of income and employment outside agriculture, there are four important potential sources of development—fishing, forestry, manufacturing industry and tourism.

Fishing

The most immediate significant source of development is fishing, which has already achieved some of the expansion in technical standards which we envisaged in relation to agriculture. In Part 2—West Donegal Resource Survey Report, it has been shown that there is a good future in the district especially for sea-fishing, and that the major ports must continue to expand as more competent and experienced fishermen acquire

their own craft. In 1967 some 265 men were engaged full time in fishing, while some 400 were engaged on a part-time basis. A further 200 were fully employed in ancillary industries. With the increase in the fishing fleet, investment in shore processing and handling facilities and ancillary service industries is growing. This growth gives the best promise of increased labour participation in the industry. With continued expansion on shore, it could be expected that the ratio of employment ashore to that afloat should reach 4:1, which is a reasonable standard in an efficient and balanced industry. The development of the catching sector of the fishing industry on the other hand will be based more on increased efficiency than on increased numbers employed. A thriving fishing industry could employ a proportion of those leaving agriculture or give seasonal off-farm employment.

As regards inland fisheries the picture of development must of necessity be a conservative one. Development, if it means increased exploitation of stocks, can only take place within limits which are imposed by the stocks of salmon. The run of salmon available at any given time is related to the numbers of salmon which have succeeded in reaching the upper waters for spawning in the relative brood year. Besides, runs of salmon are subject to considerable variation, not so much cyclic changes which could be predicted but rather a series of peaks and valleys of quite unforeseeable duration. In these circumstances it must be recognised that salmon fishery development has special problems.

From 1962 to date runs of salmon have been exceptionally good and the average seasonal catch of over 170,000 fish recorded for the Survey Area over the years 1965 to 1967 is one which can hardly be materially improved upon. By judicious river improvement work it is hoped, at least to maintain this standard by enhancing the stocks of a number of rivers in the survey area. In most cases this should provide an increased tourist attraction and in the Gweebarra river improved catches both by anglers and by netmen.

As regards improving brown trout angling there are the high costs of development and maintenance referred to already in Part 2 of the Survey Report. It would probably be best under the circumstances, to encourage angling even for the smaller fish initially. This would reduce stocks and leave more food so that those remaining could reach more acceptable sizes. The adoption of this policy by local associations for lakes to which access is comparatively easy could add materially to the tourist amenities of the area.

Forestry

Forestry employs a smaller number than fishing; there were 60 workers in state plantations in 1966. The available plantable land is unlikely to support any substantial timber industry within the area itself (see Forestry—West Donegal Resource Survey Report—Part 2) Even if the area acquired for planting was increased considerably, the extra employment potential would only account for a relatively small proportion of those likely to leave farming.

Manufacturing industry

In the case of manufacturing industry the problems of expanding employment are particularly difficult. During the years 1961/65 the number employed in industry in the Glenties Rural District remained vitually static despite the fact that over the past decade nine firms have received industrial development grants amounting to over £150,000. The problem in West Donegal is a microcosm of the national industrial

development problem. The recent Buchanan Report on Regional Studies in Ireland¹ considers the policy of dispersing industry to those parts of counties where the extra jobs are most needed with the aim of reducing emigration rates to the lowest possible common level. The report has this to say (p. 113): "We then found, however, that the required distribution of jobs involved rates of industrial expansion in some counties which could not be considered realistic. For example, County Donegal would have to get about 17% of all the future jobs whose location is susceptible to government influence—that is, five times its share of the new jobs in grant-aided enterprises in the period 1956-67. Whatever the special inducements offered, there is no reason to believe that such a dramatic increase could be achieved, particularly as at the same time increases only slightly less spectacular would be required in a number of other counties". This applies even more strongly to Glenties than to Donegal as a whole and it is clear that a major increase in industrial employment is unlikely to take place in the foreseeable future.

In its recommendations on growth centres, the Buchanan Report (p. 121) suggests that "there may be scope at village level for concentrating new development in public services, such as primary schools, post offices and community halls as far as possible in a limited number of selected village growth centres, so as to provide better services and focal points for development in areas of very scattered population". This would be of particular significance in Glenties with its scattered population and considerable number of small towns and villages. The development of the large new school at Glenties town may have some effect in this direction although more than one local growth centre may be required for this large rural district.

Tourism

The other major source of potential new employment is the tourist industry. This area has outstanding natural beauty and excellent sandy beaches, yet West Donegal has fewer visitors than other parts of the county. In 1968 there were nine relatively small hotels and 12 guest houses which together had less than 300 bedrooms. The development of new modern hotels, as has been the case in Kerry, is an essential part of the expansion of tourism, and the opening of one such hotel in 1969 at Dungloe is a welcome development in this direction. There is, however, an obvious potential for further tourist development particularly if the area can be included in the national circuits of coach tours.

DEMOGRAPHIC FACTORS AND THE DEVELOPMENT POSSIBILITIES

In considering the resources and the possibilities for economic betterment in West Donegal, a basic question is whether the population base is numerically and structurally adequate for the task of developing the area's economy. To restate very generally the main conclusions from the study of demographic trends (West Donegal Resource Survey Report—Part 3), West Donegal had a faster rate of depopulation in the early 1960s than at any time in the past century. The main immediate reason is a particularly high rate of out-migration, accounting for two out of every three people born in the area. The migration operates selectively as it is the better educated and more virile age groups which tend to go thus leaving a population with severe imbalance in many

¹ Buchanan, C. and Partners, 1968. Regional Studies in Ireland, An Foras Forbartha, Dublin.

of its structural features. A combination of fewer young people and more old people has produced a low rate of natural increase. In fact, as far as can be estimated for the West Donegal area as a whole, the present population is barely maintaining itself apart altogether from the diminution of numbers due to outward migration.²

Again looking at the entire area, and despite the decline in the numbers of young people both in absolute terms and as a proportion of the total area population, the key problem in West Donegal is not yet one of shortage of young people coming into the working age groups but a scarcity of employment opportunities for those who seek them in the area. The majority of the 1,840 young people aged between 10 and 14 years in 1966 will be seeking jobs within the next few years. If the stabilisation of the West Donegal population is to be achieved then jobs must be available in the area even if it means considerable alteration in the spatial distribution of the population. The generation of more employment would curtail migration and gradually correct the structural deficiencies in the existing population. In this context we must have regard to the growth potential of the bigger towns. Indeed the most promising aspect of the area's demographic situation was the capacity of the towns and villages, particularly those over 500 persons, to increase population in 1956-66 despite the exceptionally high rate of depopulation in the open country areas.

Formidable obstacles to development from a human resource standpoint would include the more qualitative aspects of community structure, such as existing levels of education and the apathy and lack of initiative which tends to exist in many of the local communities with populations severely depleted by migration. It is essential to improve the educational standards of the farming community in order to develop the managerial effort required to make a viable farming economy in the area. There is already a community awareness of the efficacy of group effort in tackling local problems as evidenced by the elaborate network of voluntary community organisations. These provide an infra-structure by which programmes of economic, social and educational content can reach the individual thereby combining statutory and voluntary effort for the development of the physical, economic and human resources of the area.

OTHER QUESTIONS

Rural planning and resource development are basically concerned with people, with the material conditions under which they live and work. Surveys designed to establish the necessary information for this task should therefore, be sufficiently comprehensive to take into account the numerous dimensions of economic and social life in rural areas. Although the present study was undertaken with full awareness of this need, some aspects of the West Donegal situation had to be left unexamined.

It would have been relevant, for example, to explore the question of the minimum size of population required to support a given level of social service provision considering the topography and settlement pattern of the survey area, the degree of subsidisation and the standards desired. Also related to development prospects are community values and attitudes including people's perceptions of their own and their

*To make this estimate for 1966, it was assumed that the number of persons in the area under 1 year at census date represented the number of births for the previous year. This was 292. To estimate deaths it was assumed that W. Donegal had an annual death rate equal to that of Co. Leitrim (15 per 1,000) since their populations were similar in age distribution. This gave West Donegal 276 deaths per year.

community's future. Allied to this question is that of the aspirations, expectations and plans of the area's youth against the background of greater educational opportunities and the increasing impact of the external cultural influences. A precise assessment of the area's effective or potential labour pool would be useful for prospective rural industry. Again the economic condition of the area, in the aggregate sense, would have been better illustrated had an examination been made of the flow of money, goods or services across the area's boundaries. At the social service level there is the important matter of the kind of provision being made for special groups, such as the aged or the handicapped. In an area with a rapidly declining agricultural population the process of the land transfer and the changing spatial arrangement of farm units could be usefully examined.

These and other questions had to be omitted from the study. Such investigations were not feasible either because of the inordinate amount of time needed to establish the basic data, or the shortage of personnel with the specific research skills needed, or because the basic research methodology had not been developed for application to Irish conditions. Nevertheless it is felt that this survey has made important advances in the collection and co-ordination of information within an interdisciplinary framework for the development of rural area resources.