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THE LARGE DAIRY HERD, EVOLUTION AND PROSPECTS

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FOREWORD

The farming industry is based upon small scale units and many of those who study its problems or contribute to its destinies are the products of that industry. This may give rise to the attitude that the advance of the farming industry is inevitably linked to the present structure based upon small scale units. My own upbringing may have developed an appreciation of the management of business units larger than those generally found in farming.

Another important influence may be that of an individual encountered in one's formative years; in the course of this study of large scale milk production one or two ideas put forward by James Wyllie kept recurring in the mind and I re-read a paper given by him in 1931. This paper examined the past and the future for milk production and here I found the germs of the various ideas which have been developed in this recent study. In 1931, farming in this country was not conditioned to develop those ideas but I think today we are much closer to that revolution in the methods of milk production which he clearly foresaw.

This study of large dairy herds is part of the research programme co-ordinated by a Research Working Party in which the M.A.F.F., the M.M.B. and the Universities are represented.

I am particularly indebted to the help given to me by the Economic Division of the M.M.B. Without this help the identification of the largest herds in England and Wales would have been very difficult. The several University Departments concerned with Agricultural Economics have been most co-operative in an investigation which covered their provinces as well as my own. There was an excellent response by the owners of the largest dairy herds, who completed a long questionnaire some of which was of a personal nature and provided the basic information for this study.

My personal thanks are due to R. E. Williams of the M.M.B. and to Professor D. K. Britton for their encouragement and for their readiness to discuss the subject matter of this report.

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University of Nottingham,
August 1970.

SOME DEFINITIONS

1. Dairy herd. All the milking and dry cows and their progeny being reared for sale and for the replacement of cows no longer required for milking.
2. Milking herd. This refers to the milking and dry cows only.
3. Unit herd. A milking herd with its own housing, machinery and labour.
4. Multiple herd. A group of unit herds under single ownership.
5. A large dairy herd or a large unit herd consisting of 150 cows (milking and dry) or more.
6. Size of milking herd. The number of cows milking and dry associated with it.
7. Plant. The buildings, roads and machinery associated with the herd.
8. The dairy distributive industry. Since the term "dairy industry" is applied both to the production and distribution of milk, the distinction is made by referring to milk production as the farming industry and to milk distribution as the dairy distributive industry.

Chapter 1

INTRODUCTION

The present structure of that part of the farming industry in England and Wales devoted to milk production is the result of many influences, historical, political, economic and social, operating over a considerable period.

In recent years structural changes have been gradual and evolutionary. Small herds have tended to go out of milk production whilst herds continuing to produce milk have tended to increase gradually the number of cows kept. A number of recent studies have examined these changes, particularly those by the Milk Marketing Board.[1] Projections of the immediate future structure have been made, using the Markov chain type of analysis.[2] Associated with this gradual structural change, the common concept of a large herd has increased within the last ten to fifteen years from 70 cows to 120 cows and even to 180 cows.

As more knowledge becomes available and as the relative costs of resources change, it is possible that a situation could arise similar to that which has occurred in the poultry industry in the past twenty years. Thus very large milking units could develop similar to the very large poultry units and bring about a basic change in the structure of the dairy industries, both production and distribution.[3] At the same time the small and farm-based dairy herds could decline rapidly in numbers as did the small poultry flocks.

In other countries conditions already exist which favour the very large unit in agriculture. The plantations of the 18th and 19th century colonial system and the state developed farms of the 20th century have each in turn enabled a limited number of men with managerial and technical skills to achieve a considerable expansion in agricultural production both for export and for home consumption.[4]

Large scale production has proved practicable in certain circumstances. Prototypes of very large milk production units are being developed and it seems feasible to consider the situation which could arise in the United Kingdom if there was a considerable expansion in

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(1) MILK MARKETING BOARD, *The Structure of Dairy Farming in England and Wales 1963-64*. Economics Division M.M.B. 1965.

(2) COLMAN, D. R., "The Application of Markov Chain Analysis to Structural Change in the North West Dairy Industry". *Journal of Agricultural Economics 18* (3), 1967, pp. 351-361.

COLMAN, D. R., and LEECH, D., "A forecast of milk supply in England and Wales". *Journal of Agricultural Economics 21* (2), 1970, pp. 253-265.

(3) BUTTERWICK, M. W. *Vertical Integration in Agriculture and the Role of the Co-operatives*. Cent. Comm. for Ag. and Hortic. Co-op., London, 1969.

Report of the Reorganisation Commission for Eggs (Wright Report) Cmnd. 3669. H.M.S.O. 1968.

(4) COLLIER, ANTHONY. "Where Big Herds Are Really Big, Yugoslavia". *Dairy Farmer*, Feb. 1970, pp. 66, 67.

the numbers of very large units. There have been reports in the press during the past ten years about projects to set up unit herds of 300 or more cows, but certainly up to 1967 there was very little evidence that these herds had approached anywhere near their objective. Indeed, one at least admitted that he had not. There are a number of possible reasons for this and it is an object of this study to identify the difficulties which must be overcome before unit herds of this size become more frequent in this country. This study is based upon an examination of the largest herds in existence in the 1960's, on the grounds that amongst them might be found the growth points for the future development of the dairy industry.

The organisation of milk production can be represented diagrammatically as a group of integrated functions (Fig. 1). At the present time many of these functions are carried out within the individual farm organisation i.e. the cows and food produce milk, the land produces food for the cows, calves are reared for dairy herd replacements and dung is returned to the land. The other functions are usually carried out off the farm by other businesses i.e. the supply of concentrated feedstuffs, the processing and distribution of milk, the rearing and feeding of beef animals, and the processing and distribution of meat.

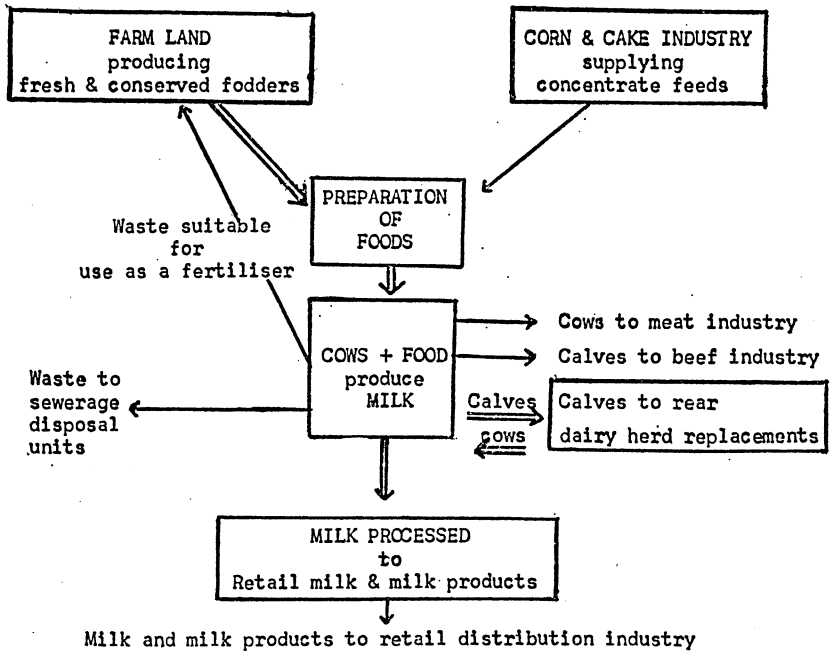

Fig. 1. Diagram of activities associated with milk production.

As milk production units become larger, two structural changes would be likely to take place. Firstly, each of the present farm operations would tend to come under separate management to service the main unit, a herd of considerable size, milked, fed and housed at a single location. Closely associated with this unit it would be necessary to have a unit for the rearing of cow replacements. The production of bulky fodders and other farming activities not directly concerned with milk production could be carried out on farms similar to those at present in existence, but this does not exclude the development of large farms and beef feeding units associated financially with the milk production units.

The second structural change could be the association of milk processing at the same location as the production units. This would involve changes in the business structure with the formation of financial firms associated with farming, dairy distribution and the feedingstuffs industry.

The most likely group of activities within a single location have been linked by a double line in Fig. 1. The unit or group of units would be of a size to maintain a supply of milk sufficient to keep the processing unit working to its daily capacity, even for twenty four hours each day.

The location of large units of this type would depend upon the economics of milk production in various parts of the country and the economics of transport of milk to the retail distribution centres. Thus it would be possible to locate those units supplying the liquid market close to the main centres of population, assuming that the lower cost of milk transport would more than compensate for higher production costs for food and housing. Units concerned with processed products such as butter, cheese and dried milk might be better located in areas of low cost milk production.

Presupposing that the consumer will continue to demand whole milk for household consumption in preference to dried milk or an artificial substitute, it is possible to outline a structure of the milk industry based upon these very large production units.

A major problem of milk marketing is the fact that sales of milk by producers fluctuate sharply both from year to year and seasonally. On the other hand, the daily requirements of the liquid market do not vary greatly and can be met by milk in transit from producer to consumer. R. E. Williams[5] calculated that the daily requirements in the U.K. in November and Deecember 1968 were 5.114 m. gallons and 5.416 m. gallons respectively. On this basis the annual requirements of the liquid milk market could be met by a basic supply of 1934.5 m. gallons (5.3×365 m. gal.). At present, a tactical reserve is needed to allow for seasonal weather and long term variations so that the total annual requirements are 2,284.6 m. gallons based upon the November daily assessment and 2,416 m. gallons upon the December daily assessment. A supply industry based upon a number of very large units could be organised to maintain a daily supply much closer to the actual present

(5) WILLIAMS, R. E. Seminar to Department of Agricultural Economics, University of Nottingham, 30th October, 1968. Unpublished. Basis of an article to be published in the Journal of Agricultural Economics.

market requirements. Some weather and long term variations could be expected and it could be assumed that an annual output of 2,100 m. gallons would be required under present conditions. This could be met by a national herd of 1.82 million cows averaging 1,100 gallons per cow per annum. The total number of herds would depend upon the optimal size or sizes—at 1,000 cows per herd, 1,820 herds would be needed and, at 2,000 cows per herd, only 910 herds would be needed to meet liquid requirements.

Such herds could be located close to the retail outlets, singly or in groups large enough to achieve economies in production, processing, packaging and transport. For example, the Nottingham conurbation with a population of about half a million would require, at 4.9 pints per head per week, a total annual supply of 16 million gallons and this could be met by 14,550 cows. If the efficient size of herd was about 1,000 cows, only 14 herds would be needed to supply this area and twenty such herds would meet the Milk Marketing Board's advertising slogan of a pint per head per day. The daily requirements of such a conurbation would be about 44,000 gallons of milk. According to Strauss[6] three distributing establishments with average daily sales of over 1,000 gallons and three smaller establishments supplied this area in 1959. He summarises the situation thus:

> "The major part of the supplies in the largest towns is thus heat treated and bottled by not more than three processing firms, almost invariably handling over 10,000 gallons per day, but in many cases responsible for daily sales of more than 20,000 (and even 50,000) gallons."

Such structural changes would have considerable effects upon the businesses at present engaged in the production and distribution of milk in England and Wales. The present distributors would be involved in the re-siting of factory premises, possibly bringing advantages in giving an opportunity to instal up-to-date equipment.

On the production side it would have a profound effect upon farming. Dairy farms as such would change to a cropping and livestock policy and this would lead to amalgamation to form viable holdings or to part-time farming. Thus a worker in a large dairy unit could also run a small farm producing crops, some for sale to the milk producers. One could foresee this as attractive to sons of small farmers. Such changes would not disrupt rural employment, for the new milk production-cum-processing units would provide regular employment with the advantage of a five day week.

The present structure of milk prices is designed to ensure sufficient production in the difficult (high cost) months. The large units would probably approach constant monthly costs, particularly if they became far less dependent upon fresh grass. To encourage level daily production for the more efficient operation of the distributive side, it would be necessary to modify the present price structure.

In order to assess the present situation, information has been collected about the present very large dairy herds and an attempt has

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(6) STRAUSS, E., "The Structure of the English Milk Industry". *Jl. R. Statist. Soc.*, **123**. Part 2, 1960. pp. 140-173.

been made to define the problems which face those who promote these large enterprises. They operate under the same influences as all milk producers and it may be that some characteristics described here would apply equally to other groups of milk producers. This is not a comparative study of the several size of herd groups but a specific study of a single group.

It is proposed to consider the following aspects of the very largest herds:

1. Location. This is to examine the relationship between the location of the largest herds and local conditions of climate, soil and economy.

2. Ownership. Since the largest herds are a small group it is necessary to determine whether there are any particular characteristics of the owners which sets them apart from the main body of the farming community — their origin, experience of farming and other activities, experience of large scale business and the degree to which they control the farm business and the land with its buildings and roads.

3. The formation of the herds. The policy, breeds and history of the largest herds are examined with a view to determining their origins, their stability and their maturity.

4. The herd structure—unit and multiple herds. The basic unit is defined broadly as a milking herd with its own housing, land, machinery and labour. An important choice lies behind this aspect, namely, the development of a very large business by the multiplication of comparatively small or medium sized units or the formation of a very large single unit.

5. The pattern of management. This aspect is especially concerned with human relationships and labour organisation, and to consider the degree to which experience has been developed for the control of large farming businesses.

6. The barriers to the development of larger units and herds. Some economic features of large units have important practical considerations in the formation of large units. Some of these considerations act as barriers to a further increase in the size of the unit.

7. Technical aspects. The development of large unit herds may enable changes to be made in husbandry techniques, particularly in feeding and cow control.

8. The impact of the development of large dairy herds upon the structure of the productive and distributive industries. The potentialities of vertical integration are considered. In areas at present devoted to milk production there could be a fundamental change in the farming structure.

Chapter 2

THE LOCATION AND OWNERSHIP OF THE LARGEST HERDS IN ENGLAND AND WALES

Identification of the Owners of the Largest Herds in England and Wales

The Milk Marketing Board in their study "The Structure of Dairy Farming in England and Wales"[7] identified 220 herds selling more than 10,900 gallons of milk in the month of March 1963 indicating a probable herd size of 150 cows and more. An examination of the situation in March 1967 showed that 199 of the original 220 still owned more than 150 cows. The M.M.B. drew up a further list of herds selling more than 10,900 gallons in March 1967.

Information with this later list indicated that the total number of herds with 150 cows and more in 1963 was appreciably more than 220 selling more than 10,900 gallons in March 1963. From the two lists, a final list of 307 producers was drawn up as probably being the owners of 150 cows and more in 1968. The M.M.B. record the number of producers with contracts in 1968 as 88,838 so that this study refers to less than one half of one per cent of producers. The significance of this group is not in its present contribution to milk supplies but in the probability that it will become more important.

A second source of information on the number of large herds is the Ministry of Agriculture Fisheries and Food's Agricultural Census. This recorded 82 herds with 200 cows and over in 1963 and by 1967 there had been a marked increase to 183 herds with 200 cows and over. This was due mainly to existing owners with more than 150 cows in 1963 increasing the size of their herds. This is discussed more fully later in the context of the stability of larger herds and their growth in size since 1963.

A questionnaire was drawn up and tried out at visits to most of the farmers with over 150 cows in the East Midlands. It was then revised and distributed by post to all areas of England and Wales except that hit by the foot and mouth epidemic in the West Midlands and Wales. 245 questionnaires were sent out. About 140 were completed and a few more provided some usable information.

The questionnaire (Appendix page 55) covered the following aspects of large herds:

1. The owners and their association with farming.
2. The history of the herds.
3. The size structure of the individual (or unit) herds under one ownership, their location, housing and replacement.
4. Management and labour organisation.
5. Feeding methods.
6. Recording and cow control.
7. Past and future policy and the successes and difficulties encountered in the management of expanding large herds.

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[7] *Loc. cit.* p. 1.

The Size of the Largest Herds

In the original 1963 sample extracted by the M.M.B., there were 208 owners. There were three owners with over 2,000 cows, and ten with between 400 and 1,250 cows, but most of the owners (176) had herds ranging from 150 to 299 cows. Most of the data included in this report has been taken from a sample of 142 herds ranging in size from 150 to 999 cows (Table 1). The 1968 Survey sample reflects the change in the size distribution during the five years. The herds expanded and proportionately more were found in the larger size groups in 1968 than in 1963. The relative decline in the size group of 150 to 199 cows may be due to the difficulty in identifying size from the March milk output, particularly at the border line. This is not an important consideration in a study concerned with the largest 300 herds, rather than with all herds over 150 cows.

Table 1. THE SIZE DISTRIBUTION OF THE LARGEST DAIRY HERDS

Size of herd	1963 M.M.B. sample	1968 Survey sample
No. of cows	No. of herds	No. of herds
Over 2000	3	—
1750 to 1999	0	—
1500 to 1749	0	—
1250 to 1499	0	—
1000 to 1249	1	—
750 to 999	3	1
500 to 749	5	7
400 to 499	1	8
300 to 399	19	26
200 to 299	83	54
150 to 199	93	46
Total	208	142

The Geographical Location of the Large Herds in England and Wales

For this study, England and Wales have been divided into regions based upon the situation and frequency of large herds (Fig. 2 and Table 2). These regions do not necessarily agree with those used by the M.M.B. or with other administrative areas. Three hundred and thirty one locations for 323 owners were identified as being in production during part or all of the five years 1963-68. Three owners each had two estates located in different parts of the country and the Co-operative Wholesale Society had six estates producing milk. All these estates have been included in the geographical distribution data as if they were under separate owners. Owners with herds on either side of a county boundary have been included in the county of their business address.

The majority of the largest herds were in the south of England, associated with but not necessarily located on the light arable lands of the Chalk Downs and East Anglia. The greatest concentration was 94 herds in the mid south west (Wiltshire, Somerset, Dorset and Gloucestershire). The counties of the mid south situated to the east of this concentration—Hampshire, Sussex, Berkshire and Surrey—contained 66 herds, so that almost half of the large herds were in the southern

Table 2. DISTRIBUTION BY COUNTIES OF THE LARGEST HERDS AND LARGEST FARMS IN ENGLAND AND WALES 1967

Area	County	No. of herds	Per cent	Farms over 500 acres crops, grass and rough grazing	
				No.	Per cent of all holdings in county or area
North	Cumberland	8		161	2.7
	Westmorland	1		83	3.3
	Northumberland	6		507	12.4
	Durham	4		59	1.3
	Lancashire	6		76	0.5
	Yorkshire	8		578	1.8
	Total	33	10.0	1,464	2.3
North West Midlands	Cheshire	16		23	0.3
	Shropshire	12		81	0.9
	Staffordshire	15		38	0.4
	Total	43	13.0	142	0.5
East and South Midlands	Derbyshire	3		36	0.5
	Nottinghamshire	7		85	1.8
	Lincolnshire	4		560	3.7
	Leicestershire and Rutland	3		103	1.9
	Isle of Ely	0		72	1.8
	Northants and Peterborough	2		158	3.9
	Herefordshire	2		49	0.8
	Worcestershire	2		39	0.6
	Warwickshire	3		66	1.2
	Huntingdonshire	2		79	4.1
	Bedfordshire	1		77	2.8
	Hertfordshire	1		100	3.6
	Buckinghamshire	2		70	1.8
	Total	32	9.6	1,494	2.1
Wales	Total	5	1.5	586	1.2
Far South West	Devon	4		84	0.5
	Cornwall	1		41	0.3
	Total	5	1.5	125	0.4
Mid South West	Gloucester	7		157	2.1
	Somerset	20		73	0.6
	Wiltshire	35		319	5.9
	Dorsetshire	32		174	3.6
	Total	94	28.4	723	2.4
Mid South and South East	Oxfordshire	3		136	4.4
	Berkshire	8		142	4.7
	Hampshire and I.O.W.	28		277	3.4
	Middlesex	4		5	0.9
	Surrey	6		34	0.9
	Sussex	24		182	2.3
	Kent	6		161	1.8
	Total	79	23.9	937	2.7
East	Norfolk	18		426	3.6
	Suffolk	10		252	3.4
	Essex	11		258	3.1
	Cambridge	1		121	4.1
	Total	40	12.1	1,057	3.5
England and Wales	Total	331	100.0	6,528	1.9

Source: Agricultural Census, Ministry of Agriculture, Fisheries and Food

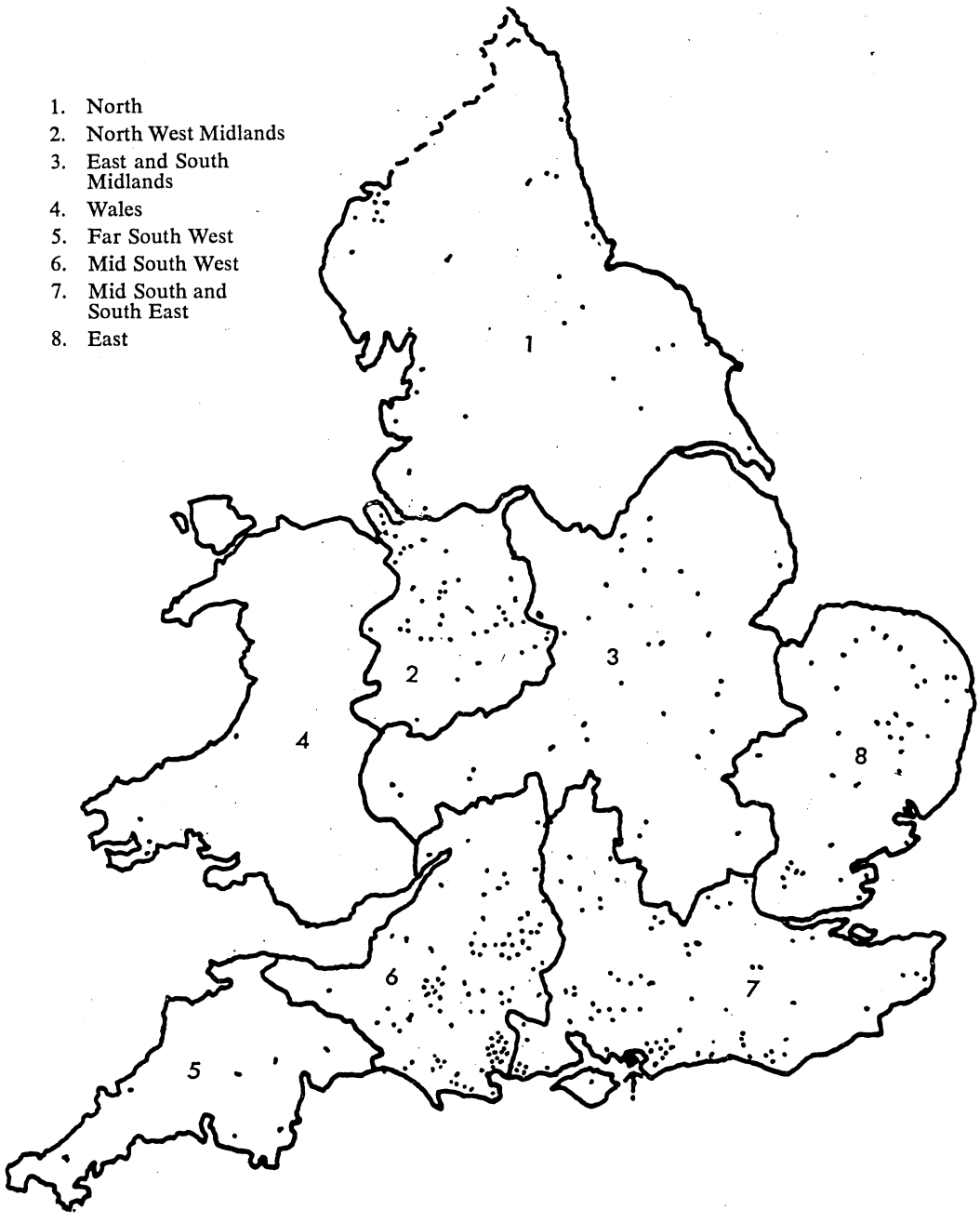

Fig. 2. Distribution of large herds, England and Wales, 1967.

counties, approximately south of a line from Gloucester along the River Thames to London. Within the outer fringes of the London suburban area there were eighteen herds. Further north and east there were 32 herds in Norfolk, Suffolk and that part of Essex, outside the London suburban area. Outside the south, the main concentration was 43 herds in the north west Midlands, (Cheshire, Staffordshire and Shropshire), and a lesser concentration of 20 herds in or just outside the counties of Nottinghamshire, Leicestershire and Kesteven (Lincs.). The large herds in Wales, the extreme south west and southern Midlands are few and widely scattered. In the north there were only two areas to be noted, north Cumberland and the north east coastal belt of Northumberland and Durham.

Within these various concentrations there is a tendency for the largest herds to cluster. The clusters situated in the following locations are all noteworthy.

North Cumberland around Carlisle.

The Wirral Peninsula.

South Cheshire around Nantwich.

Mid Staffordshire around Stafford.

North Nottinghamshire.

East Norfolk.

Norfolk - Suffolk border around Diss.

N.E. London fringe around Ongar.

Sussex:
(a) around Chichester.
(b) around Brighton.

Hampshire:
(a) around Bournemouth.
(b) around Winchester.

Somerset:
(a) around Crewkerne.
(b) around Shepton Mallet.

Dorset:
three clusters
(a) N.W. of Dorchester
(b) S.E. of Dorchester
(c) around Blandford Forum—this is the largest and most concentrated cluster.

Wiltshire. In the area of Westbury, Melksham, Vale of Pewsey and Marlborough.

The significance of the geographical location is not due to any single factor and the following examination shows it to be closely related to the pattern of ownership and historical changes in the structure of farming.

The most prominent feature of the location of the largest dairy herds is the association with light land arable farming. Thus the pattern of distribution in the south of the country follows very closely the chalk and limestone areas and the light land areas of the eastern counties. The cluster of herds about Carlisle and the isolated herds in the northern counties and Yorkshre also tend to be found in light land arable farming areas. The herds are found on both the arable farms in these areas and in nearby alluvial valleys on land better suited for grassland than ploughland. Most of these are areas of low rainfall, e.g. 25″ to 30″ per annum, and therefore not especially suited to the production of grass, which is generally regarded as the basic food for milk production. These areas are considered to be important sources of present day milk supplies. Therefore it seems that the development of large scale producers is due to some local factor and the most likely is

the presence of a higher proportion of large farms than in other parts of the country (Table 2). At some point in agricultural history milk production expanded in these areas. The larger farmers were naturally experienced in handling relatively large enterprises and set up large dairy herds.

The expansion in milk production in the early part of the 20th century was associated with the growth of the London milk market and the provision of special trains. This development was not confined to those counties close to London, particularly Essex and Kent, but further afield to Hampshire and Sussex and also to the more distant counties of Wiltshire, Staffordshire and Derbyshire from which special trains were run to enable milk produced in these counties to be delivered on the retail rounds within 24 hours of production. This was essential in those days when refrigeraton and pasteurisation had not been fully developed. In such conditions a number of large scale producers of milk established themselves and their descendents are among the largest producers of the 1960's. A similar development occurred around Carlisle and in this case the milk was transported by special train to Newcastle.[8]

This pattern of growth was given a further boost with the collapse of cereal growing in 1922-1925. This not only increased milk production in the existing areas but also had an important effect in the eastern counties of Norfolk, Suffolk, and Essex. Here the change-over from cattle rearing and fattening to milk production took place in an area of relatively large farms and again large herds were set up.

In two areas, Somerset and Cheshire, the chief product was cheese, which became increasingly more profitable to process on a factory scale. Some farmers developed the two sides of the business and this association of a large dairy herd with "factory" cheese making had one feature in common with the development of large herds in areas of large arable farms—the men of experience with large size enterprises were there.

The common denominators in these developments are two:

(a) the presence of men with experience of large business.

(b) an assured market for large quantities of milk.

The structure of the clusters adds strength to this observation. In some cases the family relationship is obvious and often very close and it is more than likely that if the marriage links could be obtained, the importance of a few families in the various areas and clusters would emphasise the effect of the earlier presence of relatively large scale farmers on the present pattern of distribution of the largest herds.

Ownership

The general pattern of ownership of the largest herds can be identified from the title of the individual farm businesses. Thus the family firm is usually distinguished by either the name of an individual with

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[8] MINISTRY OF AGRICULTURE AND FISHERIES, Economic Series, H.M.S.O.
No. 16. The Fluid Milk Market, 1927.
No. 22. Marketing of Dairy Produce, Part I, Cheese, 1930.
No. 30. Marketing of Dairy Produce, Part II, Butter and Cheese.
No. 38. Report on the Reorganisation Commission for Milk, 1933.

or without the addition of close relatives e.g. "Bros." or "Sons," or a farming company incorporating the name of a farm, village or an estate. Within this broad definition 296 of the 326 owners were family firms. Twelve herds were owned by well-known feed and fertiliser firms, universities and research organisations, for research and demonstration purposes. The remaining herds were owned by corporate bodies; two by "Foundations," two by city corporations, nine by retail co-operative societies. (Table 3).

Table 3. TYPES OF OWNERSHIP OF LARGE HERDS BY GEOGRAPHICAL AREAS, 1967

Area	Family	C.W.S. and retail Co-ops.	Research and demonstration	Other	Total
North	30	2	1		33
North West Midlands	35	2	5	1	43
East and South Midlands	23	6	1	2	32
Wales	5				5
Far South West	3	1	1		5
Mid South West	92	2			94
Mid South and South East	76		2	1	79
East	38	1	1		40
England and Wales	302	14	11	4	331

According to the replies to the questionnaire, there was a considerable variation in the 134 family groupings, the dominant group being the present-day restricted family — father, mother, sons and daughters (Groups 1, 2 and 3, Table 4). Not only did 97 of the 151 owners surveyed fall into this group but a number of the remainder originated in this way although they now included the sons and/or daughters with their families, other related partners and no related partners. The capital ownership was spread more widely—the 133 family firms were owned by 304 individuals, including wives. This suggests that the need to provide an income for two or more families, each consisting of a husband, wife and minors, was an incentive to set up a large farming business.

Table 4. OWNERS OF LARGE HERDS BY FAMILY RELATIONSHIPS
151 Owners

Group No.	Kind of owners	Number of farm businesses	Number of individuals owning the businesses
1	Sole owners	38	38
2	Husband and wife	14	28
3	Parents and their family	45	157
4	Brothers, sisters and their families	21	55
5	Other related partners	6	16
6	Non-related partners	10	23
7	Corporate bodies	17	not definable
All	Total	151	317

These bare statistics of the pattern of ownership do not disclose the wide range of the social and farming background of these owners, from the "dirty boot" farmer who has expanded by his own ability and effort to the owner of estates which have been in the same family for many generations.

Land Tenure

Apart from the personal characteristics of the owners of the large herds, one very marked feature of the group as a whole is that they are primarily a land owning group. Thus, of 143 herd owners supplying information, 126 owned land directly or through a family trust and this amounted to 70.2 per cent of the land they were farming. (Table 5). Only five of these did not own a sufficient proportion of their land to justify, by present considerations, the erection of buildings for a large dairy herd on their own land. In addition a further 23.0 per cent of the land was rented from corporate bodies and large estates by 58 owners of large herds and in 15 of these cases, this rented land was the major or sole proportion of their land holding. It is likely that these large estates are under progressive management and the combination with a tenant also in a large business permits adequate capital provision for suitable buildings.

Table 5. TENURE OF LAND FARMED BY OWNERS OF LARGE HERDS
143 owners

Tenure	Acres		No. of herd owners occupying land of each type	Remarks
	Total	Per cent.		
Owned by herd owner, absolutely or by a trust in which herd owner is interested	147,233	70.2	126	121 owned a sufficient proportion of their total holding to justify building cow accommodation upon their own land
Rented from corporate bodies and large estates	48,194	23.0	58	Excluding owners already included above, 15 rented a major portion in this way
Rented from individuals and small estates	13,102	6.3	33	Excluding owners already included above, six rented a major portion in this way
Not specified	1,140	0.5	1	
Total	209,669	100.0	143	

Chapter 3

THE POLICY, GROWTH AND STRUCTURE OF LARGE HERDS

Production Policy

Large herd owners are in the business for profit. In the long run if losses are incurred the business will be reviewed and either closed down or put on to a profitable basis. Obviously men of intelligence and drive with businesses of this size will introduce new practices with a view to maintaining profits in an ever changing economy. In general, these businesses can be expected to exhibit a basic stability with periodic improvements as plant and buildings become obsolete.

Whether the dairy herd is the major enterprise or one of several, it will be an enterprise of size and importance requiring considerable attention from the management, security for the capital and an adequate reward for both. Moreover, it is too large to rely entirely for its profitability upon profits from sources not directly involved, such as capital appreciation of land, tax saving and the inter-related economy of other farm enterprises such as sale crops. The large dairy herds in this country have not yet reached a point at which they are divorced from land use as has happened with some poultry and pig enterprises.

The survey showed that the main concern of the great majority of the owners of these large herds was the production of milk, using a production plan with three basic features:

(a) a herd of cows maintained from their own progeny.

(b) a feeding system based upon grass, grazed in the summer, conserved for winter feeding and supplemented by cereals (some grown on the same farm as the herd) and other concentrated cakes and meals (particularly imported protein supplements).

(c) A labour force, plant and housing devoted exclusively to the herd and its milk production.

In a number of cases sales of pedigree cattle and quality cows and heifers make an appreciable contribution to the output from these large herds. Thus 14 per cent of the replies to the questionnaire indicated that attention to pedigree breeding for sale was an important feature of herd policy. Indeed a number of the leading pedigree dairy herds are found among the largest dairy herds and some of these hold annual draft sales, mainly of milking stock.

Table 6. THE HERD STRUCTURE BY BREEDS
144 owners

Breed	Number of unit herds		Numbers of cows		National herd 1965
	Total	Per cent.	Total	Per cent.	Per cent.
Friesian	270	74.0	28,481	72.8	64.2
Ayrshire	42	11.0	5,084	13.0	15.7
Channel Islands	25	7.0	2,523	6.4	10.0
Other	27	8.0	3,052	7.8	10.1
Total	364	100.0	39,140	100.0	100.0

The large herds include a higher proportion (73 per cent) of Friesians than are found in the national herd (64 per cent in 1965), and consequently a lower proportion of the other breeds (Table 6). In many cases there has been a change of breed since the foundation of the herd and even during the last ten years there have been a number of conversions to Friesians, particularly from Ayrshires. This suggests that owners of large herds prefer the Friesian. Some owners keep two or more breeds and these will usually be in separate unit herds. There were 17 owners with Channel Islands herds and, with one exception, these were kept in unit herds. Ten of these owners kept more than one breed and twelve were associated with producer-retailing at some time during the existence of the herd.

The Formation and Growth of Large Herds

The information from completed questionnaires suggests that there was a tendency for large herds to be founded at particular periods, rather than being spread evenly over the whole hundred years (Fig. 3).

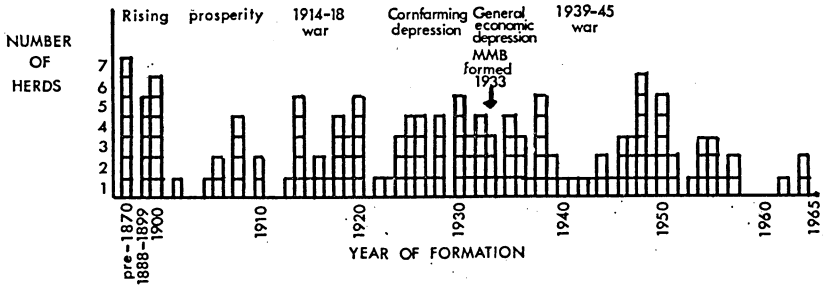

Fig. 3. Year of herd formation.

The main periods of foundation of 140 large herds for which information was available are as follows:

(a) Seven were founded during the middle of the 19th century or earlier.

(b) The upswing in farming prosperity at the end of the 19th century.

(c) The two immediate post war periods 1919/20 and 1946/48.

(d) The years 1924/28 a period of agricultural depression when milk was probably a more profitable enterprise than corn.

(e) The years immediately preceding and following the formation of the Milk Marketing Board in 1933. The agricultural depression was still in existence but the formation of the M.M.B. improved the profitability of milk to corn.

There are no indications of a sudden upsurge in the formation of large herds in the last ten years. Certainly there has been an increase in the total numbers of herd owners with more than 150 cows but this has been due mostly to expansion of existing herds, which is a process to be distinguished from going into business with a large herd. Thus 77

per cent report an increase in the herd size since 1961 (Table 7). This is an understatement since the questions were directed towards ascertaining major increases and there must also have been some increases which were not reported in this context.

Table 7. THE HISTORY OF HERD POLICY
142 owners

	Numbers	Per cent.
Date of herd formation		
Before 1870	7	5.0
1888 — 1899	5	3.6
1900 — 1914	22	15.7
1915 — 1929	34	24.3
1930 — 1944	38	27.1
1945 — 1959	31	22.2
Since 1959	3	2.1
	142	100.0
Date of formation of last unit herd		
1930 — 1945	20	14.1
1946 — 1960	45	31.7
Since 1960	40	28.2
None added since formation	30	21.1
Reduced / no information	7	4.9
	142	100.0
Date of last major increase in cow numbers		
1945 — 1950	3	2.1
1951 — 1955	4	2.8
1956 — 1960	23	16.2
1961 — 1965	32	22.5
Since 1965	50	35.2
Gradual increase	27	19.1
Reduced / no information	3	2.1
	142	100.0

The Production Unit

So far the milking herd has been considered as consisting of all cows belonging to a particular business or group of businesses. It is often itself a unit within a larger business. It is also itself divisable to provide convenient production units which should make efficient use of the specific resources of cows, men, land, plant and buildings devoted to each unit.

The most common structure of the largest herds is the multiple of two or three unit herds (Table 8). In some cases these unit herds consist of 60 to 80 cows with one full time cowman, and in others of 120 to 140 cows with two full-time cowmen. It is probable that this has developed from the general structure of farms in England and Wales. This was in comparatively small units by acreage and was the result of the large and immobile labour force required on a comparatively small acreage to handle horses and to milk by hand. The more successful farmer expanded by adding another farm complete with buildings and cottages. Rather than re-organise the two holdings as one, the additional holding was organised in a very similar way to the original. If the business continued to flourish, then further farms were added,

each to a considerable extent a self contained unit comprising the necessary land, labour, stock, plant and buildings.

Table 8. THE DISTRIBUTION OF UNIT HERDS BY SIZE AND BY OWNERS
144 owners

Herd size	Number of unit herds		Number of unit herds per owner	Number of owners	
	Total	Per cent.		Total	Per cent.
80 cows or less	126	34.6	9	1	0.7
81 to 120 cows	140	38.5	8	2	1.4
121 to 160 cows	63	17.3	7	1	0.7
161 to 200 cows	19	5.2	6	2	1.4
201 cows and over	16	4.4	5	2	1.4
			4	14	9.7
Total	364	100.0	3	34	23.6
			2	64	44.4
			1	24	16.7
			Total	144	100.0

The alternative method is to create a new unit. This has occurred in one of two ways, either by the adoption of new techniques or by the creation of much larger units.

Thus during the period 1920-1930, Hosier and others developed a system of cow-keeping suited to chalk downs and light soils generally. Basically this system consisted of putting a herd of cows, its labour force and a mobile milking plant—the bail milker—on an area of land and it was thus independent of existing farm structures and buildings. Incidentally it enabled milk production to be introduced on these farms without the need to erect buildings at a time when farming on these soils was passing through a period of deep depression. A unit such as this could be easily repeated and a few men have used it in this way to build up a large dairy herd. It has become associated with the name of Rex Paterson who adapted the system to his own purpose and, who, by proper training and control of the two man labour force of each unit, has become the proprietor of one of the three largest herds under a single ownership.

The creation of much larger units has advanced further in the U.S.A. and in Europe than in the U.K. In England and Wales a few producers have planned unit herds of more than 300 cows but the main development so far has been within the range of 150 to 200 cows with a lesser development in the range from 201 to 260 cows (Table 9).

Table 9. THE DISTRIBUTION OF UNIT HERDS OVER 150 COWS BY SIZE

Size of unit herd	Sole units belonging to one owner	Units in a multiple herd	Total
450 cows	1	—	1
201 to 260 cows	10	3	13
150 to 200 cows	11	30	41
All units of 150 cows and over	22	33	55

It is rare to find a unit herd within the size range, 150 to 450 cows, developed independently of an existing herd. Usually they are the result of a new set of buildings and plant designed to accommodate an existing unit herd which has been considerably expanded, or two or more small unit herds. Such large unit herds can be multiplied, once a satisfactory unit has been evolved. Two of the owners of the very largest herds are working towards this end, one using the 180-200 cow unit and the other the 350 cow unit[9].

It is noticeable that the multiple herd owners appear to be concentrating on the 150 to 200 cow unit whereas the sole unit owners are about equally divided between this size and another size between 220 and 260 cows. Whilst there is no evidence that the pressure on space—total farm acres per cow—is any greater for the sole unit owners than for the multiple unit owners, (Table 10) it is probably significant that the average size of holding for the sole unit owners is half that of the average size of holding of the large muiltiple owners (940 acres and 1905 acres respectively). Thus pressures to expand the total business through an increase in the dairy herd possibly induce the owner to consider a bigger unit—capital in buildings and cows rather than in land.

Table 10. THE AVERAGE SIZE OF HOLDING RELATED TO STRUCTURE OF DAIRY HERD
143 owners

Structure of dairy herd	Number of dairy herds	Average size of holding (acres)
Single unit	22	940
Multiple units with at least one unit over 150 cows	25	1,905
Multiple units all units under 150 cows	96	1,472
All dairy herds	143	1,466

[9] Reported in *Farmer and Stockbreeder*, 10th October, 1967.

Chapter 4

MANAGEMENT AND MAN

An important feature of large enterprises is the manner in which the pattern of management is organised, with a chain of command from the senior manager to the workers in the individual production units. To identify this an outline of the managerial pattern was included in the questionnaire (p. 59 appendix) and the owner was asked to identify the chain of command. Within this chain there are individuals concerned with certain functions of management and these are summarised as follows:

FUNCTION	PEOPLE
Ultimate financial and general direction.	The owners — one of whom is "president."
General direction of policy and active engagement in the business.	General manager or managing director. This could be one of the owners, an estate agent or a farms manager.
Day to day control of an enterprise.	Milk production manager, an owner or an employee.
Group leader of the team of workers, to whom they look for on the spot decisions.	Head cowman.
Workers in a group concerned with a specific enterprise.	Cowmen.

On the whole this pattern of management could be identified on most of the farms in the survey. The most likely cause of variation to this pattern could have arisen from the structure of large farms as a group of multiple farms upon each of which is a residence, a set of buildings and a group of men under day to day working direction of the resident owner or a resident bailiff, foreman or farm manager. It is possible that, by reason of physical nearness, such a person could come between the head cowman and the general manager/under manager with special responsibility for milk production. In fact most examples fitted the pattern of direct delegation and responsibility from president to general manager, milk production manager and cowman. One felt that milk production was the personal responsibility of one of the owners, of the sole owner or the managing director and subsequent delegation was through specialist workers and not through a general livestock, general arable or general foreman. Yet some of the answers bore the signs of doubt—or the seeds of doubt. The chart may have indicated the correct chain of control—if it didn't fit, the farmer realised this. A few even suggested that they were a little too anxious to get on a tractor seat and leave the cowman to his own resources.

Within organisations of this type, specialisation of labour will occur, though the divisions may not be identical from farm to farm. The broad

division is into two—cowmen and managers—and this tends to refer to a place in the pattern rather than to functions.

The cowmen are concerned with the day to day physical tasks of the milking herd but may also carry out some of the management functions. Within this definition, they were almost all paid employees responsible in varying degrees to an owner or to a paid manager (Table 11). The majority were employed on a fixed wage, overtime and bonus arrangement. In one or two isolated cases, an owner or farms manager milked regularly. In only ten cases out of 144 recorded, the milking and feeding was on a contract basis, generally at a rate per gallon of milk produced. The contractors undertook both the hiring and payment of labour, and the organisation of labour routines for milking and feeding to the requirements of the owner.

Table 11. THE LABOUR ORGANIZATION IN LARGE HERDS
140 owners

System	Owners	
	Total	Per cent.
Regular men on weekly wage	132	94.3
Regular men on contract	10	8.6
Milking agency	2	
Relief arrangements		
Within group	51	36.4
Other workers	61	43.6
Spare cowman from herd to herd	40	28.3
Family labour	26	18.3

It is easier to arrange a weekend holiday and sick relief in the larger groups of workers associated with large farms. In many cases only skilled cowmen were used for relief, either within a self contained group (36.4 per cent of owners) or by a cowman moving from herd to herd (28.3 per cent of owners). It was also quite common for other workers (other stockmen and tractor drivers) on the farms to act as relief cowmen. In some cases an owner or manager would undertake relief duties, even moving from herd to herd, and by so doing exercise close supervision over each unit herd.

Control of Cows and Feed for Efficient Production

As the functions of management and labour in milk production tend to be performed by separate persons, the need for communication by records becomes more important. As one farmer put it in reply to the question, "There is no recognised system but the biggest sin is not to tell other people what you are doing."

Control starts once policy has been decided. The manager of dairy cows should have a written plan of feeding and calving. The plan should be kept up to date and adjustments made to meet changing circumstances. Such a written plan should be readily available to both manager and cowman, to the former as a management guide, and to the cowman as a daily instruction and control. The important day to day records can be summarised briefly as follows:

1. Date of calving.
2. Forecast of probable date of service.
3. Date of first service and repeats.
4. Signs of failure of first service and appropriate veterinary action.
5. Signs of ill health.
6. Date of future calving and date to be dried off.
7. Changes in yield—the lactation curve.
8. The current feed routine.
9. Periodic assessment of quantities of feed used.
10. Daily total production of milk.

It might be bold to assert that the few in the survey who did not report the use of records for cow control were, in fact, not keeping a record of any kind, however elementary. On the other hand it could not be maintained that, of the 92 per cent who kept records, all kept them in a well organised and up-to-date manner. It is obvious from this analysis and from the high proportion making regular feed checks, keeping milk records for individual cows and co-operating with recognised schemes of herd management study (Tables 12 and 13), that the owners of large herds have found it essential to keep at least these basic records of their milk production enterprise. A few might seem to have overdone this side of their activities and this is due to a readiness to co-operate in various schemes, and sometimes from a competitive or league table mentality.

Table 12. THE METHODS OF COW CONTROL IN LARGE HERDS
136 herds

	Number of cases reported	
	Total	Per cent.
Desk records		
Book or loose leaf record kept by the head cowman at the same place as the cows	44	32.4
Master records kept at central office	24	17.6
Two sets of records—one kept by head cowman and one at the central office	58	42.6
None reported as kept	10	7.4
	136	100.0
Visible records		
Wall boards	31	22.8
Individual cow boards	11	8.1
Loose leaf desk records	26	19.1
Small desk or wall charts	13	9.6
Two or more visible records kept	43	31.6
None reported	12	8.8
	136	100.0
Location of visible records		
Manager's office	21	15.4
Location of cows	78	57.4
Manager's office and location of cows	26	19.1
None reported as kept	11	8.1
	136	100.0

The general pattern of the records kept to maintain control over services, calving and health suggests that it is desirable to have records readily available to the manager and to the head cowman. The actual location of these records depends upon individual circumstances. Primarily these records should be in the cowman's place of work and 75 per cent in the survey were kept there. In a number of cases (42.6 per cent), they were kept also at the central office. In 17.6 per cent of the cases they were kept only at the central office but they were probably readily accessible to the head cowman.

There was an extensive use of visible records and as would be expected, they were mainly located close to the cows (76.5 per cent). At the same time one third of these cases kept visible records in the manager's office. There does not appear to be a marked preference for one particular visible record—65 used small desk or wall charts, 55 used wall boards and five used loose leaf desk records. Some form of recording the milk yield of individual cows is widely practiced, though it is possibly surprising that 7.4 per cent do not. Some producers adopt a group or blanket system of feeding which does not depend upon accurate information about individual yields and these producers will consider that the time spent on milk recording is wasteful. Checks upon feed consumption are in very general use and only three out of 135 producers did not make at least a monthly check. The most common check was carried out weekly or fortnightly by 58.5 per cent of producers. Many of these checks were obviously linked with the dairy herd management schemes operated by the M.M.B., N.A.A.S. and feed/fertiliser firms.

Table 13. THE METHODS OF FEED CONTROL AND MANAGEMENT CHECKS
135 herds

	Number of herds	Per cent.
Feed consumption checks.		
Daily	9	6.7
Daily and weekly	1	0.7
Weekly or fortnightly	73	54.1
Weekly and monthly	4	3.0
Monthly	44	32.6
Daily, weekly and monthly	1	0.7
None	3	2.2
	135	100.0
Cow feeds analysed:		
Occasionally	81	60.0
Regularly	35	25.9
	116	85.9
Milk records of individual cows	125	92.6
Co-operation in management checks		
M.M.B.	67	
N.A.A.S.	53	
University agricultural economists	23	
Management consultants	11	
Feed or fertiliser firms	43	
None	14	

It may seem strange that the owners of the largest herds obtain management data from these organisations. However, it is not possible without an intimate knowledge of the individuals to assess the extent to which they use this for the more important role of management decisions, in contrast to its obvious value in keeping the cowmen on top of their jobs with the regular monthly report from an outside body. The general impression is that, even at this size, there is not an extensive office organisation. A number of these large farms employ full time clerical assistance yet much clerical work is still left to managers and the managing head cowmen. This may not overload them because the business is not large enough to so occupy them on their primary function, managing or the physical aspects of a cowman's work, that they do not have time for clerical work.

Changes in the Functions of Managers and Cowmen

There are a number of functions of management: policy, production planning, finance, control, buying and selling. In the smaller farm businesses these functions are performed by two or three persons, who are also carrying out the physical tasks of production, recording and marketing. Certain characteristics and abilities are required of these individuals. Milk producers and head cowmen are concerned with the day to day control of pre-planned enterprises. To a considerable degree their success depends upon the diligence they apply to the physical aspects of production and the correct application of the plan. Banks, insurance, co-operatives, boards and commissions provide the small farmer with specialist services and within this structure, most of them will react wisely to the economic pressures arising from the prices of resources and products.

As the unit herd becomes larger, some of the functions of the head cowman are transferred to the manager and the cowman becomes a technician, i.e. a skilled craftsman who is prepared to carry out instructions conscientiously and to record those facts which the manager requires in order to manage. In general such men will quickly reach their maximum wages but will not have the ability to progress into the higher levels of management. Their training will be limited to the correct use of machines for milking, to feeding to instructions, and to the observation of health and disease.

The manager will become a specialist in milk production concerned with day to day control over the herds under him. He will make the decisions on feeding methods, on action in health and disease and on the development of the whole enterprise. In short, the manager decides, the cowman carries out the decisions.

Whilst there is a considerable variation in the individual relationships between managers and cowmen from farm to farm, the present structure of the industry, based upon small herds, has resulted in the training and supply of cowmen suited to the system. They are required to be technicians and also to have some knowledge of husbandry enabling them to contribute to management decisions on feeding, breeding and organisation. They can only obtain experience in small herds. As a result, there is a supply of cowmen whose physical and mental capacity is such that the total number of cows over which they can exercise

efficient control is limited. This is one of the factors limiting the size of unit herds and favouring expansion by the multiplication of small unit herds.

Large dairy herds and large unit herds require men, managers and cowmen with special attitudes and abilities and such men are scarce for there is little opportunity for men to obtain such experience. A study of the three largest dairy herds and some large retail businesses indicates the way in which experience is gained and the problems of growth overcome. The evolution of one of these (Lord Rayleigh's and Strutt and Parker Farms) in the second half of the nineteenth century has been described by the biographer of the firm, Sir William Gavin, in "Ninety years of Farming."[10] Edward Strutt took control of 854 acres in 1876 and twenty years later was farming 4,315 acres and managing many more. "Intensive milk production, to take advantage of the nearby London market, was the basis of Edward Strutt's programme for making farming pay in these difficult days." The book goes on to describe the men and the methods responsible for the control of this large organisation with lands in Essex, Suffolk and London in the days before the motor car. At the same time a large milk retail business and a land agency were set up.

At that time farms were restricted in size by the physical limitations imposed by the distances which men and horses could move to the fields. Each farm unit had to be self sufficient in men, horses and machines. The problem of the owner of a number of farms was to keep in touch with each and all, geographically spread and scattered, in times before the speeding up of communication by telephone and motor car. The factors in Edward Strutt's success appear to have been an aptitude in the selection of managers to assist him, the introduction of an accounting system to provide management information, and a personal vigour enabling him to undertake the physical effort involved in travel as well as the arduous duties (particularly mental) in controlling a large organisation.

Similarly and at much the same time the two firms of Marks and Spencer[11] and John Sainsbury[12] were evolving. The need for retail shops to be placed near to the consumer tended to limit the size of each shop. Michael Marks and John Sainsbury expanded their business activities by setting up several retail establishments and initially they were able to control these personally by travelling round to each. In both cases it was not long before the introduction of managers and of control through accounts became necessary. Marks invited Tom Spencer to join him primarily to organise the expanding business. These three organisations, Marks and Spencer, Sainsbury and the Rayleigh/Strutt and Parker Group have been fortunate in that members of the family and individuals marrying into the family have provided continuous family management for a very long time.

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(10) GAVIN, SIR WILLIAM, *Ninety Years of Family Farming*. Hutchinson, London, 1967.

(11) REES, GORONWY, *St. Michael. A History of Marks and Spencer*. Weidenfield and Nicolson. London, 1969.

(12) *J. S. 100. The Story of Sainsbury's*. J. Sainsbury Ltd., London, 1969.

The histories of these now large businesses reveal the same pattern of growth—the development and multiplication of the efficient small unit plus effective control. From time to time, the structure of management and finance was altered to meet the demands of a growing business. Similarly it was necessary to modify policy and to initiate new and more efficient units.

Another of the owners of the three largest herds, the Co-operative Wholesale Society, started farming by the purchase of a number of estates early in the 20th century but these estates were organised upon a small farm basis. Thus, the Stoughton Estate in Leicestershire was organised as seven farms and a piggery. Each farm had its own labour force with a dairy herd of 60 to 70 cows which was large for those days. Later the land work became increasingly centralised but more dairy herds were set up. It is only in the last five years that amalgamation of the dairy herds into larger units has become a feature of these estates. It is also of interest to note how these estates, found in various parts of England, Northumberland, the West Midlands, Leicestershire, Gloucestershire and Bedfordshire, have moved towards the same basic organisation as any other large business. Originally the individual estate managers were independent and only the accountancy was centrally controlled from the Head Office in Manchester but, after the second World War, this policy was changed with the appointment of a general manager of all the estates and the formation of a small central staff to assist him.

After the World War, 1914-1918, the bail system of milk production was developed, particularly on the chalk downs of Wiltshire and Hampshire. This is a system in which the dairy herd is grazed summer and winter and the milking unit or bail is mobile and can be moved from field to field with the herd. Rex Paterson[13] found these bail herds suitable for multiplication and built up one of the three largest herds as a group of 70 cow units each with a two man labour force. Others have found the bail unit suitable for multiplication.

The fact that a few have been operating successfully on a large scale for a long time suggests that profits have, over a long period, been adequate. Yet there has not been any great move towards an increase in the proportion of the largest. Essentially milk production, as indeed farming as a whole, remains an industry of relatively small businesses. The economy of agriculture in many countries is to a considerable extent a consequence of this and the consumer has had to pay the cost, whether in the actual price paid or by subsidies of many and various kinds.

Basically the matter is a very human one—the urge of the few to become leaders. Moreover it is only a few. Such men and women do not necessarily start in life with more capital goods than the rest. Initially they are able to do their own job particularly well whether it be as salesman, cowman or manager. Moreover they are able to get others to do the same—they inspire and train and receive loyalty. A few come into farming with a background of large business and those who have survived applied their knowledge of large organisation wisely.

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[13] SMITH, J., "The Story of a Farming Adventure". *Farmers' Weekly*, 25th April, 1969.

At this stage the large business is only in embryo and a successful and satisfying business and life can follow without further expansion. The more energetic will expand within their individual capacity to control the business and these are the basis of the one, two and three unit herd systems. Probably the limiting factor to further expansion is an unwillingness to share or to delegate responsibility. These cases can be identified from the pattern of control — the owner/manager controls directly each head cowman and possibly each foreman. An increase in the number of unit herds can only come about by an increase in the number of managers—either the head cowmen take on more responsibility or the day to day control of the unit herds passes to a dairy herd manager. Once this point is passed, further expansion is limited by personal ambition until a point is reached at which the business outruns its capacity to supply its own capital and secure financial assistance is needed. The growth during this period probably relies upon the building up of an efficient managerial group.

On these grounds, the conclusion to be drawn is that the development of a large concern in agriculture based upon multiplication of units of production depends upon the appearance of an individual with the necessary qualities. It is the scarcity of men of such ability, more than the lack of technical knowledge, which is the barrier to a considerable expansion in the number of very large multiple dairy herds.

Alternatively, expansion can come about by the development of much larger units without the management structure being changed. It has been noted that the chances are much greater that a unit herd over 200 cows will be developed by a sole unit owner. He still has to control only one, two or three men, and the expansion is primarily a technical one. A specific example of this is the development of the 100 or 120 cow herds in place of 40 to 80 cow herds. The human problem is now at cowman level and the setting up of herds in this way can be accompanied by an inability of the cowman to cope with the pressures of expansion and a replacement has to be found.

Another aspect of the larger business is its abilty to renew the management. Consider again the date of foundation of these large dairy herds. A number go back more than 30 years and have had to replace the original "managing director," whether he was the proprietor or an employee. The twenty to thirty year old businesses are now reaching the point of replacement. Fortunate is the man who is able to trust an able son, for he can make the essential financial arrangements to ensure the continuity of the business and an income for other members of the family who may have a financial stake in the business.

A few of the large herds are under paid management. The owner or owners may have other interests as well as the land they have inherited and three groups can be distinguished:

1. The settled estates remaining in the same families for many generations and frequently associated with peerages.

2. The estates of business and professional men. In some cases it might be difficult to distinguish them from the first group.

3. The family group without a member able and willing to manage the farms.

The first two groups are forced by their circumstances to plan the succession to management and there is a small professional class of managers which recruits and trains its replacements. It was noticeable that a number of the large herds under paid management tended to show progressive management and larger unit herds were being developed.

The problem group is the family without a natural successor. The owner builds up a successful business and shares this with his family, his wife, daughters and non-farming sons. They are to some extent dependent upon its continuation but the owner is also concerned for the future welfare of his employees. The whole concern is viable and the appointment of a manager to assure continuity is a necessity. Such an appointment can maintain or increase the size of the business and the manager may not be employed to his capacity.

The professional manager, initially with limited capital, is a potential source of larger farming units and one can foresee mergers between similar concerns because the manager guarantees the capital owners an adequate return on their capital and he derives income and satisfaction from making a fuller use of his specific ability. This is illustrated by the example of Edward Strutt in the development of the Rayleigh's and Strutt and Parkers' Farms. He increased his management sphere partly by bringing the farms of another branch of the family within his surveillance and partly by managing the farms of others e.g. Guys Hospital.

The relevance of this resumé of the characteristics, functions and operations of managers of a large farming business is to place in perspective the possibility of a considerable increase in the number of large milk producing businesses. All one can point to is a group of able people with the potential experience to develop large enterprises.

At this stage the managers of the larger unit herds are adopting new techniques and testing new equipment, whilst they are developing their own skills in the control of the larger units. It seems likely that eventually one or two will develop a successful unit herd of 1,000, 2,000 or 3,000 cows and they will then be in a position to develop a chain of such units. Whilst their own personal ability and ambition may be the driving force in such a development, one must not overlook the fact that economic stresses in the production and marketing of milk may arise to give an impetus to the formation of such large units.

Chapter 5

THE FACTORS AFFECTING THE SIZE OF UNIT HERDS

J. P. Madden, in a study of "The Economics of Size in Farming,"[14] has set out a principle which applies to the size of unit herds. According to this there is no single optimum size for a unit herd but a number of optimum sizes each using different combinations of resources. Within each combination there will be increasing efficiency with increasing size up to the optimum point at which profits are maximised. Once this point has been reached, the unit will continue to operate at a profit so long as there are no undue changes in resource costs and product prices. Within each combination there are physical factors which limit the number of cows which can be handled in the unit. If these factors are altered by a change in a particular item of equipment and appropriate changes made in the other resources, a new unit is created with its own optimum size. These factors can be described as the barriers to expansion—barriers can be surmounted.

It is probably correct to assume that the majority of the unit herds making up the very large herds in England and Wales are operating somewhere near their optimum size. Therefore it seems logical to consider the reasons for 73 per cent of these unit herds consisting of 120 cows or fewer (Table 8). Primarily it follows from the comparatively small size of farms in England and Wales. This has resulted in herds, which, until recently, only exceptionally exceeded about 70 cows. These were housed in cowsheds and could be managed by a small labour force of one to four men, including the farmer. Particularly with improved machinery and simplified feeding systems, there has been a saving of labour, a combination of fewer hours per man per week and fewer men per herd. A limiting factor to a major increase in size was the cost of extra housing in the traditional cowshed. The development of specially designed milking parlours increased the number of cows per man which could be milked twice a day. The cows could be loose-housed in relatively cheap buildings. As a result, a considerable number of unit herds of around 120 cows were formed in the last twenty years.

Under these conditions three resources developed certain characteristics which tended to limt the size of the herd:

1. The dairy farmer not only managed the herd but also spent a considerable part of his time in the daily physical work of feeding and milking.

2. Cowmen were required to be efficient milkers and be prepared to spend part of their working time in farm activities other than those directly associated with the milking herd. Further, head cowmen were expected to be knowledgeable in the management of the herd.

3. The agricultural engineering industry developed milking machines and milking parlours to fit the particular sizes of unit herds that were being developed.

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[14] MADDEN, J. P., *Economics of Size in Farming*, Econ. Report No. 107, U.S.D.A., Washington, D.C., 1967.

All types of housing and methods of miking were found in the survey (Table 14). It may seem surprising that nearly one quarter of the unit herds are still housed basically in cowsheds. A considerable proportion of these herds are under 80 cows. The original cowsheds were probably well designed and the units will continue to function with reasonable efficiency at low capital cost until the owners are prepared to make major changes in their organisation. About one third of the unit herds are housed in yards and milked in line abreast and these date mainly from the 1950's. In the last decade the herringbone parlour has tended to replace the line abreast and with a speeding up in the rate of expansion in the size of unit herds, there has been a considerable introduction of this type, nearly one third having adopted this system.

Table 14. THE TYPES OF COW HOUSING AND METHODS OF MILKING
343 unit herds

Cow housing	Method of milking	Number of unit herds
Cowshed	Cowshed	66
Cowshed	Cowshed (batch)	16
Cowshed	Bail	5
Yards	Bail	11
None—lie out all the year round	Bail	11
None—lie out all the year round	Abreast and tandem parlour	13
None—lie out all the year round	Herringbone parlour	1
Yard	Cowshed (batch)	2
Yard	Abreast and tandem	102
Yard	Herringbone	64
Cubicles	Abreast	9
Cubicles	Herringbone	38
Kennels	Abreast	3
Kennels	Herringbone	2

As unit herds have become larger, the need for a return to the housing and control of the individual cow as in the cowshed as well as the need to reduce the quantity of bedding per cow has led to the development of the cubicle and the kennel by which each cow has its own bed and freedom of movement. Nearly one seventh of the herds are partially or completely housed in this way and this is a fairly high rate of introduction.

The introduction of bail milking and outwintering on the chalk downs and other light soils has already been discussed. About one tenth of the unit herds are kept on this system. It is a separate development and presumably will be subject to its own pattern of changes. The unit herd is likely to remain small because there is a need for mobility for the milking plant and there are limits to grazing a large number of cows within range of the milking plant.

To sum up, the pattern of plant used in these large herds is the result of continuous businesses building up capital reserves or acquiring capital which are used for the development of more efficient unit herds and their multiplication. Probably this is a human cycle of ageing management and its replacement by youthful management.

Changes in Policy and their Results

These large herds show the general trend of gradual expansion year by year over a long period. One is more interested in structural changes made by individual owners, adjusting the unit herd to changes in the costs of resources. Two thirds (66 per cent) have made major increases in the size of unit herds, involving considerable capital expenditure in the past seven years (Table 15). Further expansion of this type is contemplated by 37 per cent of the owners. Others have added or contemplate adding unit herds and others are concentrating more cows in fewer herds.

Table 15. CHANGES IN POLICY AND THE RESULTS
138 owners

Item	Carried out since 1960		Planned 1968-1973	
	Numbers	Per cent.	Numbers	Per cent.
Major increases in size of unit herds and outlay on plant and buildings	91	66	51	37
An increase in the number of unit herds	20	14	20	14
A decrease in the number of unit herds(1)	53	38	37	27
Full time manager appointed in control of milk production	12	9	7	5
Increase in the number of cows per man	75	54	50	36
Increase in stocking rate on summer grazing	73	53	51	37
Problems arising from changes				
Appreciable reduction in yield per cow	18	13		
Handling problems:				
Food and straw	24	17		
Dung and effluents	38	28		
Faults in layout and plant	26	19		

(1) Some of the answers are subject to doubt

An interesting development is the appointment of specialist managers to control milk production from several herds. Seven said that they were contemplating this in the next five years. However, it may be fair comment to suggest that a questionnaire puts ideas into the mind of the individual completing it. Looking at this figure in conjunction with the pattern of control, it appears that there is a considerable amount of specialist management in large herds.

Structural changes in the housing and equipping of unit herds give rise to practical changes. An increase in the number of cows handled per man is reported by 54 per cent and an increase in the stocking rate on summer grazing is reported by 53 per cent. Many list these as important objectives in future changes. Inevitably there are successes, difficulties and failures. Some of these are mechanical. The handling of greater quantities of materials strains the organisation of men and equipment. Faults are found in the layout of plant and buildings. Difficulty in straw handling is mentioned quite frequently in relation to its frequency of

use. Nearly 28 per cent report difficulties in handling dung and liquid effluents and this is a high proportion in relation to the number of relatively small unit herds in the sample. Eighteen report an appreciable reduction in milk yields per cow following structural changes and this is a part of the cost of adjustment.

Upon the question as to "What is the limit to the size of unit herds?" (Table 16), it is interesting to identify conflict in the minds of large herd owners. Some realise that there is no limit to man's ingenuity to provide conditions for herds much larger than those of today. At the same time they are aware that the physical restrictions of their own farms and plant determine the present size of their unit herds. There is no doubt that a number of owners have personal objections to large units, probably based upon beliefs that the cowman can only supervise a small unit efficiently, and that large units create stress among the cows. These objections tend to disappear as the owner becomes conditioned to thinking in terms of units of over 150 cows. Thus of 130 replies, 91 said that they had no objection to large herds, although a few stated that the maximum number should not exceed 100. Twenty-two objectors to large herds put the maximum numbers at 100 or fewer and seventeen put the limit between 101 and 250. The most important group is that of 34 owners with open minds who put no limit, a limit of 251 and over, or "it all depends upon circumstances" limit upon the size of the unit herd.

Table 16. OPINIONS UPON THE LIMITATIONS TO THE SIZE OF UNIT HERDS
130 owners

The replies to the question "Have you a personal objection to keeping large numbers of cows in one herd?" have been analysed (columns 2 and 3) according to the answers to the question "What do you consider the maximum number of cows which should be kept in a unit herd?" (column 1).

Maximum size of herd	Number of replies	
	Yes	No
Column 1	*Column 2*	*Column 3*
Under 100 cows	12	4
100 cows	10	8
Between 101 and 149	8	16
Between 150 and 250	9	29
Between 251 and 300	None	6
300 and over	None	9
No limit or "it depends upon circumstances"	None	19
Total	39	91

These owners and others with open minds and a progressive outlook are in a position to take advantage of new ideas at the present time and to make major advances in the development of much larger unit herds. The able manager opts out of manual work and concentrates his energies upon the control of the dairy herd. This means that he can control many more cows. At the same time, the nature of the labour force is changing, particularly in its attitude to leisure. The result is a move towards a five or five and a half day working week. To operate such a week a minimum of three men of equal ability is required as each must be able to operate the system laid down by the management. The most

important implication of the three man labour unit is its effect upon the minimum size of the unit herd. Existing parlours and milking machines can be adapted to enable such a labour force to handle a unit herd within a range of 160 to 250 cows but this gives rise to problems in the housing of the cows and the handling of materials. The survey indicated the existence of a number of such unit herds.

Beyond this barrier, there does not seem to be any total limitation upon the size of the unit imposed by the labour force. The problem is simply an organisational one—to design the milking plant so that one can maintain a required flow of cows through it. Two situations can be considered.

1. A larger parlour based upon the herringbone principle and present day labour concepts.

If two men can operate a 16 (8-8) standing herringbone then it should be possible to operate 48 standings, either three units in parallel or in a double line of 24. Assuming a throughput of 60 cows per man at each milking in a 16 standing herringbone, the throughput with 48 standings operated by six men would be 360 cows, i.e. a unit herd of 435 cows.

2. A parlour based upon a different principle e.g. the rotary parlour and specialisation within the labour force.

One group of men would be specialist milkers and the rest of the work of the herd would be the concern of men skilled in feeding and managing cows, using automatic feeding. The size of the unit would depend upon the combined capacity of the milking staff and the machines. The factors to keep in mind would be the need to service the machinery and the fatigue involved in the routine. The only difference between this process and that of a machine operator in a factory is that a living animal replaces inanimate material. Assuming that a team of six men were used for the milking routine—moving cows, washing cows, actual milking and controlling milk flow to an appropriate container,—a calculation could be made that the throughput could be at the rate of one cow per man every two minutes over a seven hour milking period, a total throughput of 1,260 cows equal to a unit herd of 1,520 cows. The actual size of the labour force and the throughput achieved in any particular case would depend on the degree to which the manager could organise the flow through the plant by the introduction of machinery to replace manual activities. It might be a superhuman task for two men to wash 1,260 cows at each milking but a simple task for one man to see that a machine was carrying out the work.

These two situations bring out the contrast between the multiple development and the new and larger model. The larger parlour based upon an existing model is merely setting up one or more extra units on the same location, and the total of each resource used tends to be multiplied by the number of units — thus an increase as suggested could multiply the quantity used of each resource by three and there is no economy of scale. In practice there would be certain economies and the managerial effort in planning the expansion would be far less than that involved in the development of a new unit with the substitution of capital (automated equipment) for manual labour and a more intensive use of management.

The Plant and Equipment Barrier

Primarily this is a matter of capital and labour substitution associated with the economy of size of individual items of plant.

There are a number of activities within a milk production unit all of which can be mechanised at a cost. The main ones are as follows:

(i) movement of cows
(ii) the whole milking process
(iii) movement of feed and bulky materials
(iv) preparation and allocation of feeds
(v) movement of milk
(vi) cleansing of plant and removal of waste.

Prototypes of machinery to perform these tasks are already available or a machine originally designed for a smaller activity can be adapted. Nevertheless a period of development is inevitable and this will require the close co-operation of milk producers and engineers. The actual size and design of a particular machine will depend upon many factors. The general problem will be to adjust the sizes of the individual machines so that there is a physical and economic balance between machines within the unit as a whole. This is not a simple decision and it will need to include provision for plant maintenance within an operation which must be carried out continuously or twice daily. Thus it may be necessary to provide an excess capacity of some plant and machines, so that a part can be withdrawn for regular servicing—for example, with a single rotolactor continuous or even twice daily use could present an unjustifiable risk of breakdown. To avoid this risk it might be better to design a smaller unit and instal three so that one can be taken out.

From the practical aspect there does not appear to be anything to prevent such units or groups of units functioning. Certain institutional factors would be included in the cost, e.g. local rates, and compliance with regulations governing building, the disposal of effluents and the housing of animals. Even the costs imposed by humanitarian objections can be met. Moreover with an enterprise of this size, there is much more at risk and the management will need to raise itself to a standard which can cope with these risks. In practical terms much more attention will need to be given to the health and control of the cows, to the feeding system and to the maintenance of equipment. There will be a need for a supply of cowmen trained to operate under these conditions and for equipment to handle materials at an economic cost.

The breakthrough to this stage is the change from a limited to an unlimited labour force, accompanied by the acquisition of the technique of keeping cows in large numbers at a single location. The basic need will be to produce plant and equipment to function without undue risk of a serious breakdown. The improvement in managerial skills necessary to develop such a plant should be accompanied by a raising of the standards of efficiency in milk production. Higher yields per cow should result from an improvement in the health of the whole herd, in the control of the lactation periods of the individual cows and in the adoption of more efficient feeding practices. As the problems of this type of unit are resolved and further developments take place in automation, the

position will be arising in which very large units of 1,000 or more cows could be developed so that they would attract capital and management for their formation.

Specialisation of Activities

It is obvious that at this level of working, the managerial and financial control will be vested in a holding company representing the capital owners. Such an organisation would be in a position to develop specialist activities related to the production of milk, now limited strictly to the feeding, housing and milking of cows. This situation was oulined in the introduction and one can now consider the implications of such a development. Initially it has been suggested that the development of such units will arise through the skill of farm managers, but subsequently businesses concerned with milk processing, food marketing and the manufacture of animal feedstuff are likely to be interested in very large milk production units.

The economies in transport and in processing a constant supply of the raw material, milk, will attract the processing unit to the production unit. This will require the construction of new processing plants and give the industry an opportunity to incorporate the latest techniques. Transport will likewise be modified to provide suitable means of transporting liquid milk to the consumer and manufactured products to the wholesale grocery distribution centres.

It would be economic for the large milk production units to compound their own foods and this would affect the turnover of the compounders. To meet this threat to their business and also to provide a growth point, the compounders could provide capital for the large milk production units and thus retain the present position by which they are the major suppliers to large milk production units. The businesses concerned with processing and compound feeds are also concerned with the retail outlets to the consumers. In this way they would bring marketing facilities and complete the process of vertical integration from cow to consumer.

Inevitably, by the time these processes had been integrated in a single business, the overriding concern would be with finance and management. These large businesses would attract investment and would be potentially suitable for major "take-overs." This has in fact happened in similar circumstances with the take-over of the feed stuff and broiler production business of the Associated British Foods Group by the Imperial Tobacco Corporation.[15]

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[15] *Loc. cit.* p. 2. BUTTERWICK, M. W.

Chapter 6

CHANGING TECHNIQUES IN COW FEEDING AND COW CONTROL

As herds become larger, methods of husbandry and the organisation of production will be subject to change. The introduction of machines, the greater number of animals involved and the greater quantities of feeds used combine to give the management an opportunity to introduce techniques which may have limitations in smaller units. It is most likely that this will occur in two very imporant activities, feeding and the maintenance of the stock of milking cows. The latter can be called cow control. The survey describes the present methods in large herds. The pioneers and research give pointers to change. It is possible to use this information as a starting point to assess the potenialities for change in these two particular activities within a much larger unit herd.

Feeding Systems

The survey revealed a wide range of feeding systems among large dairy herds and these have been summarised by combinations of bulk feeds (Table 17) and by combinations of concentrates used (Table 18). The general conclusion to be drawn from the survey is that large dairy herds are integrated in the farming system as a whole, whether this be based primarily upon grassland, upon arable land or a combination of both. In all cases summer grazing of grassland is a basic feature of the feeding of large dairy herds.

Of the 130 replies, 64 recorded the use of homegrown cereals, 81 recorded the use of arable by-products, and 61 of these fed straw. The geographical distribution showed a close association of large herds with areas of arable farming. All this points towards the importance of the integration of the feeding of the large dairy herd with arable farming at the present time and it is a factor in the economy of both the milk and the cash crop enterprises.

There is a marked preference for silage among owners of large herds. Ninety-six herds fed hay, 103 herds fed silage and these figures include 71 herds feeding both. Although the replies did not give the relative quantities of hay and silage used, they gave an impression that silage was the main feed. This is confirmed by the National Investigation into the Economics of Milk Production—in both 1965-66 and 1968-69, the herds of 100 cows and over consumed the highest quantity of silage per cow, 73.6 cwt. in 1965-66 and 67.7 cwt. in 1968-69.[16]

Of 135 replies on the use of concentrates, 42 used purchased compounds only and the remaining 93 used home mixes in varying proportions to purchased compounds. Only 22 used home mixes of straight cakes, cereals and meals to the total exclusion of a complete purchased

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(16) *Costs and Efficiency in Milk Production 1968-69.* Ministry of Agriculture, Fisheries and Food, H.M.S.O. 1970.

Table 17. THE SYSTEMS OF BULK FEEDING
130 herds

Bases	No. of herds	Bulky supplements	No. of herds	
Hay	25	None		6
		Arable by-products		4
		Arable by-products — supplemented straw	6	15
		Arable by-products — straw — purchased bulk	5	
		Supplemented straw	1	
		Straw and purchased bulk	3	
Hay and Silage	71	None		26
		Arable by-products		16
		Arable by-products — supplemented straw	6	29
		Arable by-products — straw and purchased bulk	4	
		Supplemented straw	12	
		Straw and purchased bulk	7	
Silage	32	None		17
		Supplemented straw	7	15
		Straw and purchased bulk	7	
		Supplemented straw and purchased bulk	1	
Straw	2	Supplemented and purchased bulk	1	2
		Purchased bulk	1	
Total	130			130

Table 18. THE COMBINATIONS OF CONCENTRATES USED
135 herds

Combination of concentrates used	No. of herds	Kinds of concentrates(2)	No. of herds
1. Purchased compounds only	42	Purchased compounds (1+2+3+4)	73
2. Purchased compounds and a high protein compound-cereals mix	13	High protein compound-cereals mix (2+4+5+6)	74
3. Purchased compounds and a home mix of straights(1)	7	Home mix of straights(1) (3+4+6+7)	43
4. Purchased compounds, a high protein compound-cereals mix and a home mix of straights(1)	11	Purchased compounds and/or high protein compounds-cereals mix only (1+2+5)	92
5. High protein compound-cereals mix only	37	Home grown cereals (2+4+5+6)	64
6. High protein compound-cereals mix and a home mix of straights(1)	3		
7. Home mix of straights(1)	22		
Total	135	—	—

(1) Home mix of straights—usually a balanced mixture of high and medium protein foods with cereals, starchy foods and mineral/vitamin supplements.

(2) The numbers following the descriptions indicate the combinations of concentrates in which they occur.

compound or a purchased supplement. The significance of this is the reliance placed by owners of large dairy herds upon the manufacturers of compounds and supplements to produce feeds balanced, both for the major food constituents, starch and protein, but also for the additives such as minerals, antibiotics and others required to supply the cow with an adequate diet. This simplifies the feeding system and enables the manager to concentrate upon the proper rationing of cows, individually and in groups, and upon the selection of feeds to give the lowest cost combination from year to year.

The development of larger unit herds may require a move away from these traditional feeding systems, particularly with regard to the place of fresh grass. Obviously the larger the unit herd the greater becomes the problem of moving cows to and from grazings. Some land will need to be sacrificed for hard surfaced roads, but a well regulated rotational grazing system should avoid poaching and ensure the maximum utilisation of the grass. Zero grazing provides an alternative by which man and machine bring the feed to the cows but this does not necessarily make any more efficient use of the land devoted to grass and roads.

It is more likely that the development of automatic feeding, the production of complete foods[17] and a need for the management to have at their disposal foods with a known composition will result in a considerable reduction in the seasonal use of foods, based upon grazing in summer and upon hay, straw and silage in winter supplemented by concentrates. Experimental work has been going on, particularly at the Grassland Research Institute, Hurley, into the production of standard feeds in which bulky fodders and concentrates have been incorporated into pellets or wafers.[18]

The importance of this development is that it avoids the disturbances to milk production which can follow a seasonal change of diet, e.g. the changes in the composition of grass, and the change from autumn grass to kale. Such changes cannot be discovered easily by laboratory analysis but become only too obvious in changes in milk output. Then the damage to future production has been done.

At the same time, the development of standard and complete feeds could simplify the demands made upon automatic equipment. For example a series of feeds could be produced to meet the requirements of cows at the various stages of the lactation and then could be fed individually at appropriate rates or at an appropriate bulk quantity to a group of cows at the same stage of lactation.

The effect of such changes on the structure of dairy farms and former dairy farms needs to be considered. Should the use of standard complete feeds be adopted, the dairy herd would no longer need to be integrated with crop production. The present compounders of feeding stuffs would be aware of the implications for their business, and they would be most likely to produce the new complete feeds. The milk producer

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(17) LODGE, G. A. AND OLALOKU, E. A. "The Use of Single, all Milled Diets for Dairy Cows". *Report of the School of Agriculture, University of Nottingham*, 1965. pp. 94-98.

(18) RAYMOND, W. F. "Some possible trends in forage conservation." *Proc. Symp. Forage Conservation.* Occ. Symp. 3. Br. Grassland Society p.p. 147-150.

would not then need capital for food production, but he might well be associated with the compounders. The compounders would need a supply of conserved grass to incorporate in the standard feeds. This supply could be met from the grassland of the former dairy farms, providing both a sale crop and a break crop on a cash cropping farm.

Cow Control

The traditional method of replacing the milking herd from its own progeny is used in the majority of the largest herds. Of the 140 for which information was available only seven owners purchased 50 per cent or more of their replacements. A further sixteen purchased some replacements at auctions and it can be presumed that others would make occasional purchases privately or at special pedigree sales. Further, the majority of the owners reared their own progeny on their own holdings and only eight relied upon contract rearing. (Table 19).

Table 19. THE SYSTEMS OF COW REPLACEMENT
140 owners

Method	Number of owners	
	Total	Per cent.
Followers remain on the farm of birth	58	41.4
Followers reared on other farms:		
(a) returned to herd of origin	56	40.0
(b) not necessarily returned to herd of origin	19	13.6
Most replacements home bred	133	95.0
Most replacements purchased	7	5.0
Total	140	100.0
Followers reared on contract	8	5.7
Replacements if purchased, purchased at auctions	16	11.4

In 114 cases the owners maintained self-contained unit herds and these were almost evenly divided between those who kept the followers on the farm where they were born and those who reared the followers by contract or on another farm often with the progeny of other herds, and then returned the down-calving heifers to their herd of origin. A further nineteen herds did not necessarily return heifers to their herd of origin. These figures indicate that, in rather more than half the largest herds, the rearing of replacements has become a separate enterprise, mostly under the direct control of the herd owners. Nevertheless the system retains the psychological advantage of the self-contained unit herd in which the cowman rears his own replacements or receives back down-calving heifers, the progeny of his herd. This is supposed to encourage pride in his herd and therefore better results.

The same motives probably lie behind the system of management of dry in-calf cows. With few exceptions (mainly in the grazing season), the dry cows remain under the control of their own cowman. From the business angle the rearing of young stock requires both specialised

management and a considerable capital investment in the growing livestock, land, housing and crop production. It is obvious that most owners of large herds consider this is a profitable enterprise, the profit arising from the contribution made to the efficiency of the milk production unit by the supply of replacements at a competitive price for animals equal in their response to the environment of the milking herd. The number of heifer calves available, even at 40 per cent of the total herd, would enable replacement to take place at the rate of every two and a half lactations per cow. Under high class management, one would expect a longer milking life than the present four to five lactations and there would be a considerable supply of heifers surplus to replacement needs. These could be sold for rearing and fattening, e.g. by smaller concerns or by former milk producers. Alternatively large rearing and fattening units could be set up within the same organisation as the large dairy units. Smaller milk producers could then purchase instead of rear replacements for their dairy herds and use the land so released from rearing for cash cropping or for cow grazing, enabling the herd to be increased in numbers.

The maintenance of the stock of milking cows is a matter of major importance to the manager of a dairy herd, for the maintenance of an efficient level of output of milk depends upon it. The present price structure of monthly prices for milk has developed from a knowledge of the monthly variations in supply and offers a higher price in those months in which it has proved difficult to maintain production due to seasonal and other factors. The object is to encourage a level supply throughout the year but this has not been achieved. The development of very large herds could enable this object to be more nearly achieved.

The greater control over feeding and the development of standard rations remove the effects of the seasonal element arising from the changes in the fresh and conserved grass portion of the feed. These circumstances would result in the relationship between the cost of the feed input and the quantity of milk produced remaining constant throughout the year. At the same time the capital cost of the plant is high and the labour force is carefully balanced to the daily production routine. Therefore it would be desirable to maintain the daily output of milk as near to the optimum level of efficiency as possible. Physical restrictions of plant and men would make it impossible to exceed this level in months of higher prices and a lowering of daily output in any period would reduce total sales. Even with the present monthly price structure, the maintenance of a level daily supply would probably be more economic. Further, if production were linked directly to the manufacture of milk products or to the retailing of milk, this division of the business would prefer a level supply for the greater efficiency in the use of its resources. A development along these lines would require a revision of the price structure for milk and a reappraisal of the calving pattern.

The present monthly pattern of milk prices puts an emphasis upon a period of 365 days between calvings, in order to maintain a monthly pattern of milk output and maximise the value of total milk sales in relation to the costs. There is evidence from milk recording data and the gradual change in the national monthly pattern of milk output that the calving period is longer than 365 days. An increase in yields is likely to be brought about by the high level of management in large herds and this could extend the calving interval. The decision as to the optimum

calving interval would then be based upon the lowest daily yield per cow that would be economic in relation to the optimum daily output, allowing for the appropriate method of drying off.

The probable organisation of the cows to meet this situation would be to divide them into groups based upon the date of calving, e.g., assuming a five week calving interval, the herd could be divided into 14 groups, the cows within each of which will have calved within the same four week period. At the end of the lactation for each group, any cows not calving within the appropriate four-week period for that group would be removed and replaced by down calving cows from another group or by down calving heifers. This would require careful planning but the process is simplified by the greater numbers involved, reducing the odds that sufficient replacements could not be available. The problems arising from the stresses resulting from the re-formation of groups would require skilled cowmanship.

Chapter 7

CONCLUSIONS

In 1931 Wyllie posed to the milk production industry the following: —

"On what lines are we to organise, or rather re-organise, the milk production industry? . . . . . We may either proceed on the basis that the existing lay-out of milk producing farms is fixed and unalterable, that all we can hope to do is to make the existing machine more and more efficient, or we may take the view that something more drastic is required, that in fact an entirely new machine is wanted".[19]

He commented that the general organisation and lay-out of milk production remained virtually the same as fifty years earlier, based upon a very small business unit, a typical herd of twenty to thirty cows.

"If milk production were a separate industry, the case for re-organisation on the basis of large scale units would indeed be very strong . . . . . the entire efforts of the manager would be concentrated on cows and milk . . . . . would be located at convenient places in the country, the equipment would be much improved, the feeding done on more systematic lines . . . . . the milk producer would become a specialist on a large scale, and would be able to give his whole attention to milk production problems".

Since 1931 there have been some changes but this study of large scale milk production emphasises the contribution made by the small units of production to the present structure of the milk production industry in England and Wales. There has been a gradual increase in the average size of these units, achieved by the development of machines and changes in feeding methods. Probably the change over from hand to machine milking and the replacement of the horse by the tractor have been the two most important factors in the development of larger unit herds. Nevertheless, neither of these changes encouraged the development of new units, and changes were mainly gradual increases in size of existing herds.

It is likely that the existence of large numbers of small units was the barrier which stood between the gradual growth of the small unit and the creation of a much larger unit. The machinery manufacturers developed milking machines and tractors for the main market — i.e. for small herds and small farms, and thereby perpetuated the small unit, which could be efficiently managed by men with limited managerial ability using a pre-planned production unit.

The more able managers could not expand the size of the unit—the machines were not available—and it was easier to set up more units, the multiple business structure. The degree of multiplication depended upon the individual, many being satisfied with up to four units and only the

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[19] WYLLIE, J., The Economics of Milk Production. Paper at Conference of Agricultural Organisers, Cambridge, 1931. M.A.F. London.

few, such as Edward Strutt in the 19th century and Rex Paterson in the 20th century, developed very large multiple businesses. The control of the individual units was simplified by the delegation of managerial functions to the cowmen and the owner's main task was to see that the cowmen carried out these tasks. Such an arrangement was unlikely to give rise to managers with the experience to control large units.

In recent years much larger unit herds have been set up by the amalgamation of two or more smaller units or a substantial addition to an existing unit, thus creating entirely new units. This study has shown the development of unit herds in various size ranges, 200 to 250 cows, 350 to 500 cows and even 1,000 cows. Within each of these size ranges there are conditions operating to limit the total number of cows which can be kept, within the requirement of maximising profits. For each unit there is a specific combination of resources which it is difficult to modify in the way that the much smaller units have been modified in the past. In order to expand, the operator is faced with an alternative: to set up similar units or to set up a much larger unit. If he has developed a 250 cow unit, he can progress in multiples of 250. Alternatively he can set up a much larger (1,000 cow) unit.

In developing the 250 cow unit, there has been a development cost, the correction of faults in the plant and in the production policy. It will probably be more economic in terms of increasing total profit to set up similar units rather than to invest capital in the development of a much larger unit, i.e., to organise and control five 250 cow units rather than set up a 1,000 cow unit in addition to the existing 250 cow unit. Thus, each size tends to become self perpetuating, once an efficient prototype has been developed.

Suitable plant and men will become available. It is probable that, in the United Kingdom at the present time, this stage is partially completed and the position could soon be reached in which there could be a rapid increase in the numbers of these large units, with the emergence of one or more sizes as the dominant feature of the structure of the milk production industry.

The potential of the larger herd and unit herd lies in its adaptability and in its demand for new methods. A prime factor in the economy of milk production is the physiological cycle of the cow. Calving, changes in yield during the lactation and a dry period are unavoidable. They can be controlled up to a point. A manufacturer with 20 identical machines knows exactly the input/output capability of these machines and can control production to his requirements—but with 20 cows the milk producer is committed to a production from each, once successful calving has been achieved. He will be extremely fortunate if he can so arrange calving over a 365 day period so as to optimise his production in relation to his plant and organisation. The larger his herd the easier this becomes, for he can so arrange the calvings that the daily variations in the herd structure are reduced. In a herd of twenty, individual cow care is possible but in large herds much of the individual cow care ceases and group care replaces it. These groups are suited to mechanical feeding — it may well be just as efficient to feed together 100 cows all at the same level of yield and stage of lactation as to feed them individually as would be done in a herd of twenty.

When this is combined with standard rations which avoid the undue seasonal variation in yields incurred when cows graze, the producer has a potential production unit which meets the needs of the market as well as being suited to efficient production, for both require that the unit should be kept as near as possible to its optimum level of production at all times. The basic ingredients and the financial structure are now assembled in a new model. The several activities of labour are specialised — the capital providers, the production controllers and the machine operators. The cow may even be standardised — a group of very large producers could introduce the latest planned breeding methods. The whole unit is now completely isolated from farming activities and will not need to be integrated with them, but could be associated with them — especially with units for the production of cow replacements. It is quite likely that such units would be associated with processing plants.

It is not forgotten that large units such as this will have their own problems—particularly of human and animal stress. Nevertheless there does not seem to be any particular obstacle to prevent man from organising milk production in this way to give an adequate reward for capital and enterprise, even at a lower cost to the consumer.

Before this can happen in the United Kingdom, certain conditions will need to develop and some existing practices will require changing. In particular this will occur in two areas, the cost/price structure of the industry and the quality of management. The cost/price structure in the U.K. is under the political influence of the Agriculture Acts and the Price Review system. Under this system there has been an increase in the efficiency of British agriculture but this has been associated with the retention of the farm structure in which small farm businesses can continue to operate. The system enables the small business to make gradual adjustments to changing economic conditions and the dairy industry, as a whole tends to operate in equilibrium. This means that milk may not be produced at the lowest possible cost, such as could be reached by the introduction of larger production units under a higher quality management than exists at the present time.

On the other hand, the U.K. does not experience the same conditions as exist in those countries in which large scale units are being developed. Two associated conditions, a peasant based agriculture and a high social value of milk, tend to be found in those countries in which the very large units are developed. In a peasant based agriculture there is a scarcity of skilled managers and the most efficient way to use them is to maximise the number of cows per manager. The high social value of milk may encourage a flow of capital from national resources in order to meet the requirements much more speedily.

Nevertheless, there is no reason to suppose that the conditions in the U.K. preclude a change. This survey of the present large herds indicates that the change has been initiated. The next stage will be the proving of a unit of 1,000 cows or more. Such a unit will attract management and capital and there could be a considerable increase in the numbers of such units. This would have implications for the future structure of both the farming industry and the milk distribution industry.

Changes in the Farming Industry

The eventual structure of the milk production industry would probably be a number of very large units within a few financial groups together with a few producers with comparatively large herds by the standards of 1970. The present structure is already changing towards this and it may well be that the two movements come from a common cause. The decline in the number of milk producers in England and Wales in recent years is evidence that there are disincentives to milk production in its present structure. The underlying causes of this decline are the changing attitudes of farmers and farm employees to work and leisure. Neither are prepared to work a seven day week and a fifty-two week year. This creates problems in organising work routines for livestock enterprises. At the same time, the development of machinery enables more stock to be looked after per man. The livestock producer is faced with an alternative — to keep many more stock or to change to crop production. Obviously such changes will not come about instantaneously but they could occur in a comparatively short time, by a combination of changes in the farm structure. Thus, farmers would switch to other livestock enterprises or to crop production, possibly accepting less work and less profit as a retirement pension. Younger farmers and employees would be attracted to the large units. Farm amalgamation would take place to form viable units for crop production or less intensive stock production. The large milk production businesses would provide a market for the farmers' crops —both cereals and conserved grass. It might even be more economic to move the waste livestock products—dung and urine—to the farms than to attempt to keep small livestock units on the farms as a source of organic fertility.

A change of this nature would have far more disturbing effects than the recent changes in the structure of the pig and poultry sectors of farming. Pig and poultry enterprises were not so closely integrated into farming systems that their discontinuance disturbed the general structure of the farm. In many cases they could be shed with practically no effect upon other enterprises and any loss of income was made good by an increase in the output from one or more of the remaining enterprises. In those cases where there was some integration, e.g., the use of rotation grass, other livestock could replace them.

Some of the causes of the formation of large dairy herds, as an enterprise separated from the farm, could also apply to other livestock, particularly the production of beef and mutton. A similar development of large units in buildings (controlled environments, mechanised handling of materials and specialised management) would remove the sole livestock alternative to milk production. From this would develop a new approach to the integration of livestock and crop production in which the maintenance of the organic humus content of the soil is considered vital. There seems no practical reason to prevent the processing of the effluent from large livestock units and its transport to the land. In the long run, this could be cheaper than the present dung cart or vast public sewage disposal plants.

The Business Structure

The survey showed the part played by the family in the structure of the businesses with large dairy herds. Once a decision had been made to allocate finance to farming, there was very little evidence of finance from sources other than those usually available to family concerns, whether a personal business, a partnership or a family company. A few of the largest estates might have access to capital for a major expansion but the majority rely upon personal credit worthiness.

The capital outlay involved in setting up large units of the size suggested is considerable. For example, a farmer with 150 cows with a capital investment of £30,000 can expand to 180 cows for an initial capital outlay possibly of £5,000, and can finance this from accumulated reserves or a bank advance. To add a unit of 250 cows would require a capital investment of possibly £50,000, equal to the investment in the first unit. Even this could be financed by some of the larger concerns included in the survey. The larger the unit, the greater the total capital cost of expansion. A flourishing business in which each additional unit cost £200,000 would soon reach a point at which the major pre-occupation would be the provision of capital.

At the same time, businesses such as feed suppliers and milk purchasers would be concerned lest these large milk production units would set up their own service units and thereby reduce considerably the size of the feed merchant's business or the milk processor's business. The usual method of overcoming this is to arrange to provide these services and this becomes, sooner or later, a merging of the business interests. The founder family may retain a considerable managerial control but it seems inevitable that, at the probable scale of operations, public companies and finance corporations will control a few businesses concerned with the production and distribution of milk.

At the present time there are a few milk producers and research workers developing much larger units and eventually a new and tested model should appear. This study has attempted to indicate some of the changes in management and techniques that are likely to appear in the new model. None of these should be so radical that they can be described as impossible. The various barriers to change have been considered — many of them are already being overcome. They introduce new standards of performance of men, cows and machines and require a rejection of existing cost and performance data. The size of the business may well be such that a much larger financial body will be needed to provide the enterprise within which the new milk production units can flourish.

We should be concerned about the possible effect upon the dairy industry as a whole, both production and processing, if there were a major change, a new model. It is easy to say it cannot happen for a long time. Changes appear to happen much more rapidly than they used to do. Anyone who has seen the developments in new materials and new communications which have occurred with accelerating speed in the past half-century must be conditioned to changes. Computers enable calculations to be made much more quickly and this speeds up research and development. They are even spreading into the actual working area, recording facts formerly noted by the workers, making decisions and

giving instructions. One may not completely eliminate human decision but these facilities enable more decisions to be made with greater accuracy—i.e., more cows can be managed per man.

The impact of these changes would enable some of the more costly features in the dairy industry to be eliminated and the abandonment of the present winter/summer price differential might be necessary to encourage these changes.

One cannot ignore the impact of these changes on individuals but let it not be overlooked that these very changes in milk production involve a re-arrangement of personal activities within the national labour force rather than actual displacement or unemployment. It is a matter for society to deal with the casualties.

Economic and social pressures are arising to bring much nearer developments envisaged in this study. Farmers and their employees are changing their ways of living and they are less willing to put in the long hours of manual work each day, characteristic of farmers of recent generations. This becomes evident by the steady reduction in the numbers of both farmers and employees engaged in agriculture. At the same time there are increasing political and economic pressures to control costs of production and to change marketing methods. These various pressures may trigger off the development of very large unit herds in the United Kingdom. Once this has happened, there could be a rapid increase in their numbers and an associated adjustment to the structure of British agriculture.

APPENDIX

STUDY OF LARGE SCALE MILK PRODUCTION

QUESTIONNAIRE

SECTION A. THE FARMING BUSINESS AND ITS OWNERS

Question No. — *Answer*

The active owners of the business and their family relationship.

Active owners are those spending a considerable part of their time in the management or those providing a major part of the capital whilst not being active managers. This question is not concerned with the distribution of capital ownership and the financial arrangements are indicated sufficiently by the trading name of the business as above, e.g., partnership, estate company, private company, limited company, etc.

Insert total number of active owners against the appropriate pattern of ownership, females being included where appropriate.

Numbers

1. Sole owner. .....
2. Family group or estate:
   - (a) Husband and wife. .....
   - (b) Father, sons and daughters. .....
   - (c) Father, sons, daughters and grandchildren. .....
   - (d) Brothers and sisters. .....
   - (e) Brothers and their sons and daughters. .....
   - (f) Other related partners. .....
3. Group of non-related partners. .....

Acres

Ownership of the properties farmed. Enter acreage under each type of ownership.

4. Owners of the farming business:
   - (a) absolutely. .....
   - (b) as family trust or estate. .....
5. Corporate body, e.g., church, crown, large estate, educational and similar bodies, insurance company. .....
6. Individuals (not part owners of the farming business) with small estates or individual farms. .....

TOTAL ACREAGE FARMED. .....

FARMING AND FAMILY BACKGROUND OF SENIOR OWNER

Question No.		*Answer* YES or NO
7.	Did your father farm?	.....
8.	(a) Did your uncles farm?	.....
	(b) Did your grandparents and/or great uncles farm?	.....
9.	Have the family herds and farms been considered large in each generation?	.....
10.	Were most of the above, if farming, milk producers?	.....
11.	Has there been an association of the family with agricultural business?	
	(a) Producer retailing of milk, etc.	.....
	(b) Farmhouse cheese making.	.....
	(c) Dairy factory.	.....
	(d) Others.	.....
12.	If the senior owner of the present farming business is not of farming stock,	
	(a) Were his parents engaged in the management of a relatively large business?	.....
	(b) Were they in one of the professions?	.....

SECTION B. PARTICULARS OF THE HERDS

13.	Is the breeding of pedigree cattle for sale considered to be an important feature of the dairy cattle enterprise?	.....
		Year
14.	In what year, approximately (allowing for inheritance) was milk production commenced.	.....
15.	What are the main breeds kept and when were they first introduced?	*Breed*
		....
		....
		....
16.	In what year was the last unit herd added?	.....
17.	In what year was the last major increase made in the number of cows kept?	.....

PARTICULARS OF THE UNIT HERDS

Question No. 18.

	A.	B.	C.	D.	E.
PARISH. Location of buildings and grazing.					
SOIL. Type. Light, medium or heavy. Geological formation. If known.					
HERD. Total Nos. of Cows in milk and dry. Main breed.					
ACREAGE of farm associated with herd.					
HOUSING. Describe briefly, e.g., cowshed, yards, cubicles.					
Type of parlour.					
No. of stalls (parlour or cowshed)					

		Answer YES or NO
19.	Are dry cows kept on the same farm as the herd to which they belong?	.....
20.	(a) Are most replacements home bred?	.....
	(b) Do followers remain on the farm where they were born?	.....
	(c) If followers from all herds are reared together on another farm, are replacement heifers returned to the herd from which they came?	.....
	(d) Are followers reared on contract?	.....
21.	(a) Are most replacements purchased?	.....
	(b) Are replacements purchased at auctions?	.....

LABOUR ORGANISATION.

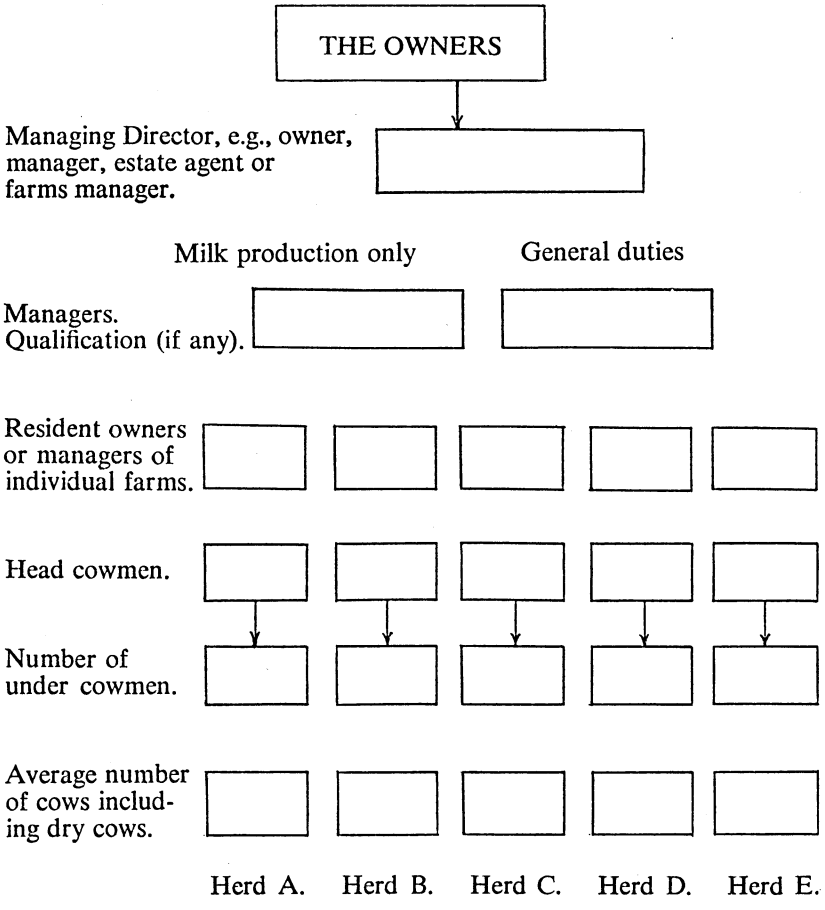
		Tick method used
22.	(a) Regular men on weekly wage.	.....
	(b) Regular men on contract.	.....
	(c) Milking agency.	.....
23.	Relief at weekends and holidays.	
	(a) Arranged within the group of cowmen.	.....
	(b) Other workers on the farm where herd is situated.	.....
	(c) A spare cowman moving from herd to herd.	.....
	(d) A member of the family.	.....

SECTION C. MANAGEMENT

PATTERN OF CONTROL OF MILK PRODUCTION

Question No.

24. Draw arrows to show the links in the chain of control, as shown by the arrows from "head cowman" to "other cowmen". Indicate the individual by name or initial and, if one of the owners including employed juniors, by relationship to the senior owner. If no one holds the job indicated, leave blank or write "none".



Note:— It would be appreciated if specimens of forms used to pass information, particularly to and from the head cowmen were enclosed with the completed questionnaire.

Question No.		*Answer* *Tick method used* Stored and mixed Centrally	Individual Herds
	FEEDING SYSTEM. Tick foods or system used. Modifications of main systems can be noted, e.g., kale could be included in any of the winter systems.		
25.	Concentrates:		
	(a) Purchased compounds.	.....	.....
	(b) Cereals and high protein concentrate.	.....	.....
	(c) Straights and cereals.	.....	.....
26.	Winter bulk feeds:		
	(a) Hay.	.....	.....
	(b) Hay and arable by-products.	.....	.....
	(c) Silage.	.....	.....
	(d) Straw — supplemented.	.....	.....
	(e) Straw and other bulk, e.g., brewers' grains, potatoes.	.....	.....
27.	Do you check feed consumption in relation to milk production:		
	(a) Daily.	.....	
	(b) Weekly.	.....	
	(c) Monthly.	.....	
28.	Do you have cow feeds analysed:		
	(e) occasionally.	.....	
	(b) regularly.	.....	
	COW CONTROL.	YES or NO	
29.	Do you keep milk records of individual cows?	.....	
	Records of services, calving, health, etc.		
	Tick those of the following methods used by you.	*Tick*	
30.	Book or loose leaf record kept by the head cowmen at the same place as the cows.	.....	
31.	(a) The head cowmen send the basic information to a central office daily or weekly.	.....	
	(b) The master records are kept at the central office.	.....	
32.	Which of the following visible records do you use?		
	(a) Wall boards.	.....	
	(b) Individual cow boards.	.....	
	(c) Loose leaf records.	.....	
	(d) Desk or small wall charts.	.....	
33.	Where are the visible records kept?		
	(a) Manager's office.	.....	
	(b) Location of cows.	.....	

GENERAL CONTROL.

34. Please tick those of the following with whom you co-operate to prepare management information about milk production.

	Tick
(a) M.M.B.	.....
(b) N.A.A.S.	.....
(c) University Agricultural Economists.	.....
(d) Management consultants.	.....
(e) Feed or fertiliser firms.	.....

SECTION D. POLICY AND PROBLEMS

Question No.		*Answer*	
	Please tick in the appropriate column those of the following changes in policy which have been recently made or are planned for the next five years.	*Tick* Carried out since 1960	Planned 1968-1973
35.	Major increases in the size of unit herds involving considerable outlay on buildings and plant.	.....	.....
36.	A reduction in the number of unit herds:		
	(a) and a reduction in the total number of cows owned.	.....	.....
	(b) and no change in the total number of cows owned.	.....	.....
	(c) and an increase in the total number of cows owned.	.....	.....
37.	An increase in the number of unit herds by addition of farms or conversion of existing farms.	.....	.....
38.	The appointment of a full time manager, as distinct from a working cowman, responsible for the control of milk production.	.....	.....
39.	An increase in the number of cows per man employed on milk production.	.....	.....
40.	Changes in the bulk foods used: Specify.	.....	.....
41.	An increase in the stocking rate on summer grazing.	.....	.....

Please tick those of the following problems which you have experienced as a result of any changes above. Brief comments would be helpful.

		Tick
42.	An appreciable reduction in milk yields per cow.	.....
43.	The feeding system has proved unsuitable.	.....
44.	Difficulties in handling materials:	
	(i) feedstuffs and straw.	.....
	(ii) dung and liquid effluents.	.....
45.	Faults in the layout of buildings and plant.	.....
46.	Any particular successes? Indicate briefly.	.....
		YES or NO
47.	Have you a personal objection to keeping large numbers of cows in one herd?	.....
		Number
48.	What do you consider the maximum number of cows which should be kept in a unit herd?	.....

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