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April 1946

AN INVESTIGATION INTO THE COSTS OF REARING CATTLE IN THREE AREAS OF DEVON.

PART 1.

(a) A study of some managerial aspects of cattle rearing practice in Devon.

(b) Costs of rearing two year old store cattle: October 1943 to September 1945.

UNIVERSITY OF BRISTOL
DEPARTMENT OF ECONOMICS.

21, Queen Street,
Newton Abbot.

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INTRODUCTION.

An investigation of certain economic and managerial aspects of cattle rearing in Devon was initiated in October 1943. The objects of this investigation were (1) The determination of the costs incurred in rearing (a) store cattle (b) heifers up to the calving stage, and (2) To study some of the more important managerial aspects associated with cattle rearing practice in Devon.

At the present time (March 1946) the investigation is still proceeding and it is unlikely to be completed earlier than December 1946. The cost data with which this report deals is therefore concerned with cattle up to the age of two years, and a further report relating to final costs and returns of store cattle and down-calving heifers will be made following the completion of the investigation.

The investigation has been carried out by the survey method, records to date having been collected for the same group of calves on each farm to cover four six monthly periods as follows:- (1) Winter - October 1943 to March 1944; (2) Summer - April to September 1944; (3) Winter - October 1944 to March 1945; (4) Summer - April to September 1945.

The cattle with which this report deals were born in the late summer and early winter of 1943 and the first six months of their life occurred during the winter of 1943-44. Cost data relating to winter reared calves will differ from that relating to summer calves at all stages of development, both in the total cost and in the relative importance of the various items of cost making up the total. This survey is limited to winter calves and the resulting costs cannot therefore be taken as applicable to calves born during spring and summer periods.

The investigation commenced in the winter of 1943-44 with 45 co-operating farms spread equally over three areas of Devon and involving altogether a total of 238 calves. The farms included in the sample were selected to represent as far as possible typical farming conditions in the area in which they are located. At the end of the two year period at Michaelmas 1945 there were 42 of the original farms and 181 of the 238 cattle left in the investigation. Altogether three farms and 57 cattle did not complete the two year period. These three farms accounted for 20 of the 57 cattle. Of the remaining 37, 7 died, 24 were sold as stores at ages ranging from nine months to two years, 3 were sold fat at less than two years old, while 3 heifers that "stole" the bull calved down at 18, 20 and 23 months respectively.

The three districts in which the investigation is being conducted are located as follows. The North Devon area includes that part of Devon north of a line from Tiverton to Launceston. The East Devon area lies to the east of a line from Exeter to Tiverton, while the South Devon area embraces that district of Devon lying to the south of Dartmoor and bounded by Haldon Moors to the east and the Tamar to the west.

The distribution by districts of the 42 farms and 181 calves that have been costed up to two years old, is set out below:-

	North Devon	East Devon	South Devon	All Groups
Number of farms	13	15	14	42
Number of calves				
(a) Steers	12	2	10	24
(b) Heifers	36	61	60	157
Total No. calves	48	63	70	181

SOME MANAGERIAL ASPECTS OF CATTLE REARING IN THREE AREAS OF DEVON.

REARING POLICY:

The rearing policy adopted in the different areas largely determines the number and type of cattle reared.

In the original sample of calves at September 1943, steer calves accounted for 38 per cent of calves costed in the North Devon group, 4 per cent in the East Devon group, and 18 per cent in the South Devon group. The distribution of steer calves in the sample reflects closely the prevailing rearing policy in each of the three areas. North Devon with the highest proportion of steer calves is traditionally a sheep and beef cattle rearing area, and on over 90 per cent of the farms investigated the cattle enterprise was primarily concerned with the raising of stores, although more than one half of these farms were selling some milk. Normally most of the healthy calves born are reared, the best heifers being calved to maintain the herd and surplus heifers and steers reared for sale as store cattle. In North Devon winter conditions are considerably less favourable than in either East or South Devon and difficulties of winter keep and housing for cattle were the most frequent reasons given by farmers in this group as limiting the number of cattle raised. Competition from sheep for the available grazing is also an important factor, but the more profitable alternative offered by milk selling may in future prove to be the most important consideration limiting the number of store cattle raised in North Devon.

East Devon, with a very small percentage of steers is predominantly an area of small dairy farms and more than one half of the farms investigated rear only heifer calves for dairy replacements, while, on the smaller farms, where maintenance of the maximum number of cows is necessary in order to derive an adequate income from

the restricted acreage, only heifer calves from the best cows are reared, any deficiency in numbers necessary to maintain the herd being made up by the purchase of freshly calved cows. On the larger mixed farms a slightly different policy is commonly adopted. All likely heifer calves are reared and selection of replacements for the milking herd is made when the animals are well grown, the heifers then culled being reared on for sale as stores, or to finish out on the farm. One farm out of every three in the East Devon group follow this practice, with minor variations. On those farms where a pure or crossbred Devon herd is kept a few steers may be reared, but in only two cases in the East Devon sample of farms was it the general practice to raise any steers at all.

Mixed farming prevails in the South Devon area and although milk production is the predominant livestock enterprise it is based upon a dual purpose breed of cattle, and milk production and stock rearing proceed side by side. Roughly one half of the farms surveyed in this area rear only dairy replacements. A further one quarter of the farms rear the majority of heifer calves, calving in the best to replenish the herd and rearing on the culls for sale as stores or for fattening on the farm. Finally, one quarter rear some steers in addition to surplus heifers, selecting calves from a type of cow judged to produce a good steer. In this area of mixed farming the number of cattle reared is determined by the general balance maintained between arable crops and livestock and between different classes of livestock.

Disposal of store cattle:

On the farms surveyed, enquiry into the method of disposal of store cattle revealed that in all groups, although a proportion of stores may be fattened on the farm as opportunity occurs, the great majority are sold as stores, and in the North Devon group over 80 per cent are disposed of in this way.

Seasonal distribution of rearing:

Where calves are selected for rearing from particular cows, as is commonly the case with dairy replacements in the East and South Devon groups, rearing proceeds all the year round as suitable calves are dropped. At the present time as the result of the emphasis upon winter milk production and the higher proportion of cows calving in the autumn and winter, there is a tendency for more calves to be reared throughout the winter period than during the spring. In North Devon where suckling is a common system of rearing, although rearing goes on to a certain extent all the year round, the bulk of the cows calve in the spring and the majority of calves are reared through the summer period.

BREED OF CATTLE:

During recent years, and markedly so during the war years the North Devon area has experienced a very considerable development of milk selling on the part of farmers previously engaged in the rearing of store cattle. This development is bringing in its train an influx of cattle of dairy breeds into an area previously

populated almost exclusively by the Devon breed of cattle. Of the calves costed in this area 65 per cent are of the native Devon breed, 13 per cent are Devon cross breds, nearly all sired by Shorthorn bulls, and the remaining 22 per cent represent the reciprocal cross; Devon bull on Shorthorn cows.

In East Devon, where the production of milk for sale is well established, there has been a gradual encroachment of dairy breeds, especially Shorthorns, spread over a considerable period into an area once dominated by Devon cattle. Of the calves costed in this area 24 per cent are Shorthorns, 65 per cent Crossbred and 11 per cent Devons.

In the South Devon area the introduction of new breeds of cattle is much less marked and the local South Devon breed still predominates to the almost complete exclusion of other cattle. The inclusion of 15 per cent of Friesian and Guernsey calves in the sample costed in this area certainly over-emphasises the importance of other breeds.

Of the total of 238 calves in all areas with which the investigation commenced, 69 per cent were pure bred and 31 per cent crossbred. Five pure breeds and nine different crosses, including reciprocal crosses were represented, but it did not prove possible to identify with certainty the multiple crossing represented by some of the calves.

REARING METHODS:

Among the 42 farms investigated wide variations in calf rearing practice was revealed, not only from district to district but also between farms in the same district. These variations depend largely upon the extent to which whole milk enters into the ration, from unrestricted use to its almost complete elimination. The systems practiced fall into two main divisions (1) Bucket rearing (2) Suckling.

These two main headings may be further subdivided. The bucket rearing method falls into three groups involving (1) The complete elimination of whole milk from the ration after one to two weeks, the calf being transferred to calf starter and then to follow-on meals (2) Feeding over a much longer period with a diminishing amount of whole milk into which calf meal is gradually introduced in increasing quantities (3) The rearing of calves on whole milk alone, fed from the bucket. In the last two methods the calf is normally suckled by its dam for the first two to four weeks. Suckling may be (1) Restricted, where the calf stays on the cow for about two or three months or (2) Unrestricted, where the calf is reared completely on the cow which it sucks from four to five months.

Among the farmers questioned it was universally agreed that the first six months of a calf's life is the most critical period, and that the constitution built up during these first few months will largely determine the animal's future development. There was almost universal agreement too, that of all systems of rearing suckling produces the best calves, fewer set backs occur and growth is more rapid.

Dairy heifers so reared will be sufficiently developed to put to bull several months earlier than those reared by artificial system. The chief ground for departing from this method is the high cost of milk, or in the case of a dairy farm, the sacrifice of income involved in feeding from 75 - 150 gallons of milk to each calf reared by this method.

The majority of farmers who have adopted the system of bucket rearing have done so with the object of economising milk. The greatest saving of whole milk occurs where milk substitutes are fed to calves from the earliest age. Of the forty two farmers in the investigation, five are at present rearing calves by this method, and another seven have done so at some time in the past but have discontinued the practice. The remaining thirty farmers have had no personal experience of this method of rearing, but all admit a strong prejudice against it. Objections raised to this method are based upon the belief that it is false economy to stint the calf in its early life. The almost complete elimination of whole milk, it is argued, results in calves that are "pot-bellied" badly grown and dull coated, instead of having the well grown, level-fleshed and alert appearance of milk fed calves. Calves so reared, it is believed, will be much more liable to digestive troubles and disease, and a poor start in life also means later maturity and in general an inferior beast. There is also little doubt that the much greater care and attention required when calves are reared on milk substitutes from the earliest age is a factor in the general unpopularity of this system of rearing, but one farmer, who has tried the method but discontinued, summed up the main objections by saying that when it takes three years growing to make two years growth, the saving in the first six months is illusionary.

Of the five farmers who have persisted in this method of rearing however the consensus of opinion is that although maturity is slightly delayed, full growth will eventually be attained provided cake and corn are liberally fed in the early stages. The tendency for calves to get "pot-bellied" is often due to over feeding, and one farmer stated that this tendency can be entirely counteracted if calves are fed by finger all the while they are on the bucket, and not allowed to drink the calf meal. Digestive troubles it was agreed are more frequent, and the extra care and attention essential for the success of this method is a considerable drawback. These farmers are satisfied that rearing by this method can be adequate if proper care is taken, but none could be described as enthusiastic about it. It is a system that appears unlikely to commend itself to farmers generally except on grounds of cheapness.

Bucket rearing with whole milk and calf meal, following two to four weeks on the cow, is the most common method of rearing among the farms investigated. There is however almost complete agreement among the farmers included in the sample, that a calf reared on the cow will thrive better than a calf receiving the same amount of milk from the bucket. The reasons most commonly given in explanation of this widely held opinion are that milk taken direct from the cow is fresh and clean, uncontaminated by the air or buckets; it is at the exactly correct temperature and being consumed slowly in small

mouthfulls instead of gulps, it is more easily digested. Digestive and scouring troubles are therefore less common, provided the calf is not allowed to take too much milk. In favour of bucket rearing with new milk it is suggested that not only is much less whole milk required than for unrestricted suckling, but there is also a considerable saving compared with restricted suckling and the setback that often accompanies weaning at about three months old is avoided. Two farmers however disagreed with the generally held opinion that new milk suckled from the cow is superior in its effect to new milk fed by bucket, and expressed the opinion that provided the calf is fed immediately the milk is drawn from the cow, and provided it is fed by finger all the time and not allowed to drink, the result will be just as good as suckling, with the additional advantage that the amount of milk fed can be closely controlled.

Relationship between system of rearing and district:

There is, in the sample of farms under consideration, no clear association between districts and methods of rearing. In the South Devon group of farms one half reared on new milk alone, fed from the bucket, four out of fourteen on new milk plus calf meal, one with milk substitutes, and two by restricted suckling. In the East Devon group, three out of fifteen reared on substitutes, three on whole milk and calf meal, two on whole milk alone, three by restricted suckling and four by unrestricted suckling. In the North Devon group one out of thirteen reared on substitutes, three on whole milk and calf meal, two on whole milk alone, four by restricted suckling and three by unrestricted suckling.

Altogether five producers drawn from all three areas reared on milk substitutes, and three of the five were in the East Devon group. More significant however is the fact that all five are solely milk producers. The North Devon group had seven out of fourteen farmers rearing by suckling compared with seven out of fifteen in East Devon and only two out of fourteen in South Devon. There is however a difference between the practice of rearing by suckling on the North Devon farms, where it is generally a matter of policy and in East Devon where it is frequently a matter of opportunity. The various types of nurse cow met with in the East Devon group include poor milkers, hard milkers, kickers and cows that will not take the milking machine, old cows, heifers with small teats, stale cows, lease cows, cows with bad quarters, and even reactors. Farmers who normally rear by bucket in the East Devon group will utalize one or other of the above categories of cows if one is available when needed, and they will sometimes rear by bucket in the winter months and by suckling in the summer when milk is cheaper and more plentiful

In the South Devon group cattle from fifteen months old are kept out of doors throughout the winter, often on straw and roots only, it being considered that provided they have had generous treatment as a calf, any check suffered will be quickly recovered when the grass comes again. In the East Devon and more especially in the North Devon group, where conditions are more severe in winter and the land is colder and wetter, the general opinion is that cattle should not be outwintered under rough conditions in these areas at less than 18 - 24 months old, as any loss in condition at

an earlier stage will never be fully recovered.

The opinion of all co-operating farmers was sought as to the value of new leys for rearing cattle. The opinions expressed are conflicting. In the East Devon group, where many of the farms before the war were all grass dairy farms, very few farmers have had any experience of grazing young cattle on leys, and in cases where leys existed before the war, they were almost invariably kept for sheep. In the South and North Devon groups, of twenty one farmers who have had experience of grazing cattle on leys, ten put leys as superior to permanent pasture, five as inferior and six considered there was no marked difference between the two. Fear of trouble from "blowing" and scouring are reasons often given why leys are not favoured for young cattle, but it was frequently remarked that although older cattle do well on young leys, a first year ley is too strong for young cattle which will,however, do well on older leys.

Essential conditions for successful rearing:

An enquiry concerning the conditions considered essential for the successful rearing of calves was made among co-operating farmers. Selecting those factors most frequently mentioned from a very comprehensive list, the first essential is indicated to be a well bred and healthy calf which should be given a good start in life on whole milk. Where this milk is fed by bucket the feeding should be regular, carefully controlled, and carried out by an intelligent and conscientious attendant so that early detection of any digestive troubles or feeding deficiencies will be made. Changes in diet should be made gradually, utensils used for feeding must be kept scrupulously clean and no stale food allowed to remain in mangers. On the farms surveyed, calf rearing, especially while on the bucket, is almost exclusively undertaken by family labour; paid labour unless really interested and conscientious is not generally considered satisfactory for this task. The scrupulous attention to detail essential for the rearing of young calves no doubt accounts for the experience commonly recorded that the small farmer who looks after the calves himself, or with the aid of his wife and family, is often a more successful calf-rearer than the large farmer who depends upon hired labour.

Calf Pens:

It is only necessary to enumerate the essential conditions for successful rearing to realise how far the practice of calf rearing falls short of ideal on many farms, and in no case is this more marked than with regard to the buildings in which calves are housed. Young calves thrive best in a light, airy, and sunny building with room for adequate exercise. In practice, calves are commonly housed in the darkest buildings on the farm, where they are often either exposed to constant draughts or cut off from all air. Old stables, cartsheds and even pigsties are among the buildings listed as being in use for housing calves, the original calfhouses being either inadequate or having been converted into shippons.

On the farms investigated young calves are most commonly run three to five to a pen but owing to difficulty of subdividing many of these houses, calves of different sizes have to be run together, and six to eight calves per pen is quite common. Many farmers would prefer to restrict the calves to two or three to a pen, as this enables calves of the same size to be run together, when not only do the calves thrive better but feeding is easier. The accomodation available in many cases makes this difficult or impossible without extensive alterations.

The calf pens on the farms surveyed were considered with regard to their adequacy under five main heads

(1) Adequate size for reasonable exercise.
(2) Light.
(3) Ventilation.
(4) Ease of cleaning.
(5) Water supply.

On the forty-two farms, not one set of calf-pens are adequate with regard to all five factors, and on only seven farms were four out of the five conditions satisfactorily met. At the other extreme five farms had calf-pens that were unsatisfactory with regard to all five conditions. The least satisfactory features relate to water supply and lighting. In thirty-four cases out of the forty two drinking water had to be carried to the calf pens, and in thirty cases the lighting of the pens was inadequate. On twenty farms the pens had cobble or earth floors; in eighteen cases the pens were inadequate in size, and in fifteen cases ventilation was either deficient or draughty. There was no marked difference between the regions, conditions with regard to all factors being similar in all areas.

On the forty two farms under consideration two farmers clean out the calf pens daily, five at weekly and nine at monthly intervals. The remaining twenty-six allow the dung to accumulate over a longer period, cleaning out being done as the opportunity arises. Three farmers who allowed the dung to accumulate stated that if the pens were easy to clean and broom out, cleaning would be undertaken daily but with earth or cobble floors it was not possible. There was however widespread agreement among the farmers questioned that provided plenty of bedding is used and the calves always lie dry, no harm results from allowing the dung to accumulate and calves will lie warmer in winter.

Disease:

The most common complaints encountered among calves of less than six months old in all districts are stated to be scour and hoose. Scour is the most common complaint, but every farm in the North Devon group, more than 80 per cent in the East Devon and nearly 50 per cent in the South Devon group suffer from the presence of the hoose parasite. Quarter-evil, although still a serious cause of loss, especially in the East and North Devon groups, is less frequently met with than in previous years owing to the preventive effect of innoculation practised on many farms where it is known to exist. Joint-evil is another complaint which is less serious than in previous years

owing to preventive precautions having become more widely adopted. Contagious pneumonia, although relatively uncommon, takes a heavy toll of young calves when it does occur. Redwater and ringworm are also listed as occasional sources of trouble.

Losses of rearing calves at under six months old over the last five years were estimated to average 3.4 per cent for all farms included in the investigation. The difference between the districts is very slight, but there was a marked difference between individual farms. Thirteen farms recorded no losses at all among this class of stock, and another eight farms had losses of less than 3 per cent. The highest loss recorded was 20 per cent, but six farms in all recorded losses in excess of 10 per cent. White scour was most commonly given as the cause of these high death rates where they occurred.

In the sample of 238 calves with which the investigation commenced, four deaths occurred within the first six months, a death rate of 1.7 per cent. This is only one-half the average estimated death rate for this class of stock on these farms over the last five years, and it appears that the sample of calves costed has been relatively favoured from the point of view of losses.

FUTURE LIVESTOCK POLICY:

As a result of the opening up of the liquid milk market during the past fifteen years to producers in all regions of Devon, some marked changes in livestock policy are becoming increasingly perceptible. The overall picture at the present time is of a movement away from traditional livestock systems towards increasing emphasis upon the production of milk for sale. The War just ended greatly accelerated this process, especially in North Devon, and resulted in an influx of former store rearers into milk-selling, in spite of the fact that the great majority of these farms have a breed of cattle buildings and water supply all unsuited to milk production.

The future development of livestock policy in Devon is a matter of the greatest importance, especially with regard to this large number of farmers in North Devon who have recently entered the liquid milk market. Not only will the production of milk in this area be affected by future policy but also the production of store cattle, of which this area provides such a large number. With a view to shedding some light upon this matter the farmers in this investigation were asked what is likely to be the future development of livestock policy in their own particular areas, based upon the assumption that the relative prices of milk and store cattle remain at about the present level.

Future developments of policy revealed by the North Devon group of farmers are distinctly confused, but there seems to be little doubt that the wartime change to milk selling will persist and develop, at least on the smaller farms. Relatively few farmers in this area however appear to contemplate engaging solely in milk production; the majority favour a combination of store-rearing with

milk-selling. Where milk-selling has been adopted as a permanent policy, either alone or in conjunction with store-rearing, a considerable amount of cross-breeding has occurred in an attempt to improve the poor milk yield of the native Devon cattle. This development is by no means free from a considerable element of risk, for there is no guarantee that cross-breeding may not impair the excellent beef qualities of the Devon cattle without producing a satisfactory milking animal. There does not appear to exist in this area at present any definite tendency towards the emergence of a clear breeding policy, but it can be anticipated that with the establishment of the artificial insemination centre contemplated for this area, rapid clarification of the situation will follow. Until this occurs there is every indication that cross-breeding will develop and extend still further.

In the East Devon area the production of milk for sale is well established, and on the majority of farms the question of rearing stores for sale does not arise. Although a large number of herds in this area are mixed and crossbred, a definite tendency is perceptible towards the use of a succession of bulls of a chosen dairy breed. In most cases the breed favoured is the Shorthorn, probably for the reason that cattle of this breed are most readily obtainable from the neighbouring counties of Dorset and Somerset, but occasionally a Friesian herd is aimed at.

No clear cut line of policy is discernible among the South Devon group of farmers, where livestock policy is complicated by the considerable differences in emphasis placed upon the two aspects of a dual purpose breed of cattle. In the majority of cases however, especially upon the smaller farms, increased emphasis upon the milk production aspect, aimed at the improvement of average milk yields appears to be the most probable development. On the other hand, in the less accessible districts of South Devon where store-rearing is of greater importance, not only is a satisfactory milk yield sought, but a type of cow is required that will produce good class stores for sale. A third aspect frequently regarded as important in the maintenance of a high butter fat content in the milk, to meet the demands of the extensive cream trade that exists in this district in normal times. These three aims of high yield, high butter fat content and beefing qualities, and the varying degree of emphasis placed upon them by different breeders will probably result in livestock policy in South Devon remaining in its present somewhat confused condition for some time to come.

Taken as a whole, livestock policy in Devon has one feature in common. The general movement towards the production of milk for sale has led, in an endeavour to improve milking capacity, to an encroachment of dairy breeds into areas once exclusively dominated by local breeds of cattle. This development is marked in East Devon, and of rapidly increasing importance in North Devon; only in South Devon is the local breed largely holding its own, and even in this area the introduction of purely dairy breeds has commenced on a small scale.

As is commonly the case in an area of small farms experiencing a change over from store-rearing to milk production, the first visible sign of the encroachment of dairy breeds is seen in the emergence of mixed and crossbred herds, and, with the lack of any definite breeding policy, cross breeding is proliferated. It is very difficult to see what development except artificial insemination can satisfactorily overcome this problem where it occurs widely throughout an area. No other development seems capable, except over an extended period, of so surely crystallizing breeding policy along the lines of pure breeds. Small farmers with their limited resources cannot afford to maintain a good dairy bull, and although a succession of poor quality bulls of the same breed may stamp a herd with recognizable breed characteristics, they are unlikely to be effective in raising the quality and milking capacity of the cattle to the high level so especially desirable for the small dairy farm. In East and North Devon the need for artificial insemination centres equipped with the highest quality dairy bulls is particularly acute not only to enable the small farms in these areas to make the most of the opportunities offered by the liquid milk market but to arrest the development of further indiscriminate cross-breeding. In the South Devon area, which is served by an artificial insemination centre at Totnes, indiscriminate cross-breeding is unlikely to develop and the very slight encroachment of purely dairy breeds that is occuring at the present time, mainly takes the form of a direct substitution of these breeds for the local South Devons.

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COST OF REARING TWO YEAR OLD CATTLE.

METHOD OF COSTING.

Milk:- For those farms participating in the Milk Cost Investigation, milk consumed by calves is entered at cost of production for the winter period. Where the actual cost of production is not known, the average winter cost for the area in which the farm is located has been employed. In cases where calves are reared by suckling, adjustment is made in the cost at which milk is entered to allow for the saving in labour which results from the fact that the cow is not milked by hand. In the case of the North Devon rearing farms, further allowances have been made for the less intensive feeding and management of the cows, but offsetting these factors is the considerably lower yield per cow on these farms, especially during the winter. When the best possible adjustment for all relevant factors has been made, the average cost per gallon of milk fed to calves in each of the three areas is as follows:-

Winter Milk	Pence per gallon d.
North Devon	19.8
East Devon	21.8
South Devon	21.2
All groups	20.7

Scald Milk:- In the few cases in which it has been fed, scald milk is entered at 9d per gallon.

Other Foods:- Purchased foods are entered at cost on the farm, and home grown foods at the average estimated cost of production for each year, determined in accordance with cost indices calculated by this department. The average costs used for the main types of foods fed are set out below.

Estimated average cost of production per ton.

	1943-4 £	s	d	1944-5 £	s	d
Oats and Dredge Corn	11	18	0	12	0	0
Hay	4	0	0	6	0	0
Straw		-		3	0	0
Mangolds	1	0	0	1	7	0
Swedes and Turnips		-			17	0

Residual manurial values have been deducted from the cost of purchased concentrates and home-grown corn and hay in accordance with standard figures supplied in connection with the Milk Cost Investigation, and the cost of these foods is entered net in all cases.

Grazing costs:- Actual grassland costs have been determined and the total cost of the grassland and aftermath allocated to the various classes of stock according to grazing equivalents determined for this province.

Labour:- The cost of direct labour for both paid and unpaid workers is entered at 10 per cent above the standard minimum wage rates appropriate to the various classes of labour engaged in tending the cattle and Sunday work is charged at overtime rates. Horse labour is entered at 9d per hour and tractor labour (exclusive of driver's wages) at 3/- per hour.

Miscellaneous Expenses:- include such items as veterinary fees for innoculation, attendance to sick animals, cost of drenches, mineral mixtures etc.

Loss by deaths:- All foods consumed by animals that died during the course of the investigation, together with an appropriate proportion of grazing, labour and miscellaneous costs up to the time of death are entered in this section together with the cost of the calf at birth. Quantities and costs of all items of food, grazing, labour, miscellaneous expenses entered under these individual headings in all tables in this report refer, therefore, only to cattle completing the full two years costing period.

Cost of calves:- It is not possible to determine with any accuracy the cost of a calf at birth. To arrive at a figure for this cost, the commercial value of the calf at two weeks old has been estimated, and from this value the cost of milk consumed together with the cost of labour expended upon the calf up to this stage is deducted, the resulting figure being taken as the cost of the calf at birth. This arbitrary method of estimation is open to serious objection, and it is adopted only because a factual basis of estimation is not available.

T.T. and Pedigree Herds:- Altogether nine herds included in the sample investigated had T.T. or Attested licences, but no special treatment apart from that necessary to comply with the regulations was given to these calves. Similarly, four farms maintained pedigree herds, but no special feeding or management of the calves was undertaken on this account.

Costs omitted:- No charge for rent of buildings or depreciation of feeding equipment has been made, but these would be only small items of cost. Similarly, at this stage, no charge has been made against the cattle for general farm overhead expenses.

Values:- The present report is concerned primarily with costs of production, and the realization value of all classes of cattle in relation to their cost of production will be dealt with in a subsequent report. It is not possible however to deal with the relative economy of different systems of rearing without taking into account not only the cost incurred, but also the value of the cattle resulting from the different methods of rearing. Accordingly, an estimate was obtained of the store market value of all bullocks at the end of each six-month period. As no extra costs have been incurred in respect of pedigree and T.T. animals, any extra value due to these factors has been discounted in estimating market values.

AVERAGE COST PER HEAD AT TWO YEARS OLD.

ALL GROUPS. OCTOBER 1943 to SEPTEMBER 1945.

In Table 1 the itemised average costs per head are set out for all cattle in the investigation at an average age of two years old.

Table 1: Average cost per head at two years old, per cent of total cost, and foods consumed per head. All groups. Oct.1943 - Sept.1945.

Number of farms	42	
Number of cattle	181	
COST PER HEAD:	£ s d	%
(1) Net cost of foods		
(a) Whole milk	6 11 0	23.7
(b) Scald milk	5 9	1.0
(c) Calf meal	10 10	1.9
(d) Cake & corn	3 1 2	11.1
(e) Hay	2 12 4	9.5
(f) Straw	1 4 8	4.5
(g) Roots etc	1 18 0	6.9
(h) Other foods	1 9	0.2
Total foods	16 5 6	58.8
(2) Grazing costs	4 5 9	15.6
Foods and grazing	20 11 3	74.4
(3) Labour Costs		
(a) Man	3 12 6	13.1
(b) Horse & tractor	2 0	0.4
(4) Miscellaneous costs	2 8	0.5
(5) Loss by deaths	6 8	1.2
(6) Cost of calf	2 17 7	10.4
TOTAL COST	27 12 8	100.0
Av. value at two years	27 7 11	
FOODS CONSUMED PER HEAD		
(a) Whole milk	76 Galls	
(b) Scald milk	8 "	
(c) Calf meal	0.3 Cwts	
(d) Cake & corn	4.6 "	
(e) Hay	12.6 "	
(f) Straw	8.3 "	
(g) Roots etc	35.1 "	
Grazing weeks per head	64.3 Weeks	
Labour		
(a) Man	52.9 Hours	
(b) Horse & Tractor	2.5 "	

It is not proposed to discuss these figures in detail, as the overall average cost conceals many differences in cost that arise as the result of different systems of rearing, and to a lesser extent, as a result of different soil, climatic and topographical conditions found in the three areas of Devon. It is worthwhile however to point out briefly a few of the more important features revealed by the overall average costs.

The average amount of milk consumed per head was 76 gallons, which at £6-11-0 per head accounts for 23.7 per cent of the total cost at two years. Total foods at £16-5-6 per head account for 58.8 per cent of total cost, while grazing costs at £4-5-9 per head account for a further 15.6 per cent; foods and grazing combined amount to £20-11-3 equal to nearly 75 per cent of total cost. Manual labour at £3-12-6 and the cost of calves at £2-17-7 per head together account for 23.5 per cent of total costs. The balance of cost, equal to 2.1 per cent, consists of direct horse and tractor labour involved in feeding cattle, miscellaneous costs and loss by deaths, all of which are small items.

The total average cost per head at two years old is £27-12-8 compared with an average estimated value per head at that stage of £27-7-11.

In Table A of the appendix the average cost per head for all cattle is analysed for each six-monthly period. The cost of the calf at birth is excluded from this analysis as it is common to all periods. The most important features of this table may be summarized:-

(1) A very high proportion (47.4 per cent) of the total cost at two years falls within the first six months. The level of total cost at all stages will therefore be largely determined by the cost incurred during this period.

(2) The cost incurred during the first six months depends mainly upon the amount of whole milk consumed. Even at two years old whole milk is the largest single item of cost, accounting for nearly one quarter of the total cost, and it is therefore the item offering the greatest scope for economising in the cost of rearing cattle.

(3) Nearly 60 per cent of the total cost of grazing at two years was incurred during the final period, the summer of 1945. Altogether 89 per cent of the total grazing cost was incurred in the two summer periods. The outstanding economy of summer grazing is well illustrated by this table. In both winter periods the rearing cost during the period exceeded the increase in value of the animal, and in both summer periods the increase in value was in excess of the cost incurred, with a substantial margin in the summer of 1945. A total cost of foods and grazing of £5-2-3 per head was incurred during the winter six months of 1944-45 compared with only £2-14-11 per head during the following summer six months when the cattle were, on average, six months older.

(4) The high proportion of labour costs (44.7 per cent) incurred during the first six months is an important feature. Direct labour however is not a heavy item of expenditure in the cost of rearing cattle, and the total man hours per head at two years old amounted to only 53, compared with an annual requirement in excess of 160 man hours for a dairy cow. Labour requirements during the summer periods when cattle are living entirely at grass, are very slight, averaging only 5.3 man hours per head during the summer of 1945.

Costs by district and by method of rearing.

The overall average costs of these cattle at two years conceals considerable differences in rearing costs according to different methods of rearing, and, to a lesser extent, according to different conditions existing in the three areas investigated. Classification of the farms in this sample by method of rearing shows that this classification cuts across the various districts in which the farms are located, and before the final analysis by method of rearing is made, it may be useful to determine whether the different natural conditions prevailing in the districts in which the cattle are located, have any important effects upon the cost of rearing, independent of the differences that arise as a result of different systems of rearing.

ANALYSIS OF COSTS BY DISTRICT.

In Table 2 (page 17) the average cost per head at two years old is set out for cattle in each of the three districts of Devon.

The cost per head of whole milk, scald milk, and calf meal show considerable difference from group to group, but these differences may be wholly attributed to the relative importance of different methods of rearing in the sample of farms from the three areas. Differences in costs that are likely to be influenced by different natural conditions in the three areas relate to:-

(1) Cake & Corn:

The cost of cake and corn is relatively high in the North Devon group and low in the South Devon group. Table C in the Appendix shows that the amount of cake and corn fed during the first six month period was similar in all groups, but that in the third period, the winter of 1944-45, the North Devon group fed over 2½ cwts per head compared with an average of less than 1 cwt in the East Devon group, and less than ½ cwt in the South Devon group.

(2) Hay and Straw:

Hay costs are very high in the East Devon group and straw costs low, while the reverse is true in the case of the South Devon group. Here again, the great bulk of the difference arises during the third period, the winter of 1944-45.

Table 2: Average cost per head and foods consumed at two years old in three areas of Devon.

District	North Devon	East Devon	South Devon
Number of farms	13	15	14
Number of calves	48	63	70
(1) Net cost of foods	£ s d	£ s d	£ s d
(a) Whole milk	7 13 3	6 18 1	5 11 6
(b) Scald milk	7 7	-	9 9
(c) Calf meal	4 2	17 10	9 2
Total (a-c)	8 5 0	7 15 11	6 10 5
(d) Cake & corn	3 18 3	3 6 10	2 4 1
(e) Hay	3 6 4	3 13 4	1 3 9
(f) Straw	1 8 5	12 7	1 12 10
(g) Roots etc	2 0 0	18 6	2 14 2
(h) Other foods	3 9	-	1 0
Total (d-h)	10 16 9	8 11 3	7 15 10
Total foods	19 1 9	16 7 2	14 6 3
(2) Grazing costs	3 18 3	4 10 2	4 7 10
Total foods & grazing	23 0 0	20 17 4	18 14 1
(3) Labour costs			
(a) Man	3 9 0	3 15 0	3 12 5
(b) Horse & Tractor	5	1 0	4 1
(4) Miscellaneous costs	2 11	3 2	2 3
(5) Loss by deaths	8 4	3 2	8 8
(6) Cost of calves	2 11 1	2 9 7	3 9 1
TOTAL COST	29 11 9	27 9 3	26 10 7
Value per head	26 4 2	26 18 8	28 12 7
FOODS CONSUMED PER HEAD			
(a) Whole milk (Gals)	93	76	63
(b) Scald milk "	10	-	13
(c) Calf meal (Cwts)	0.15	0.43	0.23
(d) Cake & corn "	6.2	4.9	3.3
(e) Hay	15.7	17.0	6.6
(f) Straw	9.5	4.2	11.1
(g) Roots etc	32.3	15.7	54.4
Grazing weeks per head	52.8	66.4	71.1
Labour	Hours	Hours	Hours
(a) Man	49.6	55.9	52.4
(b) Horse & Tractor	0.6	1.5	5.9

The average consumption of hay per head during this winter period was less than 1 cwt. in South Devon compared with 7 cwts per head in North Devon and nearly 9 cwts per head in the East Devon group. On the other hand, straw consumed per head during this period, the only period in which any appreciable quantity of straw was fed, averaged nearly 11 cwts per head in the South Devon group compared with 9 cwts in North Devon and only 4 cwts per head in East Devon.

(3) Roots and Green Fodder:

The consumption of roots and green fodder over the two year period was 54 cwts per head in the South Devon group compared with 32 cwt in North Devon, and only 16 cwts in the East Devon group. Roots were fed more heavily in South Devon at all periods, but especially in the winter of 1944-5. Mangolds were the root crop most commonly fed in all districts, but swedes in North Devon, and swedes and turnips in South Devon were also fed to a considerable extent. (See Table D of Appendix)

(4) Grazing Costs:

Compared with South Devon, climatic conditions are much more severe in North Devon, which is not only more exposed, but in general has wetter and colder soil conditions. In East Devon, soil and climatic conditions occupy a position intermediate between the other two areas. As a result of the less favourable conditions in North Devon, the grazing season is considerably shorter. On average, young cattle were turned out to grass a month earlier in the South Devon than in the North Devon group. During the winter of 1944-5, all the cattle under investigation in the North Devon group were housed, and nearly half were housed day and night. In the East Devon group less than one half were housed, but, of those at grass day and night throughout the winter, nearly all had an open shed for shelter. In the South Devon group only one-quarter of the cattle were housed, and it was exceptional for any shelter to be available for cattle out day and night except that provided by woods, banks, etc.

The length of the grazing period in each district shows wide variations. The total number of full weeks grazing (counting grazing by day only, as one half of full time grazing) averaged only 53 weeks in the North Devon group compared with 66 weeks in East Devon and 71 weeks in South Devon. Cattle in the South Devon group enjoyed a longer time at grass in all periods, but the difference was most marked in the winter period of 1944-45 when, on average, they were at grass twice as long as in the North Devon group.

(5) Cost of Calves:

This cost is rather higher for the South Devon group, but this is merely a reflection of the higher value of the larger South Devon cattle which, on average, had slightly higher commercial values at all stages of growth.

Summary:

The salient features of the variations in costs arising from differences in locality, appear to be mainly related to the cost in the third six month period, the winter of 1944-5 during which period the cattle were (on an average) aged 12-18 months. These variations arise mainly

as a result of the different climatic and soil conditions, and, to a lesser extent, as a result of different systems of farming in the three areas.

North Devon, with the least favourable natural conditions for stock rearing, has lower grazing costs, due to the shorter grazing period and a correspondingly higher expenditure upon cake and corn, and upon hay and straw combined, resulting from the larger amount of hand feeding undertaken during the winter periods when the cattle are housed. South Devon, with the most favourable conditions, has a relatively long grazing period and a low cost of hand feeding during the winter, when the majority of cattle are kept out of doors and fed, in most instances, on straw and roots. Expenditure upon cake, corn and hay is therefore low in this area, but is correspondingly high for straw and roots, while the extended grazing period is reflected in a relatively high grazing cost. A feature of this area is the relatively high value of cattle at all stages compared with the other two areas. In the East Devon area feeding costs are characterised by a relatively high rate of expenditure for hay and grazing, and a low expenditure for straw and root crops, which result from the fact that this area is essentially an area of small grass farms.

The average cost per head of those foods that are directly affected by differences in natural conditions and farming systems (i.e. total of d-h in Table 2), show a range in cost from £7-15-10 per head in the South Devon group to £10-16-9 in the North Devon group, a difference in favour of South Devon of more than £3 per head. The East Devon group with a cost of £8-11-3 per head, occupies a position intermediate between the other two. It is not possible to say exactly what proportion of the higher cost of these foods in the North Devon group is due directly to the relatively unfavourable winter conditions in that area, but it is clear that a considerable proportion, and probably by far the major part of the difference may be so attributed.

ANALYSIS OF COST BY METHOD OF REARING.

Although this investigation was not specifically designed with the object of comparing the economy of different systems of rearing, the determination of whether the extra expense involved in rearing by suckling is justified, taking into account the value of the animal produced, or whether bucket-rearing, using whole milk or cheaper substitutes is a more economical method, is a matter of considerable practical importance. In an endeavour to investigate this point, the forty-two records obtained for the whole group have been analysed under the following headings according to the system of rearing adopted.

(1) BUCKET REARING

(a) Calf-starter and calf meal
(b) Whole milk and calf meal
(c) Whole milk only

(2) SUCKLING

(a) Restricted: two to three months on the cow
(b) Unrestricted: four to five months on the cow

The number of farms and the number of calves included under each method of rearing are set out below:

	Starter and Meal	Milk and Meal	Milk Only	Suckling Rest-ricted	Suckling Unrest-ricted
No. Farms	5	10	11	9	7
No. Calves	23	40	52	40	26

In Table 3 below the average total cost and value per head at two years old are set out for each method of rearing:-

Table 3. Average cost, value and margin per head at two years old by method of rearing

	Average Cost			Average Value			Average Margin (a)Surplus			(b)Deficit		
(1) Bucket Rearing	£	s	d	£	s	d	£	s	d	£	s	d
(a) Starter & Meal	23	16	9	23	13	0		-			3	9
(b) Milk & Meal	28	3	5	26	0	0		-		2	3	5
(c) Milk only	26	5	8	27	15	9	1	10	1		-	
(2) Suckling												
(a) Restricted	27	8	10	30	0	6	2	11	8			
(b) Unrestricted	33	17	6	28	4	7		-		5	12	11
All methods	27	12	8	27	7	11		-			4	9

The range in average cost is from £23-16-9 per head for the Starter & Meal method, to £33-17-6 for Unrestricted suckling, while the range in average value is from £23-13-0, also in the Starter and Meal group, to £30-0-6 for the Restricted suckling group. It is clear that, for the group of farms investigated, rearing on calf-starter and meal is certainly the cheapest method of rearing, but it is also shown that this method produces an animal of relatively low value. The cattle with the highest value are found among those reared by suckling, but the results of this analysis confirm that unrestricted suckling is a very expensive method of rearing.

Before it is possible to make a more detailed comparison of costs between the different systems of rearing, a further point must be considered. Differences in the natural conditions prevailing in the three areas have been shown to exert a material influence upon rearing costs, especially upon those costs incurred during the third six month period, the winter of 1944-45. It is therefore necessary to assess, as closely as possible, the importance of this influence upon the relative costs and values of each system of rearing.

The percentage of cattle from each of the three areas included in each system of rearing group is set out below:

	North Devon	East Devon	South Devon	Total
(1) Bucket-rearing	%	%	%	%
(a) Starter & Meal	26	52	22	100
(b) Milk & Meal	30	28	42	100
(c) Milk only	10	23	67	100
(2) Suckling				
(a) Restricted	30	37	33	100
(b) Unrestricted	50	50	-	100
All methods	27	35	38	100

With one exception, all five methods of rearing were encountered in the sample from each area of Devon; rearing by unrestricted suckling however was not met with on any of the South Devon farms investigated. Analysis of the records by system of rearing cuts completely across area divisions, but certain broad associations may be noted:-

(1) Cattle from East Devon predominate in the Starter and Meal group, while the South Devon group is under-represented.

(2) The Milk only group contains a very high proportion of cattle from the South Devon area, and a corresponding under-representation of the other two areas, especially North Devon.

(3) The Unrestricted suckling group contains no cattle from the South Devon area, and the North Devon area especially is over-represented in this group.

(4) The Milk and Meal, and the Restricted suckling groups contain approximately proportional representation of all three areas.

In Table 4 (page 22) the average cost per head at two years old is set out for each system of rearing. Table E of the appendix shows the average consumption of the various types of food per head and data relating to grazing weeks and hours of labour expended per head.

Table 4. Average cost per head at 2 years old by method of rearing.

(i) Including calf starter (ii) Including greenfodder	BUCKET REARING			SUCKLING	
	Starter & Meal	Milk & Meal	Milk Only	Restricted	Unrestricted
1. Net cost of foods	£ s d	£ s d	£ s d	£ s d	£ s d
(a) Whole milk	1 14 8	5 12 5	5 17 2	7 19 8	12 5 11
(b) Scald milk	–	1 0	14 7	–	–
(c) Calf-meal (i)	1 17 8	1 7 6	–	–	–
TOTAL (a-c)	3 12 4	7 0 11	6 11 9	7 19 8	12 5 11
(d) Cake & corn	4 14 0	2 16 1	2 12 3	2 3 4	4 4 8
(e) Hay	2 19 4	3 4 1	1 11 7	2 11 5	3 11 2
(f) Straw	1 7 2	1 4 1	1 2 11	1 9 2	19 7
(g) Roots etc. (ii)	18 10	2 11 2	2 7 3	1 9 0	1 10 2
(h) Other foods	3 10	4 7	1	1 0	2
TOTAL (d-h)	10 3 2	10 0 0	7 14 1	7 13 11	10 5 9
Total Foods	13 15 6	17 0 11	14 5 10	15 13 7	22 11 8
2. Grazing costs	3 13 4	3 10 10	4 14 2	4 12 2	4 15 3
Foods & grazing	17 8 10	20 11 9	19 0 0	20 5 9	27 6 11
3. Labour					
(a) Man	3 0 3	3 18 7	3 17 2	3 7 2	3 12 4
(b) Horse & tractor	1 7	1 6	2 7	2 8	11
4. Miscellaneous costs	2 2	3 9	2 0	1 10	4 8
5. Loss by deaths	15 3	11 11	3 7	5 0	–
6. Cost of calves	2 8 6	2 15 11	3 0 4	3 6 5	2 12 8
TOTAL COST	23 16 9	28 3 5	26 5 8	27 8 10	33 17 6
Value at 2 years old	23 13 0	26 0 0	27 15 9	30 0 6	28 4 7

Milk and Calf-meal: The consumption per head of whole milk averaged 20 gallons in the Starter and Meal group, 64 and 67 gallons respectively in the Milk and Meal and the Milk only groups, 94 gallons per head for Restricted, and 140 gallons for Unrestricted suckling.

The cost of milk and milk substitutes combined (total a-c Table 4.) reveals very considerable differences between the different systems of rearing, ranging from £3-12-4 per head in the Starter and Meal group to £12-5-11 per head in the Unrestricted suckling group. The Milk and Meal group shows a higher cost at this stage than the milk only group as the saving in whole milk effected by using calf meal was very slight in the sample of farms investigated. Rearing on calf-starter and meal shows a saving, in this group of foods, of approximately £3 per head compared with the other two bucket rearing methods, of more than £4 per head compared with Restricted suckling, and more than £8-10-0 per head compared with Unrestricted suckling.

Cake & Corn: The average cost per head of cake and corn is very high in the Starter and Meal, and in the Unrestricted suckling groups. Reference to Table F in the Appendix shows that although in the first six months period the cost of cake and corn was not greatly dissimilar for all groups, subsequent feeding of cake and corn in the period from 6-24 months old shows very considerable differences between the various groups. The high cost of cake and corn in the Unrestricted suckling group can be largely attributed to the high proportion of North Devon cattle in this group. This is not however the case in the Starter and Meal group, and it is clear that, for the group of farms investigated, rearing with starter and calf meal involved a considerably higher expenditure upon cake and corn than for other systems of rearing.

Hay & Straw: If the cost of hay and straw is considered together, the average cost per head at two years is seen to be similar in all groups except the Milk only group, where the combined cost is considerably lower. The low cost in this group arises from the very low expenditure upon hay during the winter period of 1944-45, which is a characteristic of the winter feeding of store cattle in the South Devon area, from which more than two-thirds of the cattle in the Milk only group are drawn. The low cost of hay and straw combined appears therefore to be due to a factor associated with a particular district, rather than with a system of rearing.

Roots & Green-fodder: The cost per head of roots and green-fodder is very low in the Starter and Meal group, a group which contains a preponderance of cattle from the East Devon area, where relatively few roots are grown. The low cost of roots in this group is therefore largely a characteristic of a system of dairy farming, rather than of a system of calf-rearing. Root costs per head are high in the other two Bucket-rearing groups, and, although the high cost in the Milk only group is clearly associated with the preponderance of South Devon cattle in this group, the reason for the high cost in the Milk and Meal group is not apparent, but there does not appear to be any valid reason for attributing it specifically to this method of rearing.

Grazing: A similar consideration probably applies to some of the differences revealed between the groups in the cost per head of grazing. The high cost of grazing in the Milk only group is certainly affected by the preponderance of South Devon cattle in this group, but the reason for the high cost in the Unrestricted suckling group cannot be explained in terms of differences of grazing costs in the different areas, nor, on the other hand, is there any apparent reason for associating it with differences in the method of rearing.

Total Foods & Grazing: Total foods and grazing per head at two years old show an extreme range from £17-8-10 for the Starter and Meal group to £27-6-11 per head in the Unrestricted suckling group, while the other three groups are covered by a range of £19-0-0 to £20-11-9 per head. By far the most important factor determining the level of food costs is the amount of whole milk fed, which ranges from £1-14-8 for the Starter and Meal group to £12-5-11 for Unrestricted suckling. In spite of the higher expenditure upon cake and corn incurred where the system of rearing on starter and calf meal is adopted, the total cost of foods and grazing by this method can be estimated to show a saving, at two years old, of at least £2-10-0 per head compared with any other method. The total cost of foods and grazing shows little difference between the Restricted suckling, Milk and meal, and Milk only groups, as the slightly lower cost in the Milk only group shown in Table 4 can be attributed to the fact that this group contains a preponderance of cattle from the South Devon area, where rearing conditions are much more favourable than in either of the other areas.

Labour: Labour costs per head at two years old do not show any significant differences between the different systems of rearing. During the first six months period the labour costs per calf were slightly lower for both of the suckling methods of rearing compared with the bucket rearing methods, but between the different systems of bucket rearing there was little difference in labour requirements during the first six months. During subsequent periods the only notable feature is the relatively low level of labour costs in the Starter and Meal group, but this arises from the fact that this group consists mainly of small dairy farms, where young cattle at grass are often in view of the farmyard and consequently require less labour than where cattle are running in outlying fields.

Apart from the slight saving in labour in the first six months associated with suckling, differences in labour costs appear to be associated with size of farm and type of farm rather than with system of rearing.

Loss by Deaths: The relatively high cost of loss by deaths in the Starter and Meal group is due to the fact that a twenty month old animal in this group had to be slaughtered following an accident. Three deaths occurred among young calves in the Milk and Meal group, and one in the Restricted suckling group. One yearling bullock died in each of the Milk and Meal, and Milk only groups. More than one half of the deaths that occurred in the whole sample are thus concentrated in one group, the Milk and Meal group, but the sample is too small to preclude the possibility that this association may be purely coincidental.

Other costs: Other items of cost do not show any significant variations attributable to the different systems of rearing.

Total Cost: Total cost of rearing at two years old shows a range from £23-16-9 for the Starter and Meal group, to £33-17-6 for the Unrestricted suckling group, and the difference in cost is largely determined by the amount of milk consumed in the first six months. That a considerable saving in cost results from the use of milk substitutes from the earliest age is fully confirmed by the results of this investigation, although part of the saving in the cost of whole milk is offset by the necessity for an increased expenditure upon cake and corn where this method of rearing is adopted. The very high cost incurred for milk where Unrestricted suckling is practised is also illustrated by the figures relating to this group, and, on the farms investigated, the high cost of milk is not offset by any saving in the cost of other foods.

The total cost per ~~calf~~ head at two years old in the Milk only group was slightly lower than in the case of the Restricted suckling group, and nearly £2 per head lower than for the Milk and Meal group, but the lower cost in the Milk only group is largely a result of better climatic conditions in the South Devon area, from which the majority of calves in this group are drawn. The tentative conclusion may therefore be drawn that, discounting differences in cost that arise as a result of different natural conditions in the three areas of Devon from which the calves are drawn, there is little difference in the cost per head on the farms investigated, between Restricted suckling and Bucket feeding on milk alone, but that both these methods show an advantage over the Milk and calf-meal method of rearing.

Value at two years: A consideration of the average estimated value per head at two years old, shown in Table 4, reveals that there are very wide differences in the value of cattle produced by the different methods, ranging from £23-13-0 per head for the Starter and Meal group to £30-0-6 for the Restricted suckling group. The cost of rearing by the Starter and Meal system is certainly the cheapest, but it undoubtedly produced a relatively inferior animal. Restricted suckling produced the most valuable animal, but the lower value of cattle reared by Unrestricted suckling is due, in part at least, to the fact that no South Devon cattle are included in this group.

As far as the cattle in this investigation are concerned, it is clear that the large amount of whole milk consumed where Unrestricted suckling is practised, results in a considerable deficit in cost over value at two years old. Compared with Restricted suckling, this method increased very considerably the average cost of the cattle, but added nothing to their value. It is difficult therefore to avoid the conclusion that for ordinary commercial practice rearing by unrestricted suckling is an uneconomic method.

Comparing the costs and values of cattle in the Milk and Meal, and Milk only groups, it will be seen that the average cost is lower, and the value higher for the Milk only group. Costs in this group however are influenced in a downward, and values in an upward direction by the

high proportion of cattle from the South Devon area included in this group. If allowance is made for these factors it seems certain that, when the system of rearing only is considered, the Milk only group still shows a very material advantage over the Milk and Meal group.

When differences arising from differences in climatic conditions and in systems of farming are discounted, as far as it is possible to do so, the relative advantage of the commercial systems of rearing practised on the farms investigated may be summarized as follows:

Margin between average cost and value at two years old, by method of rearing:

	Starter & Meal	Milk & Meal	Milk Only	Restricted Suckling
	£ s d	£ s d	£ s d	£ s d
(a) Surplus	-	-	-	2 10 0
(b) Deficit	-	2 0 0	-	-

Value per head exceeds cost of rearing at two years old by a substantial amount in the Restricted suckling group, while the Milk & Meal group shows an appreciable debit balance. Average value and cost approximately balance in the Starter & Meal, and Milk only groups.

The relative economy of different systems of cattle rearing on dairy farms

In determining the system of rearing to be adopted, the milk producer will consider not only the actual cost of each system of rearing in relation to the value of the animal produced, but also the loss of income which results from feeding whole milk to calves.

If the bucket-rearing methods are compared with rearing by restricted suckling, there is a saving of whole milk of 74 gallons for the Starter & Meal group, and of 20 gallons and 17 gallons respectively for the Milk & Meal, and Milk only groups. The milk producer will therefore have the extra income to be derived from the sale of these quantities of milk if he adopts one or other of the bucket-rearing methods, rather than rearing by Restricted suckling.

For the Winter 1943-44, the average profit for a sample of milk producing farms in Devon and Cornwall is shown, by the Milk Cost Investigation, to be approximately 6d per gallon. The economic considerations affecting a milk producer in deciding which method of rearing to adopt may therefore be summarized:

	Starter & Meal			Milk & Meal			Milk Only			Restricted Suckling		
Margin of value of cattle over cost	£	s	d	£	s	d	£	s	d	£	s	d
(a) Surplus	-			-			-			2	10	0
(b) Deficit	-			2	0	0	-			-		
Profit from sale of milk saved	1	17	0		10	0		8	6		-	
Net Margin												
(a) Surplus	1	17	0		-			8	6	2	10	0
(b) Deficit		-		1	10	0		-			-	

These figures are not intended to be firm estimates of the costs and returns involved in different systems of rearing on milk-producing farms. They are given merely to illustrate the order of magnitude of the relative differences for the sample of farms under investigation.

They show that, for this sample, ~~Un~~Restricted suckling undoubtedly gave the best results at two years old. The value of the animal produced is the highest of all systems of rearing, and the margin of value over cost is greatest, even when the loss of income from the sale of milk involved in feeding an average of 94 gallons of whole milk per calf is taken into account.

Of the bucket-rearing methods, the Starter and Meal group shows the best immediate results for the milk producer; the cost of rearing is low and more milk is available for sale, but the low value of cattle produced by this method of rearing is an important factor that should not be overlooked. It is possible to doubt, in the case of a heifer reared for the dairy herd, whether it can be considered a sound policy to adopt a method of rearing that results in an animal which at two years old, has not made satisfactory development, as future milk yield may thereby be affected.

SUMMARY.

It is again emphasised that, although the farms included in this sample have been selected to represent, as nearly as possible, typical conditions in each of the three areas of Devon, the total size of the sample is not large, and the possibility of errors due to sampling and to the method of investigation cannot be ignored. Also, this investigation has been confined to winter reared calves. For summer calves it is possible that the cost and value relationships will differ materially from that shown for winter calves. Subject to these qualifications, the more important results revealed by this investigation into cost data relating to cattle-rearing on a group of Devon farms may be summarized:

(1) Over all cattle surveyed, there was a slight deficit at two years old of estimated value over cost.

(2) On average, the cattle in the South Devon group alone showed a surplus at two years; the East Devon group shows a slight deficit, and the North Devon group a deficit of more than £3 per head.

(3) The favourable natural conditions prevailing in South Devon, where the grazing period is longer and less hand feeding is required during the winter period, are factors of considerable importance in the relatively low cost of store-rearing in that area. In North Devon, the relatively less favourable conditions of soil, climate, and topography add materially to the cost of rearing cattle, especially during the winter period.

(4) The level of rearing cost at all stages is shown to be largely determined by the cost incurred in the first six months.

(5) The cost in the first six months depends mainly upon the amount of whole milk consumed per head during that period. This ranged, on average, from 63 gallons in the South Devon group to 93 gallons in the North Devon group, and from 20 gallons per head for rearing on calf-starter and calf-meal, to 140 gallons where rearing is carried out by unrestricted suckling. The importance of an adequate amount of whole milk for the production of a well developed animal is clearly shown. The results for this investigation suggest however, that, if whole milk is fed beyond a certain point, the cost of rearing is increased without producing any commensurate increase in the value of the animal. Unrestricted suckling, as practised on the farms investigated, is revealed to be an uneconomic method for the rearing of commercial cattle.

(6) The relatively low direct labour requirements for cattle rearing is shown by this investigation. Compared with an animal requirement in excess of 160 man hours of direct labour for a dairy cow, the total amount expended per head at two years old was only 53 man hours for rearing cattle.

(7) Of the total labour requirements per head at two years old, nearly 45 per cent was incurred during the first six months. During this period, labour costs are slightly lower for the suckling system of rearing compared with bucket-rearing, but the difference is not large enough to affect significantly the overall cost of rearing.

(8) Of the methods of rearing practised, Restricted suckling undoubtedly produced the most satisfactory results. The value of the animal produced was the highest, and the margin of value over cost the greatest, even when the loss of income resulting from the feeding of an average of 94 gallons of whole milk per calf is taken into account.

(9) Of the bucket-rearing methods, although rearing on calf-starter and meal involves a higher expenditure upon cake and corn, the large saving in whole milk resulting from the adoption of this method gives it an advantage in cost over the other bucket-rearing methods, especially in the case of milk producers. There must remain some doubt however, as to whether the materially poorer development of the store animal resulting from this method may not, in the end, prove to be a false economy.

(10) Of the two more common bucket-rearing methods, using whole milk and calf-meal, and whole milk alone, it can be said that, unless the amount of whole milk that is saved by feeding calf meal in addition to milk is considerably greater than the saving revealed by the sample of farms investigated, the balance of advantage between the two methods will lie with rearing on whole milk alone.

R.R.JEFFERY.

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APPENDIX.

In this appendix some of the tables in the main report are extended in greater detail. The periods referred to in the tables are as follows:-

	Period.	Age of cattle.
First six months	Winter October 1943 to March 1944.	0 to 6 months.
Second six months	Summer April 1944 to September 1944.	6 to 12 months.
Third six months	Winter October 1944 to March 1945	12 to 18 months.
Fourth six months	Summer April 1945 to September 1945	18 to 24 months.

Table A: Average cost per head for four six month periods. All groups. October 1943 to September 1945.

Six month period	WINTER 1943-44	SUMMER 1944	WINTER 1944-45	SUMMER 1945
Age in months	0-6	6-12	12-18	18-24
Net cost of Foods	£ s d	£ s d	£ s d	£ s d
(a) Whole milk	6 11 0	-	-	-
(b) Scald milk	5 9	-	-	-
(c) Calf meal	10 10	-	-	-
(d) Cake & corn	1 9 3	16 1	15 1	10
(e) Hay	15 2	8 2	1 6 11	2 1
(f) Straw	-	-	1 3 10	10
(g) Roots	6 1	4 0	1 6 10	1 1
(h) Other foods	7	1 2	-	-
Total foods	9 18 7	1 9 5	4 12 8	4 10
Grazing	-	1 6 1	9 7	2 10 1
Foods & Grazing	9 18 7	2 15 6	5 2 3	2 14 11
Labour				
(a) Man	1 12 6	13 3	18 5	8 4
(b) Horse & tractor	-	-	1 11	1
Miscellaneous Costs	9	8	8	7
Loss by deaths	2 10	1 10	-	2 0
TOTAL COST	11 14 8	3 11 3	6 3 3	3 5 11
Increase in value	7 3 5	4 11 2	5 8 11	7 6 10
Consumed per head				
Whole milk (Gals)	76	-	-	-
Scald milk "	8	-	-	-
Calf meal (Cwts)	0.28	-	-	-
Cake & Corn "	2.1	1.2	1.2	0.1
Hay "	4.6	2.3	5.3	0.4
Straw "	-	-	8.0	.3
Roots etc. "	6.2	4.0	24.0	.9
Grazing (Weeks)	-	20.4	18.4	25.5
Labour (Hours)				
(a) Man	24.3	9.8	13.5	5.3
(b) Horse & tractor	-	-	2.3	0.2

Per cent of total cost at 2 years falling within each period

	%	%	%	%
Total foods	60.9	9.1	28.5	1.5
Grazing	-	29.9	10.7	59.4
Foods & Grazing	48.3	13.5	24.9	13.3
Labour (Man)	44.7	18.3	25.4	11.6
Total cost	47.4	14.4	24.9	13.3

Table B: Analysis of Concentrates and Roots etc. by six month periods. All groups.

	0-6 months	6-12 months	12-18 months	18-24 months	0-24 months
Concentrates	Cwts	Cwts	Cwts	Cwts	Cwts
(a) Calf Nuts	0.87	0.38	-	-	1.25
(b) Linseed	.14	.03	-	-	.17
(c) Cake	.07	.12	0.05	0.01	.25
(d) Beet-pulp	-	.08	.12	-	.20
(e) Corn	1.01	.59	1.07	.06	2.73
Total	2.09	1.20	1.24	0.07	4.60
Roots etc.					
(a) Mangolds	5.8	3.9	11.5	0.6	21.8
(b) Swedes	.2	-	6.4	.3	6.9
(c) Turnips	.1	-	4.0	-	4.1
(d) Flatpoll	.1	-	.4	-	.5
(e) Kale	-	.1	1.7	-	1.8
Total	6.2	4.0	24.0	0.9	35.1

Table C: Average amount of foods fed per head, grazing weeks and hours labour per head, for each six month period. By districts.

	0-6 Months			6-12 Months		
	North Devon	East Devon	South Devon	North Devon	East Devon	South Devon
	Cwts	Cwts	Cwts	Cwts	Cwts	Cwts
(1) Cake & corn	1.9	2.3	2.3	1.6	1.6	0.6
(2) Hay	4.9	4.8	4.3	3.1	2.7	1.4
(3) Straw	-	-	-	-	-	-
(4) Roots etc.	4.9	4.6	8.2	1.9	3.4	6.0
(5) Grazing weeks	-	-	-	16.4	19.9	22.8
(6) Labour (Hours)						
(a) Man	20.8	28.5	23.6	9.4	10.6	8.4
(b) Horse & tractor	-	-	-	-	-	-
	12-18 Months			18-24 Months		
	Cwts	Cwts	Cwts	Cwts	Cwts	Cwts
(1) Cake & corn	2.6	0.9	0.4	0.1	0.1	-
(2) Hay	7.1	8.8	0.8	.6	.7	0.1
(3) Straw	8.9	4.1	10.9	.6	.1	.2
(4) Roots	23.2	7.4	39.7	2.3	.3	.5
(5) Grazing weeks	10.5	20.6	22.3	25.9	25.9	26.0
(6) Labour (Hours)						
(a) Man	14.4	11.2	15.2	5.0	5.6	5.2
(b) Horse & tractor	.6	1.5	5.5	-	-	.4

Table D: Analysis of average consumption of concentrates and roots etc. per head at two years old. By districts.

	North Devon	East Devon	South Devon
(1) Concentrates	Cwts	Cwts	Cwts
(a) Calf nuts	1.3	1.5	1.1
(b) Linseed	.1	.2	.3
(c) Cake	.2	.4	.2
(d) Beet-pulp	.6	-	-
(e) Corn	4.0	2.8	1.7
Total	6.2	4.9	3.3
(2) Roots etc.			
(a) Mangolds	21.9	13.0	28.9
(b) Swedes	9.1	1.1	10.4
(c) Turnips	-	.8	10.4
(d) Others	1.3	.8	4.7
Total	32.3	15.7	54.4

Table E. Average consumption of foods; grazing weeks, and hours of labour per head at two years old. By method of rearing.

	BUCKET REARING			SUCKLING	
	Starter & Meal	Milk & Meal	Milk Only	Restricted	Unrestricted
(a) Whole milk	Gals 20	Gals 64	Gals 67	Gals 94	Gals 140
(b) Scald milk	-	1	19	-	-
	Cwts	Cwts	Cwts	Cwts	Cwts
(c) Calf meal (i)	0.8	0.8	-	-	-
(d) Cake & corn	7.5	4.1	3.8	3.5	6.2
(e) Hay	14.3	15.3	8.1	12.1	16.8
(f) Straw	9.0	8.1	7.8	9.8	6.5
(g) Roots etc (ii)	17.0	50.2	43.6	26.0	24.6
Grazing	Weeks 59.5	Weeks 64.0	Weeks 66.6	Weeks 67.4	Weeks 61.7
Labour	Hours	Hours	Hours	Hours	Hours
(a) Man	47.5	57.9	57.1	47.2	50.3
(b) Horse & tractor	2.2	2.3	3.9	3.9	1.4

(i) including calf starter.
(ii) including green fodder.

Table F: Average cost per head for periods 0 to 6 months old, and 6 to 24 months. By method of rearing.

	0 to 6 MONTHS											
	BUCKET REARING								SUCKLING			
	Starter & Meal			Milk & Meal			Milk Only			Restricted			Unrestricted		
Net Cost of Foods	£	s	d	£	s	d	£	s	d	£	s	d	£	s	d
(a) Whole milk	1	14	8	5	12	5	5	17	2	7	19	8	12	5	11
(b) Scald milk		-			1	0		14	7		-			-	
(c) Calf Meal	1	17	8	1	7	6		-			-			-	
Total (a-c)	3	12	4	7	0	11	6	11	9	7	19	8	12	5	11
(d) Cake & Corn	1	10	9	1	5	11	1	15	2	1	6	8	1	13	6
(e) Hay		17	11		14	0		10	11		12	6		14	3
(f) Straw		-			-			-			-			-	
(g) Roots etc		2	1		7	2		6	10		7	4		5	2
(h) Other Foods		3	10			1			1			8			2
Total (d-h)	2	14	7	2	7	2	2	13	0	2	7	2	2	13	1
Total Foods	6	6	11	9	8	1	9	4	9	10	6	10	14	19	0
Grazing		-			-			-			-			-	
Foods & Grazing	6	6	11	9	8	1	9	4	9	10	6	10	14	19	0
Labour															
(a) Man	1	11	10	1	12	4	1	15	3	1	11	2	1	11	11
(b) Horse & tractor		-			-			-			-			-	
Miscellaneous Costs			3		1	2			8			7		2	2
Loss by deaths		-			7	2		-			5	0		-	
TOTAL COST	7	19	0	11	8	9	11	0	8	12	3	7	16	13	1
Increase in value	6	1	5	7	3	0	7	3	2	8	2	4	6	19	7
	6 to 24 MONTHS											
Net cost of Foods	£	s	d	£	s	d	£	s	d	£	s	d	£	s	
(a) Whole milk															
(b) Scald milk															
(c) Calf meal															
Total (a-c)		-			-			-			-			-	
(d) Cake & corn	3	3	3	1	10	2		17	1		16	8	2	11	2
(e) Hay	2	1	5	2	10	1	1	0	8	1	18	11	2	16	11
(f) Straw	1	7	2	1	4	1	1	2	11	1	9	2		19	7
(g) Roots etc		16	9	2	4	0	2	0	5	1	1	8	1	5	0
(h) Other Foods		-			4	6		-				4		-	
Total (d-h)	7	8	7	7	12	10	5	1	1	5	6	9	7	12	8
Total Foods	7	8	7	7	12	10	5	1	1	5	6	9	7	12	8
Grazing	3	13	4	3	10	10	4	14	2	4	12	2	4	15	3
Foods & Grazing	11	1	11	11	3	8	9	15	3	9	18	11	12	7	11
Labour															
(a) Man	1	8	5	2	6	3	2	1	11	1	16	0	2	0	5
(b) Horse & tractor		1	7		1	6		2	7		2	8			11
Miscellaneous Costs		1	11		2	7		1	4		1	3		2	6
Loss by deaths		15	3		4	9		3	7		-			-	
TOTAL COST	13	9	1	13	18	9	12	4	8	11	18	10	14	11	9
Increase in value	15	2	11	16	1	1	17	12	3	18	11	9	18	12	4

Table G: Average consumption per head of foods; grazing weeks and labour per head for periods 0 to 6 months and 6 to 24 months. By method of rearing.

0 to 6 MONTHS	BUCKET REARING			SUCKLING	
	Starter & Meal	Milk & Meal	Milk Only	Restricted	Unrestricted
	Gals	Gals	Gals	Gals	Gals
(a) Whole milk	20	64	67	94	140
(b) Scald milk	-	1	19	-	-
	Cwts	Cwts	Cwts	Cwts	Cwts
(c) Calf-meal (i)	0.8	0.8	-	-	-
(d) Cake & corn	2.5	1.6	2.6	2.2	2.3
(e) Hay	6.1	4.9	3.8	4.3	5.0
(f) Straw	-	-	-	-	-
(g) Roots etc (ii)	2.1	7.3	6.9	7.3	5.2
Labour	Hours	Hours	Hours	Hours	Hours
(a) Man	25.1	24.3	27.2	22.0	22.8

6 to 24 MONTHS

	Cwts	Cwts	Cwts	Cwts	Cwts
(d) Cake & corn	5.0	2.5	1.2	1.3	3.9
(e) Hay	8.2	10.4	4.3	7.8	11.8
(f) Straw	9.0	8.1	7.8	9.8	6.5
(g) Roots etc (ii)	14.9	42.9	36.7	18.7	19.4
	Weeks	Weeks	Weeks	Weeks	Weeks
Grazing	59.5	64.0	66.6	67.4	61.7
Labour	Hours	Hours	Hours	Hours	Hours
(a) Man	22.4	33.6	29.9	25.2	27.5
(b) Horse & tractor	2.2	2.3	3.9	3.9	1.4

(i) Including calf-starter.
(ii) Including green fodder.