USE OF PASTURES AND PASTURE-EQUIVALENTi IN PIG-KEEPING.

RECOMMENDATIONS OF THE MANAWATU-OROUA PI6 RECORDING AND DEVELOPMENT CLUB.

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THERE are great variations in the degree of success with which pastures are being utilized in pig-keeping. These variations are due primarily to differences in the extent to which pasture utilization by pigs is based upon the following important facts.

The digestive organs and processes of pigs differ materially from those of other farm *animals fed* on *pastures-e.g., sheep and cattle.* From the digestive viewpoint cattle and sheep are much better fitted naturally to utilize much more bulky foods of low digestibility than are pigs. In the first place, cattle and sheep, but not pigs, are ruminating animals. In ruminating animals the food after being swallowed for the first time does not ordinarily reach the true digestive stomach until it has been first brought back to the mouth, where it undergoes a very thorough mastication or " chewing of the cud " which reduces it to a finely divided condition that facilitates the action of digestive juices. This in its turn enables the ruminants to digest more effectively than non-ruminants feeds of low digestibility, such as woody or stemmy crops-e.g., pastures of rank or mature growth. In the second place, the alimentary canal in which digestion takes place is relatively much greater in cattle and sheep than it is in pigs.

The volumes of the alimentary canal in different animals computed from data given by Colin are—

	Volume of Alimentary Canal per 100 lb. of Live-weight. (In Pints.)
Cattle	. . 50 to 60
Sheep..	. . 50 to 60
Pig	. . 16 to 20

These figures, which obviously vary, depending on the size and condition of the animal, are in general agreement with those of other authorities.

The volume of the alimentary canal is of basic importance in feeding. Its function has been likened rather aptly to that of factory-space. Just as a large factory can handle more material than a small factory, so, in a similar way, an animal with an alimentary canal of large volume in comparison with its weight can utilize bulky supplies of feed better than can an animal having an alimentary canal of comparatively small volume. In this case feed is the raw material out of which flesh or milk is manufactured, and from the previous data it is clear that the cow and the sheep have spacious alimentary canals in comparison with the pig.

There are great differences, vital in *pig-feeding,* between *the characteristics and feeding-values of pastures of leafy relatively short young*

growth and of ones *of stemmy mature or rank growth.* These differences are intensified when the latter pastures are characterized by the absence, or the markedly scant supply, of clovers, which are specially rich in proteins and mineral matter.

The comparative feeding-values of leafy growth. of pastures and of stemmy growth may be gauged from the following facts : (1) The dry matter of samples of leafy pasture contains approximately twice as much phosphate and lime as the dry matter from corresponding herbage at the hay stage, (2) The dry matter of leafy pasturage contains approximately two and a half times as much protein as occurs at the hay stage. (3) About 80 per cent. of the dry matter of leafy pasturage is digestible, whereas only from 40 per cent. to 60 per cent. of the dry matter of stemmy growth is digestible.

The true significance of these three facts lies in the further fact that the rations of animals capable of a high rate of production, such as pigs, are apt to fall short of the full requirements in respect to their mineral and protein contents and their digestibility.

From this it follows that any system of pasture utilization which brings about rank herbage or which lessens the clover content of pastures is in those respects unsuitable in pig husbandry.

There are important differences between (a) *leafy growth of pastures, roots,* and green *crops and* (b) *skim-milk, whey, cereal* grains *and meals,* and *meal* and *fish meals.*

The position is indicated by the following table :—

Yield of Nutritive Material *(expressed as Pounds of Starch Equivalent)* from *100 lb. of Dry Matter.*

	I&.
Skim-milk	99
Whey	93
Maize	96
Peas	90
Barley	87
Meat-meal (containing a good deal of fat)	137
Leafy grass	70 to 80
Carrots	70
Swedes	66
Chou moellier	66
Coarse grass	40 to50
Hay	30 to 45
Straws	15 to 25

This table shows that feeds can be grouped into three distinct classes-(i) Poorly digestible or bulky ; (ii) readily digestible or non-bulky. Cereals; meals, and skim-milk belong chiefly to the latter, in which skim-milk is outstanding ; while hay, straw, and coarse grass belong to the 'former. To obtain any given amount of nutriment the digestive apparatus of the animal has to deal with much more feed material (irrespective of its water content) in the case of the former than that of the latter, which therefore are more suited in general to the needs of animals with relatively small volume of alimentary canal. (iii) Leafy pasture-growth, root crops,

and green fodders before they become woody are intermediate in character : in practice they serve as readily digestible non-bulky feeds when not fed in excess, or as poorly digestible bulky feeds when fed in large amounts.

Because of the limited capacity of the alimentary canal of the pig the difference between bulky and non-bulky feeds is of prime importance. Hence it is well to bear in mind that a feed which from the storage viewpoint is bulky is not necessarily bulky also from the nutritive viewpoint. Bulkiness in respect to nutrition is governed largely by the character of the dry matter : if a substantial amount of the dry matter is not readily digestible, as when the feed is woody or of high fibre content, then for nutritive purposes the feed is bulky, whereas if the dry matter is of high digestibility, as when its fibre content is low, then the feed is non-bulky. Hence, for practical purposes skim-milk, from which fibre is absent, is non-bulky, whereas hay or silage, with a fibre content of 25 per cent. to 35 per cent. of its dry matter, is bulky, and pasture-growth with a fibre content of 10 per cent. to 20 per cent. of its dry matter is of intermediate type. The bulkiness of the feed itself as distinct from its dry matter is of some moment, but the dominant consideration is the character of the dry matter as determined largely by its fibre content.

There is a close and inescapable connection between economy in feed-consumption and *rapidity of growth.* This may be illustrated by considering the feed requirements of a pig of 200 lb. live-weight. Such a pig requires for mere maintenance the equivalent of 3.6 lb. of meal daily and an additional 2 lb. of meal or its equivalent for each 1 lb. increase in live-weight. Hence, if such a pig is growing at the rate of 1 lb. daily a total of 5.6 lb. of meal or its equivalent is required to produce 1 lb. increase in live-weight, but if the pig is growing at the rate of only $\frac{1}{2}$ lb. daily then 9·2 lb. of meal is required to obtain 1 lb. increase in live-weight. This means that in respect to production of flesh the effectiveness of the feed used at the slower rate of growth is only 60 per cent. of that of the feed consumed at the quicker rate of growth. Keeping this in mind, let us return to the use of bulky and non-bulky feeds. In growing animals the maintenance requirement is met first, only the balance over and above this requirement being available for production. If the pig, with its limited " factory " capacity, is fed on bulky feeds the nutriment available will be only little, if at all, in excess of the maintenance requirement : if the pig is given non-bulky feeds comparatively large amounts of nutriment will be available for production. Hence, if it is desired to obtain growth at the maximum rate then easily digestible non-bulky feeds should be fed. Such easily digestible non-bulky feeds are often called " concentrates," the most important of which in New Zealand dairying are skim-milk [a diluted concentrate), cereals, and peas.

It follows from the facts just considered that in the interests of feed-economy concentrates such as skim-milk should be used as exclusively as possible in the production of flesh, and to enable this to be done less concentrated feeds, such as pasture-growth, root crops, and green forage

crops, should be used mainly-and as much as possible to replace concentrates-for maintenance, The more such crops can be used for maintenance the greater is the amount of farm-produced concentrates available for flesh-production with a minimum of feed-consumption. This is the key to the judicious use of pastures and pasture-equivalents in pig-keeping as a subsidiary venture to dairying. In dairying the production of concentrates in the form of dairy by-products is distinctly and definitely limited ; the provision of other concentrates, such as the grains of barley, maize, and peas; either by farm-production or by purchase, is costly in comparison with the provision of less concentrated feeds such as pasture-growth, root crops, and green crops.

Access to pastures or crops of similar *nature is frequently valuable because of the exercise it provides and because of its influence upon the health of animals.* This results from the freer provision of vitamins and of sunshine.

The pig, whether it be the sow *with* young or *the* growing animal, normally *is capable of high and efficient production.* One aspect of this is reflected in the computation that for 100 lb. of digestible nutrients consumed-(a) The pig produces 25 lb. of dressed carcass, equivalent to 15 lb. of edible dry meat ; *(b)* the sheep and steer yield less than 10 lb. of dressed carcass, equivalent to only from $2\frac{1}{2}$ lb. to $3\frac{1}{4}$ lb. of edible dry meat.

But from data already discussed it is clear that such economical conversion of feed into meat is compatible only with feeding which allows the maximum rate of growth to be attained.. This in its turn is incompatible with the free use of somewhat coarse feeds of relatively poor digestibility or the general toleration of any substantial "store" period in the case of animals being prepared for slaughter. The sow with young ranks with the rapidly growing pig. in its high rate of production and in its need for a high standard of feeding. The position in respect to well-developed dry breeding-animals is somewhat different, rations slightly in excess of maintenance requirements normally being sufficient for these. Further, a "store" period in the case of animals being grown for slaughter is at times justified, when, for instance, the "store" period enables advantage to be taken later of a cheap concentrate as occurs when pigs are wintered as stores and finished off on dairy by-products in the spring, and when the alternative to the store period would be the use of concentrates, expensive in comparison with dairy by-products. In such cases the winter "store" period—i.e., the period of relatively slow growth-involves the use mainly of farm-grown crops, which can be provided at a comparatively low cost.

Summary of Basic Principles of Successful Utilization of Pastures by Pigs.

To sum up, the successful utilization of pastures and kindred crops in the production of pig-meat as a subsidiary to dairying are based largely upon the following considerations :—

(1) The digestive organs of the pig are unfitted to utilize coarse bulky feeds effectively.

(2) Coarse swards containing but scant amounts of clovcrs are substantially inferior to the short. leafy 'growth of well: balanced mixtures of grass and clover in respect to their digestibility and their content of flesh-forming substances and of mineral matter.

(3) To exploit the capacity of the pig for high production and rapid growth, highly digestible rations' rich in minerals and flesh-forming substances must be provided as far as is compatible with costs and returns.

(4) Economy in feed-consumption is governed by rapidity of growth.

(5) While highly concentrated feeds such as skim-milk and cereals are desirable for rapid growth, less concentrated feeds serve well for maintenance.

(6) The less concentrated feeds as a rule are cheaper or more easily obtainable than the highly concentrated ones, the use of which should be confined as much as practicable to the pigs of highest production-e.g., pigs for slaughter and sows with young.

(7) Irrespective of direct feed-economy, access to pastures and other crops of. similar nutritive value is useful in respect to health and 'to exercise, which may affect carcass quality.

PRACTICAL APPLICATION OF THE PRINCIPLES.

The application of these concepts in practice may be 'summarized as follows :-

(1) Pasture-utilization should be based upon extensive- rather than upon *intensive* methods of grazing.

(2) Considerable use should be made of pastures for-

(u) Dry sows :

(b) Suckling sows with litters :

(c) Not as a rule for pigs definitely 'being fattened, for which, however, access to pastures at regular intervals' should be provided. Especially, however, should young pigs have access to pastures and outdoor conditions for some time 'immediately after weaning :

(d) Store pigs only if fluctuations in the feed-supply make this advisable ; generally a store stage is undesirable.

(3) It is desirable to provide pasture-equivalents for use during periods of pasture-shortage ; crops which yield suitable equivalents, 'including luceme, subterranean clover, broad red clover, Montgomery red clover, 'green cereals, and chou moellier and roots.

(4) Where practicable it is- desirable to 'grow- cereal- crops or peas for grain, such crops because of their less bulk being valuable in conjunctron with the pasture-equivalents.

EXTENSIVE VERSUS INTENSIVE METHODS OF GRAZING.

Extensive methods of grazing may be practised by giving the pigs range over pastures of several acres the feed from- which is consumed mainly by dairy cows. It contrasts with the, intensive method of grazing, in which the pigs are confined to relatively small

areas of grassland : one of the layouts which has been recommended commonly for this purpose provides for the subdivision of an area of 2 acres into ten small paddocks to which access is given by a central race and beyond which the pigs arc not to be allowed to graze. It has been demonstrated that the intensive system, involving the use of only small paddocks, when operated with suitable equipment facilitates the convenient and systematic feeding of pigs ; further, because of its open-air character and the grazing that it permits, it is definitely superior to a system under which pigs have little or no access to grassland. On the other hand, it has been found in practice to have certain substantial disadvantages . apart from its cost, which is considerable.

In the first place over a wide range of conditions, in winter and early spring, when usually leafy feed is particularly needed, the small paddocks are " poached " or " pugged " or productive of comparatively little feed. In the second place, 'eventually, and indeed fairly soon, the feed in the small paddocks deteriorates greatly, becoming less wholesome and less attractive. This is due to unavoidable changes in the composition of the swards of the small paddocks, changes which necessarily arise from the enrichment of the soil due to the excreta of the pigs. The changes normally consist of clovers being suppressed and grasses becoming dominant and coarse. It becomes difficult, if not impracticable, to keep the resultant herbage short and leafy, and even if it is kept fairly short and leafy it may be expected to be relatively poor in mineral matter, which is believed to be of considerable moment in the nutrition of pigs. It would bc much better to avoid, as far as possible, the undesirable change in the composition of pastures by having the animal manure from the pigs distributed as evenly as possible over, say, 12 acres to 20 acres instead of 2 acres-a result which is at least partially secured under extensive methods of grazing. Distributed over the larger area the manure leads to improvement, whereas concentrated on the smaller area it leads to deterioration of pasture.

Grazing by the extensive method is sometimes far from successful. To be successful the grazing must be arranged in such a way that the pigs receive not only highly nutritious feed-fresh, leafy, and satisfactorily rich in clover--but also ample amounts of such feed. In the winter especially pigs are often grazing on bare pastures. Poor results may be expected from pigs so grazing unless suitable supplementary feeding is carried out, just as the results are poor from cows grazing on bare pastures without suitable supplementary feeding.

Because of the highly 'profitable returns obtainable from well-fed pigs, and because good feeding of the pig calls for the provision of feeds of relatively high nutritive value and digestibility, there is no justification for management which gives the pig second place to the dairy cow as is sometimes done by making 'pigs "followers " to cows on pastures. When this practice is adopted the cows naturally consume the choice leafy herbage, leaving the comparatively inferior stemmy herbage for the pigs, which are less fitted physiologically to use such herbage effectively than are dairy cows.

Against grazing by pigs on wide range by the extensive method it has been objected that damage to the pastures results from the rooting habit of pigs. It has been shown that danger of such damage can be removed by suitable "ringing" of the pigs. Another objection often raised to extensive grazing by pigs is that ordinary fencing is insufficient to keep pigs from roaming widely and even on to ncighbouring farms. Experience shows that as a rule pigs do not pass through a seven-wire fence reasonably well made and maintained, but that fences in bad repair and poor feeding both beget wandering habits, which are not eradicated readily and which may lead to pigs going through even good fences. Further, areas of special crops usually can be secured without much effort or cost. A further objection raised to extensive grazing is that the pigs would be subject to tubercular infection from herbage contaminated by infected cows. Veterinary opinion is that generally any danger in this connection is small, that it is at least offset by the greater vitality with greater general resistance to disease which results from the more healthy conditions provided by extensive grazing, and hence that the expectation of disease in pigs on wide range is less than in confined pigs. A possible exception to this arises in the case of pigs grazing after cows suffering from tuberculosis of a type which leads to discharge of the tubercle on the herbage.

While as much extensive grazing as possible is advocated, it is not to be deduced from this' that no small paddocks are desirable. As is indicated later, the use of small paddocks for particular purposes and particular circumstances is recommended. But because of the cost of providing small paddocks suitably equipped for the convenient watering and feeding of stock, and also because of the drawbacks to the small paddocks relative to grazing which have already been considered, the aim throughout should be to. reduce the number of small paddocks as much as is possible having regard mainly to the beneficial influence a small amount of green feed, exercise, and open-air life may have upon the well-being of the pig.

DRY SOWS ON PASTURES.

Great success has attended the grazing of sows between the weaning of one litter almost up to the farrowing of the following litter. When the pastures used for this purpose have been ones of high quality yielding leafy herbage sows have lived largely, if not wholly, on the pastures alone for long periods, and the subsequent results have been good. The mature sow can with safety live more completely upon pasture-growth than can the young developing sow, the requirements of which are greater to meet not only the needs of maintenance and pregnancy which are common to both mature and developing sows, but also those of growth. The feeding of sows on pastures in this manner is of great practical moment because it increases the proportion of dairy by-products available as a concentrate or non-bulky feed for use in rapid 'flesh-production by pigs for slaughter. That quite a substantial amount of additional cheap concentrate may thereby be made available for rapid flesh-production may be gauged from the fact that the maintenance requirement of two pigs of 250 lb. live-weight has been estimated to be approximately equal to the maintenance requirement of a COW of 800 lb. live-weight.

Probably the feeding of breeding-sows estensively upon pastures of poor or badly balanced botanical composition or of stemmy over-mature growth would provide a deficient diet and result in poor litters. On the other hand, observation shows that, if no other factors intervene, good litters may be expected from sows grazing on pastures providing abundance of high-quality leafy herbage.

Sows with Litters on' Pastures.

The. essential difference between the grazing management of dry sows and that of sows with litters arises from the desirability of having full control of the litter. One way of securing this is the provision of a small paddock of grass to which there is access from the stationary farrowing-quarters. This small paddock probably is of more value as an open-air accommodation area than as a grazing-area from which nutriment is obtained. What is a suitable size for such a paddock varies with the nature of the soil-a smaller paddock suffices on well-drained soil. Paddocks ranging in size from about $\frac{1}{8}$ acre to $\frac{1}{5}$ acre are proving serviceable according to the conditions.

Such small "accommodation" paddocks should have direct access to larger paddocks for grazing by the extensive method when the litter is old enough to be allowed wide range--i.e., after it is about four weeks old. Up to weaning, the sow with litter is fed and housed at the farrowing-house,

Store Pigs on Pastures.

The normal procedure, having due regard to feed-supplies and feed-costs, should be to eliminate a store stage by providing from weaning to slaughter stage rations which meet not only maintenance requirements, but also full production requirements. Such rations provide the essential basis for, the rapid growth and consequent economy of feed which has already been- discussed.. However, as the result of seasonal fluctuations in the supply of cheap concentrates-e.g., dairy by-products-it may become possible to supply such rations only in the form of farm-grown or purchased concentrates, and this at a cost which is not economic or maybe not so economically attractive as would be an alternative course. This. alternative course consists in having the growing pigs pass through a store stage, during which they are fed largely on pastures or pasture-equivalents which provide a relatively cheap supply of feed. The wintering of store pigs which later utilize effectively the supplies of dairy by-products in the spring often is a useful application of this. For this purpose.', when the supply of feed directly available from pastures is inadequate, it often may be supplemented suitably by the use of one or more of several farm-grown crops, including mangels, carrots,, swedes, pumpkins, chou mocllier; temporary pastures, green cereals, and subterranean clover ; and the use of limited amounts of concentrates-e.g., grains of cereals, including maize, peas, meat-meal, and meals of similar nature-to supplement such crops is usually sound economically. Similarly, in the latter part of the summer, if the milk-production falls off at an abnormally rapid rate because of exceptionally dry conditions a store stage for

growing pigs may become advisable, and, then areas of lucerne and pastures rich in red clover are fitted to provide valuable yet cheap grazing. The best results from the grazing of store pigs are normally obtained from adoption of the extensive method of grazing, and the pigs may be accommodated in special inexpensive housing.

THE USE OF GRASS FOR PIGS BEING FATTENED.

Recent investigations carried out at Massey Agricultural College and at Ruakura Farm of Instruction give results which are in agreement and which also are in general agreement with the results of similar overseas investigations. Further, these results confirm the experience of many successful farmers in indicating that little, if anything, is to be gained in regard to direct economy of feed from the grazing of pigs being prepared for slaughter. Hence the use of fattening-pens is advocated. It is considered advisable by some, however, that, in general, pigs, being prepared for slaughter should not be confined continuously throughout the after-weaning period to the fattening-pens. Because of this each fattening-pen should have a companion small paddock of grass to which the pigs should. be given access for relatively short periods at regular intervals. Farmers who adopt this practice consider that it fosters good health, and that in the case of pigs which tend to develop too much back-fat the practice minimizes or corrects this tendency. Some experimental work carried out in New Zealand supports this view.

THE GENERAL OBJECTIVE SUMMARIZED.

Leafy pasturegrowth, especially when not poor in clover, being intermediate in character between non-bulky and bulky classes of feeds, and being suitable for use as a non-bulky feed when not consumed in excess by pigs, may be made a very important and inexpensive part of the rations used in pig-keeping. On the other hand, coarse stemmy pasture-growth, being a bulky feed, has little if any value as part of the rations of pigs. Because of the fundamental difference between leafy and stemmy growth the basic purpose of pasture-utilization by pigs should be the provision of leafy growth. This means appropriate pasture-control, which in the case of grazing by the extensive method can be obtained readily by using cattle as the agents of control. In the case of the small paddocks prescribed for the use of sows with young litters and of fattening pigs it is difficult, if not impossible, to maintain suitable control of the pasture-growth by the grazing of pigs only, and it is usually advisable to resort to the mower and to other grazing-stock such as sheep and store cattle as aids to the control of the growth.

DISCUSSION ON PAPERS BY MESSRS. P. W. SMALLFIELD AND R. P. CONNELL.

Mr. Rodda : Relative to the Ruakura trials it was a bomb-shell to me to realize after two years of experimentation that grass apparently had no feeding-value for the raising of pigs from weaning to slaughter weights. Why is it ? During the trials it was only at certain periods of the day that pigs grazed. During hot weather they did not graze, but they grazed in the evening after 5 o'clock. The result was that the pigs in the sty put on weight more quickly than those out in the pastures. We had no difficulty in controlling the pigs, which was done by putting an extra barbed wire in the seven-wire fence, within 2 in. of the ground. Regarding the

growing of crops for the feeding of pigs, I think that kumi-kumi should be included in the list, In the producing of litters or grazing of big sows on pastures we have had fairly good results, especially where the pasture was well controlled and raised good litters from sows fed on pastures alone. Other litters have been very weakly. I attribute this to pastures not being sufficiently controlled by other stock. Cattle or sheep are necessary to keep pastures suitable for sows.

Mr. *Hamblyn :* I take it that at Ruakura the sty-fed pigs were provided with green food. On the average dairy farm, when fattening pigs are put into a sty, that is one of the things that is overlooked. The skim-milk is given and they do not get green feed. A comparison of pigs fed on pastures or carried from the weaning-stage on pastures plus skim-milk is somewhat different from the conditions under which that experiment was. carried out in that if they were kept in sties they would probably have very little greed feed. For fattening pigs with a fattening sty, a small pen for a run is suggested. The average farmer would find difficulty in providing this. In the open-air grazing of sows with litters, just a shed for the sows at night is required. In the Old Country the use of a tether has been developed to avoid special fencing. There is a difficulty in connection with hay and silage. In the modern dairy farm there are 30 acres to 40 acres of pasture shut up in the spring for hay and the sows do give a great deal of bother. Mr. Rodda mentioned a seven-wire fence with an extra wire for keeping in the sows at Ruakura, but the average farmer has not got seven-wire fences. I believe in a fattening-pen, but, instead of having a run-out, I suggest a handy cow-paddock .pig-proof, to run pigs out once or twice a week. A cow-paddock specially manured and shut up in the autumn to get a good clover-growth has been used to winter successfully all the stores required to consume the skim-milk available in July and August. Whether the growing of special crops for wintering is a better idea or not, the provision of a special pasture has served for the winter-carrying of stores on water, meat-meal, &c. Except for the difficulty with hay and ensilage, the sows in the open cow-paddocks do quite well. The same paddock which is used for fattening pigs can be used for wintering of stores.

. *Mr. McIlwaine :* Under New Zealand conditions, where the droppings are exposed to direct sunlight, the risk of pigs contracting tuberculosis when grazing is very small compared with the risk the pig runs in consuming large quantities of skim-milk when a cow is advanced in tuberculosis, probably of the udder or even is spreading infection in the droppings. Dr. Williams has shown that the germ lives for five or six months in droppings provided the droppings arc kept in a shady place, but under ordinary dairy-farm conditions in New Zealand where sunlight gets in the risk is very small.

Mr. Cockayne : I understand that in the Ruakura and Manawatu trials all the pigs, both those on grass and those sty-fed, throughout the whole trial had a full ration, in the Ruakura instance one of skim-milk alone, and in the case of the Manawatu pigs a ration consisting mainly of skim-milk with a certain amount of supplement. It looks obvious that the pigs could not have eaten very much grass. If they had consumed a lot of grass some of the nutriment of that grass would have tended to show a significant economy in the utilization of the ration that was provided. Where sows, particularly large, heavy sows, are fed entirely with grass for a long period before farrowing, and produce satisfactory litters, it is equally evident that those sows must have consumed a very large amount of grass. One would like to know whether, with a reduction in the ration fed, WC do get a corresponding increase in the amount of grass consumed without bringing down the daily weight-gain of the pigs to a very appreciable extent. With regard to the two trials carried out, the daily weight-gains, based on dressed weight, have been pretty satisfactory—that is, the pigs were fed with sufficient food to give a very good daily gain. In both instances the rate of gain per day was just about on the danger mark so far as quality is concerned. It is very desirable that our baconers tend to be lean rather than fat. Perhaps we have not heard the last of grass-feeding so far as fattening pigs is concerned. It may be possible to reduce the amount of material, other than grass, that is fed per day and to use a larger amount of pasture in a way which will enable the pigs to secure a reasonably good gain per day. A slogan " Rapidity in time in producing your product means economy of production " went forth, and it was a useful one; but where you view the matter from the viewpoint of the farm as the business unit that slogan may, I think, be rather overdone. In the future it will not be so much rapidity of putting on flesh throughout the life of the pig, but rather the reasonable putting-on of flesh and, perhaps, the consequent improvement in quality from the overseas buyers' standpoint which one should look at.

Mr. Hart : There is a theory that the pigs tend to render pastures unpalatable for dairy stock. I should like an opinion on this point.

Mr. *Connell* : Regarding the kumi-kumi, I have no experience. I have experience of pumpkins, and, while they are considered of substantial value per ton, the yield per acre is much smaller than the appearance of a crop would lead one to expect. In this district a number of crops have been weighed-if they were very good they yielded 30 tons an acre. In this respect they cannot compare with mangels. There may be some place for the pumpkins or, say, for carrots, for use before the mangels are ripe. As to tethering, I know nothing about it, and so I make no recommendation. Mr. Hamblyn makes the point about hay and ensilage, which is of importance. If the farmer wishes to make money out of pigs he has to make some outlay-some more fencing is required. The question whether a farmer should grow special crops for pigs or not is a very vexed one. In this district many farmers are growing special crops for their cows, and it does not upset their plans to grow an additional amount for their pigs. The economic soundness of special cropping depends greatly on circumstances on the individual farms. In this district I have advised men not to grow crops because, on going into their particular propositions, 1 found they would have to employ more labour, which the pigs would not fully pay for. Each farmer will have to settle this matter of crops for himself. The recommendation about cropping is quite a general one, but as a rule, where conditions allow, crops should be grown. Mr. Cockayne raised a point about the trials. The recommendation that pigs for fattening should not be given access to pastures was arrived at without any consideration being given to the trials: the recommendation is the result of field experience. As to pigs making pastures unpalatable for dairy cows, I dare say that if pigs were put in great numbers on a limited area of pasture they would make it for some time unattractive for cows, but under the procedure recommended the pig-population of any particular paddock is pretty light and the pigs are not in any one field for a prolonged period, and in practice no trouble of this sort has come under notice.