Feeding Sweet Potatoes to Pigs

IAN R. WATT, Pig Husbandry Adviser

Tropical Pig Breeding and Research Centre, D.A.S.F., Goroka

Since the establishment of the Pig Production Section in mid-1969, a considerable amount of research into the value of sweet potatoes as a pig food has been undertaken at the Tropical Pig Breeding and Research Centre, Goroka. This work has been conducted by Dr G. L. Malynicz, Senior Veterinary Officer—Pig Production, with the assistance of Mr H. Nad, Assistant Livestock Officer. In all, seven research projects involving sweet potatoes have been completed which provided much interesting and valuable information suitable for village pig production.

The initial experiments were aimed at finding suitable protein additives because sweet potato is very low in protein. Part I of this article describes work done with pigs under intensive management, while Part II outlines experiments on pigs grazing on sweet potato.

This article summarizes the work which has been carried out at Goroka over the past three years. A more detailed account of the work will appear in the P.N.G. Agricultural Journal during 1973.

Part I—INTENSIVE MANAGEMENT

Because not much grain is grown in Papua New Guinea, and because the small amount which is grown can be expensive when landed in certain of the pig producing areas, sweet potato (kaukau—*Ipomoea batatas*) appeared to be the only food readily available for feeding to pigs. However, it was known that sweet potatoes on their own were not suitable for intensive pig production, as they do not provide sufficient protein.

Sweet Potato with High Protein Plant Foods

Three reasonably high quality protein-rich foods (raw peanuts, soyabeans, raw or cooked, and soyabeans with salt and bone ash) were fed to pigs with raw and cooked sweet potatoes.

1. *Peanuts*

Peanuts were fed raw at a daily rate of up to 1½ lb with raw sweet potatoes fed *ad lib* (as much as the pigs wanted). The pigs in this group had an average daily liveweight gain of 0.2 lb and consumed less than half the food of any other group. When the cost or value of the peanuts was taken into consideration, it became apparent that the feeding of raw peanuts and raw kaukau was impracticable and uneconomical.

2. *Soyabeans*

Soyabeans were also investigated as a suitable protein supplement for feeding with raw sweet potato. In this experiment one group was fed raw soyabeans while the other was fed cooked soyabeans. Both lots of soyabeans were fed to a maximum of 1.2 lb per day with sweet potato fed *ad lib*.

The pigs fed on raw soyabeans consumed an average of 0.24 lb per day over the fifty day period of the experiment, while those on cooked soyabeans consumed an average of 0.36 lb per day.

The average daily liveweight gain of the two groups showed that the cooked soyabean diet produced a gain of 0.44 lb while the raw soyabean group produced a gain of only 0.13 lb. This result was more or less expected as it is known that soyabeans contain a growth inhibitor which is rendered harmless when the beans are cooked. The growth inhibitor is a chemical substance which stops pigs growing normally. So, although soyabeans contain plenty of protein, they will not help pigs to grow bigger unless the beans are cooked.

3. *Soyabeans plus salt and bone ash*

Another experiment was undertaken to determine the effect of adding salt and bone ash to soyabean and sweet potato rations. The straight *soyabean/sweet potato* group achieved an average daily liveweight gain of 0.63 lb. The same ration with common salt added and fed *ad lib* improved the average daily liveweight gain to 0.93 lb. The addition of bone ash did not increase the daily gain, nor did it reduce it. The addition of bone ash is therefore not recommended at this stage.

Sweet Potato with Commercial Concentrate

The peanuts and soyabeans mentioned above are food plants which can easily be grown by a pig farmer in Papua New Guinea; only the salt and bone ash would have to be bought.

There are, however, various high protein foods specially prepared for pigs which pig owners can buy. This kind of food is called "pig concentrate" or "commercial concentrate". It is made in Australia and imported into Papua New Guinea. It is usually a mixture of fishmeal, meatmeal, cottonseed meal and feather meal, with the addition of vitamins and minerals. When mixed with grain it is supposed to give a complete and balanced ration. It varies in protein content from 45 per cent to 55 per cent. This product is available in Papua New Guinea under several brand names, all of which are similar in content.

The initial experiment using pig concentrate involved the feeding of 1 lb per day per pig with *ad lib* raw sweet potato. The pigs grew at an average daily liveweight gain of 0.72 lb over the 84-day period of the trial. This result was encouraging as the normal station ration used at Goroka (sorghum and concentrate) achieved an average daily liveweight gain of 1.25 lb. This method of feeding 1 lb per day per pig regardless of age or size was a modification of a system devised by Lehmann in Germany at the turn of the century.

The Lehmann system worked on the knowledge that pigs eat for energy and not for protein. Pigs have an increasing energy requirement while their protein requirement stays at about the same level. This means that as the pig grows, both in size and in age, its requirement for energy increases and so it consumes more sweet potatoes. This is why there must be sufficient sweet potatoes available for the pig to eat. The 1 lb of concentrate per day is sufficient to meet the pig's protein requirements regardless of age or size, except when sows are lactating in which case they require 2 lb per pig per day.

Cooked Sweet Potato with Commerical Concentrate

The system of feeding described above has been widely advocated by the Pig Production Section and has gained acceptance in most areas as being satisfactory and practical. However, it became apparent over the 12 months or so after its introduction that producers were not very keen on maintaining the concentrate level at 1 lb per day. A further experiment was therefore conducted using three levels of protein supplementation—1 lb, 0.5 lb, and 0.25 lb per pig per day. At the same time the sweet potatoes were boiled, whereas previous experiments had been on raw sweet potatoes. It was thought that cooking the sweet potatoes could improve palatability and digestibility, thereby improving the growth rate. The results of the experiment were quite impressive. The group fed 1 lb concentrate per pig per day with *ad lib* boiled sweet potatoes, grew at an average daily liveweight gain of 1.30 lbs. The second group fed on 0.5 lb concentrate gained at the rate of 0.96 lb per day while the third group (0.25 lb) grew at 0.70 lb per day. The result was clear—pig concentrate should be fed at the 1 lb per pig per day rate for maximum results.

To assess the value of cooked sweet potato as against raw sweet potato, an experiment was recently conducted. This showed that cooking increased growth rate by about 40 per cent over that achieved by the raw sweet potato group. At the same time as this factor was being investigated, two groups of pigs were fed 1 lb of concentrate mixed with 10 lb of cooked sweet potatoes with this mixture being fed *ad lib*. The average daily liveweight gain of this group was better than either of the two other groups.

Economic Return

Mr D. Clark, Regional Economist, studied the costs involved in these feeding systems. Some people want to have pigs in order to sell them and make money. Other people are not so interested in making money; they just want to have more pigs and bigger pigs than other people, so that they can use them for bride price payments or traditional ceremonies. These experiments show that those people who want to make money should feed each pig 1 lb of commercial concentrate per day plus *ad lib* cooked sweet potato. They will have to pay out money to buy the concentrate, but they will get a lot more money back when they sell the pigs.

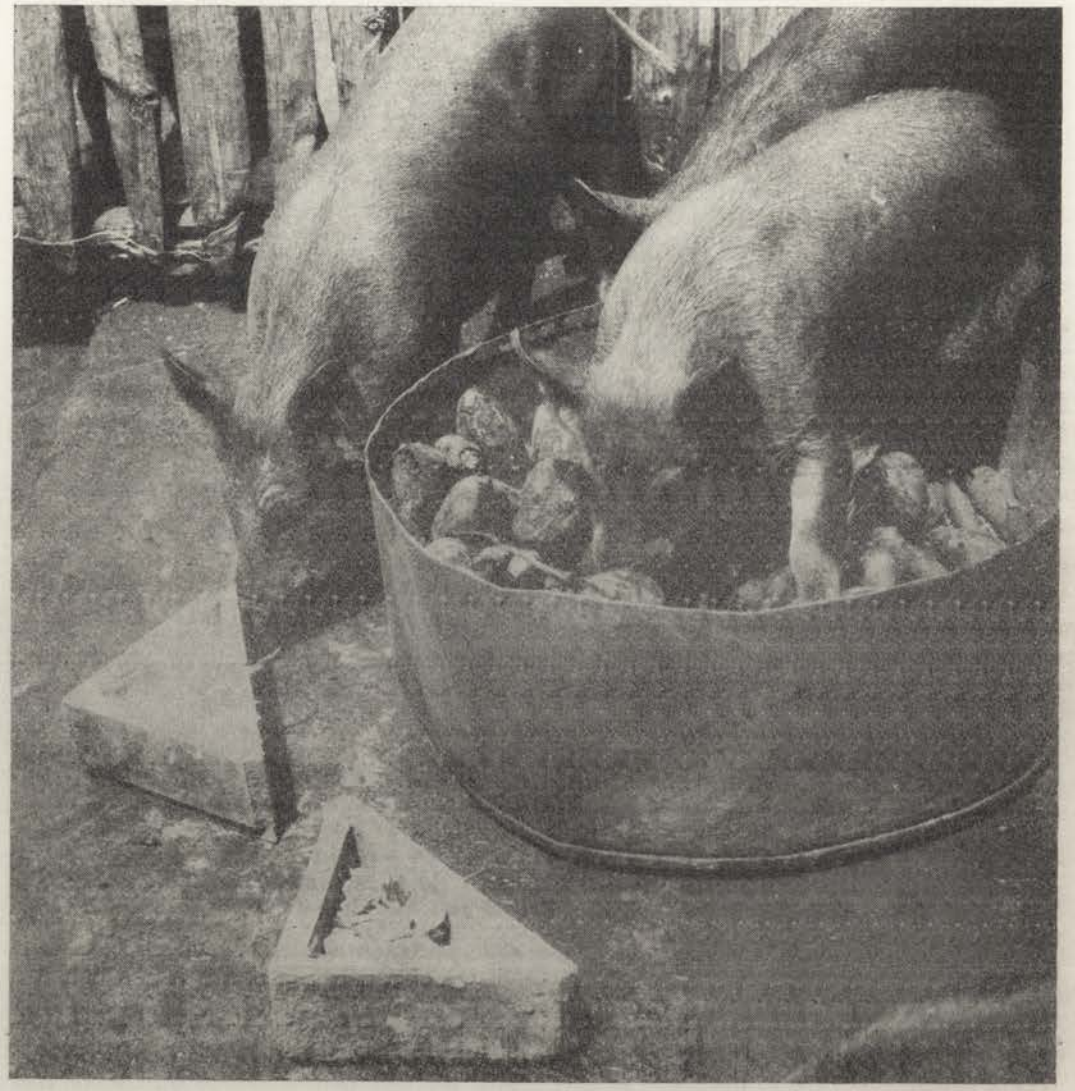
For people who are not interested in making money, but want to have bigger pigs than other people have, they also should feed their pigs 1 lb of commercial concentrate per day. A man who doesn't want to spend much money can give his pigs only 0.5 lb or 0.25 lb of concentrate per day. If he does this, however, his pigs will not grow as big as those on the full ration of 1 lb of concentrate per day.

As well as the cost of the concentrate, the cost of cooking the sweet potato must be considered. In the experiment described above, the sweet potato was cooked in a mumu (earth oven). It was noted that 1 lb of firewood was sufficient to cook seven pounds of sweet potatoes. If the firewood has to be purchased, then it is doubtful whether there is any economic gain in cooking the sweet potato.

Part II—GRAZING

All the work described in Part I of this article was done in an intensive unit, with pigs housed on either concrete or deep litter floors, and the sweet potato fed by hand (*Plate* I). Grazing of pigs on sweet potato was investigated as an alternative to intensive housing.

Part I described work done to establish the fact that some kind of protein supplement is needed for pigs which are being fed largely on sweet potato. In Part II, the first three experiments describe the use of different kinds of protein supplement, with the pigs in each getting the sweet potato by grazing. In the



(Photo: D.I.E.S.)

Plate I.—Pigs being fed sweet potatoes under intensive management. Supplementary feeding is provided in the triangular boxes in the foreground

third and fourth experiments, the same supplement was used, but in the last case, a system of rotational grazing was tried.

Grazing with Various Supplements

In the first experiment the pigs grazed on sweet potatoes and in addition they were fed supplements of:

1. Salt: mineral block.
2. ½ lb margarine per pig per day.
3. 1.2 lb meatmeal (50 per cent protein) per pig per day.
4. No supplementation.

Only the meatmeal group gained weight at an average daily gain of 0.76 lb while the other three groups all lost weight.

Grazing with Reduced Concentrate Supplement

The second experiment involved five groups of pigs. All pigs grazed sweet potatoes, but three of the five groups had additional high protein food. These were:

Group 1. 0.68 lb of protein concentrate (55 per cent protein) per pig per day.

Group 2. No additional food

Group 3. 0.46 lb of whole peanut kernels per pig per day.

Group 4. No additional food.

Group 5. 0.9 lb concentrate per pig per day.

Results. As expected, the pigs in Groups 2 and 4 did not increase in weight at all; in some cases they lost weight. Group 1 pigs gained weight at the rate of 0.57 lb per day, Group 3 at 0.3 lb per day, and Group 5 at 0.82 lb per day.

Grazing with Full Concentrate Supplement

In the third of this series of experiments, one group of pigs grazed sweet potatoes with no supplementation, while a second group was fed 1 lb concentrate per pig per day. Once again, the groups grazing the sweet potatoes without any supplementation lost weight, while the second group had an average daily weight gain of 0.9 lb.

As a continuation of these experiments, it was decided to conduct a similar trial at a different location using 1 lb concentrate per pig per day as supplement.

Rotational Grazing with Full Concentrate Supplement

This experiment was conducted at Banz with three consecutive groups of pigs grazing one area of sweet potato. The area was of one acre subdivided into ten equal paddocks, which were planted at one month intervals. The pigs were allowed to stay on one of these paddocks until it was grazed out, and then moved on to the next paddock. After moving, the paddock was immediately replanted. The pigs were provided with adequate shelter in which they were fed the supplement. The acre was stocked with five growers. The first group achieved an average daily liveweight gain of 1.2 lb, the second group 1.4 lb, and the third group 1.1 lb. These results were very satisfying in that the managerial skill and effort is lower in this type of enterprise than in an intensive unit. There was no appreciable drop in yield of sweet potato over the three crops.

SUMMARY AND RECOMMENDATIONS

It is quite apparent that sweet potatoes have a definite value as a pig feed, but they must be supplemented with some form of protein. Both peanuts and soyabeans must be cooked before feeding. Pig concentrate is a satisfactory supplement and should be fed either at 1 lb per pig per day, or in the ratio of 1 lb of concentrate to 10 lb of sweet potato. Cooking the sweet potato gives increased average daily liveweight gains as well as increased consumption, but against this must be considered the cost of the actual cooking.

As a result of this research work, the following recommendations have been made:

1. Soyabeans and peanuts must be cooked before feeding to pigs.
2. Salt should be fed with soyabeans.
3. Sweet potato is not a suitable food on its own.
4. Cooking sweet potatoes increases the daily liveweight gain and food consumption when compared with raw sweet potatoes.
5. Protein concentrate should be fed at the rate of 1 lb per pig per day for maximum results.
6. The mixing of 1 lb of concentrate with 10 lb cooked sweet potatoes gives slightly better results than feeding cooked sweet potatoes under the Lehmann system.
7. Grazing sweet potatoes is a satisfactory method of feeding.
8. Pigs grazing sweet potatoes require protein supplement of 1 lb concentrate per pig per day.