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POTENTIAL OF ANIMAL FEED PRODUCTION IN WESTERN SAMOA

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1. INTRODUCTION

One of the limiting factors in the efficient development of commercial livestock production in Western Samoa is the irregular supply, poor quality and high price of concentrated feeds from overseas.

At present, there are two possibilities open to the local farmer for feeding his animals:

(a) Use of available local feed materials such as taro, bananas, and coconut combined with simple grazing or rooting of animals around the houses.

(b) The importation of balanced livestock rations from overseas.

Prices for pig and poultry products are relatively attractive on the local market and there are some farmers, mainly egg producers, who import rations to feed their animals.

Traditional methods of feeding animals in the future development of commercial livestock production in Western Samoa are likely to prove impractical and uneconomic as a result of increasing demand and lack of supply.

The future development of intensive livestock production in Western Samoa would benefit from the introduction of simple, fully balanced feed at reasonable cost from local sources. This should help make production financially more attractive to the producer and at the same time reduce inflationary price rises for the produce.

II. DEVELOPMENT OF LOCAL RAW MATERIALS

With an increasing population and a rise in general living standards there is greater demand for protein food. Increased demand has, up to the present time, generally been satisfied by larger imports of meat and other livestock products the increasing cost of which contributes to a trade imbalance.

The Department of Agriculture, Forests and Fisheries has prepared plans to improve future livestock production and the development of animal feed from local materials is one of the most important measures being considered.

The grain component used in commercial feeds is not locally available and possible alternatives were investigated. Cassava was considered to be the most promising because

(a) It grows relatively well under local conditions throughout the year and appears to have high productivity.
(b) It can be grown by simple methods with a small labor input.
(c) The whole plant can be fully utilized.
(d) It can be simply processed into suitable high energy feeding constituent.
(e) It is not normally included in the Samoan diet, the staple items of which are banana and taro. Most of the cassava produced could be directed into animal rations, although a proportion might be directed into the bakery and confectionary trade because of the high price of imported flour.

There are also disadvantages in the production of cassava, such as a certain risk of toxicity due to the Hydrocyanic acid (HCN) content, short storage life of the harvested roots, and the risk of spoilage by rodents. Despite these disadvantages cassava appears to have a potential not shared by other plants of the region.

III. AGRONOMY

Cassava is not systematically cultivated in Western Samoa at present although several cultivars exist which are frequently to be found growing in small patches close to dwellings. The actual origin and approximate date of introduction of this crop into the country is uncertain.

Planting material from the various local cultivars has been collected and forms the basis of the cassava research programme being conducted at South Pacific Regional College of Tropical Agriculture (SPRCTA), Alafua. High yielding cultivars suitable for local soil and climatic

conditions are being sought through Centro International de Agriculture Tropical (CIAT), Colombia, subject to satisfactory quarantine procedures.

Clearly some basic agronomic information is essential before production on large scale can be developed. The research programme is seeking to provide information on such topics as:

(a) The most suitable cultivars from the point of view of resistance to pests and diseases, yield of tubers and tops/acre, rate of bulking, HCN levels, etc.
(b) Suitable plant populations and system of culture.
(c) Nutrition and rotational aspects.
(d) Cost of production.

Early indications from the SPRCTA research suggest that cassava production has considerable potential. Local selections have produced yields of about 15 tons/acre (Equivalent to 5.25 tons DM/acre) at six months when grown on the ridge at $2\frac{1}{2}' \times 3'$ spacing in the absence of fertilizer. In addition cassava requires little maintenance after planting. With abundant, well-distributed rainfall and reasonably constant temperature throughout the year, yield in excess of 20 tons/acre in a nine-month period might reasonably be expected. Western Samoa is largely free of cassava pests and diseases, particularly virus diseases, which are major limiting factors in production in many areas of the world.

It is likely that people would be encouraged to grow cassava once a market had been established. Active participation of the extension service will be necessary to promote cassava production as it represents a departure from normal traditional cropping habits.

IV. PROCESSING

Cassava tubers were washed and cut into thin slices (2 mm.) and soaked for two days in 1000 ppm SO_2. The water was decanted off and the slices were sun dried, followed by hot air drying at 64°C for one day before grinding.

The process of soaking in sulphur dioxide solution would be expected to increase the storage and palatibility of the meal by:

(a) Acting as preservative, i.e. preventing the formation of aflotoxins caused by moulds during drying and subsequent storage of the meals;
(b) Liberating the HCN in tubers which would then be removed with the water;
(c) Causing partial hydrolysis of the starch rendering it more digestible;

* (d) Inducing further detoxification of the HCN by reaction with SO_2 to yield amino methionic acid which could possibly be converted to methionine in the intestines.

Other ingredients were:

(a) Cassava leaves which were sun dried and finely ground;
(b) Copra meal (a by-product from the local soap factory);
(c) Fish meal: the only imported ingredient (from nearby American Samoa).

The approximate composition of ingredients available and the formulation of swine feed are shown in Tables N° 1 and 2.

The approximate cost of production and processing is shown in Table 3.

The crude fibre content of the meal was higher in mature than immature tubers. However, it was always relatively high compared with commercial feed and it is interesting to note that it produced no apparent side-effects in the feeding trial.

Table 1 AVERAGE COMPOSITION OF INGREDIENTS

Ingredient	Crude Protein %	Calcium	Phosphorus
Cassava meal	1.40	0.05	0.05
Cassava leaves**	30.34	1.00	0.40
Copra meal	20.00	0.05	0.14
Tuna meal	55.00	5.00	3.00

**Varied between old and flush growth.

Table 2 COMPOSITION OF CASSAVA-BASED PIG FEED

Ingredient	%	Crude Protein	Ca	P	NaCl
Cassava meal	45.0	0.6	0.05	0.05	
Cassava leaves	17.0	5.1	0.22	0.09	
Copra meal	30.0	6.0	0.05	0.14	
Tuna meal	7.5	4.1	0.40	0.23	
Salt (mineralized)	0.5				0.50
Total	100.0	15.8	0.72	0.51	0.50

* Previous workers have reported that the added methionine improves the performance of animals fed on high cassava diets. More work is necessary in this area.

Table 3 APPROXIMATE COSTS OF PRODUCTION AND PROCESSING

Raw material	Cost (WS s/kg)* Ingredient	Proportional cost Compound feed (WS s/kg)	Cost imported feed (WS s/kg)
Cassava meal	2.00	0.900	
Cassava leaves	1.00	0.175	
Copra meal	1.25	0.375	
Tuna meal	6.90	0.700	
Salt (mineralized)	2.50	0.125	
Total		2.375	13.00

* 1WS s (sene) = US$0.0166 (approx.) = A$0.0112 (approx.)

V. FEEDING TRIAL IN PIGS

A comparative feeding trial was arranged to compare the cassava-based ration with commercial feed.

A total of six Large White weaners were selected out of a single litter of 12 piglets.

The six weaners were of equal weights and were kept on the standard commercial feed formula until they were about 35 lbs. average liveweight.

Two groups of three pigs each, two males (barrow) and one female (gilt) were separated. Both groups were housed in a good standard concrete house in two separate neighbouring pens with the same environment. Both groups were fed twice daily at the same time as other pigs in the house. One group was given the experimental feed; the second was fed imported commercial feed.

Comparative analysis of feed formulae used for feeding is shown in Table 4.

Weight gains and feed consumption of pigs are shown in Table 5.

The largest pigs from each group were slaughtered for comparison and the two remaining pigs (barrow and gilt) of each group were kept for further observations on the commercial feed.

Details of the slaughtered pigs are shown in Table 6.

The following observations were made during the feeding trial:

1. Pigs fed with cassava-based, trial feed

   (a) The quantity of daily feed was consumed faster than by the control group. This indicates good palatibility of feed, despite the fact that the trial feed was prepared in the form of a fine meal and the control feed was pelleted.
   (b) The pigs were quiet, satisfied and undisturbed between feeding times.
   (c) The pigs were visibly well-filled out and gained weight better after the first week of the trial.
   (d) They did not show any side effects from the feeding.
   (e) They had soft, dark faeces of good consistency and easy, regular defecation.
   (f) The gilt on trial entered the first heat period at six months of age while gilt on control feed did not show any signs of heat during the trial period.

2. Pigs fed on the imported feed

   (a) This group did not finish the feed in a short time, causing some degree of feed spoilage.
   (b) The pigs developed a degree of constipation which varied in intensity throughout the trial period.
   (c) They were not so quiet and restful as the cassava fed pigs.
   (d) They had emptier abdomens.
   (e) They showed a lower feed intake in a later stage of development, which caused an intake reduction of 1lb/day for 29 days.

3. Pigs slaughtered from both groups

   (a) The carcass of the pig fed with experimental feed had a better, more natural-colour meat than the control pig. The consistency of the meat was better, the muscles more developed and juicy. The meat from the control pig was comparatively soft and gelatinous.
   (b) Unlabelled samples of roasted meat were given to a testing panel. The results suggested that the meat from the cassava-fed pig was as good as, or even superior, to meat from the control.

Table 4 AVERAGE FEED ANALYSIS

Feed Sample	Dry Matter	Nitrogen	Cr. Prot.	Cr. Fat	Cr. Fibre
Cassava Meal	95	2.47	15.[illegible]	4.23	[illegible].73
Control Meal	95	[illegible].4	16.[illegible]5	[illegible].75	[illegible].[illegible]2

Analysed by: SPRCTA, Alafua Research Laboratory.

Table 5 PIG FEEDING TRIAL - LIVEWEIGHT GAINS (LBS)

Pig Number	Sex	Initial w.	Final w.	Weight gain	Feed Consum.
Trial Group:					
1.	F	38.[illegible]	183.[illegible]	145.0	
2.	M	36.0	190.0	154.0	
3.	M	35.0	207.0	172.0	
Average 1-3		36.3	193.3	157.3	445
Control Group:					
4.	M	35.0	178.0	143.0	
5.	M	37.0	181.0	144.0	
6.	F	38.0	139.0	101.0	
Average 4-6		36.[illegible]	166.0	129.3	436

Table 6 COMPARATIVE EVALUATION OF SLAUGHTERED PIGS (LBS)

		Trial feed	Control feed
Initial liveweight		35	37
Final liveweight		207	191
Total gain in 91 days		172	144
Feed consumption		445	436
Feed conversion ratio	- liveweight	1:2.58	1:3.03
	- carcass	1:2.94	1:3.[illegible]
Average daily gain	- liveweight	1.8	1.57
	- carcass	1.65	1.37
Average daily feed consumption		4.8	4.7
Carcass weight (hot-dressed)		151	126
Back fat thickness (12 rib reg.)		6 cm	5 cm
Muscle thickness (12 rib reg.)		5.5 x 7 cm	5 x 6 cm

VI. DISCUSSION

The purpose of this project was to find whether feed produced from a cassava component can be of equal quality to feed imported into Western Samoa.

The results suggest the advantage of using freshly prepared feed including a proportion of dried green leaves. (These contain a high protein and vitamin content concentrated by a drying process and a wide range of amino-acids).

The compounded feed appears to be beneficial to the pigs and has good palatibility. Simple hydrolysis of the starch component by soaking cassava tubers for two days in SO_2 solution may have improved the utilization of the feed.

The preliminary results described in this article are encouraging and demonstrate the need for research and development work which will enable industrial production to be placed on a sound scientific basis. They indicate a considerable potential for feed production from local raw materials using simple agronomic and processing methods.

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