FRESH CASSAVA AS A FEED FOR FATTENING PIGS

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Summary

An experiment was conducted to investigate the effects of feeding fresh cassava roots on the performance and carcass quality of pigs raised from 15 ± 1 kg to 85 kg live weight. Fresh unpeeled cassava roots were chopped into chips and offered separately along with a protein concentrate made up of copra cake and meat and bone meal, and a local mineral-vitamin premix. Commercial pig grower and finisher diets served as control. A total of 24 pigs were used in an incomplete randomised split-plot design experiment. Pigs fed fresh cassava-based diet grew as fast, 0.78 vs 0.77 kg/day, and were as efficient, 3.74 vs 3.77 in converting feed into body weight gain as those fed the commercial control diet. Similarly, there were no differences in carcass quality measured in terms of dressing percentage, 77 vs 77; backfat thickness, 2.76 vs 2.78 cm; loin eye muscle area, 29.2 vs 29.1 cm^2 and in the relative proportions of the different carcass cuts between the two dietary treatments. The use of fresh cassava along with the protein and the local mineral-vitamin premix however, resulted in lowered total feed cost and cost per unit of live weight gain. It is concluded that fresh cassava roots can be fed along with copra cake, meat and bone meal protein concentrate and a local mineral-vitamin premix to fattening pigs with no adverse affects on performance and carcass quality.
(**Key Words**: Fresh Cassava, Fattening Pigs, Performance)

Introduction

Pigs require large quantities of energy and moderate quantities of protein for growth and development. In the leading pig producing areas of the world, large quantities of grains available at reasonable price provide this energy source needs. In other countries, such as those in the South Pacific region, production of cereal grains is insufficient to meet the livestock feed demands (Ainuu, 1985; Fernando and Tofinga, 1985). Many of the countries in the region such as Tonga, Fiji, Vanuatu, Solomon Islands, Western Samoa and Papua New Guinea, however, have the potential or are already producing fairly large quantities of other feed sources that, if properly processed and supplemented could support a large and efficient commercial as well as traditional pig industry. One such feed source with a great unrealised potential is cassava, *Manihoit esculenta*.

Cassava is typically a high energy, low protein, mineral-vitamin feed (Agudu and thomas, 1982). The successful utilization of cassava in livestock feeds therefore depends on how effectively these nutrient deficiencies can be overcome by using cheap and abundant good quality protein and mineral vitamin sources. Copra cake (CC) is an abundant and cheap protein feed for use in livestock feeding in the South Pacific region. However, although cheap, the protein quality of the cake is relatively low on account of its low digestibility and low lysine content (Pond and Maner, 1974). Meat and bone meal (MBM), which is cheaply produced in the South Pacific region, is a good quality protein feed which can help correct the poor amino acid balance in copra cake (Ochetim, 1986). In addition, recently a new locally produced mineral-vitamin premix, was developed for use in livestock feed (Ochetim, 1987a,b). It is a very cheap premix that is made using locally available ingredients on the farm.

In light of the high feed import dependency nature of commercial pig farming in the region, this experiment was designed to test the effects of feeding fresh, chopped cassava roots along with a protein concentrate made up of copra cake and meat and bone meal, and the locally produced mineral-vitamin premix on the performance and carcass quality of fattening pigs raised from

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approximately 15 kg up to 85 kg live weight. Commercial grower and finisher pig feeds produced by Samoa feeds Limited, served as control diets.

Materials and Methods

Diets

Cassava used in this trial was purchased from a local farm in Apia, Western Samoa. The fresh, unpeeled roots were chopped into chips using a bush knife and then offered to experimental pigs. Meat and bone meal, copra cake and the commercial Pig Grower and Finishing diets were bought from the Samoa Feeds Limited. The locally produced mineral-vitamin premix was made using soil, ash from coconut husks and leaves of cassava on the basis of the recently developed formulations (Ochetim, 1987a,b). The composition of the locally made mineral-vitamin premix is shown in table 1. This premix was included at approximately 2 percent level in the test diets in order to satisfy requirements of pigs (ARC, 1967).

TABLE 1. CHEMICAL COMPOSITION OF LOCAL MINERAL-VITAMIN PREMIX USED

Mineral elements	Amount or percent per kg of premix	Vitamins	Amount or percent per kg of premix
Calcium (%)	40	Vitamin A (IU)	150,000
Phosphorus (total, %)	30	Vitamin D (IU)	12,000
Sodium (%)	5	Vitamin E (IU)	800
Chlorine (%)	4	Vitamin K (menadione) (mg)	30
Magnesium (%)	2	Biotin (mg)	3
Potassium (%)	1.3	Choline (mg)	30
Iron (mg)	5	Folacin (mg)	20
Zinc (mg)	5	Niacin (mg)	1.5
Copper (mg)	300	Pantothenic acid (mg)	700
Manganese (mg)	200	Riboflavin (mg)	200
Selenium (mg)	15	Thiamin (mg)	60
Iodine (mg)	6	Vitamin B_6 (mg)	90
		Vitamin B_{12} (mg)	1

Two sets of test diets were formulated. During the growing phase from 15 to 55 kg live weight, fresh chopped cassava was offered at the rate of 2 kg per animal per day. The protein, mineral and vitamin supplement was made up of meat and bone meal, copra cake and the locally produced premix at a ratio of 2 : 7 : 1 by weight, respectively. During the finishing stage, cassava was offered at 3 kg per animal per day, and the concentrate supplement again was made up of meat and bone meal, copra cake and locally produced premix but in the ratios of 1 : 8 : 1 parts by weight, respectively. In both phases, the protein-mineral-vitamin supplementary feed was offered *ad libitum* in a separate feed through containing fresh, chopped cassava. Respective commercial grower and finisher pig feeds were served as controls to the test diets during growing and finishing phases investigated. These commercial feeds were based largely on imported maize, wheat, fish meal and commercial mineral-vitamin premix. However, due to the commercial nature of these feeds, data could not be obtained on the composition of the ingredients comprising the feeds. Water was available *ad libitum* at all times.

Animals and Management

Twenty four weaning pigs of average initial weight of 15 ± 1 kg were used. The animals comprised of eighteen female Landrace × Large White pigs and six males of Duroc breed, from three litters that had been weaned at seven weeks of age. They were randomly divided into six groups. Each group consisted of four animals each, made up of three females and one male

in such a way that the effects of litter outcome groups and sex were balanced. Three such groups were randomly allocated to the cassava-based growers diet and the other three to the commercial grower diet. Animals in each pen were fed as a group. The grower feed was offered up to 55 kg live weight and thereafter the animals were fed finisher feed. Body weight changes were monitored on a weekly basis. Upon attaining 85 kg live weight, two animals, comprising of the only male and one female randomly selected from each dietary treatment pen were starved for 18 hours but with access to drinking water and then slaughtered for the determinations of carcass yield, backfat thickness, loin eye muscle area and relative proportions of hams, loin, spare ribs and side pork, picnic shoulder and Boston shoulder cuts (Ochetim and Nicholson, 1977).

Analysis

Analysis for proximate components of fresh cassava, copra cake, meat and bone meat and Western Samoa commercial pig feeds followed the methods of AOAC (1975). Gross energy values were determined using Adiabatic Oxygen Parr bomb calorimeter. All samples were analysed in triplicates. Data on growth rate, feed intake, feed efficiency and carcass quality were subjected to Paired Student 't' test with significant differences reported between the two diet groups at the five percent level (Steel and Torie, 1980).

Results and Discussion

Data on chemical analysis of cassava, copra cake, meat and bone meal and the Western Samoa commercial pig feeds are presented in table 2. The values obtained on cassava, copra cake and meat and bone meal are consistent with those reported elsewhere in the literature (Pond and Maner, 1974; Agudu and Thomas, 1982; Ochetim, 1986). The commercial Western Samoa grower and finisher feeds contained acceptable levels of nutrients (ARC, 1967).

TABLE 2. CHEMICAL ANALYSES OF FEED INGREDIENTS AND COMMERCIAL FEEDS

	Nutrient level							
	DM	CP	EE	Ash	NFE	Ca	P	GE
	.....	.....	.....	(%)	.....	.....	.....	(MJ/kg)
Cassava, fresh	35.0	0.8	0.2	1.3	32.7	0.02	0.03	5.0
Coconut meal	90.1	20.4	7.2	7.0	55.5	0.2	0.6	12.5
Meat and bone meal	89.9	50.2	7.5	23.5	8.7	9.1	4.3	12.1
Commercial grower feed	90.0	16.1	4.5	8.5	60.9	0.8	0.6	14.8
Commercial finisher feed	90.0	14.2	4.3	8.0	63.5	0.6	0.5	14.5

All animals were healthy throughout the experimental period. Pigs fed fresh cassava feed supplemented with protein and the locally produced mineral-vitamin premix grew as fast as those fed the commercial feeds during both growing and finishing phases (table 3). There were no differences in feed intake, expressed on a 90 percent dry matter basis, and in feed conversion ratios between the two dietary groups. Carcass characteristics as measured in terms of dressing percentage, backfat thickness, loin eye muscle area and the relative amounts of the major cuts were also similar between the two dietary groups. In order to make fair comparisons with intakes obtained on commercial feeds, data on cassava intake was converted to a 90 percent dry matter basis. Based on these calculations, the average daily feed intakes on cassava based feeds during the growing and finishing phases were 1.67 and 2.9 kg, respectively. Of the 1.67 kg of cassava based grower feed, 0.67 kg was cassava and 1.00 kg the protein supplement and the local mineral-vitamin premix. In the finisher phase, the 2.9 kg of daily feed was made up of 1.0 kg cassava and 1.9 kg of protein supplement and the local mineral-vitamin premix. Based on nutrient contents of these feed stuffs, it was calculated that the dietary protein and digestible energy contents of grower and finisher feeds were 16% and 15% CP, and 3,300 and 3,300 kcal/kg, res-

pectively. These calculated protein and energy values were close to the expected levels of dietary protein and energy in standard diets of growing and finishing pigs and lend further support to the general observation that pigs have the ability to balance their protein intake when offered a protein supplement free-choice but with a fixed intake level of energy source (ARC, 1967; NRC-NAS, 1973; Pond and Maner, 1974).

There were no cases of mineral-vitamin related disorders in the animals fed diets containing locally made mineral-vitamin premix. This observation indirectly further supports the effectiveness of the newly developed local mineral-vitamin premix as an effective source of minerals and vitamins for pigs (Ochetim, 1987b).

TABLE 3. PERFORMANCE AND CARCASS QUALITY OF EXPERIMENTAL PIGS

	Diet		
	Fresh cassava + supplement	Western samoa feed	SEM*
No. pigs	12	12	
Growing phase			
Av. initial wt. (kg)	15	15	
Final body weight (kg)	55	55	
No. days	67	67	2.07
Av. daily gain (kg)	0.61	0.60	0.71
Daily feed intake (kg)**	1.67	1.70	0.31
Feed conversion ratio**	2.77	2.83	0.21
Growing + finishing phases			
Final body weight (kg)	85	85	
Total number of days	90	93	2.37
Av. daily gain (kg)	0.78	0.77	0.13
Daily feed intake (kg)**	2.92	2.90	0.33
Feed conversion ratio**	3.74	3.77	0.21
Carcass weight (kg)	66.4	66.3	1.81
Dressing percentage (%)	78.1	78.0	2.12
Backfat thickness (cm)	2.63	2.65	0.32
Loin eye muscle area (cm^2)	30.2	30.0	0.01
Cuts as percentage of carcass weight (%)			
Ham	19.5	19.3	0.72
Loin	15.5	15.4	0.51
Spare ribs + side pork	15.7	15.6	0.49
Boston + picnic shoulder	16.8	16.7	0.48

* SEM: Standard error of treatment means.

** Values derived after conversion of cassava intake values on to a 90% dry matter basis.

Calculations were also made on feed costs and cost per unit of gain on the two diets (table 4). The results indicated that the feeding of cassava in combination with the protein supplement and the locally produced mineral-vitamin premix reduced feed costs and total cost of feeding pigs by approximately 35 percent when compared with the commercial Western Samoa feeds. These reductions in feed costs and costs of feeding pigs resulted in increased gross profit returns of nearly 72 percent over revenue obtained from using Western Samoa commercial pig feeds. As feed is reported to be most costly and limiting factor in commercial pig farming in the South Pacific (Ochetim, 1986), these findings should be of considerable interest to pig farmers in the

TABLE 4. FEED COSTS AND ECONOMIC PERFORMANCE OF EXPERIMENTAL PIGS (WST[1])

	Diet	
	Fresh cassava + supplement	Western Samoa commercial feed
Cost per kilogramme of grower feed	0.45	0.70
Cost per kilogramme of finisher feed	0.42	0.65
Total feed cost to slaughter	78.55	128.90
Gross revenue from carcass sale	199.20	198.90
Gross profit over feed cost	120.65	70.16

[1] WST: Western Samoa currency called Western Samoa Tala. At the time of the trial 1 WST was equivalent to US $ 0.41.

region. These findings offer opportunities for increasing pig farming using cheap and locally available feed resources in the region.

Conclusion

The results of this feeding trial indicate that fresh cassava when fed along with locally produced copra cake meat and bone meal and "SO" mineral-vitamin premix produces not only satisfactory performance in growing and finishing pigs, but also markedly lowers the cost of raising pigs to slaughter weight. The consequences of these effects should help encourage pig farming in the South Pacific region.

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