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Poultry Feeding Systems in Papua New Guinea (PNG)

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Executive Summary

The production of cheaper or more appropriate feeds for livestock was one of the main research opportunities identified by the PNG National Agriculture Research Institute (NARI) during the nation-wide prioritizing activity conducted during 2001. This ACIAR supported activity involved smallholders, researchers, extension staff and other stakeholders, including the private sector and NGOs. Reducing the cost of feeds was identified as the primary means of improving or maintaining profitability of smallholder broiler chicken production, particularly through greater use of locally available feed resources.

PNG smallholders who operate independently from the vertically-integrated commercial frozen carcass broiler industry produced about 6 million birds per year for sale in informal local markets. The sale of chickens was the major source of income from the livestock sector of traditional smallholder farming systems, with an estimated 50,000 families producing broilers. Smallholders purchase day-old chicks with high genetic merit from the commercial sector, usually in lots of 50, grow them out for 6-8 weeks using commercial feeds and some locally available feedstuffs, and sell them as live birds in local markets.

Profitability of raising broilers was primarily constrained by input costs. Commercial feed costs continue to rise as most dietary ingredients are imported. For birds grown to 2.5 kg in 49 days in 2001, commercial feed costs were 7-9 Kina for a selling price of 12-14 Kina. This margin continues to tighten, hence stimulating more interest in alternative cheaper feed sources that may lengthen the grow-out period by 7-10 days but increase the profit margin. Agro-industrial by-products such as copra meal and palm kernel meal were available at some locations and could be used more widely. The high cost of transport prohibits their use in small lots away from the source. Other feeds that are or could be available within the villages, such as root crops and forages, can be used as poultry feeds but farmers have limited or no information on how to formulate balanced rations from these feeds.

In Australia, the egg and broiler sectors are developing alternative less intensive systems of production. These include more fibrous diets to slow growth, and free-range systems to allow freedom of movement and reduce physiological stress on birds caused by rapid growth. Options include feeding protocols for free-range broilers and information for the intensive commercial industry on suitable higher fibre and lower energy diets that ameliorate the effects of conventional diets. The Australian component of the project concentrated on aspects of these alternative production systems that have some commonality with the smallholder systems under study in PNG.

In 2001 there was no national facility in PNG for the testing of locally available feedstuffs to determine their value as components of poultry rations. Establishment of such a facility was considered essential for the long-term viability of the smallholder production sector through the development of lower cost rations utilizing local products to replace high-cost imported components.

The research approaches were to:

- Establish a quality assured live bird feed testing facility to appropriate standards to enable PNG to assess locally available feeds for both broiler and layer chickens; profile, according to feeding value, including seasonal and varietal variation, availability and cost, a
- Selected range of feeds abundant in PNG but not well documented according to modern standards; conduct on-station feeding trials at both Labu (NARI) and South Australian Research and Development Institute (SARDI) with broiler chickens to determine production performance on rations derived from the tested and (as necessary) other feeds; and
- Field-test diets manufactured by Lae Feed Mills and demonstrate on-farm in a participatory manner the use of appropriate rations determined by the testing procedures and taking into account regional availability of feeds.

Objectives

Objective 1: To establish a quality-assured research facility in PNG to determine the quality of poultry feeds.

In 2002 senior livestock scientists from NARI visited the Pig and Poultry Production Institute (PPPI) in South Australia and worked in the poultry Apparent Metabolisable Energy (AME) unit. It was agreed that cage facilities being used at the PPPI for determining the AME of feed would also be suitable for use in PNG. PPPI researchers visited PNG and prepared plans with NARI researchers for the layout of the AME research unit in PNG. Cages and other equipment were made in Adelaide and shipped to Lae in 2003. During this period Dr Janet Pandi visited the PPPI and undertook training on setting up a feed trial, milling feed and faecal samples, measuring gross energy of feed and provided documentation on standard operating procedures.

Dr. Bill Winter, Program Manager, Livestock Production Systems, ACIAR officially opened the AME centre at Labu in PNG in April 2003 (see Figure 1). A shipping container for storing feed was sited next to the AME facility. For the first trial assistance was provided by PPPI staff and Lae Feed mills provided the feed ingredients for the test diets. Growth and feed conversion of birds was excellent and matched the growth of birds in AME facility at the PPPI.

Objective 2: To formulate and evaluate low-cost milled and home mix rations based on locally available feeds.

A variety of feed resources from PNG were tested using the AME feed evaluation unit at Labu. These included maize, wheat, sorghum, sweet potato, sago, cassava, banana and legume leaves from village crops. By-products tested were millrun, rice bran, palm kernel meal, copra meal, tuna offal meal and pyrethrum marc. Potential poultry ingredients with AME values ranging from 12-15 MegaJoules (MJ)/Kg Dry Matter (DM) were agro-industrial by-products such as copra meal (15.01 MJ/Kg) and pyrethrum marc (13.63 MJ/Kg), traditional staples such as cassava (15.87), sago (15.01) and sweet potato (15.39 MJ/Kg) and grains such as wheat (12.76). AME bioassays were conducted including high fibre materials such as palm kernel meal and copra meal at 30% inclusion. The AME values of palm kernel meal and copra meal respectively at 30% inclusion were 9.05 and 9.86 MJ/Kg. Growth of birds was measured for 7 days in the AME unit and fully evaluated over 6-8 weeks in the broiler grow-out facility. Birds (3 weeks of age) fed diets for 7 days in the AME unit with low inclusion rates of cassava, sweet potato, palm kernel meal and copra meal performed well. Copra meal-based diets were superior. Evaluation of local feed resources over the full growing period of broilers were also undertaken with diets containing maize, cassava, copra meal, fishmeal and leucaena leaf meal. These diets were compared with a commercial ration comprising mainly imported feeds. In some trials feed conversion was superior in the commercial ration. Palatability and excessive proportions of local ingredients (eg. copra meal) of the local diet may have contributed to poorer feed conversion. In other trails there was no difference between the commercial or the PNG feed-based diet. An alternative feeding strategy was developed. It involved the development of a high protein poultry concentrate containing fishmeal and copra meal. The concentrate was fed with up to 70% of high energy sources such maize, sweet potato or cassava. Research and village trials (see Figure 2.) were conducted to evaluate the concentrate feeding strategy. Meat birds fed commercial broiler feed outperformed those fed the concentrate diets but the net income from sale of live birds was only 5% lower for the concentrate sweet potato diet. However, the huge demand for live birds still made it profitable to use local feed resources mixed with a poultry concentrate, particularly in remote areas of PNG. The cost of preparing large tonnages of poultry concentrate needs to be determined to evaluate economic viability of this approach.

Objective 3: To establish a system for the exchange of information with smallholder farmers about low-cost rations for poultry production.

In 2003 a survey of 250 PNG smallholder farmers was conducted in the Morobe, Madang and Eastern Highlands Provinces. Information was obtained on chicken feeding practices, farmer's attitudes, constraints and their needs in raising meat chickens. Broiler chicken farming in these regions provides an additional source of income for families and is not done on a large scale. Most farmers started farming broilers on their own initiative. The husband and wife share the workload; men do most of the travelling and purchasing, while women do most of the selling. Feed and travel costs are a burden. Demand for live birds is high and there is a community agreement over prices. Farmers have similar problems; price of chickens and feed, no access to information and no help from the government system. Most farmers agreed that farming chickens was easy and little experience was required, but time consuming. Materials utilized for farming structures were made of readily available local products. Family members or students managed farms, performing the various husbandry chores required. Decisions about marketing of chickens were left to personnel in charge of the operations or the community. Respondents were observant in noticing signs of disease, however, disease treatment was lacking. Respondents welcomed the opportunity to have Extension Officers visit their facility to provide advice on poultry, sources of low-cost feed, disease control, business management, planning and financial opportunities. Alternative feed sources were being sought to replace the high price of commercial feeds.

In Australia:

Objective 4: To establish a free-range broiler production facility and evaluate local feeds.

In the Australian component of the study conducted at Roseworthy Campus a free-range broiler facility was established in 2003 (see Figure 3). Forage paddocks were planted with vetch, medic, wheat, oaten and barley hay. AME, proximate, mineral and crop contents analyses were determined to evaluate the role of these forage sources in poultry diets. Three free-range trials with meat birds were conducted during the project. The first two trials examined birds grazing on vetch, medic forage and wheat stubble. For the first grazing trial conducted during winter, birds grazing on medic and vetch forage had a body weight at 60 days of age of 3.78kg (control-intensive); 3.53kg (vetch forage) and 3.58kg (medic forage). Average pasture % in crop contents of free-range birds in paddocks ranged from 1.2%-13.8% with some individual birds having 50% of pasture crop content. During summer, the second trial was conducted with meat birds grazing on wheat stubble vs. a control group (no foraging, ad libitum feed). Control birds (3.46 kg) were significantly heavier at 54 days of age compared to free range birds (3.05 kg). Average pasture % in crop contents of free-range birds grazing stubble ranged from 1.2%-5.3%. The final grazing trial compared birds provided standard feed (fed *ad libitum*) diluted with 10% of vetch forage with birds provided 90% of their ration and given access to vetch pasture. Body weight of birds at 49 days allowed to graze was 2.77 kg compared to

2.98 kg for the birds provided 10% vetch forage in their feed. Body weight of the control group (fed *ad libitum*, no grazing) was 3.12 kg.

The ME of feed consumed by free-range birds was assessed by analysing crop contents. A chemical estimate of ME was 14.3 MJ/Kg for birds not supplemented vs. 15.5 MJ/kg for birds given supplementary feed. These values were considerably higher than the ME values of crop contents based on ingredients identified in the crop. Further studies were required to refine the measurement of ME based on crop contents.

Figure 1. Development of poultry research facility in PNG

Original shed cages

Shed selected for AME facility

Bill Winter opening facility

Guests at facility opening

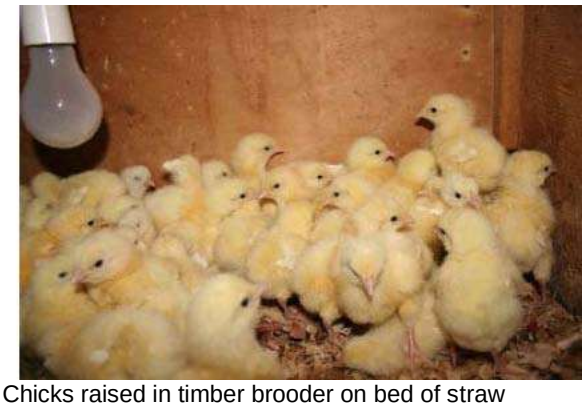
Staff tending to chickens

Staff weighing birds

Chicken in cages

Figure 2. Chicken enclosure design used during the trial.

Farmer showing chickens on wire bed.



Chicks raised in timber brooder on bed of straw

Farmer showing newly constructed bamboo shed

Purpose built chicken house

Brooder box lined with a wool blanket.

Typical chicken house design

Figure 3. Development of free-range chicken meat facility at Roseworthy

Roseworthy Site

Pad Preparation

Shelter Construction

Completed shelter with perimeter fencing

Pen Layout