LIVESTOCK RESEARCH AND DEVELOPMENT IN PAPUA NEW GUINEA

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ABSTRACT

The paper provides an overview of livestock research and development in Papua New Guinea together with some of the major constraints encountered. Strategies and opportunities for improving animal production in PNG are examined.

Key words: *Livestock research, Livestock development, constraints, strategies.*

INTRODUCTION

Traditional subsistence animal production in PNG is based on pigs and chicken. Pigs in particular have played an important role in the lives of people in nearly all of the 700 ethnic groups of PNG. There is no history of grazing animal management in PNG. The existing populations of cattle, sheep, goats and buffaloes were introduced into the country by Missionaries, Plantation Settlers and Colonial Administration as early as the 18th century mainly for the purposes of weed control under coconut plantations, draught power and self-sufficiency in fresh meat and milk supply.

Establishment of livestock industry in any country is a complex process. Adequate resources, appropriate technology, investments, proper planning, correct policies and above all participation of the beneficiaries (researchers, producers and consumers) and a realistic time frame are essential components of livestock development strategies. These are not easy to achieve. Early development strategies assumed that "technology transfer", not "research" was the key to progress. But it has been proved that, direct transfer of technologies from developed to developing countries like PNG has rarely been successful by any standard, technical or economical. The transfer of specialised animal production technologies from developed countries to PNG, occasionally had led to short term gains in animal production. However, the long term consequences have been a dependency on imported meat, feeds and superior animals to take advantage of the transferred system. Another negative side effect of imported technologies has been the serious neglect of indigenous breeds and local feed resources and frequently excessive high production cost.

In PNG it is not easy to introduce technological innovations in livestock production at village level. Without adequate knowledge of taboos, customs and the sociology of the village communities, the development agencies have little hope of establishing methods to improve traditional systems. Subsistence farmers must first ensure their families food supply. Only then can they think of improving their pastures and animal production throughout.

This paper presents the overview of livestock research and development in PNG and outlines some of the major limitations encountered, the current strategies and opportunities for improving animal production in PNG.

OVERVIEW OF LIVESTOCK RESEARCH AND DEVELOPMENT

During the colonial era much livestock research work was done to evaluate the adaptability and performance of imported livestock species (cattle, pigs, chicken, sheep, goats and buffaloes) under PNG climatic, nutritional and management conditions. Major emphasis was focused on reproduction and growth aspects of genotype X environment interactions of exotic breeds and their crosses with indigenous breeds and naturalised breeds of earlier importations. These researches were carried out on research stations. Very little was done on farms.

Research activities to provide the technical foundation for livestock development carried out in the

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Table 1. **Comparison among Javanese Zebu and Droughtmaster breeds of cattle for growth and reproductive performance under two environments.**

	Javanese Zebu		Droughtmaster		
	Erap	Urimo	Erap	Urimo	Source
Growth rate of calves (kg/d)	0.5	0.53	0.72	0.35	Holmes (1981)
	-	-	0.72	0.46	Schottler *et al.* (1977)
Calving interval (months)	11.9	12.8	13.8	21.5	Holmes (1981)
	-	-	13.8	18	Schottler *et al.* (1977)
Calf production per cow (kg/yr)	122	122	162	61	Holmes (1981)
	-	-	153	82	Schottler *et al.* (1977)

1970s were mainly based on research stations at Erap, Bubia, Aiyura and Menifo. Apart from formal research there has been much trial and error practical application of ideas for pasture improvement. Unfortunately much of both types of experimentation has been inadequately documented, and the results have not become availabe for general application. Therefore, many of these studies can be regarded as preliminary and not conclusive but do provide some basic guidelines for expansion and improvement.

Ruminants

Earlier studies on the reproductive and productive performance of different beef cattle breeds and their crosses at different locations and nutritional conditions in PNG suggest that performance of beef cattle is generally poor with low reproductive rates and low growth rates of weaners at both pre- and post-weaning (Holmes *et. al.* 1974; Schottler *et. al.* 1977). There were marked differences in the performances of different breeds at different locations which were attributed to by Genotype X Environment interactions.

For example, when the Javanese Zebu and Droughtmaster breeds were compared for growth and reproductive traits at Urimo and Erap, the Zebu performed better under Erap condition (Table 1). This was because the Zebu (*Bos indicus*) was adapted to survive, produce and to reproduce on very poor nutrition under very harsh environments where as the Droughtmaster is a cross between the tropical and temperate breed (*Bos taurus* and *Bos indicus*) (3/8 Shorthorn, 5/8 Brahman). Therefore, the Droughtmaster was able to perform better only on improved pastures (*Cenchrus ciliaris*) at Erap.

Herd fertility is reported to be low (<60%) in PNG. Environment, genotype and management factors combine to influence the reproduction performance of beef cattle in PNG. Rainfall pattern of a local environment is an important factor that influences the growth of pastures and nutrition of the animal. Some breeds of cattle such as Brahman are known to have longer lactational anoestrus period which affect their oestrous cycles between calving intervals.

For example, Brahman cross cows at Erap calved 56 days earlier when their calves were weaned at 4 months compared to those weaned at 7 months (Schottler and Williams 1975). Delaying the weaning age from 4 to 7 months did not affect the average pre-and post-weaning growth of calves (0.70 kg/d vs 0.63 kg/d and 0.28 kg/d vs 0.27 kg/d respectively), except that the 7 months old calves were heavier than 4 months old calves at weaning (196.8 kg vs 120.0 kg). However, the growth of early weaned calves at 4 months was dependent on season of birth and pasture quality. The most favourable period for calf growth was found to be between Janaury - March, which is the main wet season.

Pastures

Much of the pasture research work in the past has been to evaluate productivity and nutritional quality of pasture types in terms of animal performance at different sites in PNG. Most research activities were carried out at Erap and Urimo (now abandoned) and was aimed at developing a sustainable pasture system utilising native grassland mainly *Imperata cylindrica* either with or without the addition of improved species or replacing the native grassland with fully improved pasture species.

Tropical pastures (native or improved) are generally of very poor quality (Low N content, high fibre content and low digestibility), thus, limiting indigestible protein and energy. These pastures are renowned for fast growth and early maturity during wet season. During dry seasons they have low nutrient concentration and digestibility, thus limiting voluntary intake and low animal productivity.

These were evident from a series of studies conducted at Erap by Holmes *et al.* (1980). The dry matter yield increased with increasing age while the corresponding nitrogen content decreased. The interesting thing noted was that the nitrogen concentration dropped by 23% within the first 6 weeks. This indicates that *Imperata cylindrica* can not maintain its quality after 4 weeks of regrowth while at the same time cannot sustain higher stocking rate at low dry matter yield. The digestibility of *Imperata cylindrica* was also lower even at early stage of growth compared to other improved species. It was shown from the same series of experiments by Holmes *et al.* (1980) that animal productivity were lower at higher stocking rates on native pasture (*Imperata*) alone than *Imperata* + legume, improved pasture + N fertilizer or improved pasture + legume. Thus, it is evident that the natural grassland in PNG dominated by *Imperata cylindrica* cannot sustain pasture quality and animal production at higher stocking rates, unless these grasslands are incorporated with other improved grasses and legumes or some forms of supplementary feeding are used.

The quality of diets selected by cattle grazing natural grassland in PNG is dependent on the seasonal rainfall pattern. At least for Erap in the Markham Valley areas, it was demonstrated that the nitrogen concentration from diets selected by Brahman cross steers were higher following higher seasonal rainfall pattern. At least for Erap in the Markham Valley areas, it was demonstrated that the nitrogen concentration from diets selected by Brahman cross steers were higher following higher monthly rainfall (Galgal, unpublished).

SUPPLEMENTARY FEEDING

If increased productivity from ruminants is to be expected, supplements with some provision of high digestible nutrient content should be given. However, supplements of such value are scarce and often expensive. In PNG feed resources in the form forage shrub/tree legumes and agro-industrial by-products such as copra meal, molasses, oil palm kernel cake, millrun, pyrethrum marc and brewer's grain are available and under-utilised.

Supplementary feeding studies with agro-industrial by-product at Erap and elsewhere have shown some positive indications on growth performances. Gwaiseuk and Holmes (1985) have reported a growth of 0.6-1.0 kg/d when Brahman-cross steers were supplemented with millrun at 3.3 kg/d over a 4 month fattening period. Galgal *et al.* (1990) have reported that a growth rate of up to 0.93 kg/d of live weight can be achieved from Brahman-cross steers grazing native pastures under coconuts when supplemented with 30% level of estimated daily DM intake with copra expeller pellets (CEP). In the same experiment, steers grazing native (*Imperata cylindrica*) pastures on open grassland gained 0.64 kg/d and 0.55 kg/d when supplemented with and without CEP respectively. Supplementary feeding trials of cattle in Australia using copra meal (CM) and cotton seed meal (CSM) have shown that even though copra meal contains half the level of protein compared with CSM (21% Vs 40%). Copra meal gave a similar growth response to the same amount of CSM (Hennesy *et al.* 1989; Gulbransen *et al.* 1990). In the study by Hennessy *et al.* (1989) weaner steers on low quality pasture given 500g/d copra meal gained a similar amount of live weight to those fed 500g/d CSM. However, when 30g of urea was added to 500g of copra meal, the weight gain was similar to those fed 1000g/d copra meal in 42 days.

Since then very little co-ordinated research and development work on livestock has been carried out in PNG. Research was done in isolation while producers were asked to improve the productivity of their animals using their animal husbandry knowledge. This saw some achieving little through trial and error while others had management problem mainly through not understanding the animal re-

quirements for nutrition, and other environmental factors. This is true in the case of ruminant animals for which the ranch manager or smallholders lack understanding of the soil and climatic requirements of different pasture species and the safe and optimum stocking rates of different pasture types, resulting in inappropriate utilisation of the abundant forage resource.

Sheep and Goats

In the mid-seventies the PNG Government decided to develop a sheep industry in the Highlands region based on smallholders. New Zealand Government assistance was sought and as a result New Zealand dual purpose breeds of, the Corriedale and Perendale were imported into the Highlands of PNG. The objectives of the project were to:

- test the feasibility of establishing a sheep industry in PNG; and
- develop management and husbandry systems suitable for farming of sheep under PNG conditions.

Research was aimed towards the development of suitable pastures for sheep grazing. Up to this day the small ruminants (sheep and goats) are still encouraged by the government. The expansion of these two species is slow because of the management problems and low extension input.

The imported breeds did not adapt well to climatic and pastoral conditions, consequently, they suffered major health problems from internal parasites, footrot and foot abscess, fly strike, clostridial diseases (tetanus, botulism, enteroximia etc,) and mineral deficiencies.

Breeding results were poor, due to the imported sheep being slow to adapt to their new environment because of heat stress, health and nutritional problems, lack of stimulus to oestrus from minor changes to day length and possible mineral deficiency. Performance, through increased and better understanding of tropical sheep farm management, has improved, but imported sheep performance is still inferior to those bred in PNG.

Monogastrics

Earlier research on pigs and poultry was aimed at improving village and peri - urban pigs and poultry. Breed upgrading through cross-breeding with exotic breeds and feeding studies utilising locally available feed resources for efficient feed utilisation were the two main objectives.
Apparently, these programmes were terminated in the early 1980s because of (i) there was no contribution to the cash economy by village level piggeries and (ii) large commercial piggeries and poultry industries have taken over commercial feed formulation and importation of commercial bred strains of birds and pigs with higher feed conversion ratios.

CURRENT STRATEGIES AND FUTURE DIRECTIONS FOR RESEARCH AND DEVELOPMENT

The government's long term objective is to become self - sufficient in food production including livestock. In line with this broad objective the livestock sub - sector's short and medium term objectives should be to:

- increase reproductive efficiency
- develop a sustainable pastoral and animal production system
- genetic improvement of local breeds
- improve marketing infrastructure for local
- improve research, extension and technology transfer and
- increase self - sufficiency and import substitution.

To implement the above objectives, the research and development plans are set in the following priority areas:

- **Evaluation and utilisation of local feed resources for intensive livestock production**
- **Genetic improvement and diversification of indigenous livestock species and adapted breeds**
- **Permanent agriculture system**
- **Manpower development and institutional capacity building.**

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