

The Development of a Cattle Industry in the Territory of Papua and New Guinea

J. L. ANDERSON.

Chief of Division of Animal Industry, D.A.S.F., Port Moresby.

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Introduction.

IN common with Australia, the Territory of Papua and New Guinea had no indigenous cattle. The first importations of cattle were made prior to World War I, when the Territory of New Guinea was under German Administration. The early importations into German New Guinea were mostly of the Jersey and Guernsey breeds, and the influence of these breeds was seen in New Guinea cattle prior to World War II. (Hutchinson 1941.) Following the Australian mandate over this part of the Territory, several other breeds were imported including some with Zebu blood. In 1909 there were fewer than 1,000 cattle in New Guinea while in 1939 the figure was in excess of 21,000 (T.N.G. Admin. 1939).

Most of these cattle were associated with the coconut plantations around the coastline of the islands. They were used on the plantations to keep down the growth of grass and herbage under the coconut palms and were most effective in reducing the cost of this operation. They provided the plantations with a supply of fresh meat and a small number of the cows were milked. There was, in effect, no cattle industry prior to World War II. The raising of cattle was a subsidiary interest of copra producers. The majority of these animals were killed during World War II, although small numbers of them did survive hostilities.

In post-war times the cattle industry has developed along slightly different lines although the use of cattle as grass cutters in coconut plantations is important in some areas. Large areas of land have now been made available as pastoral leases and these have been taken up for the grazing of beef cattle. A census of cattle in the Territory of Papua and New Guinea taken at 30th June, 1960, showed the presence of 17,478 head.

The Administration of the Territory of Papua and New Guinea has an active policy of encouragement of a cattle industry. The ultimate aim is a cattle industry which will enable the Territory to be self-sufficient in beef and beef pro-

ducts. To this end the Administration provides free veterinary and advisory services, operates a freight subsidy scheme on the importation of approved breeding cattle and runs livestock stations where experiments in cattle breeding and management and pasture improvement are carried out.

The present land tenure system in the Territory of Papua and New Guinea will restrict a rapid expatriate development of a pastoral industry. All land in the Territory is native-owned until it is purchased by the Administration at which time it becomes Crown Land. This Crown Land is then leased by public application. Purchase of land depends upon the willingness of the present native owners to sell the land as well as their ability to sell based upon their estimated future needs. As a result, the large areas for pastoral pursuits can be obtained only in areas of low native population. Expansion of the pastoral industry in areas of high population density will depend on the development of a native cattle industry. At the present time in the Markham Valley, the area of the greatest potential, approximately 86,000 acres are under pastoral lease and approximately 20,000 acres are under mixed farming lease. These areas developed to the full would carry in excess of the present Territory cattle population.

Environment.

The Territory of Papua and New Guinea lies within the zones of super humid and humid tropics. The temperatures are moderately high and humidities very high. Climatic stress on domestic livestock is therefore considerable and tends to favour small breeds of animals and small individuals of other breeds. This poses a challenge to the development of high producing cattle.

There are two completely separate environments in Papua and New Guinea:—

(a) Lowland Environment.

It was in this environment that all pre-war cattle development took place. The environment is typical of the humid and super-humid

tropics. In many areas plantation and pastoral lands must be wrested from tropical rain forest but several large areas of natural grassland occur along the valleys of the larger rivers. It is in these large grassland valleys that present development is concentrated. Foremost among these valleys is the Markham-Ramu river system which cuts right across the island of New Guinea from the Huon Gulf (Lae) to the mouth of the Ramu and Sepik Rivers between Wewak and Madang.

In this lowland environment European breeds of cattle show poor productivity and although much can be done in the development of improved pastures providing a better nutritional level, the immediate answer seems to lie in the development of types of cattle which are fitted to economic performance in the environment.

Climatic details of Port Moresby are given in graphical form in Figure 1.

(b) Highland Environment.

Several upland valleys exist in the highland areas of the island. Chief among these are the Wahgi and Asaro systems where a large proportion (approximately 40 per cent.) of the native population of New Guinea is found. As a result of the high population density in these highland valleys there is little land available for pastoral development. Most of these valleys are between 4,000 and 6,000 feet above sea level and this altitude modifies the climate sufficiently to produce an environment to which European breeds of cattle are adapted.

A climograph of Goroka, the chief centre in the Asaro valley, is included in Figure 1 and coincides closely with climographs of a typical temperate climate, and also of tropical areas into which European breeds have been successfully introduced (Kenya Highlands and Ceylon Highlands).

It is in this highland environment, which is suited to European breeds of cattle, that the introduction of cattle to the native village economy has been attempted.

Pastures.

In both the lowland and highland pastoral areas the dominating natural pasture is one of Kangaroo grass (*Themeda* spp.) and Kunai (*Imperata* spp.). The vine type legumes *Centrosema*, *Pueraria*, *Calopogonium* and *Clitoria* were introduced as cover crops for plantation management and have become firmly established throughout the island. Where rain forest has

been cleared for plantations these legumes combine with *Paspalum conjugatum* to provide a nutritious pasture which forms a significant portion of the coastal pastoral land of the Territory.

The natural kangaroo grass and kunai pastures are not very productive and the introduction of better type grasses plays an important part in the development of the Territory cattle industry. This can be attributed to several factors among which are:—

1. The relative scarcity of alienated pastoral land encouraging lessees of the available land to develop the maximum carrying capacity of the areas leased.
2. The need for an intensive system of animal husbandry because of husbandry and disease problems peculiar to the Territory.
3. The need for most breeders of cattle to fatten their own bullocks.

The grasses which have shown most promise are Guinea grass (*Panicum maximum*), Elephant grass (*Pennisetum purpureum*), Buffel grass (*Cenchrus ciliaris*), Para grass (*Brachiaria mutica*) and Molasses grass (*Melinis minutiflora*). Of these Buffel and Molasses grasses provide little problem in establishment as viability of locally produced seed is high, however, the other grasses must be established by cuttings. The vine type legumes mentioned above are used in conjunction with these grasses and provide a good mixed pasture. Townsville lucerne (*Stylosanthes sunaica*) and Brazilian lucerne (*Stylosanthes gracilis*) have also proved of benefit in some areas. The leguminous tree *Leucaena glauca* is used extensively in coastal areas as a shade tree for plantation crops of cacao and coffee, and volunteer growth in pastoral areas is readily eaten by cattle. It has not been used to any degree on any of the pastoral leases.

Animals.

On animal health grounds the importation of cattle into the Territory of Papua and New Guinea is limited to animals originating from Australia. As a result, we are placed in the position of importing cattle bred in temperate and sub-tropical areas into a purely tropical country. Although Zebu and Zebu crossbred cattle are available in Australia, they are not available in any large numbers to develop rapidly the Territory industry.

Immediately post-war, cattle herds were built up by introduction of large numbers of breeders of the European breeds. These cattle, together

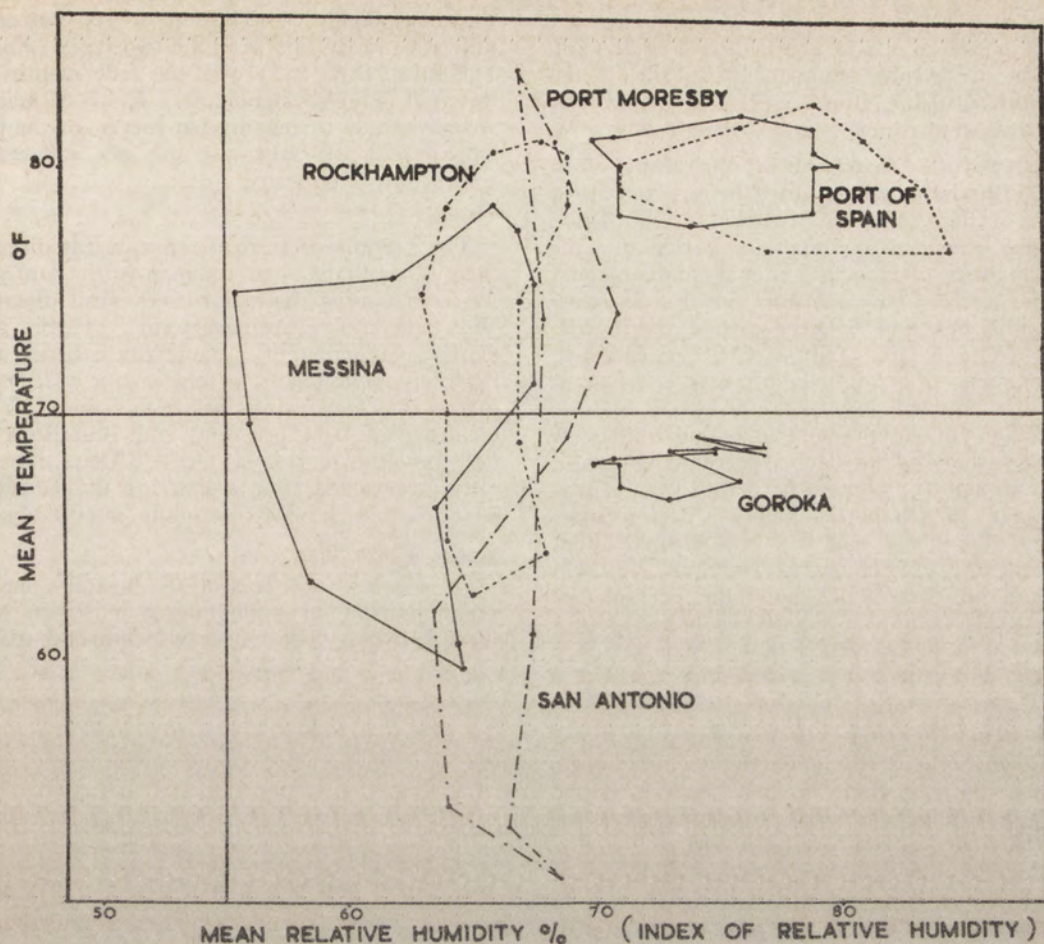


Figure 1.

with the more recent importations must form the basis of the development of types of cattle which produce well under Territory conditions. The tendency in later importations has been to purchase cattle from properties in the north of Australia especially where the animals are destined for properties in the lowland environment.

It has been found that the introduction of European breeds of cattle into the Territory is accompanied by a failure of adaptation to the new environment in a varying percentage of the animals imported. The percentage depends upon the type of environment into which the animals are taken and is lower in the highland environment than in the lowland environment. This can be shown particularly with dairy cows

imported from the one herd. Some cows after importation produced close to their Australian herd average while others produced considerably less. Visual estimations on beef breeders seem to indicate the same tendency. This type of phenomenon was shown by Payne & Hancock (1957) in the experiment with identical twin calves one of each pair being in Fiji and the other in New Zealand.

European breeds thrive quite well in the highland environment. The main breeds encountered are Shorthorn and Angus. These animals produce well, particularly where pasture improvement has been undertaken. Two trial shipments of steer beef air-freighted from the Department's Western Highlands Livestock Sta-

tion, Baiyer River, to Port Moresby, showed that Shorthorns would produce carcasses dressing out at an average of 610 lb. at 2-2½ years. Figures available from a private producer at Kokoda show similar carcass weights.

In 1954 the Department of Agriculture, Stock and Fisheries imported three heifers and three bulls of the American Brahman breed. These animals provided an important nucleus for the development of crossbred animals more adapted to the lowland environment. Small scale cross-breeding experiments were carried out in the Port Moresby area and in 1959 an intensive programme of cross-breeding was commenced on the Papuan Lowlands Livestock Station, Moitaka. In this programme Brahman blood is being introduced into an Aberdeen-Angus herd with an aim to produce a herd with varying percentages of Brahman blood. Performances within this mixed herd will be compared under the existing environment. The final aim will depend on observations upon the performance of animals within the varying percentage groups. Selection is to be carried out towards the type which shows optimum performance under the local environment. (Anderson 1961.)

A subsidiary programme of grading up to the Brahman breed is also under way to increase the number of high grade Brahman animals in the Territory. Bulls from this programme are available for sale to Territory cattle owners.

More recently other importations of Brahman and Brahman crossbred cattle have been made by private interests and the Department has introduced Afrikaner bulls obtained from C.S.I.R.O. National Cattle Breeding Station, "Belmont", via Rockhampton. The successful development of a cattle industry in the lowlands of Papua and New Guinea will depend largely on the use of these tropical breeds of cattle.

This may be illustrated by the results of a preliminary weight gain trial in progress on the Papuan Lowlands Livestock Station, Moitaka. Five Angus heifers and five F¹ Brahman-Angus heifers are the test animals. They were weaned onto the natural kangaroo grass pasture and have been maintained on this pasture throughout.

Average weights just after weaning (12 months) were for the Angus group 331 lb. and for the Brahman-Angus group 407 lb. At 21 months the weights were 466 lb. for the Angus group and 670 lb. for the Brahman-Angus group. A graph of the weights against age is

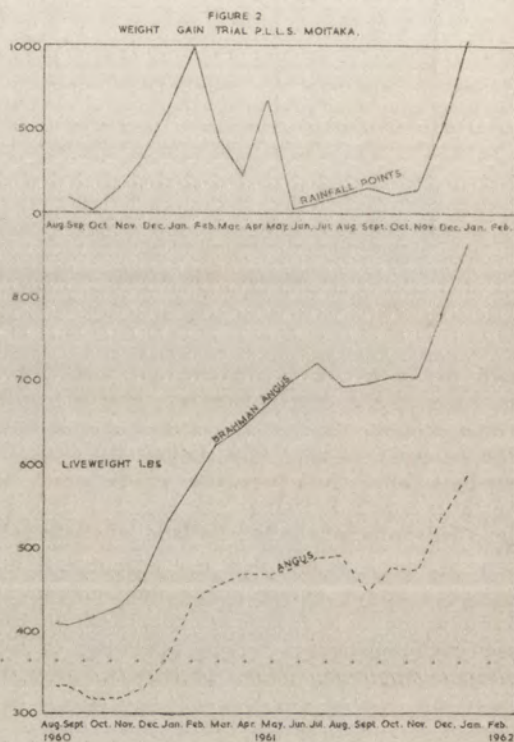
shown at Figure 2. The almost 100 per cent. difference in gain between the two types (Angus 135 lb. to B.A. 263) over the nine months of this trial is highly significant. The B.A. heifers are now ready for mating but the Angus heifers although of the same age are not sufficiently well grown to be mated.

Disease.

The Territory is freer of serious cattle diseases than is Australia. In common with Australia we have none of the major exotic virus diseases. We have no pleuropneumonia. Cattle tick exists as a legacy of pre-war cattle herds and has been eradicated from some major cattle raising areas. Tuberculosis has been reduced to an incidence of 0.44 per cent. and Brucellosis to 0.95 per cent. of animals tested. These diseases can be prevented from re-entering the Territory by quarantine service controlling importations.

Screw Worm Fly.

One disease not present in Australia has a major bearing on cattle raising in Papua and New Guinea. This is screw worm fly strike.



This graph shows progress in the trial 8 months beyond the stage mentioned in the text.

The fly incriminated in this disease is *Chrysomya bezziana* the common old world screw worm fly. This fly is a common species widespread in Africa and the Orient. In the South-East Asian area it occurs in India, Ceylon, Indo-China, Malaya and eastwards to the Philippines and New Britain. It does not appear to be known from Australia or the South Pacific area east of New Britain (Crosskey 1961 in litt.).

The fly is present throughout the Territory of Papua and New Guinea with the exception of the Islands of Bougainville and Buka. It is not a severe problem at altitudes of 5,000 feet above sea level. Its presence necessitates regular (4-6 weeks) prophylactic insecticidal treatment of all animals and the inspection of the animals at least every two days. Routine procedures such as branding and castration must be carried out at times when the incidence of fly is low or has been reduced by spraying at more frequent intervals. The treated animals must be kept under close supervision until the wounds have healed to the stage where they are no longer attractive to the fly. It is important also that each new born calf be treated to prevent navel strike. If calving proceeds during the wet season, the period of highest fly activity, it is not unusual to have 100 per cent. of new born calves struck by the fly within 24 hours of birth.

From this short explanation of the effects of the screw worm fly it is evident that cattle raising must be carried out on a more intensive scale than is usual in much of Australia. This fact was mentioned earlier in discussing the reasons for an emphasis on pasture improvement in the Territory. If cattle are not constantly inspected then losses will occur from screw fly strike. Figures available from one property where an extensive method of husbandry is practised show that an average of 13 per cent. of the cattle are permanently under treatment for screw fly strike, while on properties where cattle are more intensively and carefully managed, less than 0.5 per cent. are permanently under treatment.

It is because of screw worm fly that polled breeds of cattle are recommended for the Territory. The characters of the skin of Brahman and Brahman crossbred cattle and their great skin mobility may also have a bearing on the susceptibility to fly strike. It is unusual to find these animals struck while European breeds running under the same conditions may suffer severely.

Thus, screw worm fly strike is the disease which has the greatest single bearing on the establishment of a Territory cattle industry. It increases basic establishment costs because of the greater sub-division necessary for adequate control of the cattle. It greatly increases running costs because of the constant inspection, prophylactic spraying, and treatment of any affected animals.

Cattle Tick.

The cattle tick (*Boophilus microplus*) was introduced into the Territory with pre-war importations of cattle. With the low cattle population early post-war, a programme of progressive eradication was laid down.

Eradication has been successful in two areas :—

1. *Eastern, Western and Southern Highlands, Territory of New Guinea.*

This is an area which can be completely isolated. There is only one road entry, all other movement being by aircraft. Spraying treatments were completed in 1955 and the areas have remained clean since. One reinfestation occurred on two herds in the area from introduced cattle even though these cattle had been subjected to three spraying treatments, the last two of which were reported to be clean. The reinfestation was immediately treated and no further outbreaks have occurred.

2. *Sogeri Subdistrict of Central District, Papua.*

This again is an isolated highland area with only one road access. The area has remained clean despite constant cattle movements in and out since 1954.

Eradication has been undertaken in four other areas :—

1. *Morobe District.*

This area was cleansed in 1956 and remained clean until 1958 when an outbreak occurred on three properties. Retreatment was introduced on these properties and they have now been clean for over twelve months. I might venture to suggest that the programme appears to have been successful in this District.

2. *Rabaul Area.*

Eradication spraying treatments were completed in 1955. Reinfestation occurred on one property in mid-1956 and again on a second property in late 1956 to which

animals from the first reinfected property had been moved in order to attempt eradication by destocking.

These sprayings were completed in mid-1958 and eradication appeared to be successful until an outbreak occurred in 1961 on two adjoining properties. These properties are being retreated. The focus of infection may possibly be the presence of feral cattle and water buffalo in reasonably close proximity to the cattle areas and the passage of deer from this focus to the cleansed areas. One anomaly in this supposition is that the cleansed cattle closest to the focus have remained clear whilst reinfestations have occurred in cattle much further from the possible source of infection.

3. Port Moresby Subdistrict of Central District.

Eradication was attempted but reinfestation occurred on all properties involved. The causes for the complete failure are three-fold:—

- (a) Incomplete musters were obtained on at least two properties;
- (b) Deer are present in the area; and
- (c) Wild horses are present in the area.

The area is now under a control spraying programme in an attempt to considerably lower pasture infestation while efforts are made to kill or capture the horses and drive the deer from the cattle areas.

4. Madang Area.

Eradication spraying programmes have been completed but the surveillance stage has not been completed. To date no reinfestations have been observed.

Some preliminary studies on the suitability of the deer as a host for *Boophilus microplus* were carried out.

In the first experiment two deer were infected with 10,000 larvae hatched from an engorged female tick recovered from a heifer. No engorged female ticks were collected from this infestation. A severe reaction to attacking larvae was observed in both animals.

In the second experiment 10,000 larvae were placed on one deer and the larvae were protected by a hessian coat. 224 engorged female ticks were recovered.

In a third experiment larvae hatched from an engorged female tick collected from a deer which had been killed in a hunt readily infected an experimental heifer.

The second experiment was designed to determine whether repeated generations of cattle tick could be maintained solely on deer. Technical difficulties however, prevented the experiment proceeding beyond the stage reported above.

This point is of importance if pasture infestation can be maintained at a very low level by control treatments of all cattle. The tick may not be able to maintain itself on deer alone, and future eradication programmes may have some chance of success.

Tuberculosis and Brucellosis.

These two diseases are subject to eradication programmes. All cattle over six months of age in the main areas are subjected to the intradermal test for Tuberculosis annually. The incidence of the disease has been reduced considerably to a figure in 1959-60 of 0.44 per cent. of animals tested.

A test and slaughter programme for Brucellosis was introduced in 1957 using the serum agglutination test. Eradication has been successful in New Britain District and Highlands Districts and the incidence in the Central District and Morobe District has been reduced to such an extent that eradication seems imminent.

Other Diseases.

Surveys into other infectious diseases will be introduced although the absence of any major infectious disease problems in Territory cattle reduces the urgency of such surveys.

Deficiency diseases are suspected in some areas especially where heavy rainfall conditions produce highly leached soils. In most cases the cattle are such a recent introduction that deficiencies shown in soil and pasture analyses have not manifested themselves in the grazing animal.

The problem of infertility in European breeds of cattle when run in the lowland environment is one of considerable concern. The Brucellosis eradication campaign has removed one possible cause of this infertility and surveys of the presence of *Vibriosis* and *Trichomoniasis* will be carried out. A small number of phosphorus estimations have been made with inconclusive results. The problem could be directly related to the non-adaptability of these animals to the

tropical environment. Differential figures of calving percentages from Angus cows and F¹ Brahman-Angus and Brahman-Shorthorn cows mated to the same bulls have been extracted from records of the Department's cross-breeding programme. The figures show a 24 per cent. (23/97) calving in Angus cows and 100 per cent. (16/16) calving in cross-bred cows. The number of crossbred cows in this group was small compared with the number of Angus cows. Fully comparative figures of calving percentage of these two types of animals in the one age group are difficult to obtain because of the poor growth rate of European breeds of cattle under the local conditions and the need to hold heifers of these breeds for an extra year so that they have grown sufficiently for mating. The different growth rates of these animals are shown in Figure 2 and illustrate this point.

Within the Angus group the calving percentage on an age basis has also been extracted. Imported cows, nine years of age and over, gave a calving of 26 per cent. (16/62) while locally bred cows, three to six years of age, gave a calving of 20 per cent. (7/35), the overall figure being 24 per cent. mentioned earlier.

It is commonly observed that bulls of European breeds refuse to work in the local environment. Bulls of Zebu breeds are much more vigorous and can be used at a lower mating percentage than bulls of European breeds. In part of the programme mentioned above, two breeding groups, one mated to Brahman bulls and the other mated to Angus bulls, were used. The Brahman bulls were mated at two per cent. while the Aberdeen-Angus bulls were mated at eight per cent. The number of calves born per Brahman bull was 32.3 and the number of calves per Aberdeen-Angus bull was 10.4.

These figures only serve to confirm the value of the Zebu and Zebu crossbred animals over the European breeds in the lowland environment.

Present position.

With the present Territory population of 17,000 head of cattle there should be a theoretical annual turnoff of 1,700 head. The total population figure, however, is biased towards breeding cattle, because of the infancy of the industry and the steady importation of breeding stock. Actual turnoff for 1959-60, excluding animals killed for private consumption, was 698 head.

Territory imports of fresh chilled or frozen beef for the year 1959-60 totalled 1,234,712 lb. which at 600 lb. per carcase would represent approximately 2,100 head. Thus, the total Territory consumption for that year was 2,800 head. As a result, approximately 30,000 can be taken as an immediate target figure for the Territory cattle population from which the Territory will produce its present consumption. This figure will increase considerably with the increase in consumption of beef by the native population as a result of the rise in living standards. This figure does not take into account the large amount of tinned meat imported into this Territory in 1959-60, which exceeded 8½-million pounds weight. The partial replacement of this by local fresh meat will also increase the consumption figure.

Freight Subsidy.

The Administration subsidises the importation of approved breeding stock into the Territory. The subsidy covers the cost of freight exclusive of fodder and attendants' fees for the shipment of approved cattle to Papua and New Guinea. To date over £70,000 has been spent for the shipment of 2,128 cattle on behalf of fifteen importers. The lack of suitable shipping has seriously affected the operation of the scheme at times but the position has been relieved by the introduction of a modern vessel to the run over the last few months.

In 1960 it was announced that the scheme would continue until a further 8,000 breeders have been imported or until 1965 whichever is the sooner. The effect of the scheme will then be reviewed.

The scheme provides a strong incentive for the establishment and stocking of pastoral properties in the Territory and will materially assist in the attainment of the target of a cattle population of 30,000 head.

Abattoir Construction.

Full development of a cattle industry in the Territory is seriously hampered by the lack of slaughtering facilities. At present beef producers must provide their own small slaughter floor if they are to market their beef. This procedure is unsatisfactory for several obvious reasons.

1. It is a time consuming and onerous job for the producer himself.
2. It is wasteful of by-products and offals.

3. The installation of the facilities for slaughter and storage of the beef on the property is expensive.
4. Transport of beef to market in the tropical environment poses problems.
5. Departmental supervision of slaughtering and inspection of carcasses is difficult if not impossible.

A plan has been prepared for the establishment of central killing works where the disadvantages mentioned above are eliminated. In the first instance, the works will be operated by the Department and a reasonable killing fee will be raised. All producers can avail themselves of the facilities and freezer and chiller storage space will be available.

The establishment of these works should supplement the subsidy scheme in encouraging the development of the Territory industry. As in all developing industries the Territory cattle industry is at a stage where present production is too small to support a processing works but the potential will not develop unless producers can see a readily available market for their produce.

Concentration of slaughter cattle upon the works and the distribution of the beef to the consumer also provide problems to be overcome. The establishment of a works in Lae where cattle can be concentrated by land from a vast area of country including the Highlands Districts will be the first step in the scheme. Distribution of local beef can be carried out in the same way as imported beef is now distributed although this will necessitate the freezing of much of the beef.

The ready availability of such works will encourage the small producer to increase his herds, and as a result the native producer will find a ready cash market for his animals.

Zebu cross-breeding.

The Administration's programme of Zebu cross-breeding has been mentioned above. This programme will provide basic adapted stock to improve Territory herds. Beef production in the hot lowland environment will, therefore, be placed on a firmer footing.

Native Cattle Industry.

The introduction of cattle to the native village economy presents an entirely new concept to the native mind. The Papuan and New

Guinean has had no previous experience with animals as large as cattle and he must be taught methods of handling them until he has some confidence in his ability. The natives who have been introduced to this work have readily absorbed the teaching and have no trouble in managing the animals.

Cattle under native ownership now total 288 head all of which are European breeds of cattle which are run at altitudes over 3,000 feet. Natives in these areas have been selected for the initial projects because of the ready availability of European breeds of cattle and the disease-free status of the areas in which they live. Husbandry in these native units is based upon a system of daytime herding with a securely fenced paddock to hold the cattle at night. The fencing and handling facilities are provided on a co-operative basis between individual cattle owners.

The scheme is still in its early stages and interest from natives outside the present pilot projects is high. The further introduction of cattle into the native economy will help to utilize large grassland areas where population densities are too high to permit alienation of areas sufficiently large for expatriate settlement. If interest remains at its present high level native owned cattle will constitute an increasing proportion of cattle marketed for Territory consumption.

The control of the problems discussed together with the application of the functions of the Administration which are mentioned should enable the Territory to approach rapidly the aim of self sufficiency in beef and beef products. Beyond this aim is a possible export market for beef products which can be produced under the conditions of an almost disease free tropical environment.

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