PASTURE IMPROVEMENT ON "OAKWOOD", UPPER KANDANGA, NEAR GYMPIE (QLD.). FIELD MEETING — 28th MARCH, 1969

GENERAL INFORMATION

The "Oakwood" property of approximately 10,000 acres was acquired in 1950, and at this time carried 1,000 head of cattle. The greater proportion of the area had a carrying capacity of about 1 beast to 10 acres and better areas of cleared land 1 beast to 6 acres.

The main enterprise is breeding and fattening beef cattle, which are turned off at about 2 years of age. In the past oats and sudax have been used to finish off steers in August at 950 lb liveweight, now the use of sown pastures has enabled cattle to be turned off at about the same age at 1,050 lb liveweight each November. Initially breeding was carried out on unimproved land and the calves were weaned on to sown pasture, but breeding is now also done on sown pasture.

The first improved pastures were sown in 1956 and the property now has about 2,000 acres of sown pasture and carries 1,100 head of stock. Hereford, Shorthorn and Angus cattle are used and in 1960 a breeding enterprise was started with Santa Gertrudis cattle.

The average rainfall at "Oakwood" is as follows:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
7.41	3.19	7.23	2.25	2.44	3.62	1.58	2.34	1.35	2.40	2.43	5.25	42.41

INTRODUCTION AND DETAILS OF OPERATIONS ON "OAKWOOD"

by

I. HART, BYRNE HART PTY. LTD., "OAKWOOD", KANDANGA.

I have great pleasure in welcoming you here today. It is indeed encouraging to have such a good attendance of members and visitors at "Oakwood", particularly in the middle of such a dry time. Just a few weeks ago we discussed whether the Field Day should be postponed because of the continued dry weather, but it was decided that it should be held, because these pastures have to take their turn of bad seasons and it is fitting that you inspect them under these conditions. However, I want you to bear in mind when evaluating these pastures that "Oakwood" has had only 17 inches of rain in the 12 months to 28th March, 1969. Furthermore, all these established pastures have carried one beast to 2 acres continuously since their first year of planting. All pastures were grazed 2 to 3 months after planting.

Let me now return to the early years on this property and discuss my reasons for entering into a programme of improved pastures. At that time I found myself in the position, that if I wanted to keep running the same number of breeders and carry my steers on to fatten at 2 to 3 years I would either have to increase the carrying capacity or buy more land. I could probably have bought more land close adjoining then for about $20 per acre. As this land would run a steer to 8 acres I would have been paying $160 a beast-area.

By improving the pastures on my existing country, investing approximately $50 an acre on clearing, ploughing, fertilizing and seeding, I can now run a steer to 2 acres. That is, each beast-area would cost $40 for land plus $100 for development totalling $140. In addition to this, on the improved pastures, I will probably have an annual fertilizer maintenance of $3.50 an acre, i.e. $7 per beast.

Against this I have found that on the improved pasture I have turned steers off 1 year younger at the same weight. The average weight of 2 to 2½ year old steers sold from "Oakwood" over the last two years has been 1,050 lb liveweight. Three year old steers of the same breeding off unimproved country averaged close to the same weight. A further advantage in improving carrying capacity of existing area is that the increased number of stock can still be managed by the same number of stockmen.

Had I bought more land I would have had a lot of ringbarking or poisoning of unwanted timber. With the developing of country for improved pasture unwanted timber is completely cleared in the first year after which the country goes into full production.

THE SOILS AND GEOLOGY OF THE "OAKWOOD" LOCALITY

by

C. H. THOMPSON, C.S.I.R.O., DIVISION OF SOILS, ST. LUCIA.

INTRODUCTION

At the last field meeting in Gympie we discussed the major soils and soil problems[1] of the Wide Bay District and looked at some of the reasons for the widespread decline in productivity following agricultural development. Our geographical reference to the area then was a reconnaissance soil map, based on the Atlas of Australian Soils Sheet 4 (Isbell *et al.*, 1967), showing the distribution of major landscapes in the district represented by some seventeen soil/parent material mapping units.

For general background today we can take a still broader view and divide the district into four physiographic and geological (Hill and Denmead, 1960) regions:

(1) The coastal lowlands of sands and sandstones in the east.

(2) The central hilly belt of phyllites and shales.

(3) The higher, steep hilly country of shales, metamorphic and volcanic rocks west of the Mary River.

(4) The hilly to steep hilly country of ultrabasics and serpentinites in the south-west corner.

The present field conference is concerned mainly with the last unit — the serpentinized belt — although we will also traverse part of the adjoining metamorphic rock area. The serpentinized belt makes up but a small part of the 1,100 square mile Gympie-Cooroy area but is more extensive to the north-west, extending to Kilkivan.

LOCAL GEOLOGY AND TOPOGRAPHY

Looking at the "Oakwood" locality in more detail we find that there are three main geological units:

(1) The serpentinite belt of serpentines and shales.

(2) The Paleozoic metamorphics and volcanics — locally chiefly shales and cherty shales with some small areas of phyllites and volcanics.

(3) Quaternary alluvium i.e. the gravelly, sandy and clayey alluvium of the Kandanga Creek flats and terraces.

[1] THOMPSON, C. H. (1966) — Soils and soil problems of the Wide Bay District. *Proceedings of the Tropical Grassland Society of Australia* No. 6, 7-12.

We can also see that there are three natural topographic divisions with differences in elevation and slope:

(1) The steep hilly country with crests to 1,250 ft, a local relief of about 600 ft, and with slopes generally in excess of 26° but exceeding 40° in places.

(2) The low hilly country with crests generally below 600 ft, a local relief commonly of about 100 ft and with slopes of generally less than 16°.

(3) The gently sloping creek flats and terraces where local differences in level are usually less than 50 ft.

SOILS

Shallow gravelly soils are characteristic of the hilly parts of the area, the soil colour, texture, structure, depth and fertility varying with parent material change and topographic position, hence the importance we attach to geology and topography. The common soils on the serpentinites are:

(1) Very dark grey-brown loams and clay loams overlying rock at 2-8 ins which we call lithosols[2] (*Um6.21*)[3] and

(2) Very dark brown — dark reddish brown, well-structured clay loams increasing to light and medium clays with depth and overlying serpentinite at 18-30 ins which we call *prairie soils* (*Gn3.42*). The lithosols are dominant on the steep hills and prairie soils occupy a large part of the low hilly unit.

Throughout the world the utilization of soils on serpentine has been hindered by a number of nutritional problems mainly associated with very low calcium and phosphorus status and very high magnesium saturation, which are in places further complicated by high chromium and nickel contents, reaching toxic proportions. Exploratory analyses of local soils show the very low phosphorus and calcium status and high magnesium saturation, as well as a low potassium level, but the chromium and nickel contents do not seem sufficiently high to cause concern when the other deficiencies are corrected.

Lithosols and *shallow gravelly podzolics* are the common soils found on the Paleozoic shales and cherty shales of the steep hilly country. The *lithosols* (*Um4.1*) are characterized by grey-brown grading to pale brown gravelly loam 4-12 ins thick to underlying shale; the *podzolics* (*Gn2.24*) have similar surface and subsurface A2 horizons but grade into yellowish red gravelly clays at 12-15 ins and into shale at 24-36 ins. Both soils frequently occur side by side on the steep slopes forming soil complexes. They are mildly acid with low to very low phosphorus contents, but are expected to have adequate potassium levels.

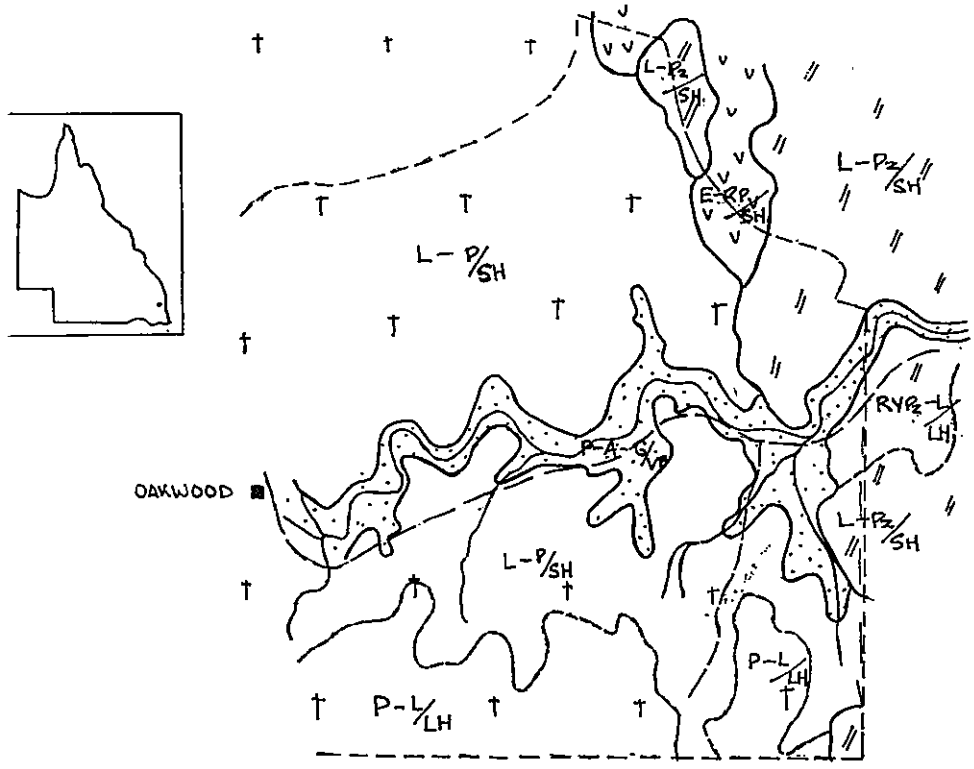
The dominant soils on the low phyllite hills are also *lithosols* and *podzolics*, but here the surface is hard-setting, the subsurface is paler and bleached and in the podzolics there is a clear boundary to a very definite clay subsoil. These differences are recognized in the Factual Key (Northcote, 1965) which places the *lithosols* as *Um2.12* and the *podzolics* as *Dr3.41* or *Dy3.41* according to the red or yellow subsoil. We have no analyses of these soils in this valley, but to the north they have very low phosphorus and nitrogen contents, respond to molybdenum, and in addition the hard-setting surface reduces water entry, thus presenting a further problem to development.

Relatively small areas of strongly weathered volcanic rocks occur through the Paleozoic metamorphics and where these are exposed they have weathered to very attractive reddish soils. These are easily recognized by the dark brown to very dark reddish brown strongly-structured clay loam surface horizons immediately overlying red strongly-structured clay subsoils. They are generally neutral in reaction, and have higher nitrogen, phosphorus and calcium contents than the adjacent soils, although a response to phosphatic fertilizer can usually be obtained. These soils do

[2] See Stace *et al.* (1968) for definition of these technical terms.
[3] See Northcote (1965) for definition of these codes to soils.

not fit well into any of the currently recognized great soil groups, having some characteristics of the reddish *prairie, euchrozem* and *krasnozem* soils; in the Factual Key they are mostly *Gn3.12* and occasionally *Dr4.12 - Dr2.12*. Because of their generally good physical properties, moderate depth and moderate inherent fertility, they are very attractive soils for horticultural and pasture development.

The soils of the valley bottoms have developed on the alluvial deposits of Kandanga Creek and are deep soils in which the morphological features vary with the particle size and age of the alluvium. The intermediate terrace is the most extensive flat area along the creek; its soils have fairly thick dark grey-brown sandy loam surface horizons with a diffuse lower boundary to brown and reddish brown



L-P/SH Lithosols & Prairie soils on steep slopes.

P-L/LH Prairie soils & lithosols on low hills

L-Pz/SH Lithosols & podzols on steep hills

RYPz-L/LH Red & Yellow Podzolics & Lithosols on low hills.

E-Rp/SH Euchrozem to Reddish Prairie soils on steep hills

P-A-G/VB Prairie Alluvial & Gleyed soils along valley bottoms

T T T Serpentinites & Shales

V V V Volcanic Rocks

// // // Metamorphic Rocks

Alluvium

CSIRO
Division of Soils
1969
SOIL SURVEYOR C.H.Thompson.

FIGURE 1

Oakwood. Soil Map Upper Kandanga, Queensland (Scale 1 inch = 55 chains approx.)

sandy to medium clay subsoils which grade back to little-weathered sandy alluvium. These are *prairie soils* (*Gn2.45*) with minimal profile development, a neutral reaction, low to moderate phosphorus levels, moderate contents of organic matter, and usually adequate calcium and potassium status. Because of their favourable topographic site, fairly good physical character, depth, and moderate fertility, they are attractive for cropping and pasture development.

Associated with them in wet depressions are more clayey soils showing strong evidence of poor drainage — the *gley soils* (*Gn3.95*) and *wiesenbodens* (*Ug516*); while on the low terrace the raw alluvium may be classified as the true *alluvial soils* (*Ucl—Uml*).

SOIL MAP

The mapping unit used is a soil-topographic-parent material unit which delineates and describes the soil patterns of the landscapes. At this reconnaissance level it is not possible to delineate separate soil types or small areas of different soils and different parent materials. Nevertheless, it does provide a sensible basis for the selection of samples, experimental sites and the extrapolation of experimental results.

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EARLY SPECIES TESTING AT "OAKWOOD"

by

G. W. KYNEUR, AUSTRAL-PACIFIC FERTILIZERS LTD., GYMPIE.

The first problem was to find suitable perennial pasture species to take the place of annual forage crops that had been regularly grown. This would have the effect both of reducing the work load and also bring the steeper hillsides into higher production.

In 1963 there was not a large fund of information on potential pasture species nor was much seed available at a reasonable price. However, since glycine-green panic pastures had proved to be very productive on the Atherton Tableland it was felt that they might be used effectively here. Coupled with this there was a reasonable supply of cheap seed of Tinaroo glycine.

The first legume based pastures were established by sod seeding Tinaroo glycine and some Siratro into an established Rhodes grass pasture on low lying land in the "Bottom paddocks" in 1963-64. Establishment was poor and the legumes disappeared within 2 years. Similar disappointing results have been recorded in many similar situations throughout the district, and can probably be attributed to grass competition and frosting.

In 1964-65 "Little Scrub" paddock was planted. The hills were cleared and worked to a loose friable seedbed, the flats were heavily grassed but the grass cover was not destroyed before sowing. Again the hillsides gave a good strike of legumes while the flats were very poor. White clover is now spreading throughout the flats. It is possible that nitrogen fertilized grass may also be useful on these flats.

A range of legumes was planted in 1964-65 in an experiment on the flats. While all but lotononis established well, none persisted after two years. It was then apparent that tropical legumes were not well adapted to the valley floors but may find their place in the hillsides which is precisely what Mr. Hart has been doing for several years now.

Fertilizer requirements have been established by soil testing and district knowledge, thus 4 cwt Mo superphosphate is now applied initially followed by maintenance dressings of 2 cwt superphosphate substituted by Mo-superphosphate every 3-4 years.

DISCUSSION

How does frost affect you in this country?

Mr. Hart: The frost is very patchy and, in fact, things get cut back even where I had not seen frost before. In other sheltered places small pockets remain unfrosted.

What is your seed-bed preparation?

Mr. Hart: Mostly we use the chisel plough but on the flatter country we use discs because they tend to give us a better kill of grass.

Do you get noticeably different grazing patterns between the flats and hillsides?

Mr. Hart: Previously there was a very noticeable difference. The steeper hill country was only grazed in the winter or in cloudy or rainy weather. Now they are grazing the hillsides continually. It very much depends on how good the feed is now.

Have you made special provision for stock watering points up in the hills?

Mr. Hart: Yes, we are increasing the watering points either by digging out old springs with the bulldozer or by building small dams. There is no doubt that the animals can be held better in the higher country when there is water for them.

I notice there is a considerable amount of Rhodes grass around, particularly on the flats. Why are you trying to replace it with setaria?

Mr. Hart: Once fairly rank the Rhodes grass becomes unpalatable and the animals eat very little of it. The Rhodes grass was planted perhaps 40 years ago on some of the flats and has spread out thickly on the spurs in this area. However, I feel with green panic and setaria we gain a lot by the increased palatability.

Would not a good legume component in the Rhodes grass pastures have increased its palatability?

Mr. Hart: No. There are places where there is quite dense legume and even there the Rhodes grass is not eaten.

Can you give an indication of what the legume-grass composition of the pasture might be over the season?

Mr. Kyneur: From the cut samples of pasture we find that it is almost half and half in mid summer. At present it is about 8 parts grass and 1 part legume. It varies quite widely.

Do you see pasture conservation as being a practical part of this enterprise?

Mr. Kyneur: In the broad sense no, because I don't think you could operate the necessary machinery on these hills. Special purpose areas on the flats might be worth considering. The winter period is, after all, the most critical in terms of animal production.

There are now areas on the flats which have been successfully seeded to white clover. In this case 1 lb Ladino and 1 lb of Louisiana white were planted. In a good winter these areas are white with flowers.

Do you artificially supplement feed in any way?

Mr. Hart: During the dry time we have been open-trough feeding with urea/molasses at the rate of $1\frac{1}{2}$ lb to $2\frac{1}{2}$ lb per day given once a week. However, this leads to irregular intake so that we will probably resort to roller drums towards the winter to provide a more even ration.

On country of minimal frost risk, what would be the latest you would risk planting a tropical legume/grass pasture?

Mr. Hart: I don't really know but I don't think I would plant as late as now (June) for fear of having the young seedlings frosted. If I could not plant before now I would wait till Spring (August). Even if you get only one or two inches of rain, if the seed is drilled in and rolled at this time it will generally germinate well.

What fertilizer rates did you use?

Mr. Hart: Initially we use 4 cwt of Mo Super with, in subsequent years, 2 cwt of ordinary Super per year.

What benefits can you expect from leaf analysis rather than soil testing in determining fertilizer requirements?

Mr. Kyneur: With leaf analysis it is possible to set up a system of crop logging which, once established, allows a detailed monitoring of the seasonal fertility status. However, the usefulness of this technique depends on considerable background information including soil analysis.

Mr. Hart: I am very interested in the phosphorus status of the plants because stock health and fertility are markedly affected by the application of superphosphate to this country. The increase in calving percentage is a very important response.

Do you find that the natural white clover is a much heavier seed producer than your sown Louisiana and Ladino clovers?

Mr. Hart: Certainly the ones I have seen coming back are not the local white clovers — they are more vigorous than that. I don't know whether what regenerates is pure Ladino or Louisiana, it could well be a hybridized type. To my knowledge there was no natural white clover on Kandanga originally. Initially I planted some New Zealand white but that was only a restricted area. Now clover is spreading up the lower slopes of most of the hills and that has been from areas planted to Ladino.

Have you found Ladino clover to be a shy seeder?

Hr. Hart: Initially, yes. Subsequently its seed production seemed to improve. This is perhaps the acclimatization process which I implied in my last comment.

Do you feel in this environment it is necessary to plant 3 or 4 different types of legumes in a pasture or can you achieve optimum production with one or perhaps two?

Mr. Kyneur: I have always supported the use of simple pasture mixtures — one grass and one legume. If each of these is very well adapted to the environment and produce well why complicate the picture, particularly where there is no

evidence that more complex mixtures are more productive. Simple mixtures are less costly to plant, particularly if tropical legumes are involved. There are cases in which you know from experience that one legume will do better in one part of a paddock than another and vice versa. In such cases it is perhaps better to sow a more complex mixture and let them sort themselves out.

Mr. Luck: I think this year there are many people who are very thankful they have Siratro in their pastures because this is the only legume which is at all productive in a drought year. Furthermore, the increasing inroads that amnemus weevil is making on green-leaf desmodium in pastures lends still more testimony to the value of having other legumes so that after a number of years you still have a productive pasture. Siratro is a wonderful base legume for a pasture but some of the other legumes are definitely needed to fill in the deficiencies of Siratro — e.g. spring production.

If a bush fire were to burn over a tropical pasture would it cause any permanent damage?

Mr. Kyneur: I know of a fire through a setaria–Siratro pasture with no ill effects. It regrew very quickly and did not seem to kill the established plants. There was also a considerable germination of Siratro seed.

Mr. Luck: Glycines are very susceptible to fire but Siratro tends to thicken up.

Have you ever tried aerial seeding on this country?

Mr. Delaforce: Only once this year on some of the very steep back-country. We have always preferred to use a machine for introducing the seed into the worked ground where it is in contact with moisture and stands a better chance of establishing, particularly where the rainfall is erratic. For this reason we have found the "Gyral Seeder" mounted on our trailing chisel plough the most suitable for our conditions. Conventional drills on this steep country are unsatisfactory because they slide sideways and the seeds runs downhill inside the seedbox. This machine with its air-blast delivery overcomes this problem. It allows accurate sowing of a variety of seed sizes simultaneously and it is very easy to calibrate.

PRODUCTIVITY OF TROPICAL LEGUME–GRASS PASTURES AT "OAKWOOD"

by

W. P. BEWG, BRIAN PASTURES RESEARCH STATION, GAYNDAH.

After the difficulties of pasture establishment had been overcome, it was necessary to assess the carrying capacity and productivity of tropical legume–grass pastures. A stocking rate of one beast to two acres had been chosen by Mr. Hart as being about the right pressure but this lacked a background of facts and it was agreed that some qualification was needed.

The 250 acre paddock known as "Little Scrub" was chosen as a typical example of a legume–grass pasture and was stocked with 125 head of steers (73 aged 9 months and 52 aged 21 months on entry in June, 1965). Liveweights were recorded regularly at 28-day intervals from 24th June, 1965 to 6th June, 1967.

Two distinct growth patterns were observed, one for winter (May–September) and one for summer (October–April). In these two periods average liveweight gains were 0.26 lb and 1.60 lb per head per day respectively. Average gain for the year was 401 lb per head and 200 lb per acre.

Having established what appeared to be a safe stocking rate with a visibly adequate supply of grazing in all seasons it was considered desirable to impose a heavier stocking rate to test the pasture's ability to carry more stock. Thus, "Little Scrub" paddock was divided into two equal areas and restocked with 9 month old weaner steers at 1:2 acres as previously and 1:1.3 acres; 62 and 92 beasts were involved respectively. In an adjacent similar paddock white clover was prevalent on the lower parts and it was anticipated that this would result in better gains in spring than was normally the case. However, this was not observed when measured with heifers. Liveweight gains over the summer and for the whole year were greater at 1 beast to 2 acres than 1:1.3. Average daily liveweight gains for the year were 1.00 lb at 1:2, 0.91 lb at 1:1.3 and 0.84 lb for heifers. Liveweight gain per acre was highest for the heaviest stocking rate, i.e. 244 lb and lowest for the heifers 153 lb. In the summer period these were 294 lb versus 336 lb gain per animal for the high and low rate respectively.

Since it was unlikely that protein was a limiting factor, at least during the growing period, and since liveweight gains were below the potential capability of the animal, it was thought that energy might be in short supply and so molasses was fed to the animals. However, no noticeable increase was observed.

DISCUSSION

What was the average weight of the animals at the beginning of the trial?

Mr. Bewg: The two groups were split at random and they averaged out at 452 lb and 435 lb respectively. Starting from 452 lb in September by the following May the lower stocking rate had achieved 830 lb and the high stocking rate 770 lb from 435 lb.

If you started off with cattle weighing 600 lb would you expect to finish them more quickly?

Mr. Bewg: Yes, but the problem is how to get them to 600 lb at that time.

Mr. D. Shaw: I think this shows that if you are going to make full use of these good pastures it is necessary to put good animals on them.

Mr. Bewg: Yes, this is precisely so. However, while we realize we can finish our animal in one season if we start at about 600 lb, we are trying to beat this by starting at weaners.

Do you expect better animal performance in good clover years than bad?

Mr. Bewg: We can't really say because even in bad clover years, for the area we still had ample clover in the experimental paddocks.

Mr. Jones: I do not think protein is the only consideration for adequate growth of cattle. Even though it must be assumed that protein intake was sufficient on these clover-rich pastures it is true that the animals didn't do as well as one might expect.

Mr. Bewg: That is right and this year we are supplementing one group with molasses to see if it is energy feed which is lacking.

Mr. Jones: Quite apart from protein, white clover is an excellent source of energy. It contains quite a lot of soluble carbohydrate and there are reports from other countries that animals grazing clover-rich pastures will gain at 2 lb per day so I don't see why it should be any different here.

What is your policy in using the Santa Gertrudis breed?

Mr. Hart: Our main interest is beef production. However, Santa Gertrudis bulls are very expensive if one considers using pure bred bulls just for producing beef animals. You may pay $5,000 for a pure bred bull so there is quite a market for cross bred bulls. Whereas a two-year-old steer might sell for $140-$150 a second cross Santa Gertrudis bull of the same age will fetch $400-$500. This still gives enough of the tropical characteristics to improve the beef when put over British breeds.

Do you find that the cattle become less responsive to artificial insemination with time as has been reported from Britain?

Mr. Hart: I have read of this effect but even though we use artificial insemination extensively I have not noticed it here. We mate each group of cows for 45 days, which covers 2 breeding cycles and expect to get about 80% of cows pregnant. Then we put out a few pure bred bulls to get a further 10% in calf. So we are not entirely relying on artificial insemination. The advantage is, of course, that one bull will serve 1,000 cows with artificial insemination, but the bull must be very good of course, otherwise little or nothing is gained in the long run.

At what age and about what weight are the cattle weaned?

Mr. Hart: That depends to some extent on the season. We have been weaning before winter in March. With improved pastures the calves are very much bigger at weaning. We have tended not to wean earlier as a result because in good seasons the cows often become too fat by mating time. We have tended also to shift calving time to an earlier date, because again the improved pastures stimulated too much milk production in the cows. The very young calves are not able to handle it. If the flush of growth comes some time after calving the calves are old enough to utilize it and benefit from it.

What health problems do you have with your cattle?

Mr. Hart: Ticks are, of course, the biggest problem. Worms are also ever present but we don't treat for them. We ran a trial two years ago in which 200 head were involved. There were four groups involving animals not treated up to animals treated 3 times over the season. The gains resulting from the treated animals were so small as to be not worthwhile. It seems that normal healthy animals build up some level of tolerance to worm infestation and perhaps treating for worms just delays the development of this condition.

I know a lot of people have trouble from worms but I suspect much of it results from inadequate nutrition. With good feed and fairly large paddocks worms are unlikely to be a problem.

We inoculate our cows and heifers as a matter of course for red water. There has also been some incidence of brucellosis which we are now inoculating for. Before we started using artificial insemination I was concerned that we might have some infertility problems but these were obviously nutritional as they have disappeared with the increase of improved pastures.

For most of the diseases we encounter here the vaccinations are cheap and we treat all stock. It only requires an extra couple of calves to pay for all the vaccinations in a year so in my opinion it is well worth doing.