

ACIAR Project No. AS2/97/18

Profitable Beef Cattle Development in Vietnam

Sub-project 3: *Forage development within intensive farming systems.*

Sub-project Progress Report:

Based on Visit to Vietnam Sites in August 1999 by Sub-project Leader, Col Middleton.

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Sub-project 3 Aims:

It is one of six integrated components of a Project that looks at a range of technologies to upgrade the beef cattle production and marketing system in Vietnam, with medium to long-term advantages to both countries.

Sub-project 3 aims to research and extend the use of high quality forage to supplement the use of rice straw and other crop residues within the intensive cropping areas. This is to be achieved by testing 'best bet' tree legumes and other legumes and grasses at key sites in Northern (Red River Delta) and Central Coastal (Quang Ngai Province) Vietnam. The main research effort concentrates on a replicated field experiment to test 15 tree/shrub legumes in a range of environments. Legumes are seen as a key ingredient in improving the low-protein beef cattle diet throughout the country. The legume selection was based largely on an earlier ACIAR project (No. 9433) that screened *Leucaena* species throughout Southeast Asia and the Pacific.

The Sub-project Team:

The Sub-project is led by Col Middleton (QBII) with all activities in Vietnam supervised by Dr Nguyen Kim Duong of the University of Agriculture and Forestry, Hue. Other key people working directly on the project are:

Red River Delta Site (NIAH)

Mr Le Hoa Binh (NIAH Forage Dept)...supervises the NIAH experiment site.

Mrs Phan Thi Phan (NIAH Forage Dept)...responsible for field recording, data preparation and site management at the NIAH site

Quang Ngai (Central Coast) Sites (two sites)

Mr Cao Hoi (Quang Ngai Province Extension Vice-Director)...supervises the Quang Ngai sites under the direction of Dr Duong.

Mr Nguyen Xuan Ba (Hue Univ of Agric and Forestry) assists Cao Hoi in the conduct of the Quang Ngai activities.

There are close linkages between this Sub-project and those led by Dr Graeme McCrabb, CSIRO (supplementary feeding research) and Dr Brian Burns, QBII (improving and understanding better animal genetics).

Site 1 progress:

The Site is located at Hanoi on alluvial soil adjacent to the Red River. The soil is a deep loam, neutral to slightly alkaline. Lat about 21°N, MAR 1700 mm. The Treatments are shown in Table 1. Changes to the original list included scrapping Tr 13 (a *leucocephala x diversifolia* hybrid, UH 91-13, that did not germinate) and replacing it with seed collected at Ba Vi from a *pallida x leucocephala* KX2 hybrid. In addition three other *L. leucocephala* lines were planted from seed collected at Ba Vi (CPI 85176, K 8 and K 28). No results from these latter three have been processed yet.

Note: The KX2 hybrid and the three *L leucocephala* late inclusions were grown from seed apparently collected at BaVi. At time of writing I do not know their full history. However if the KX2 is from Fi plants then the material used could be highly variable and not represent the true F1 that has performed well elsewhere.

Seed was planted (14/9/98) and grown in 12 mm x 18 mm pots in soil plus a NPK fertiliser. Seedlings 15-20 cm high were planted in the field on 30/10/1998 as per the experiment design and field layout. Good establishment occurred despite dry season planting and no supplementary water. Only a few replacement plants were necessary.

1) Psyllid damage.

Psyllids are a serious problem on leucaena in this part of Vietnam. This year was no different. Psyllids arrived at the site in early January 1999, reached a devastating level by April and disappeared at the onset of the heavy summer rains in May (Table 1). At the time of visit in early August there were none present.

In January only minor damage was evident on Cunningham, Bharu (a *leucocephala x diversifolia* cross) and the *pallida x leucocephala* KX2 hybrid (Tr 13). By early February there was moderate damage (3-4 on rating scale where maximum damage rating is 9) on all *L leucocephala* lines, Bharu and Rending (*leucocephala x diversifolia* cross) and the *pallida x leucocephala* KX2 hybrid. By March the damage on the above had got worse and moderate damage was also occurring on both *L pallida* lines, *L macrophylla* and *L esculenta* and minor damage on *L trichandra* OFI 53/88 and *L collinsii* OFI 52/88. By early April there was severe damage to all *Leucaena* lines except *L trichandra* (2.3) and *L collinsii* (3.7).

Confirmation of these results on the mature stands next year will be interesting. The disappointing results this year were that both Rendang and Bharu (selected for psyllid and acid soil tolerance) and Tarramba did not appear significantly better than any of the others. The results with *L collinsii* OFI 52/88, *L trichandra* OFI 53/88 and, to a lesser extent *L macrophylla* OFI 47/85 confirm a degree of psyllid resistance. The level of damage on *L collinsii* was a little higher than has been recorded elsewhere. However its other useful characteristics (low tannin content and high digestibility) make it a species well worth looking at in high psyllid pressure areas both in Vietnam and Australia.

2) Establishment growth

A measure of establishment was achieved by recording plant height at monthly intervals commencing 5/11/98. The data has not been fully processed or analysed. However Rep and Treatment means for July 1999 are presented in Table 2.

By March 1999 the best growth was from Bharu (69 cm), Rendang (64 cm) and the KX2 hybrid. Slowest initial growth was from *L macrophylla*, gliricidia, calliandra and the *pallida x leucocephala* UH 92-93 hybrid. At the time a clearing cut was done on 14 July 1999 the highest five (240 –204 cm) in descending order were Tarramba, Gliricidia, Rendang, Cunningham and *L collinsii*. The lowest three (144-154 cm) were *L esculenta* and the two *L pallida* accessions.

At the time of visiting the site there was 16 days regrowth since cutting. No psyllids were present. Visually the best regrowth appeared to be from Cunningham followed by

Tarramba, *L leucocephala* K 28, Rendang and Bharu (both seeding) and *L collinsii*. Lines showing slowest regrowth were *L pallida* CQ 3439, *L trichandra* OFI 53/88, *L macrophylla* OFI 47/88 and the KX2 hybrid which looked decidedly unhealthy and yellow.

The first yield sampling will be taken in about four weeks. The sampling plan calls for two key wet season samplings (about 6 weeks regrowth each) and one key dry season sampling (8-10 weeks regrowth) when dry matter yield of leaf and stem will be recorded.

Other samplings will record green yields only. Treatments will be rated at monthly intervals for psyllids only when they are present.

The late Dr Ha, Mr Binh and Mrs Phan have done an excellent job in getting this site to the stage of yield sampling inside 12 months, considering planting occurred outside the normal wet season. Highly useful psyllid data is already to hand.

Site 2 progress:

This site is located at “The Buffalo Farm”, Hanh Thuan Commune, Quang Ngai Province, 15° N latitude, MAR 2300 mm, 20 km from the coast. The soil is about pH 5.5 (1:5 water). The site formerly was used for cut and carry elephant grass forage.

The Treatments sown were similar to Hanoi except gliricidia was discarded (not popular among farmers because of unpalatability) and K8 and the KX2 hybrid were not included.

A similar establishment process to Hanoi was carried out with seedlings established in small plastic bags and planted in the field on 29 January 1999.

Excellent establishment and growth has taken place with some lines over 3.0 m high. Psyllids have not been a problem at this site to date. A height recording and clearing cut was carried out on 6 August 1999 and the cut material fed to the cattle and buffaloes penned on the farm.

Establishment growth

Plant heights have been recorded on a monthly basis commencing 8 February 1999. This data has not been analysed yet. Three months after planting the heights ranged from 111 cm (*L macrophylla*) to 74 cm (*L leucocephala* CPI 85176). Eight lines exceeded 90 cm. Less growth occurred during the period (< 80 cm) from *L leucocephala* CPI 85176 and K8, *L esculenta* OFI 47/87 and *L pallida* OFI 137/94.

Heights at the time of the August 1999 clearing cut (6 months after field planting) are shown in Table 3. Highest growth (> 3.0 m) was shown by *L macrophylla* and Tarramba, both noted for tall growth. Others to exceed 2.5 m were *pallida x leucocephala* UH 92-93 hybrid, *L pallida* CQ 3439, and Cunningham. The only lines less than 2.0 m in height were *L esculenta* (1.81 m), *L collinsii* (1.84 m) and *L trichandra* (1.97 m). Height does not necessarily translate into edible forage and there is a obvious range in leafiness with lines like Cunningham and *L collinsii*. Rendang and Bharu are seeding heavily and appear early flowering. The effect of cutting on the stimulation of basal branching and yield of leaf relative to stem will be interesting. The first yield sampling will be taken in about six weeks.

Site 3 progress:

The site is located at Nghia Lo Commune, Quang Ngai Province on a deep sandy soil with surface pH 4.9 (1:5 water). The area was previously used for sugarcane. Fifteen lines were planted with *L leucocephala* K28 replacing UH 92-93 hybrid and *L leucocephala* CPI 85176 replacing gliricidia.

Field planting was delayed due to floods. The site was not planted until 4 April 1999. A good establishment has occurred with the best treatments currently over 2 m high. A height recording was carried out while I was there. It was decided that the clearing cut will be delayed for about one month. No height data has been processed yet.

At the present time the line that stands out is Rendang (flowering, not a lot of basal branching) followed by Cunningham, *L leucocephala* (6-way cross). It is interesting that Rendang looks the best at present as this is the most acid site (pH 4.9) and this line (a *diversifolia* x *leucocephala* cross) was selected for acid soil tolerance. Tarramba and Bharu are good but inferior to the above. *L collinsii* is also reasonable. The poorest growth is from *L esculenta* and *Calliandra*.

As with the HaNoi Site the two central sites are now well established, and very well managed and monitored by the team in Quang Ngai. Two years' sampling data will be easily achieved during the project period, more than sufficient to isolate the better lines.

Overall, the major research aspect of Sub-project 3, the tree legume evaluation component, is on schedule.
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Grass and legume demonstration plots:

A range of grasses and legumes (about 40 as listed in the Sub-project Operation Manual) were sown in small plots at the Buffalo Farm in early February 1999. Many (*Bothriochloa*, *Urochloa*) failed to establish due to grass weed competition and accidental weeding due to identification difficulties. These have now been resown.

The best grass growth is on Panicum maximum TD 58, a line that has performed well elsewhere in Vietnam. It was showing N deficiency symptoms. Others good ones were Signal, Splenda and Solander. Any of these could be successfully used to complement elephant grass.

The outstanding legumes to date are the *Stylosanthes hamata* lines (Verano and Amiga). No anthracnose was evident. CIAT 184 had not been planted yet. Excellent growth also occurred from Cardillo centro. It would make a good high quality protein source in this high-rainfall area. However farmers do not like having to cut the trailing/twining legumes.

Technology Extension/Adoption:

It is too early to expect much activity out of the current project. However the Extension staff from Quang Ngai have requested a supply of stylo seed to distribute among farmers. Similarly R&D staff and a large land 'owner' from the Central Highland area have requested some stylo seed (10-15 kg) in order to commence some small-scale development in low-fertility natural pasture areas.

It will be 12 months before possible new material from the legume tree work is isolated. In the meantime I have distributed a small amount of leucaena seed to extension staff at Quang Ngai. This area has less psyllid problems than the HaNoi area.

Other than a shortage of land, the main problem that will face farmers in developing better forage systems in Vietnam is the availability of pasture seed.

Linkages with Sub-projects 4 and 5

While in Vietnam I visited the BaVi Animal Research Farm with Dr Vu Van Noi and Mr Pham Kim Cuong of NIAH to see progress in Sub-project 4 (Supplementary feeding with by-products). The first feeding experiment had been commenced about three weeks earlier. This aimed to compare a rice straw/molasses and a pangola hay/molasses based ration. The work was being done very well. The pangola hay had analysed very low in protein, about similar to the rice straw. It was from a haystack that had been made several months previously. I visited the pangola paddock, which was being cut for hay at the time and suggested a fresh sample be analysed. It is likely that the pangola is inherently of low protein because of lack of available fertiliser and this would have declined further in external storage.

Sub-project 5 looks at Breeding and Genetics. I had the opportunity to visit M'Drak in the Central Highlands where a major part of the project was conducted, with Mr Pham Chien, Animal Livestock Co. of DaLac and Mr Nguyen Van Dinh, Manager of the Cattle Centre at M'Drak. To date about 200 cattle have been inseminated with Droughtmaster, Belmont Red and Red and Grey Brahman. A further 124 are to be inseminated over the next 4-8 weeks.

Farm Visits

A very wide range of farms (about 20) were visited in northern Vietnam at Ha Tay Province (around Ba Vi) and in the northern province of Tuyen Quang, in the Central Coastal area around Quang Ngai and the Central Highlands centred on M'Drak..

1. Northern Vietnam

Dr Noi, Mr Cuong and Dr Dzung (Ba Vi area) and Mrs Vu Hai Yen (Tuyen Quang area) facilitated visits to many farms to see a range of forage development systems. We inspected a new leucaena establishment where the leucaena was grown between fruit trees (papaya).

The northern province of Tuyen Quang is a major agro-forestry re-development area with emphasis on forestry protection and renewal. The integration of forage production is for provision of forage for land stabilisation (on the slopes) as well as forage for cattle.

Farms are generally larger than in the intensive cropping areas and there is no communal grazing land. Eucalyptus and bamboo are grown for pulping.

On the farms rice and fish are farmed on the valley floors. On the sloping land crops (tea, coffee, fruit trees, pineapples and many other vegetables) are grown in rows/strips on the contour with forage grasses and legumes between these rows for erosion control and cattle forage. The most common forages grown are elephant grass, Guinea grass and *Brachiaria* with smaller areas of *Setaria* and *Paspalum atratum*. The most widely used legume was stylo, with both Verano and a *S guianensis* line looking good. The grasses and legumes were usually grown separately to make cutting easier. *Leucaena leucocephala* was grown in rows by a few farmers. It was cut and fed to both cattle and pigs. A small amount of leucaena was also grown for the production of leaf meal for feeding to poultry and fish.

The extension/adoption process with forages consists of planting small demonstration areas (100 m²) on a farm within a few Communes. Farmers from the Communes visit the trial areas (Field Days!) and select the plants they prefer. They plant these either vegetatively or by seed provided by the Provincial Agriculture Department (with accompanying instructions). An example given was where 16 grasses were established in two Communes in 1996. In 1997 nine families 'adopted' the use of one or more grasses. This increased to 53 families (1998) and 100 (1999). The demonstration sites have been extended to four Communes.

Forage technology adoption in the north seems well advanced compared to that in the intensive areas of Central Coastal Vietnam. However, while there are many useful grasses available there is heavy reliance on stylo as the legume. There is room for the use of more leucaena. There is also room for the use of trailing legumes like centro.

2) Central Coastal Vietnam (Quang Ngai)

Farm visits in the Nghia Dung and Nghia Dong Communes highlighted the intense pressure to produce a wide range of foodstuffs in the small 'home' area within the village in the intensive cropping areas. The cattle rely on a wide range of crop residues and cut grass to supplement rice straw. Elephant grass, with growth often limited by shading from fruit trees, is the almost exclusive grass used in this >2000 mm rainfall area. Crop residues in use included maize leaf progressively removed from maize plants as the grain matured and the by-product of cassava after starch removal. Few legumes were seen although stylo would be suited. In some wet sites viewed *Aeschynomene* could be used successfully in conjunction with elephant grass. Seed of these will be sent to the Quang Ngai Extension staff. Leucaena hedges were successfully grown at one site.

Mr Nguyen Su (AI Operator) showed a number of different cattle being used in the villages. These included crossbreeds involving Yellow, Red Sindi, Laisind and Red Brahman.

3) Central Highlands

I was accompanied on a brief visit by Mr Pham Chien (Director, Dac Lac Animal Husbandry Co. and Mr Nguyen Van Dinh, Manager, M'Drak Cattle Centre and Mr Pham The Hue, Tay Nguyen University.

The farming enterprises are variable depending on location (soil). The red volcanic soils around Buon Ma Thuot grow significant amounts of coffee.

Some 500,000 cattle are farmed in the Central Highlands, with the Government's intention to increase this to 1M head by year 2010. A short visit was made to the cattle producing development area around M'Drak where there are about 20,000 head of cattle. The region has a rainfall of about 1,700 mm, mostly between May and December. The rest of the year is very dry. The soils are generally shallow, moderately acidic and not very fertile. In this area cattle and sugarcane are widely grown.

The area has been designated a development area for cattle. Farm sizes are larger than in the intensive cropping areas (5-15 animal herds, occasionally up to 100). Production systems vary from cut and carry forage (on small holdings where rice straw is still a major feed source) to predominantly grazing of low quality natural pasture.

The Dac Lac Animal Husbandry Company controls about 3,500 cattle (most leased out to farmers) run on 23,000 ha of land and turns off about 1,200 animals (200 kg liveweight, up to 20 months of age) for the Ho Chi Minh City market each year (price around \$1A/kg). In the grazing areas calves are weaned at about 6 months. Because of the poor quality native pasture breeders are supplemented continuously (half kg of each of molasses and cottonseed cake) and weaners until about 15-18 months of age.

There is not much evidence of the use of sown pasture. A number of experimental plots in the M'Drak area shows there are grasses (e.g. Brachiaria) and legumes (stylo) that could be successfully used to upgrade the existing pasture. Large improvements in cattle nutrition could be achieved by incorporating stylo alone with the natural grasses with nil or minor soil disturbance. Doubling the present cattle numbers would require replacing existing pasture with sown grasses and legumes. This would require pasture seedbed preparation and a higher level of pasture management.

If there is to be a rapid expansion of cattle production in this area the primary need is for access to large quantities of affordable seed and cultivation/planting equipment. Unless/until it can afford imported seed, Vietnam needs a small seed growing industry to develop the more extensive pasture areas.

The M'Drak area is a major site for Sub-project 5 (breeding). We were informed that about 200 cattle had been inseminated with Droughtmaster, Belmont Red, Red Brahman and Grey Brahman semen. A further 124 were to be inseminated over the next two months.

Visit to ACIAR Headquarters, Australian Embassy, HaNoi

While in HaNoi I visited Mrs Teresa Scott, ACIAR Manager, Vietnam for discussions on progress of the Beef Project and her recent visit to project sites in Central Coastal Vietnam. Wide communication of project activities was a point emphasised by Teresa.

Summary:

The aims of the overseas travel were achieved. The Sub-project is progressing on schedule. All experimental sites (one at Hanoi and three at Quang Ngai) have been established according to plan and field data is being collected. As a result of early progress some pasture seed has already been distributed to Vietnam Extension Officers in Quang Ngai to distribute to farmers.

Cooperation among the Sub-project team at the three Centres (NIAH, University of Hue and the Provincial Agriculture Department at Quang Ngai) is excellent.

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25 August 1999.