

PASTURES IN THAILAND

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ABSTRACT

Trend in pasture development in Thailand is favorable but since the major part of agricultural land is planted to food crops, the approach to pasture development is centered on the improvement of communal grazing land, roadside waste areas, paddy bunds and waste areas by oversowing with legumes. The most important legumes used for this purpose are Verano stylo, Townsville stylo and Siratro. Backyard pasture is promoted in small dairy farms and the important species for this type are Hamil, Guinea, Ruzi, Para and *Leucaena*. Pasture establishment under plantation and forestry crops is also being promoted. Selected species are Signal, Centro, Cori and Guinea. Establishment of pastures is usually performed by seed sowing but for backyard pastures transplanting techniques are recommended to avoid damage caused by animals kept around the homestead of the farmers. Soils in many areas are low in P, and S and N are required to increase the yields of forages. Large amounts of farm by-products are considered to be an important source of animal feed and techniques for improving their quality are available.

Research on species evaluation, fertilization and crop-livestock integration is presently carried out but the problems inherent to the limited facilities and lack of coordination body between institutes hamper the progress of pasture work.

Introduction

The government of Thailand has a strong desire to develop the dairy and beef industry in the country with a view to achieving not only the well-being of the people, as far as food and nutrition are concerned but also to reduce the quantity of dairy products imported from foreign countries, which is increasing each year. For the past two years, for instance, the imported value of this commodity went up to nearly US\$ 53.0 million. The demand for this kind of products is reported to be 1,457 ton a day but the supply by the local dairy farms has so far reached the maximum 100 ton a day (Agricultural Statistics Center, 1983). So it would appear that there is a good opportunity for dairy business to be developed. At the same time, the production of beef and draft animals is being actively promoted by the government. Cattle and buffaloes are vital to the economy of Thailand. These two classes of animals could serve as a source of farm power and human food. Although farm machineries are being introduced into some farming areas, small farmers still keep 2 to 3 head of either cattle or buffaloes for draft purpose. Improvement of the local breeds to produce more meat of better quality is being carried out. Regarding the trade and markets for beef, the government is negotiating with the government of countries in the Middle East and Southeast Asia for the possibility of exporting Thai beef. According to the 5th National Economic and Social Development Plan, an annual increase of one million head of cattle and buffaloes is projected (Office of Prime Minister, 1981).

Trend in pasture production

In line with the plan to increase the quantity of meat and milk, the government has already exerted great effort to develop pasture land for small farmers who are the important producers of meat and milk for the country. Village animal production would cost less

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compared to the production in ranch type pastures. Village cattle and buffaloes are raised in public grazing land and waste areas along the roadsides and rice bunds which are covered by native grasses. The improvement of this source by low cost techniques would be important and oversowing with legumes is the appropriate technique used at present. According to the Department of Livestock Development, an area of 25,000ha will be oversown by Hamata (Verano stylo) in 1984. In addition to this, the backyard pasture program which is suitable for the small dairy farms is also in operation. It has been widely accepted and in several locations the whole villages are converting land to backyard pasture.

It is interesting to note that during the period 1980-1983 when the price of pineapple and sugarcane went down, dairy farms were introduced into such areas to replace parts of these two crops and thereby helped relieve the pressure of returns from such crops.

Dairy exploitations with one thousand head of milking cows have already been established in the area. Also plans are being worked out to develop a farming system that would integrate livestock raising into crop production areas. Funds are available from the International Research Development Center to carry out the research into farming systems. Also, UNDP provides funds for the study of ley farming and the project is under way at the village level in the Khon Kaen Province in the Northeast. The other interesting area for pasture is the integration of pastures into the agro-forestry system which was already initiated in a few areas in the forest plantations belonging to the Forest Industry Organization. All these developments indicate that the trend in pasture development is favorable and deserves a higher scale of priority.

Establishment and management of pastures

When pastures are expected to be of the extensive type such as in the case of communal grazing land, roadsides, and rice bunds where village cattle and buffaloes are raised in a traditional way and no control grazing is being imposed, the establishment of forage species will be a low cost method. In this case the existing grazing lands are to be improved by oversowing with suitable legumes without soil cultivation or seed bed preparation. The recommended species are Hamata (Verano stylo), Townsville stylo or Khon Kaen stylo and Siratro. The area is to be heavily grazed before sowing to keep the existing grasses as short as possible. This is to provide favorable conditions for the legume seedlings to grow successfully. Seeds of Stylo are treated with hot water at 80°C for 5-8 minutes and seeding rate of 3.5 to 7kg per ha is normally used with the sowing time being in the early part of June.

In the small areas, hand sowing is adopted and the villagers are usually helping in sowing operations but in larger holdings aerial sowing is performed. In 1981 an area of 27,584ha was sown to Verano stylo (Office of Livestock Development, 1981). In 1984 approximately 19,200ha will be improved by this technique. In the forest plantations with trees with a narrow branching system, such as the *Eucalyptus* tree, seeds will be sown by aerial sowing and in 1982 an area of 1,600ha was improved (Charoonrote, 1982). Areas on roadsides which are also good sources of forage for cattle are being improved by oversowing technique and the legume species used for this purpose are Hamata and Siratro, and for the southern areas, especially, Graham stylo. On the rice bunds Hamata and Graham stylo are used.

Grazing management of the communal grazing land is of the continuous type and normally very high stocking rates are adopted due to the limitation in grazing areas, particularly during the wet season when all other cropping areas are planted to crops. No fertilizers are applied even though the soils in most areas need N, P or S. Zero grazing is recommended for rice bunds during the growing season but after rice harvesting the animals are free to graze in any area.

Establishment of backyard pastures follows the same techniques as those used in other cash crops. Land preparation, fertilization and weeding are always required. The species used

for this purpose are Hamil, Guinea, Ruzi, *Leucaena*, *Gliricidia*, Hamata and Siratro. *Sesbania* and *Erythrina* are also recommended, particularly for growing in hedgerows of the homestead. The villagers are requested to apply transplanting techniques for Hamil and Guinea because of the slow growth of the seedlings of this species which could be easily damaged by pigs and chickens living around the homesteads. Also to avoid serious weed competition during the seedling stage the plants are transplanted when they are about 20cm high. Division of old rootstocks is also normally practiced which could give better strike.

For *Leucaena* the bare-root planting technique is strongly recommended, particularly when the growing conditions are not satisfactory (Topark-Ngarm, 1983). Local, Ivory coast, K 8 and Cunningham are some varieties that are grown at present. Cunningham variety has not been widely used due to seed limitation. For establishment purpose, *Leucaena* seeds are soaked in hot water, 80°C, for 2 minutes before planting. In soils with low pH liming is encouraged. *Rhizobium* inoculation is also recommended but its use is limited by the unavailability of adequate amounts of inoculum.

Erythrina which is a promising plant for areas with long periods of drought is also recommended for backyard pastures. Establishment is performed by planting the cuttings in plastic bags, nursing until rooting is adequate followed by transplanting.

Sesbania grandiflora is propagated by seeds which germinate well. The seeds must be treated with insecticides if good germination is expected. This species is suitable for heavy soils and if grown in soils with low pH liming is also recommended. *Gliricidia* is propagated by seeds or cuttings. Planting of cutting hastens the establishment. *Sesbania*, *Gliricidia* and *Erythrina* require under-spacing.

Management of backyard pastures is of the intensive type in applying the cut-and-carry method of grazing. Forage grasses are cut frequently and rotationally and manures applied after each cutting. For *Leucaena*, the first cutting for the first year is performed when the plants attain a height of 1.50 meter or more and the successive cutting is performed at 3-3 1/2 month-intervals using lower cutting height. *Leucaena* has a definite place in Thailand and in addition to being a forage source, as mentioned above, the production of leaf meal from this tree legume is expanding. It is estimated that about 60,000ton of leaf meal were produced in 1982 (Chanchai Manidool, 1982).

Utilization of pastures and local resources

According to the Center for Agricultural Statistics (1982) there are approximately 0.66 million ha of grazing land. This land is being used by the villagers who normally let loose their stocks to graze on native grasses and plants. In the Northeast, the dominant species are *Arundinaria pusilla*, *Themeda triandra*, *Dactyloctenium aegyptium*, several *Eragrotis*, *Digitaria ascendens*, *Cynodon dactylon*, *Aristida* spp. and *Panicum repense*, *Alysicarpus vaginalis* are the main legume species in this area.

In the North *Imperata cylindrica* is the main species covering the open areas on the highlands. In the lowlands of the central part of Thailand the species that are normally suitable for feeds are *Brachiaria mutica*., *Echinochloa* spp., *Eriochloa* sp. and sedge which is relished by the buffalo. *Ischaemum aristatum* is found in paddy fields having acid soils. *Leucaena* and *Sesbania grandiflora* are the tree legumes normally planted for human use but they are gradually becoming a good source of animal feed. In the South, *Axonopus affinis*, *Paspalum conjugatum*, *Microstegium ciliatum* form a good forage source under shady areas. *Chrysopogon orientalis*, and *Eremochloa* are abundant in sandy soils in the coastal areas, while *Panicum repense* covers swampy areas and is found in sandy places with relatively poor drainage.

All these areas are normally grazed heavily by cattle in the villages and in some areas, occasionally burnt, to stimulate early growth in the rainy season.

As mentioned earlier, some of these natural grazing lands, particularly in the Northeast are under improvement program.

Other sources of feeds which are as important as natural grasses are represented by the large amount of farm by-products such as rice straw, cane tops, pulse crops and pineapple wastes. Table 1 shows the acreage of these crops. Particularly rice straw is considered as the

Table 1 Planted area and production of important crops in Thailand

| Crops | Area (million ha) | Production (million ton) |
|-----------|----------------------|-----------------------------|
| Rice | 9.62 | 16.9 |
| Corn | 1.8 | 3.0 |
| Cassava | 1.3 | 17.8 |
| Sugarcane | 0.58 | 24.4 |
| Sorghum | 0.24 | 0.23 |
| Kenaf | 0.22 | 0.19 |
| Mungbean | 0.48 | 0.28 |
| Soybean | 0.125 | 0.11 |
| Pineapple | 0.067 | 1.34* |

Center Agricultural Statistics, 1982/83.

* Year 1981.

most important by-product and is the main source of feed during the dry period. The farmers collect the straw and conserve it in a traditional way. Techniques to improve its nutritive value by treatment with urea and ensiling are now available and being promoted. Promma (1984) has shown that rice straw ensiled with 6% urea in water has a higher digestibility than untreated straw and higher weight gain was obtained in cattle fed with urea-treated rice straw compared to the lot receiving untreated straw. Many dairy farms in the Chiangmai area in the North are attracted to this new technique.

Sugarcane top is another interesting by-product. Dairy farmers in the central part of Thailand feed their cows with this roughage as part of green feeds while in other areas this product is not used. Recently, however, drying plants have been established in many areas to produce dehydrated sugarcane tops and the products are exported to Japan. Bagasses and molasses are also used for animal feed to some extent, but most of these products are either exported or reused in the factories. Bagasses are a source of supplemented fuel for paper pulp manufacturers. Rice bran, soybean cake meal and coconut cake meal are the other important ingredients for both ruminant and monogastric animals.

Size of holdings

As mentioned earlier, pasture improvement in Thailand involves the development of the backyard type due to the limitation in the land area available. The majority of the land is planted to cash crops. The average pasture area per family would not exceed one fourth of a hectare. This size of pasture does not enable to produce an adequate amount of feed for the stocks but traditionally the village cattle will be let loose to graze the public grazing land, roadsides and rice bunds or forest areas. For dairy cows, however, concentrate supplements form the major feed source. In the past, there were few ranch type farms with size ranging from 150 to 300 ha but the cost of investment was too high and the market price of cattle was too low for a profitable operation of such farms. At present farmgate price of cattle is US\$ 0.7 per kilogram which is too low for farmers to invest in inputs for their pastures. The

average cost of pasture establishment amounts to US\$ 116.8/ha.

Several larger farms having 100 or more head of draft animal, therefore, have established a cattle rent program. According to the scheme one or two head of cattle or buffaloes, for draft purpose, are rented to the small farmers and the rental fee ranges from US\$ 50 to 60 per season. The fee is paid in cash or in specie.

In the case of dairy farms, however, a greater number of cattle are kept, the average being 3-6 head/family. In all cases the pastures are of the backyard type.

Pasture research

Plant introduction is the major step in pasture development in Thailand and all the important forage species are the introduced ones. Very little work has been done to evaluate the performance of indigenous species. Systematic tests for the adaptation of the introduced species are carried out in several institutions including the universities and the Department of Livestock which includes pasture research in its organization.

Topark-Ngarm (1983) has supplied a list of species well adapted to the conditions prevailing in Thailand. As mentioned earlier, the most striking species are Verano stylo, Siratro, Centro, green leaf *Desmodium*, *Leucaena*, *Plicatulum*, Ruzi, Hamil and Signal.

Sorghum almum and some hybrid forage sorghum species are popular in dairy farms. Emphasis is also placed on the collection and selection of shade-tolerant plants for pasture under tree crops. Also, species for problem soils such as peat in reclaimed swamp soils and soils of coastal areas are of particular interest.

Pasture establishment techniques

Khon Kaen University and the Department of Livestock have carried out research into this important subject, particularly for the design of low cost techniques for the development of communal grazing land and backyard pastures. For the former, aerial oversowing is being studied using Verano seeds on native grazing land and forest areas (Charoonrote, 1982). In one forest plantation of *Eucalyptus* trees in the Northeast a check in the second year has recorded an average of 26.3 plants/m² of Verano seedlings.

Establishment of grasses by seeds always presents some problems due to slow growth and weed competition. This is always one of the important topics to be studied.

Fertilization at the establishment stage, particularly in the Northeast is also being worked out at Khon Kaen University (Boonrue, 1979), showing that P, K and S affect the Verano stylo establishment less than ploughing. However, from the economic point of view, ploughing to establish this legume in communal grazing land would increase the cost. Thus the present technique applied consists of grazing down the native grass as short as possible and the Verano seeds are sown before the start of the rainy season.

Through the establishment of the Verano in a tall grass species, early grazing has given encouraging results. Early grazing enables to keep the grass low and allows the legume to compete with the existing grasses. Selection of legumes for this purpose has been undertaken at Khon Kaen University. In 1983 one selection was released and named "Khon Kaen Stylo".

This line is resistant to anthracnose which had seriously affected the seed yield of a Townsville stylo line formerly used for communal land improvement. Study on the establishment of Ruzi grass under coconuts in the South has shown that high seeding rate with fertilization could give better strike and higher yield of the grass (Chanchai, 1983). With Guinea, however, quicker establishment was obtained by planting in using rootstocks, provided the soil moisture was adequate.

Pasture fertility

Khon Kaen University has carried out significant research on this aspect, particularly in the Northeast soils. In other regions the Department of Livestock and some other institutions have also been interested in this subject. In general soils in Thailand have low contents of N, P and in particular some Northeast soils, have low S contents (Gutteridge, 1976; Kesorn, 1977). In the highland areas of the North P and S are always needed and marked response of green leaf *Desmodium* to these fertilizers has been obtained (Andrews, 1978). In heavier soils, such as the red brown soils in the central highland area, a very significant response has been obtained in several grasses (Hoshino *et al.*, 1979). In the coastal areas in the South P is definitely required and the application of double super-phosphate at the rate of 190kg/ha has increased the yield of Para grass by 260%.

Forage crops in the farming systems

Emphasis is being placed on crop-livestock integration into the farming systems. Few legumes have been evaluated in inter-planting with rice, cassava and Kenaf. Endeavour stylo, Verano, Sunhemp and Lablab are promising legumes. Work at Khon Kaen University has shown that for upland rice interplanting the stylo 4 weeks after the germination of rice seeds using a plant density of 3-9 plants/m² did not affect the yield of rice grain. Ley farming technique is being evaluated in one location in the Northeast. Crops used are cassava and rice in combination with pastures composed of grass and Verano and *Leucaena*. Conclusions have yet to be drawn but good progress is being made.

Pasture establishment under coconuts and in forest plantations has attracted the attention of most pasture scientists. To date there are few reports on this line and few species such as Guinea, Signal, Ruzi, Cori and Centro are considered promising. The suitability of using *Desmodium ovalifolium*, a native shade-tolerant legume is being evaluated.

Grazing trials on Signal-Centro pastures revealed that the appropriate stocking rate could be around 1.5 head/ha. Weight gain under this stocking rate was 106.2kg/ha/year as compared to that obtained from the stocking of 1.0 and 2.5 head/ha, respectively (Chanchai, 1983). Trials on pastures in rubber plantations have shown that at the end of the fourth year after planting of rubber, pasture crops could not tolerate the dense shade of the trees. The plots were invaded by native grasses such as sour grass and *Ottochloa*, suggesting that native species would be more suitable under such conditions.

Areas in old mines may also be developed into pastures due to the nature of the soils which have a low fertility and are not suitable for other cash crops. Trials are being performed and so far signal grass (*Brachiaria brizantha*) seems to be promising.

Forest plantations are another area where pastures could have their place. Research along this line is being carried out by the Forest Industry Organization with a view to reducing the cost of weed control and a source of additional income for the villagers.

Major constraints

Although several institutions are engaged in pasture work, there is no organized national body for the coordination and planning of national pasture programs and similar studies are carried out by different institutes. This situation is aggravated by the limited number of trained personnel and facilities. Staff with a sound background in pasture research technology, tropical pasture management and pasture seed technology are needed.

As for development aspects, hindrance to the progress of pasture research is caused by the poor market or trading conditions of beef and dairy products. No good incentives are available to encourage the farmers to invest on pasture improvement. All these matters

should be carefully worked out if pasture development is to be achieved.

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Discussion

Cocks, P.S. (ICARDA): I would like to congratulate you on your programs of village development. In West Asia and North Africa we face the problem of developing communal grazing lands, in particular since nobody is responsible for the management of these lands. How are these lands managed in Thailand?

Answer: In these villages a cattle raising group is organized under the headman of the village who is responsible for the decisions to be made. Usually when the price of cattle is high, the villagers are enthusiastic about the project but when the prices fall the pasture area is destroyed and the farmers grow crops such as cassava and kenaf. In the North-East, a cow-calf scheme production for dairy purposes is being promoted. The animals are raised for 6-8 months and sold to other areas while the farmers are paid immediately.

Kawanabe, S. (Japan): I was impressed by the fact that in Thailand even small areas of land are used for herbage production. Does the government consider the possibility of introducing pastures into shifting cultivation areas?

Answer: An organization under the Forestry Department sets up forest village areas. Farmers' groups are organized to devise means of utilizing the land. Crops are generally grown for one year and thereafter pastures are established for animal grazing.

Mendoza, R.C. (The Philippines), **Comment:** The problem is how to maintain a proper

balance between these integration systems.