

Prospects for Integration of Forages for Ruminants into Coconut Plantations in North Sulawesi

L.W. Sondakh* and D.A. Kaligis*

Abstract

There are about 250 000 ha of coconuts in North Sulawesi, mostly cultivated by smallholders with an average farm size of 1.7 ha. The industry employs approximately 60% of the total labour force in agriculture and contributes about 80% of the province's exports. Land under coconut palms is mainly used for subsistence food production and cattle are raised in a traditional way for draught purposes with little adoption of modern practices. The market prospects for high quality meat are encouraging and should provide incentive for further investment in pasture research and improved husbandry practices.

Various studies have indicated possibilities for the modernisation of cattle and goat farming by smallholders through improvement of forage production, breeding and better cattle production systems. However, smallholder adoption of new technologies remains in doubt as the technologies have not been financially and economically evaluated at the 'on-farm' level.

INDONESIA, an archipelago with a population of 175 million, is the world's second-largest coconut producer after the Philippines. Coconuts are cultivated throughout the archipelago; approximately 10 million people obtain their livelihood from about 200 million palm trees on 3 million ha of coconut farms. Approximately 10% of the total coconut area of Indonesia is situated in North Sulawesi, the most important coconut-producing province in Indonesia.

North Sulawesi, with a land area of 2.57 million ha, occupies the eastern section of the long northern peninsula of Sulawesi. The mainland section is about 560 km long and never more than about 80 km wide; the Sangir and Talaud Islands stretch to the north, with the northernmost islands lying closer to the Philippines than to Manado. The climate is equatorial with a heavy rainfall spread evenly through the year, though it is drier between May and September. Leaching is severe under such conditions when the forest cover is removed. But, fortunately, the Indonesian 'ring of fire', or arc of active volcanoes, passes through Minahasa and the Sangir Islands, giving rise to fertile soils from volcanic deposits.

Nearly 60% of the land area of North Sulawesi is covered with forests, but plantation crops (mainly coconuts) form a significant part of the agricultural land (Table 1). According to an aerial survey reported by Babcock and Cummings, cited by Sondakh and Jones

(1989), land identified as suitable for intensive farming occupies only 297 000 ha or 11% of the total land area. However, Table 1 suggests a total farming area of 658 000 ha which considerably exceeds the suitable farming area. It is clear that more and more farmers have recently been moving to the hillsides in their quest for land, and this has resulted in serious erosion problems. Fortunately, in most areas, and especially in Minahasa Province, the hillsides are used mainly for coconut palms, a land use which does not lead to erosion.

Despite the leading role of rice in the food crops subsector, the province continues to import between 40 000 t and 50 000 t of rice per year. The potential for irrigation is estimated to be at least 51 000 ha, but effectively only about 20 000 ha have been fully irrigated. The second food crop is maize. In addition, the production of soybeans and, to some extent, peanuts and vegetables, has been rising rapidly.

Table 1. Land use in North Sulawesi.

Land use	Area ('000 ha)	Percentage
Forests	1500	58.1
Food crops	328	12.7
Plantation crops	330	12.8
Urban settlements	48	1.9
Lakes and rivers	30	1.2
Grasslands	26	1.0
Other (swamps, marshes, etc.)	316	12.3
Total	2578	100.0

Source: Sondakh and Jones (1989).

*Faculty of Animal Husbandry, Sam Ratulangi University, North Sulawesi, Indonesia

Plantations have long been the backbone of the economy. Kabupaten Minahasa is the major plantation area, containing over half of the coconut plantations and about two-thirds of the clove plantations. Nutmeg is produced mainly in Sangir Talaud, and coffee in Bolaang Mongondow.

The Coconut Production Subsector

Approximately 250 000 ha of land in North Sulawesi is devoted to coconut plantations producing about 250 000 t of copra per year. About two-thirds of all farming households in the province are coconut farmers with an average cultivated area of 1.7 ha. The industry contributes about 20% of the province's regional income. In addition, about 70% of its foreign exchange earnings come from exports of coconut products, mainly coconut oil, copra meal, and also charcoal and desiccated coconut. Other products of the coconut palm (often referred to as the 'tree of life') such as husks, trunk and palm juice have not yet been utilised. Intercropping is widely practised. Intercrops such as cassava, maize, rice and vegetables enable smallholders to secure their basic needs. About 30% of smallholder farm income derives from intercropping.

There are two main varieties of coconuts being cultivated in Indonesia, the traditional 'tall palms' and the newly introduced hybrid palms. The tall palms, with a density of 100 stems/ha, produce about 1 t/ha of copra with a productive life of at least 60 years in North Sulawesi. The hybrid palms with a density of 144 stems/ha are claimed to produce in excess of 6 t/ha of copra with a productive life of, at most, 40 years. The evaluation currently carried out on hybrids shows that these palms may not be as productive as expected.

The Intercropping Practices

A study by Sondakh (1984) on nearly 200 coconut farms in North Sulawesi showed an inverse relationship between size of coconut area and the proportion of area intercropped (Table 2). Intercropping under coconut palms is possible only if the palms are not too closely planted, e.g. fewer than 175 old tall palms/ha (Burgess 1981). Intercropping is also possible during the initial growth stage of both hybrid and tall palms when light interception is still low. Table 2 further shows that, on average, 35% of coconut land is used for intercropping. The main crops cultivated as intercrops are corn, rice, soybean, groundnuts, cassava, and sweet potato. Rice is mainly confined to the wet season, but other crops are grown in both wet and dry seasons.

The Livestock Subsector

The livestock industry has considerable potential. Pig consumption exceeds the national average, and the poultry industry has expanded rapidly. Cattle production has increased from 190 000 in the 1970s to nearly 300 000 in 1990. Cattle are raised in a traditional way mainly for draught work on farms. The province exports about 10 000 cattle annually to Jakarta, Kalimantan and Irian Jaya. These cattle are mostly male and/or females more than 8 years old. The meat is often of low quality.

Recently Alamtaha (1990) carried out a survey of 50 coconut farmers in Kabupaten Bolaang Mongondow (Table 3). The survey showed that, on average, one ha of agricultural land carried approximately 0.5 cattle. This is similar to the carrying capacity at the regional level, indicating that agricultural land including coconut land has not been used optimally for livestock production.

Table 2. Proportion of coconut area used for intercropping for different farm size categories.

	Farm size				
	Small	Medium	Large	Very large	All farms
Coconut farm area ranges (ha)	0.50 - 1.35	1.36-2.66	2.67-4.00	> 4.01	0.50-8.00
Average area (ha)	0.96 (0.23)*	1.94 (0.97)	3.41 (0.44)	6.16 (1.28)	2.64 (1.81)
Area intercropped (ha)	0.67 (0.44)	0.73 (0.70)	1.14 (0.02)	1.52 (1.72)	0.93 (0.85)
Proportion intercropped (%)	70	37	33	25	35

Note: In the wet season, the coconut land for intercropping may be cultivated with corn and upland rice. In the dry season, the land may be cultivated with corn, soybean and groundnuts.

* Figures in parentheses are standard deviations.

Source: Sondakh (1984)

Table 3. Land use and livestock numbers of SO coconut farmers in Kabupaten Bolaang Mongondow.

Average land use per family	
Coconuts (ha)	3.46
Cloves (ha)	1.88
Rice field (ha)	0.69
Coffee (ha)	0.16
Intercrops (ha)	0.05
Average number of livestock per farmer	
Cattle	2.60
Goats	2.60
Pigs	0.16
Chickens	7.00
Ducks	0.60

Source: Alamtaha (1990).

The Potential and Constraints for Increased Livestock Production

Future demand for good quality meat is quite promising. The stable and sustained economic growth experienced by Indonesia over the last 25 years has shifted the tastes and preferences of beef consumers from low to higher quality meat. Since income elasticity of meat exceeds unity, market prospects for better quality meat must be good. Unfortunately, the steady increase in demand is not followed by a steady increase in supply. Therefore the stronger domestic demand for good quality meat in Indonesia is mainly met by imports from Australia, New Zealand and North America. Most hotels in Indonesia serve imported rather than domestically produced meats.

Traditionally, the people of North Sulawesi husband cattle not only for draught but also as an asset and as security. In rural areas of the province, cattle ownership affects the social status of farmers. Husbandry practices are, however, traditional. Feeds for cattle are mainly grasses, e.g. lalang (*Imperata cylindrica*) and some legumes growing naturally under coconut palms. Grains and high quality grasses and legumes are rarely fed. Pest control is seldom applied. Vaccination is applied occasionally by officers from Dinas Peternakan. Well planned or well designed breeding programs are nonexistent. The traditional way of raising and breeding cattle is the main reason for the low rate of growth.

The main factors influencing smallholders not to adopt modern cattle farming are:

- (1) lack of capital and an inability to afford finance for modern systems of cattle farming;
- (2) poor farmers first have to secure their basic needs, which means that they must use their limited land for food crops and not for modern livestock farming practices; and
- (3) farmers have no access to improved profitable technologies in breeding, feeding and management of cattle.

The problems of lack of capital at the farm level may not be serious at the macro-level but it is serious at the 'on-farm' level. The majority of coconut farmers are smallholders whose incomes are just sufficient to secure their basic needs, and they are subject to high risks due to wild fluctuations of copra prices. For example, in the last five years, copra prices have fluctuated Rp 150-550/kg.

The problem of lack of capital is further aggravated by the fact that there is no history of technological change in the livestock industries. Over the past 25 years, Indonesia has been very successful in increasing food and export crop productivity but not so in livestock productivity. Rice production increased from 2 to 6 t/ha but the productivity of cattle remained constant. The lack of technological change in livestock production is caused by the lack of research and development in this industry. For example, the use of research funds for pasture and legume production at Sam Ratulangi University was no more than 2% of the total budget in each of the past five years.

Lack of research and information on available technologies at the farm level is the main factor in the comparative disadvantage of livestock production compared to other agricultural commodities. In other words, farmers do not yet believe that it is more profitable to allocate their limited land and capital to increased integration of livestock into their farming system.

Against this, the prospects for increasing farm cattle production are, however, quite promising. Research undertaken by the Faculty of Animal Husbandry, Sam Ratulangi University (Kaligis and Sumolang, these Proceedings) shows that soils and climate in North Sulawesi are suitable for intensive livestock production systems. The team has identified more productive grasses and legumes suitable for North Sulawesi. Unfortunately the technologies already identified have not carried through into on-farm trials, which are necessary for the technologies to be disseminated to farmers.

A study undertaken by the Coconut Research Institute in Manado (Mahmud and Allorung 1989) shows that improvement of 'natural pastures' under coconut palms in North Sulawesi can significantly influence daily weight gain of cattle (see Table 4).

The data show that greater access to planted setaria (*Setaria sphacelata*) pasture improves bodyweight gain. These results indicate that the potential for increasing cattle production through introduction of improved grasses and legumes and related management practices is quite high. The Research Institute also reported that the introduction of intercrops of food crops and/or grasses and legumes under coconut palms may also increase coconut production.

Table 4. Weight gain of cattle fed varying proportions of *Setaria* sp. in addition to a low-quality basal diet

Feeding regime (% <i>Setaria</i>)	Weight gain (g/head/day)
0	-94
20	314
40	526
60	757
80	909

Note: The feeding trial was run over 5 weeks and the basal diet consisted of natural grasses plus concentrates.

Source: Mahmud and Allorung (1989).

Conclusions

The data presented in this paper demonstrate the potential for increased integration of forages and cattle into coconut-farming systems. However, further research, particularly on-farm, is still needed before we can be confident that the new technologies can be disseminated at farm level.

References

- Alamtaha. 1990. Intensive dan Peranan Ternak Sapi dalam Usahatani Kelapa. Penelitian Thesis Sarjana Peternakan, Universitas Sam Ratulangi, Manado.
- Burgess, R.J. 1981. The intercropping of smallholders in Western Samoa: An analysis using multistate linear programming. Research Studies 4, Development Studies Centre, Australian National University, Canberra.
- Mahmud, Z. and Allorung, D. 1989. Hasil hasil penelitian tanaman kelapa danpalma. Makalah yang disampaikan pada Saeminar Hasil Penelitian Terpadu Sub-Sektor Perkelapaan dan Cengkeh; Pusat Penelitian Universitas Sam Ratulangi, Manado.
- Sondakh. L.W. 1984. Growth and equity aspects of credit programs for small-farm coconut development in North Sulawesi, Indonesia. Ph.D. thesis, University of New England, Armidale, Australia.
- Sondakh, L.W. and Jones, G.W. 1989. North Sulawesi: unexploited potential. In: Hill, H., ed., Unity and Diversity. Regional Economic Development in Indonesia since 1970. Oxford University Press, Singapore.