Farmer evaluation of forages in Indonesia: Progress, experiences and future plans

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Introduction

On-farm evaluation of forages with the Forages for Smallholders Project commenced in East Kalimantan in 1995. Since then farmer evaluation of forages expanded to seven sites in East and Central Kalimantan, Aceh, North Sumatra and North Sulawesi. Collaborators based at these sites are from Provincial and District Livestock Services, and the Agency for Agriculture Technology Assessment, all under the Ministry of Agriculture. These institutions have personnel based in the communities where the FSP is working (Table 1).

Table 1. Sites and collaborating institutions of the FSP in Indonesia.

Site	Collaborators
Saree, Aceh	Provincial Livestock Services
Pulau Gambar, North Sumatra	Assessment Institute for Agriculture Technology
Marenu, North Sumatra	Assessment Institute for Agriculture Technology and the Transmigration Office of North Sumatra
Sepaku, East Kalimantan	Provincial Livestock Services
Makroman, East Kalimantan	Provincial Livestock Services
Kanamit, Central Kalimantan	Provincial Livestock Services
Gorontalo, North Sulawesi	Provincial Livestock Services

Collaborators from East and Central Kalimantan worked already with the Southeast Asian Forage Seeds Project from 1992 to 1994. All collaborators had experience in research and / or development work either with forages or with farmers.

Description of sites

Table 2 shows the location and brief climatic summary of FSP sites in Indonesia. A brief description of soils and the farming system is presented in Table 3.

Most of the sites are upland areas, except for Pulau Gambar and Kanamit which are flat. Kanamit is in an areas which is seasonally flooded and recent efforts to drain the area have resulted in large areas of acid sulphate peat soils with extremely low pH. The site in Gorontalo is dominated by smallholder coconut plantations with farmers growing annual food crops under the plantations. Sepaku is located in *Imperata* grasslands which have partially been allocated to farmers (1-2 ha per farmer). Wild pigs make upland

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cropping difficult at this site and farmers rely more on cattle and pepper for cash income. Generally, soils are of clay type, with pH varying from very acidic to slightly acidic and low to moderate fertility. Topography varies from flat to steep. Altitude ranges from sea level to more than 500 m above sea level in Saree, Aceh and Marenu, North Sumatra.

All sites have farms that are crop-based but livestock play an important role as a source of draft, cash income and manure. Often, corn and cassava are the major food and crops; rice is cultivated in valleys or flat areas. Farmers in North Sumatra plant fruit crops, vegetables and oil palm. Fruit crops, vegetables and peppers are cultivated in East Kalimantan. Farmers in Central Kalimantan plant banana, coconut and coffee as cash crop. Most farmers in all sites use fertiliser and manure for their crops, and some also sell manure.

Sale of crops is a major source of cash income in all sites. Chicken and goats are used for religious ceremonies, festivals, or provide cash for immediate needs, while cattle or buffalo is sold when the family needs a large amount of cash; like for schooling, weddings, or building a house. In some cases, during dry season, male members of the families, go to adjacent towns, working off-farm. All the sites experience an increase in area devoted to crop production, thereby reducing the grazing areas available for ruminants.

In most areas, except in Aceh and Central Kalimantan, cattle and buffalo are tethered or graze freely on native vegetation in vacant areas during the day with basically no or minimal supplementation of salt. Only animals kept in pens or tethered near the house for fattening are supplemented with rice bran and extra cut feed. Farmers cut native grasses from roadsides, rice fields, forest areas, or near plantation crops, for night feeding. In Aceh, large areas of natural grassland are still available, but these are in poor condition. Farmers graze their animals on these grasslands, relying solely on the vegetation available there. Since forages became available through the FSP, farmers grow forage banks near their communal sheds and use this feed for night feeding. In Central Kalimantan most of the cattle are kept near the houses and are supplemented with grasses cut by the farmers.

Table 2. General description of FSP sites in Indonesia: Physical characteristics.

Site	Latitude	Altitude (m)	Annual rainfall (mm)	Wet season	Wet months (>50mm)
Saree, Aceh	5^0 N	500	1580	Oct - Apr	4-8
Marenu, North Sumatra	4^0 N	300	2330	Oct - Apr	7-10
Pulau Gambar, North Sumatra	3^0 N	<100	>2000	Oct. - Apr	7-10
Sepaku, East Kalimantan	1^0 S	<100	2400	Nov - Jun	7-11
Makroman, East Kalimantan	1^0 S	<100	2040	Nov - Jun	7-11
Kanamit, Central Kalimantan	3^0 S	<20	2750	Nov - Jun	8-11
Gorontalo, North Sulawesi	0^0N	18	1290	Nov - Jun	5-7

Table 3. General description of FSP sites in Indonesia: Soils and farming system.

Site	Soil Characteristics	Description of farming system
Saree, Aceh	• Clay-loam • Slightly acidic • Moderately fertile • Well-drained • Flat to steep	• Intensive upland farming and grassland • Crops: corn, sweet potato, peanuts, vegetables, for consumption and cash • Crops fertilised with manure and inorganic fertiliser • Animals: locally-breed beef cattle • Grazed native vegetation with salt supplementation
Pulau Gambar, North Sumatra	• Clay • Slightly acidic - neutral • Moderately fertile • Poorly drained • Flat	• Intensive rainfed rice and access to oil palm and rubber plantations • Crops: lowland rice, vegetables for consumption and cash • Crops fertilised with manure and inorganic fertiliser • Animals: sheep • Pen-feeding
Marenu, North Sumatra	• Clay-loam • Extremely acidic • Very low fertility • Well-drained • Rolling	• Intensive upland farming • Crops: corn, upland rice, vegetables, and oil palm for consumption and cash • Crops fertilised with manure • Animals: sheep • Pen-feeding
Sepaku, East Kalimantan	• Red-yellow podsolic • Very acidic • Low fertility • Well-drained • Rolling to steep	• Large areas of *Imperata* grasslands • Crops: small areas of lowland rainfed rice and small areas of upland vegetables (home garden), and upland pepper for consumption and cash • Crops are fertilised with manure • Animals: beef cattle (Brahman crossbred) • Tethered to graze native vegetation during the day, and cut and carry for night feeding
Makroman, East Kalimantan	• Podsolic • Very acid • Well-drained • Low to moderate fertility • Rolling to steep	• Mixed lowland rainfed rice and upland crops • Crops: corn, rainfed rice (valleys and flat areas), cassava, sweet potato, vegetables for consumption and cash • Crops are fertilised with manure and inorganic fertiliser • Animals: beef cattle and goats • Mostly pen-feeding
Kanamit, Central Kalimantan	• Acid sulphate peat • Clay soils in higher areas • Extremely acidic soils • Seasonally flooded • Low fertility • Flat	• Under lowland rain-fed rice and upland crops • Crops: coconut, corn, banana, fruit trees, coffee, vegetables; for consumption and cash • Crops fertilised with manure and inorganic fertiliser • Animals: beef cattle • Animals tethered near the house, and fed cut and carry forages during the day and for night feeding.
Gorontalo, North Sulawesi	• Clay-loam • Seasonally flooded • Moderately fertile • Flat	• Large areas are under coconuts; upland crops are grown under coconuts • Crops: coconut, corn, banana, fruit trees, vegetables; for consumption and cash • Crops fertilised with manure • Animals: beef cattle • Animals tethered to graze native vegetation, and cut and carry for night feeding. During dry season feeds are bought. Some farmers grow a third corn (leave only, no cobs) for feeding animals during the dry season.

Procedure and results of participatory diagnosis

Participatory diagnosis (PD) has been done at all sites. The basis for selecting farmers in the activity were their membership in farmer groups that already had a good working relationship with the collaborators and their perceived need for forages. Table 4 shows a summary of the problems expressed by farmers and those that are being addressed by on-farm activities.

Lack of feed during dry season, poor animal performance and unavailability of adapted forage species were problems expressed at most sites. This problem was mostly due to increases in animal population and a declining area available for grazing. At some sites, a lack of feed during cropping season, when most areas are planted to crops, was also a problem. Farmers did not see soil erosion as a major problem, despite it being clearly evident at some sites (eg. Saree). Uncontrolled grazing is a problem for farmers in Saree and Pulau Gambar where farmers have tried to establish forages which were then damaged by animals of other farmers.

Farmers in East Kalimantan and Marenu expressed a need for new forage varieties. These farmers had previously grown giant Napier grass (King grass) or *Setaria sphacelata* var. *splendida* for their animals. They observed that these species were not able to persist under their conditions.

Table 4. Major problems identified by farmers in Participatory Diagnoses in Indonesia.

Problem	Saree	Pulau Gambar	Marenu	Sepaku	Makroman	Kanamit	Gorontalo	Kanamit	Gorontalo
Lack of feed in dry season	+ ✔	+ ✔	++ ✔	++ ✔	+ ✔	+ ✔	++ ✔	-	++ ✔
Uncontrolled grazing	+	+	-	-	-	-	-	-	+
Increase in unpalatable weeds	+	-	-	-	-	-	-	-	-
Diseases in animals	-	+	+	+	-	-	-	+	-
Poor animal performance	+	+	+	+	+	-	-	+	+
Unavailability of adapted forages	+ ✔	+ ✔	+++ ✔	+ ✔	+ ✔	+ ✔	+ ✔	-	-

[1] + = moderate priority; ++ = high priority; +++ = very high priority.
[2] ✔ = Problem is being addressed by on-farm activities.

Farmers are coping with the lack of feed by using rice straw and other agricultural by-products, taking their animals to far away areas to graze, gathering tree leaves and banana trunks, gathering native forages from areas along roadsides, rice fields, or near plantation and forest areas, and carrying these to their animals. Some farmers also provide salt supplementation.

Activities conducted at the sites

Activities vary between sites (Table 5). The basic procedure, however, involves consulting with farmers (PD and planning), followed by establishment of initial testing and multiplication areas, followed by individual testing by farmers on their own land. In between these stages, field days, trainings and cross-visits are arranged. Regular meetings with farmers were done to exchange experiences (eg. participatory evaluation) and maintain the initial testing area. Likewise, farmers were visited to gather feedback.

The initial testing and multiplication areas were established and managed by farmer groups. The decision on which species to try was made in consultation between site collaborators and farmers. These multiplication areas were very useful for conducting field days and trainings. Farmers could see the species and decide for themselves which ones they would like to try on their farms.

The major basis for selecting farmer-co-operators was their interest and availability of land to plant forages. Whenever possible, innovative farmers with leadership and communication skills were chosen.

Distribution of planting materials was done either during field days or by individual request. The latter seemed to result in better establishment since the farmers are keen and ready to plant before they gets the planting materials. This was done in cases when farmers wanted large amount of planting materials.

On the other hand, farmers always ask and get planting materials during field days. In this case, collaborators ask the farmers to plant just a few plants near their houses to later serve as source of planting materials if farmers want to expand.

Table 5. Summary of FSP site activities in Indonesia.

	Saree	Pulau Gambar	Marenu	Sepaku	Makroman	Kanamit	Gorontalo
Type of activity							
Communal – formal[1]	✔	✔	✔	✔	✔	-	✔
Individual – formal[1]		✔	✔	✔	✔	-	✔
Individual – informal[2]	✔	-	✔	✔	✔	✔	✔
Method of planting material distribution							
Field days	-	-	-	✔	✔	✔	✔
From FSP	✔	✔	✔	✔	✔	✔	✔
Individual contact	-	-	-	✔	✔	✔	✔
Possible forage types/options							
Grasses for cut-and-carry							
- in hedgerows	-	-	-	✔	✔	✔	✔
- in blocks	✔	✔	✔	✔	✔	✔	✔
Grasses for grazing	✔	-	-	-	✔	✔	✔
Herbaceous legumes							
- for grazing	✔	-	-	-	✔	✔	✔
- as cover crops	-	-	-	-	✔	-	✔
- for soil improvement	✔	✔	✔	✔	✔	✔	✔
- as relay to main crop	-	-	✔	✔	✔	✔	✔
Tree/shrub legumes							
- in hedgerows	-	-	✔	✔	✔	✔	✔
- in fence lines	✔	✔	✔	✔	✔	✔	✔

[1] Technicians and farmers together decide on what species and what option to test.
[2] Farmers chose the species and option by themselves.

Progress of forage technology development, evaluation and adoption

Validation of the result of PD was conducted two to three months after the PD. If the farmers still expressed their needs for forages, the meeting continued to participatory planning. During participatory planing, farmers proposed what they need individually and as a group. Later on, the technicians and the field extension workers, assisted by the chairman of the group, helped the farmers in setting up their forage plots.

The pace and progress of on-farm work varied between sites, but most sites are now into individual farmer testing (except Aceh), trainings and farmer field days as well as participatory evaluation, except legume trees in East Kalimantan and Gorontalo (still in early stages of growth) and Central Kalimantan (have not started individual planting).

Collaborators at all sites report that it takes time for establishing forages on-farm with the farmers. Factors like farmers' access to other cash crops, income sources other than livestock, the availability of native species often slow down the process despite frequent visits and discussions.

It is the farmers with a strong need who are the ones establishing forages, even to a point where they approach the technicians or pay some money to get planting materials.. On the other hand, there are farmers who succumb to peer pressure or to an impulsive, but temporary instinct, to get planting materials. Moreover, there are also 'wait-and-see' types of farmers.

Farmer visits, field days, trainings and cross-visits were very useful in sustaining interest of farmers. It is during these activities that farmers and technicians share ideas, learn from each other and plan activities for the next few weeks.

It was also observed that there were more farmers who obtained planting materials in sites where livestock dispersal programs exist. This implies that forage technology development would be facilitated if implemented with livestock improvement program.

Moreover, successful forage establishment was facilitated in cases where strong farmer organisations existed. The existence of 'kelompok tani ternak' (farmer groups) also was a big factor in rapid establishment of forages in individual farmers' fields.

Farmers' feedback

Farmers reacted well to the participatory approach. They felt involved and free to choose whatever species, options and way of establishment they wanted. Involving these farmers in field days and in training other farmers has been beneficial for the trainees and the farmer trainers as well.

In terms of individual forage species, farmer preferences varied with sites. At early stages (initial testing and multiplication), farmers tended to prefer species which grew well and showed good yield potential. Later, other major criteria were palatability, easy establishment and management, and persistence during dry season.

For grazing species, farmers started to realise the value of grazing tolerance (for grazing species), ability to spread and produce ground cover and palatability. For instance, farmers in East Kalimantan found that *Brachiaria humidicola* spread fast, tolerate close grazing and possess good palatability. Even for cut and carry species, farmers in Central Kalimantan found it very useful.

A farmer in East Kalimantan observed that the meat quality of his cattle improved when his cattle grazing this grass.

Centrosema pubescens CIAT 15160 was found to suppress *Imperata* in Makroman, making it a useful cover crop and was palatable to goats and cattle. They also observed

that when they intercropped it with corn and cassava, the taste of the crop did not change while the need for fertiliser and weeding decreased, the yield of corn increased and the yield of cassava was reduced only slightly.

Farmers favoured tall and upright grasses like Napier (King and elephant grass), *P. maximum*, *Setaria sphacelata var. splendida*, *Paspalum atratum, Paspalum guenoarum* and *Andropogon gayanus* for cut-and-carry, especially because of their good yield and palatability. In addition, *P. atratum* and *P. guenoarum* were found tolerant to occasional flooding and was not itchy when cut, but *P. atratum* has sharp leaves which may reduce its spread.

Farmers have also observed that legumes like S*tylosanthes guianensis* 184 were not as palatable as grasses for cattle. These cases occurred when these species were fed with grasses during wet season.

Desmodium cinerea (previously called *D. rensonii)* was found to posses de-worming effects in Saree, while *Desmodium heterophyllum* CIAT 349 died during dry season, even though it formed a dense ground cover during wet season.

Farmers' management of forages

As of this stage, many individual farmers in East and Central Kalimantan, and Marenu are planting larger areas, while farmers in Pulau Gambar and Gorontalo are still planting the species in small plots (either in blocks or short hedgerow lines), either near their houses or in portions of their farms. The farmers' group in Aceh has not yet expanded the initial area of the pasture; the species are either grazed or cut and fed to animals from time to time.

The farmers' group in Saree also planted *Panicum maximum, Paspalum atratum, and Brachiaria brizantha* near the communal shed, and they cut them every 2 – 3 weeks, even during dry season. They said that if they let them grow more than 3 weeks, leaves are too coarse for the animals. This is also the case with *Brachiaria humidicola* in Central Kalimantan.

Grasses and shrub/tree legumes were also planted in fence lines. A farmer in Makroman started planting *Centrosema pubescens* CIAT 15160 and *Stylosanthes guianensis* CIAT 184 between the rows of corn and cassava. He then observed that *C. pubescens* preserved the moisture of the soil, suppressed the weed, kept the soil friable, reduced the need for fertiliser, as well as providing good feed for his goat. Learning these results, his neighbours were excited to try this 'new technology' to the point that they planted *Paspalum atratum* between the rows of corn. When they were told that the grass may reduce the yield of the corn, they said it did not matter, since they also needed the forages for their animals.

Experiences with participatory evaluation

Participatory evaluation (PE) has been carried out at most sites. This was done mostly in the initial testing and multiplication area. Farmers observed the species and gave their comments. In some sites where farmers have planted forages on their own farms, farmers' observations on the forages that they established were also taken. Open-ended evaluation and preference ranking were used for PE.

Farmers answered on characteristics related to the utilisation of a particular species. This includes information on yield, palatability, regrowth ability, itchiness, persistence, as well as easy management and time saving effect of forages when planted near the house.

There is still a need to gain more experience and skills in evaluation techniques like probing and asking questions as well as obtaining farmers' criteria in selection of a certain species. In the process of evaluation, a lot of things can happen and the person handling the evaluation has to learn how to deal with the situation. These skills only be obtained by practice, reflection and training. Every evaluation session is different from another.

Technical issues

A major issue for expanding on-farm evaluation is the production and handling of seeds. At this stage, most of the grasses are established using vegetative planting material. Legume species are usually established from seed. The problem is there is no commercial production of forage seeds in Indonesia. Government stations only produce a small amount of legume seed, due to their location and climatic factors. Moreover, there has been no successful seed production attempt at the farmers' level. With the hot, humid climatic conditions in most of Indonesia, it is difficult to store seeds for any length of time. This problem needs close attention if rapid expansion of forages is to be attained.