

Forage Seed Production and Seed Supply Systems in Southeast Asia

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ABSTRACT

There is good potential to increase forage seed production and to develop trade in forage seed among countries in the Southeast Asian region. More than 1200 tons of seeds were produced in Thailand in 1995, with smaller quantities of seed having been produced in China, Lao PDR, Malaysia, Philippines and Indonesia. The four main species were *Brachiaria ruziziensis*, *Stylosanthes hamata*, *Stylosanthes guianensis* and *Panicum maximum*. There is a need to increase seed production of widely adapted species in the region. Additionally, common seed quality standards, seed certification, storage and shipping guidelines must be developed. This paper summarizes the forage seed production and seed supply systems in Southeast Asia. The strengths and weaknesses of the present seed supply system are examined and future development of private sector involvement in forage seed industry are also discussed.

INTRODUCTION

The available technology for tropical forage seed production in Southeast Asia is now being advanced through research and development of seed production programs. Research in Southeast Asia has largely been directed at developing appropriate production systems, notably in Thailand where the long tradition of

smallholder farming practices is being successfully continued with grass and legume seed production. Works to develop local forage seed production is also being undertaken in Malaysia (*Aminah et. al., 1996*), India (*Turton and Baumann, 1998 and Krishnan, 1998*), China (*Guodao et. al., 1998*), Philippines (*Valenzuela, 1989*) and Indonesia (*Nitis et. al., 1996*).

The demand for forage seeds has increased rapidly in recent years. This is related to the expanding beef and dairy production which in turn is fueled by the ever-increasing human population and the rising living standards in parts of Southeast Asia. The demand for forage seed increased as it has been proven that dairy farmers will achieve greater profit by increasing the proportion of improved pasture in the feed and reducing their dependence on expensive concentrates.

SEED PRODUCTION AND SEED SUPPLY SYSTEMS

In all countries in Southeast Asia, the government plays an important role in forage seed production. The amount of seed produced, seed supply systems and main forage species produced in countries in Southeast Asia in 1995 is shown in **Table 1**. Species with more than 10 tons of seeds produced in 1995 were *Brachiaria ruziziensis*, *Stylosanthes hamata* cv. Verano,

Table 1. Estimated amount of seed produced (tons), seed supply systems and main forage species produced in six Southeast Asian countries during the year 1995 (Phaikaew et al. 1997).

Country seed produced (t)	Seed Supply Systems		Major species produced
	Production system	Marketing	
China P.R.			
20.5	State Farms (government run but operating relatively independent)	Sold directly from the state farms to other government companies or private farms	<i>Stylosanthes guianensis</i> CIAT 184 and cv. Graham, <i>S. scabra</i> cv. Seca, and small quantities of <i>S. hamata</i> cv. Verano, <i>Melinis minutiflora</i> , and <i>Brachiaria decumbens</i>
Indonesia			
1.6	Government Livestock Stations producing cuttings and seed	Largely for use of government programs. Some cuttings (mainly King grass) are sold to private companies	<i>Leucaena leucocephala</i> K 636 and cv. Cunningham, <i>Macroptilium atropurpureum</i> , <i>Sesbania grandiflora</i> , and small quantities of <i>Stylosanthes guianensis</i> cv. Cook and CIAT 184, <i>Paspalum atratum</i> BRA 9610, <i>Centrosema pubescens</i> CIAT 15160, <i>C. macrocarpum</i> CIAT 22552, <i>Paspalum plicatum</i> and <i>Gliricidia sepium</i> cv. Retalhuleu and <i>Cratylia argentea</i>
Malaysia			
2.4	Department of Veterinary Services(DVS) Livestock Station Sintok Farm. Small quantities for research purposes are produced by the Malaysian Agricultural Research and Development Institute (MARDI).	Seed is distributed free of charge to dairy farmers, beef cattle and sheep rearers, and government researchers. Seed is sold to private companies for road side erosion control (e.g. <i>B. ruziziensis</i>) and to commercial farms	<i>Brachiaria ruziziensis</i> , <i>Stylosanthes guianensis</i> CIAT 184, and small quantities of <i>Panicum maximum</i> cv. Vencedor and cv. Common, and <i>Arachis pinto</i> cv. Amarillo

continued. . .

Table 1 continued.

Country seed produced (t)	Seed Supply Systems		Major species produced
	Production system	Marketing	
Lao PDR			
2.7	From 1985-1989, farmers produced seed of <i>Stylosanthes hamata</i> on contract to the Lao-Australian Livestock Development Project. Since then seed has been produced on the government cattle station Nam Suang	From 1985-1989, seed of <i>S. hamata</i> was distributed to farmers free of charge. There was a lot of wastage and seed is now sold to farmers. Seed is also used by government R&D programs	<i>Brachiaria ruziziensis</i> and small quantities of <i>Andropogon gayanus</i> , <i>Panicum maximum</i> , <i>Brachiaria brizantha</i> , <i>Gliricidia sepium</i> and <i>Leucaena leucocephala</i> K 636.
Philippines			
< 1.0	Government stations	a) Largely for the sowing on government stations; small amounts of seed are given free to farmers	<i>Stylosanthes guianensis</i> cv. Cook and small quantities of <i>Desmanthus virgatus</i> , <i>S. guianensis</i> CIAT 184, <i>Brachiaria decumbens</i> , <i>B. brizantha</i> , <i>Andropogon gayanus</i>
	b) Farmer's production of small quantities organized through two NGOs (Mindanao Baptist Rural Life Center and Mag-uugmad Foundation of Cebu)	b) Sold to organizations and farmers directly; seed is usually collected only upon receipt of an order	b) <i>Desmodium rensonii</i> , <i>Leucaena diversifolia</i> , <i>Flemingia macrophylla</i>
Thailand			
1,279	a) Farmers produced seed on contract for a guaranteed price for the government	Seed is processed and marketed by the Government; it is used largely in government projects such as dairy promotion, agricultural restructuring and extension projects; it is sold to farmers and private enterprises at low prices	a) Farmers produced 740 tons or 82% of <i>Brachiaria ruziziensis</i> , 130 tons or 87% of <i>Stylosanthes hamata</i> cv. Verano and 90 tons or 65% of <i>Panicum maximum</i> TD58
	b) Government animal nutrition		b) Stations produced <i>B. ruziziensis</i> , <i>S. hamata</i> cv. Verano, <i>Panicum maximum</i> TD58, and small quantities of <i>Paspalum plicatulum</i> , <i>P. atratum</i> , forage sorghum, other grasses, <i>Leucaena leucocephala</i> , <i>Centrosema pubescens</i> , <i>S. guianensis</i> CIAT 184 and other legumes

Stylosanthes guianensis CIAT 184, and *Panicum maximum* TD 58.

The amount of forage seed production by the Thai government has decreased since 1995. This decrease was due to the decreasing demand from government projects and the government's policy to gradually transfer the production and marketing role to the private sector.

In 1996, there was evidence that direct selling forage seeds from farmer to farmer is increasing. Panit-uttra and co-workers (1997) reported on a survey of forage seed sales of 115 farmers in Prayuen District, Khon Kaen, Thailand, which is one of the big farmer in seed producing areas (Table 2). Quota sales of Ruzi grass seeds to the Department of Livestock Development (DLD) accounted for only 30% of the total sales of Ruzi seeds of the farmers. The proportion of seeds of Purple guinea and Verano stylo sold to DLD were higher at 69 and 83%, respectively. The remaining seeds were sold directly by farmers to other livestock farmers and seed merchants. This shows that the amount of forage seeds produced by farmers is much higher than the amount bought by the government. The amount of above quota seeds for all of Thailand is not known but it appears that the total quantity of seed produced by farmers has not decreased although the quota from

government has been reduced.

While the role of the Thai government in buying seeds from the farmers is decreasing, DLD has increased the range of forage species produced on station and by farmer (Table 3). Due to high demand of new grass species, such as *Paspalum atratum*, and new legumes, such as Stylo 184 and Cavalcade Centurion, have been or are produced in large quantity in 1997 and 1998. The major species are still Ruzi, Verano stylo, Purple guinea and Plicatulum.

Research and Evaluation of Seed Production of New Species

In Thailand, if a new forage crop is being introduced to farmers for seed production, research on seed crop management is first conducted on station for 2-3 years. This enables management practices to be developed and the average seed yield obtained in order to work-out a price to offer to farmers for contract growing. In the last two years, the Thai DLD started research on seed crop management of *P. atratum* BRA 9610, *M. gracile* cv. Maldonado (*Llanos macro*), *C. pascuorum* cv. Cavalcade (Centurion) and *S. guianensis* CIAT 184 (ThaPra stylo). Issues researched included methods of establishment and harvesting, and suitable seed production technologies are now available for these species.

Table 2. Amount of forage seed sale of 115 farmers from Prayuen District, Khon Kaen, Thailand during the year 1996 (Panit-uttra et. al., 1997).

Farmer Seed	Seed Buyer (kg)		Proportion Sale to DLD (%)
	DLD	Others	
(<i>Brachiaria ruziziensis</i>) Ruzi	13,247	31,676	30
(<i>Panicum maximum</i> TD58) Purple guinea	3,185	1,455	69
(<i>Stylosanthes hamata</i>) Verano Stylo	7,885	1,593	83
Total	24,317	34,724	41

Table 3. Amount of forage seed (tons) produced by Thai DLD in 1997 and target yield in 1998.

Forage Seed	1997			1998		
	Station	Farmer	Total	Station	Farmer	Total
Grasses	141	160	301	130	66	196
Brachiaria ruziziensis (Ruzi)	75	135	210	66	52	118
Panicum maximum TD58 (Purple guinea)	21	21	42	17	10	27
Paspalum atratum	11	4	16	22	3	25
Paspalum plicatulum	21	-	21	13	1	14
Centchrus ciliaris (Rhodes)	2.5	-	2.5	3	-	3
Others grasses	10	-	10	9	-	9
Legumes	17	63	80	30	60	90
Stylosanthes hamata cv Verano stylo	4	58	62	2	46	48
S. guianensis CIAT 184 (ThaPhra Stylo)	1	1	2	2	7	9
Centrosema pascuorum cv Cavalcade	5	-	5	19	3	22
Centrosema pubescens	0.4	3	3	2	2	4
Leucaena leucocephala	-	1	1	-	2	2
Arachis pintoi	0.1	-	0.1	1.2	-	1.2
Macroptilium gracile (Llanos macro)	0.5	-	0.5	1.0	-	1.0
Desmantus virgatus	1.2	-	1.2	1.0	-	1.0
Other legumes	4.8	-	4.8	1.6	-	1.6
TOTAL	158	223	382	160	125	285

Other grasses include : Setaria, Sorghum, Green panic, Signal, Jarr and B.brizantha

Other legumes include : Bundy Centurion, Seca and Siran Stylo, Pigion pea, Lee and Glenn Jointvetch

If there is a demand for forage of new species then it is normal to go to existing seed producers to ask them whether or not they would like to try out a new seed crop. The DLD has found that it is best to approach experienced seed growers for new seed crops. Usually, the DLD asks 10-40 farmers to grow a new species. These farmers are very good operators and their fields are usually not too far from the research station, so that research officers can visit the crops regularly. If the new species produce high seed yields in the villages and the farmers are happy with the crop, then production will expand in the following years, provided that there is a demand for seed.

Examples of seed yield and seed quality of *P. atratum* from various method of harvesting is shown in **Table 4**. The results of this experi-

ment show the good potential to produce seed of *P. atratum*. DLD aims to increase the amount of *P. atratum* seed production from 15 tons in 1997 to 25 tons in 1998.

Strengths and Weaknesses of Seed Supply System

Strengths

The present seed supply system has facilitated the large-scale planting of pastures on government stations and large farms and in backyard forage programmes in the villages. It has also enabled many thousands of kilometres of roadsides to be oversown with Verano stylo in Thailand.

Government subsidies for seed is helping to break down old prejudices. Many farmers believe that grass is a free commodity supplied by

Table 4. Seed yield (kg/ha) and seed quality of *Paspalum atratum* from various method of harvesting (Phaikaew, unpublished data).

Seed harvesting methods	Seed yield (kg/ha)	Purity (%)	Seed quality		Pure germinable seed yield (kg/ha)
			1000 seed weight (g)	Germination (%)	
Shaking seed head 3 time/week	605c	92	3.078	91	506
Covering with nylon net bag	1050a	87	3.030	90	827
Cut 10 days after flowering	678c	63	2.114	59	254
Cut 15 days after flowering	789bc	84	2.572	87	587
Cut 20 days after flowering	333d	71	2.404	79	193
Standing net receptacle	922ab	92	2.987	93	793

nature and that to buy grass seed is not money well spent (Phaikaew and Hare, 1996). This attitude is changing as more and more farmers are encouraged to use grass seeds and come to realize the economic benefits of growing good quality forage rather than buying expensive concentrates for their cattle.

Village seed production has brought economic benefits to many smallholders through higher returns per hectare. It has also enabled them to grow crops that do not deplete soil fertility. Probably the most important underlying factors contributing to the development of the present system has been continuity and commitment by the government. In Thailand, there has been continuous research and development for more than 20 years, and in particular a continuity of key personnel and experienced support staff to facilitate progress. There has been strong commitment shown at all stages, firstly to the success of the various pilot projects and then to the development of production on a larger scale including government financing of the DLD seed enterprise. The extensive network of DLD field officers and forage stations in nearly all provinces has enabled village seed production and pasture development to expand rapidly.

WEAKNESSES

Limited range of species. The present seed supply system has been restricted to a limited range of species, mainly, Ruzi grass, Verano stylo and purple guinea (Phaikaew and Hare, 1996). A wider range of species is required to maximize the benefits from pasture development in Southeast Asia. In case of dairying, where high quality forage is needed, none of the current major species really meets this criterion. Recently, there is a wider range of species and large amount of seeds have been produced, ie. *P. atratum*, *S. guianensis* CIAT 184 (ThaPra stylo), *Cavalcade Centurion*, *A. pinto* and *D. virgatus* in Thailand. Also, research on evaluation of *Brachiaria* species for seed production and dry season tolerance is being conducted with promising varieties emerging.

Need government support. To date, governments in all countries in the region play a crucial role in the forage seed supply system. Farmer seed production would not be possible without initial government support (Phaikaew, 1996). In many cases, government agencies produce seed on government stations and utilize the harvested seed in government projects. The demand for seeds fluctuate from year to year, making seed production a risky enterprise for

farmers. In Thailand, the government has limited the risk for farmers by guaranteeing farmers a contract price for a certain amount of seed. Purchase of excess product is not guaranteed. But many farmers produce seed above quota and sell this seed directly to other farmers.

Low price of seed. In the past, a lot of seeds was given free of charge to farmers, or very cheaply at subsidized prices. In such circumstances, many farmers have not looked after their pasture properly. For example, they were not concerned if their pasture was damaged by overgrazing during the dry season because they could replant cheaply again at the start of the wet season. For many such farmers, pasture establishment is an annual event. Nowadays, farmers generally have to pay for seed although seed prices are low in Southeast Asia.

Need more research and extension. The present seed supply system involves many government personnel who could be utilized more fully in research and extension rather than production (*Phaikaew and Hare, 1996*). They should be involved in breeding, evaluation and initial seed multiplication. Many producers in Thailand now have considerable experience, so the need for strong government supervision of production and its heavy involvement in marketing is decreasing.

Many of these problems can be overcome through greater private sector involvement in forage seed marketing.

Future Development

In Southeast Asia, there is considerable demands for forage seeds which can not be met by in-country production. Thus, there is a good pros-

pect to increase forage seed production within countries and to develop international trade links between countries in the region by importing species which we find difficult to produce and exporting others that we can produce well.

The challenge for the future seed supply systems in all countries is to gradually transfer the role of marketing to the private sector. Direct selling seeds from farmer to farmer is still very limited.

There is a need to expand the range of species grown to service a wider range of markets, e.g. high quality forage for dairy production, salt-tolerant forages, amenity roadside planting for recreation use, rehabilitation of degraded land, for turf and even ornamental use.

For this to be realized, countries in the region must decide on the most useful and widely adapted forage species. In addition, common seed quality standards, seed certification, storage and shipping guidelines must be developed.

REFERENCES CITED

- Aminah, A., G. Khairuddin and M.Y.Abd. Kadir. 1996. Effect of planting material and harvesting time on seed production of *Arachis pintoi* in Malaysia. In: R.A. Halim and C.P. Chen (eds). Proc. of the Fifth Meeting of Forage Regional Working Group on Grazing and Feed Resources of Southeast Asia. Vientiane, Lao PDR, 16-20 January 1996, pp. 95 - 100.
- Guodao, L., Bai Changjun and Huang Huidе. 1998. Forage seed supply systems in Hainan, PR China. In: P.M. Horne, C. Phaikaew, and W.W. Stür, (eds.). Forage Seed Supply Systems: Proc. of an International Workshop held in Khon

- Kaen, Thailand, 31 October to 1 November 1996. CIAT Working Document Number 175, Los Baños, Philippines.
- Hare, M.D. 1993. Development of tropical pasture seed production in northeast Thailand-two decades of progress. *J. Appl. Seed Prod.* 11: 93-96.
- Krishnan, K. 1996. The Kerala experience with forage seed production and supply system. In: P.M. Horne, C. Phaikaew, and W.W. Stür, (eds.). *Forage Seed Supply Systems: Proc. of an International Workshop held in Khon Kaen, Thailand, 31 October to 1 November 1996.* Los Baños, Philippines CIAT Working Document Number 175.
- Nitis, I.M., K. Lana, M. Suarna, S. Putra, A. W. Puger and Sukanten, W. 1996. Farm level seed production of a top performing *Gliricidia sepium* in dryland farming area of Bali. In: Halim, R.A. and C.P. Chen (eds). *Proc. Fifth Meeting of Forage Regional Working Group on Grazing and Feed Resources of Southeast Asia.* Vientiane, Lao PDR., 16-20 January 1996. pp. 101 - 108.
- Panitutra, C., K. Klum-em, T. Ponbumroong, T. Rujiravong and H. Funo. 1997. Survey of forage seed produced by small farmer at Prayuen, Khon Kaen. *Pasture Newsletter.* 2: (1): 3 - 10. in Thai.
- Phaikaew, C. 1997. Current status of and prospects for tropical forages seed production in Southeast Asia: Experiences and Recommendations from Thailand. In: Stür, W.W. (ed.) *Feed Resources for Smallholder Livestock Production in Southeast Asia. Forages for Smallholders Project.* Los Baños, Philippines. CIAT Working Document No.156: 57-64.
- Phaikaew, C. and M. Hare. 1996. Thailand's experience with forage seed supply systems. In: Horne, P.M., C. Phaikaew, and W.W. Stür, (eds.). *Forage Seed Supply Systems: Proc. International Workshop held in Khon Kaen, Thailand, 31 October to 1 November 1996.* Los Baños, Philippines. CIAT Working Document Number 175.
- Phaikaew, C., L. Guodao, A. Aminah, M. Tuhulele, E. Magboo, B. Bouahom and W. Stür. 1997. Tropical forage seed production in Southeast Asia: Current status and prospects. *Proc. 18th International Grassland Congress,* 8 -19 June, 1997, Canada.
- Turton, C. and P. Baumann. 1996. Beyond the formal sector: fodder seed networks in India. In: Horne, P.M., C. Phaikaew, and W.W. Stür, (eds.). *Forage Seed Supply Systems: Proc. International Workshop held in Khon Kaen, Thailand, 31 October to 1 November 1996.* Los Baños, Philippines. CIAT Working Document Number 175.
- Valenzuela, F.G. 1989. Development of forage seed production in the Philippines. In: Halim, R.A. (ed) *Grasslands & Forage Production in SE Asia.* Proc. First FAO Meeting of Regional Working Group on Grazing and Feed Resources of Southeast Asia, 27 Feb. - 3 March 1989 at Serdang, Malaysia. pp. 164-165