ECHO Asia Notes

A Regional Supplement to *ECHO Development Notes*

Edited by Abram Bicksler and Rebecca Garofano

February 2015 | Issue 23

Featured in this AN

Working with Farmers in Malaysia

by Tan Swee Lian, Ph.D.

[Editors' Note: Dr. Tan Swee Lian is from Kuala Lumpur, Malaysia, and has been a member of ECHO's network since the 1980s. She completed her Ph.D. at the University of Malaya, Malaysia, before working in agricultural research at the Malaysian Agricultural Research & Development Institute (MARDI) for 37 years.]

In Malaysia, agriculture is practised by a range of farmers – from subsistence cultivators of the soil to sophisticated, commercially-driven entrepreneurs. The latter group are quite adept at assessing the latest in technology and varieties, and already have established marketing channels. The challenge for an agronomist and scientist like me is determining how to effectively transfer scientifically-generated technology and know-how to the aforementioned subsistence cultivators.

I worked with a government agricultural research institute for 37 years as a plant breeder and agronomist, specializing in cassava (*Manihot esculenta*) and sweet potato (*Ipomoea batatas*), before retiring from fulltime employment. I continue to work with farmers and entrepreneurs who have an interest in these two root crops. In this article, I would like to share some of my experiences with ECHO Asia network members who are also involved in extending technologies to farmers.

Some Lessons Learned

1. Never assume that book learning is more important than hands-on experience or even common sense!

One day, a farmer approached me for help when his recently planted cassava crop showed patches of uneven growth. A well-meaning friend with a degree in agricultural science urged him to add more fertilizer, but more fertilizer did not help. In fact, the farmer's wife was able to determine the problem. She told me that the cassava cuttings had arrived at the farm before the soil had been tilled in readiness for planting. She remarked that the cuttings had been left out in the open, exposed to the hot sun, while waiting to be planted (she had also shared this with the farmer at the time of planting, but was largely ignored). Of course this caused some cuttings to dry out and when planted, they either failed to survive or, if they did, they were stunted in growth. Mrs. Farmer even took the initiative of digging out these plants to "unearth" the reason…only a few shrivelled roots had developed - which were naturally unable to take advantage of the added fertilizer!

2. Showing is better than telling.

The eldest brother of a family with 25 years of experience in planting cassava always assumed that luxurious top growth is indicative of a promising root yield. He always

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used a balanced NPK fertilizer (15:15:15), just as the patriarch did. He proudly uprooted a large cassava plant to show me, but was disappointed (and embarrassed!) to find a disproportionately small clump of scrawny storage roots. There I was, a slip of a girl (this was in the early days of my working career), coming along to tell him that cassava needs at least twice as much potassium (K) as nitrogen (N) for good root yield. The youngest brother decided to do his own "experiment," planting a small plot of cassava and applying a fertilizer with higher K content (12:6:22). The scepticism of the eldest brother vanished when harvest time came and the plot yielded well-filled roots!

(Auxiliary lesson: A younger farmer tends to be more open to new ideas than an older one).

[Editors' Note: This is a great example of the benefit of small-scale research conducted with or by farmers in a "Participatory Approach." For some past ECHO work on the Participatory Approach, see EAN #18, Fraiser; also see the MEAS project, and ECHO Asia's work on the continuing role of the Small Farm Resource Center.]

3. Sometimes, a new farmer is more accepting of new technology.

In a group-farming pilot project to plant sweet potato for a flour factory, it was often more difficult to get farmers who had been planting sweet potato for a long time to adopt a recommended agronomic package. These farmers felt that they already had experience in planting sweet potato, so what was new to learn? They were more willing to accept a new variety than to change their agronomic practices, such as plant spacing or fertilizer rate. By contrast, those farmers who had never planted sweet potato were open to the agronomic package and keen to get it right.

4. Even "less educated" farmers can recognise a profit-making venture.

Do not assume that farmers with little to no book learning do not understand or recognise a good thing (= an opportunity to make more money) when they see it. The best way to transfer an improved technology is by actually showing it to be better. The time-tested method is to plant one plot showing the traditional method of doing things, right next to another plot in which the new technology is adopted:

Traditional practice: e.g. old fertilizer rate	Improved practice: e.g. new fertilizer rate

This can be expanded further to a 4-plot demonstration:

1 Traditional practices: Old variety, Old agronomic practices	2 Modified traditional practices 1: New variety, Old agronomic practices
3 Modified traditional practices 2: Old variety, New agronomic practices	4 Improved practices: New variety, New agronomic practices

The last three plots should be able to clearly demonstrate that yield is increased in each case, in comparison to what the farmer had been doing in the past (the first plot).

5. Transfer of technology, like communication, is a two-way street.

Getting off your high horse and being a humble learner certainly helps. Nothing cultivates respect from farmers better than working alongside them…do not just stand back and give instructions on what should be done.

Useful Practical Tips Learned from Farmers

1. Keeping wild pigs away. Wild pigs love sweet potato and the edible varieties of cassava (they are able to sniff out the varieties that are safe to eat!). Collect hair clippings from the local barber and sprinkle them around your crop. This works in two ways:
   - The human scent keeps them away,
   - The snuffling or routing habit of wild pigs leads to the hair clippings being inhaled, which does not harm the pig, but is an unpleasant experience for it!
2. Keeping monkeys away. Monkeys can cause damage by breaking off shoots and branches from the cassava plants (sometimes it is just for the heck of it!). Trap one monkey, paint it red and let it go. The red monkey will frighten off his pals! It is not a permanent solution though; the monkeys learn quickly there is nothing to fear.
3. Which way up? Cassava cuttings (or setts) are either planted upright or laid flat and buried. In the former case, cuttings must be planted the right way up (i.e. the buds face up), otherwise they will not root properly and will die off eventually. When preparing cuttings, gather the long woody stems together in a bundle with the shoot ends all facing in the same direction, and tie at regular intervals. Cut them into 20-25 cm lengths, and allow the smaller bundles to fall upright into a tray containing red food dye (any other strong colour will do) so that the soil-facing ends of the cuttings are stained. This will guide the farmer on how to position the cutting correctly during planting.

Conclusion

Working with small farmers can sometimes be frustrating for scientists who are anxious (and impatient) to push their improved technologies. Being humble, accommodating, and helpful goes a long way in cultivating goodwill with farmers. When the farmers do finally adopt new practices which bring better yields and more income, the broad smiles on their faces will really make your day, and render all your efforts worthwhile!

Exchanging ideas with farmers.

The Use of Tropical Forages for Livelihood Improvement in Southeast Asia: A Focus on Livestock

by Stuart Brown, CAMAG Consulting.

[Editors' Introduction: Stuart Brown is an agricultural consultant with over 16 years of experience, the last five years of which have been in Cambodia. Stuart has two primary areas of expertise: tropical agronomy, which includes forage systems, soil sampling and analysis in tropical farming systems; and commodity value chain research. He has worked extensively with both the international development community and the private sector.]

Introduction – What are Forages?

In its simplest definition a forage is any plant material grazed or fed to livestock. However, a more specific definition that's presented in this article focuses on plants (grasses and legumes) that are planted specifically to provide superior feed benefits to livestock due to: 1) higher protein content, 2) lower labour requirements, and 3) additional farming system or social benefits.

Forage grasses are characterized as either: short, spreading types or upright, clumping, and tussock-forming types. Forage legumes can be separated into three categories: short and spreading, forming a low cover which develops new plants at stolons or rhizomes; twining and expansive, spreading over a wide area but not developing new plants through stolons or rhizomes; or shrub or bush-like plants and trees. The grasses described in this article that exhibit "best bet" characteristics are clumping, while the legumes are shrub or bush-like. I will also provide information about additional legumes, favored for their multi-purpose use, which can be characterized as short and spreading or twining and expansive. All species are detailed extensively in the sections below.

Many smallholder farmers raise livestock, mostly cattle, as part of their farming system. In Cambodia, many farmers maintain a small herd of cattle for a variety of reasons: a "cow bank" that can be sold when cash is needed for cultural celebrations, accidents or other unforeseen expenses; a source of fertilizer for their farming system (rice, vegetables); and a source of animal power to pull implements or for transportation. While the latter is becoming less and less common as mechanization rapidly increases, cattle remain important and shifts toward mechanization also open the possibilities of alternative income uses for the livestock maintained by farmers (smallholder dairy or beef fattening to increase farmer incomes).

In lowland rice production farming systems in Southeast Asia, farmers that maintain a small herd need to provide feed solutions that will maintain the cattle's condition. Farmers are often forced to find feed solutions from the surrounding landscape. In the wet season it is common practice for farmers to utilize locally available plant materials, such as roadside grasses and bund grasses, for animal forages. After the rice has been harvested, in the beginning of the dry season, rice straw is used as a forage. Farmers will often spend hours in the morning and evening seeking grasses to cut and transport back to their cattle, and will occasionally buy cut grass from small-scale grass traders. In many cases, these resources are low in protein, but they are the most readily available. They are often used with no or limited knowledge of alternative options for animal feed.

Many of the forages that farmers currently provide to their livestock are of low quality but are perceived as being readily available and low in cost. However, the opportunity costs of spending time seeking forages is often not considered; the time spent herding and tethering animals to find feed is also time away from other educational or income generating activities. I propose an alternative method: to integrate tropical forages into the smallholder farming system, in order to improve farmers' livelihoods.

The forages discussed in this note are well-adapted to tropical environments (wet season/dry season; predominantly acid soil conditions), are well-researched "best bets" for smallholder systems, and potentially have solutions for the time/labour, economic constraints of smallholder farming systems in Southeast Asia.

Each of these grasses and legumes include the following attributes:

- Are available commercially or through international development institutions,
- Have been carefully selected through research and field application by international and national experts in the region to fit into smallholder farming systems,
- Are generally adapted to Southeast Asia's climate and soils (see species details below),
- Are already being promoted and implemented in participatory ways throughout Southeast Asia,
- Offer greater productivity benefits than locally available feed resources,
- Are simple to grow and to manage, and
- Provide additional farming system benefits over and above livestock feed.

Growing Forages for Livelihood Improvement

Social Benefits

The use of forages within a smallholder farming system offers significant benefits to a farmer in terms of labor and time savings. Forages can be planted close to the house and animal pens, saving significant time when gathering the feed. Also, smallholder farmers that keep animals are often confronted by feed shortages, particularly in the late dry season. Growing forages close to the home can help farmers through this critical period of the year when feed is often in short supply.

Planting forages within the confines of the family household, or on other land not suited to cropping, can potentially free the family members' time for other opportunities such as education or alternative business ventures. These concepts are eloquently stated by Connell, Stür and Horne (2010).

Confining animals close to the family home (with forages nearby) provides an opportunity to manage the manure more effectively. Manure can be collected and composted efficiently, for greater benefit to the cropping systems of the household.

In northern Laos, a group of farmers used to spend up to 3 hours per day gathering and preparing feed for their pigs. Often the food was not of a high quality, and the pigs grew poorly. Then, the high protein legume, *Stylosanthes guianensis cv. CIAT184*, was established in fodder banks within household compounds and the surrounding area. As a result, feed preparation was reduced to less than 30 minutes per day, and pig fattening time was reduced to six months from ten.

Soil Improvement and Environmental Benefits

The incorporation of forages in a smallholder farming system can have a variety of environmental benefits, such as soil protection and erosion control, soil fertility improvement through legume nitrogen fixation, and the reduction or elimination of short-term shifting agriculture.

This is particularly significant in upland regions of Southeast Asia, which can be very vulnerable to erosion in the wet season and to rapid reduction in fertility if the land is not allowed to rest. A modified farming system that includes perennial forage species allows for permanent cover all year round. If legumes are included, fertility can be maintained or enhanced.

The benefit of erosion control is closely related to the social benefits identified above. By maintaining permanent soil cover in erosion-prone landscapes, soil is preserved and a steady supply of forages is available to feed livestock, thus reducing the time needed to find feed sources. This in turn opens opportunities for other employment and livelihood benefits.

Income Generation through Livestock Improvements

The demand for beef cattle is growing across Southeast Asia, as the region rapidly develops, and smallholder farmers will want to tap in to that growing demand. One method of doing so is to speed up the fattening time for the animals, which in turn decreases the time it takes to get them to market, by feeding the cattle higher protein forages.

Improved tropical forages can be fed as a high protein feed to improve the weight gain and health of livestock. Protein helps develop muscle and provides energy for the animal. In order for animals to gain weight and improve their health, they should ingest between 12 and 15% crude protein from dry matter forages. Also, forage guides indicate that cattle require 2.5 to 3.5% of their body weight in dry feed each day, or 10 to 15% of their body weight in fresh forages each day, in order to grow well and put on weight. (More details regarding crude protein of forages is discussed in the section on “best bet” forages.)

In Cambodia, cattle commonly are fed rice husks and rice straw, which can’t be digested very easily and take a long time to break down in the stomach. This means that a cow can take in less food, and as a result, accumulates less fat and muscle.

Fresh leaves of young grass and legumes are easier for the cattle to digest than rice straw, and will lead to quicker weight gain. For optimal growth, young cattle require large quantities of fresh grasses and legumes.

Grasses provide a high yield of plant material. For example, *Panicum maximum* can yield up to 25 tonnes/hectare/year in a medium to high fertility soil. With higher fertilizer inputs of between 200 to 400 kg of N/Ha, the grass can yield even more, provided that adequate water is available.

While legumes do not yield as much plant material as grasses, they provide the multiple other benefits already mentioned in the previous section, “Soil Improvement and Environmental Benefits.” Legumes are higher in protein than grasses, so less feed is needed to provide a significant benefit to cattle. Legumes also provide essential minerals and vitamins for healthy growth. Aside from nutrition, legumes provide added nitrogen to the soil through leaf loss, roots and production of biomass. Combining grasses and legumes in cattle’s diet will significantly improve the quality of the animals and the resultant sale price for slaughter.

An optimum use of forages is to develop multiple single-species stands of each forage adapted to a location, so that there is variety of diet for animals but ease of harvesting for the farmer. With single-species plots, a farmer can easily identify the appropriate mixes of feed to supply to livestock. An example may include multiple rows of *Panicum maximum* or *Stylosanthes guianensis* between trees in a newly established orchard. As the orchard develops, the forages may be of less economic significance while the orchard becomes more economically important. Boundary plantings of tree legumes can also provide significant feed resources in spaces that otherwise might be unused.

The use of the forages listed below can enable a farmer to increase the size of his or her herd plus reduce the time necessary for animals to reach a critical market weight. The concept could be considered a “buy thin, sell fat” strategy.

[Editor’s Note: This article focuses on forages which may be useful for ruminant animals, ie. those animals which contain a multi-chambered stomach, which allows the animal to acquire nutrients from plant-based food through fermentation in the stomach. For other non-ruminant animals, such as pigs, forages can be given, but ECHO Asia also promotes fermented feed production through Natural Farming approaches and supplementary protein for healthy growth.]

Optimal Use of Space and Dual Purpose Use of Forages

Many forages have multiple roles in a farming system. For example, in addition to providing fodder for livestock, tree legumes can form living fences and barriers to protect main cash crops. In many parts of Indonesia, *Gliricidia sepium* is used as a living fence. This species is reasonably long-lived. When planted closely, it can form a suitable barrier to livestock while also being cut for feed and green manure.

In Sri Lanka, the Philippines, and elsewhere, live tree legumes are used instead of poles for pepper production, reducing the logging of native tree species for pole production. These living fences are cheaper than timber poles, provide nitrogen through fixation and leaf drop, and at certain times of the pepper development can provide critical shade requirements.

Tropical Forage Species for Southeast Asia

Many species have been trialled and introduced into Southeast Asia: Ruzi grass, a variety of *Brachiaria species*, paspalums, stylos, etc. The following list includes what I consider “best bests” for livestock production based on availability of commercially available seed or cuttings; adaptation to a wide range of agroecologies; and ease of management for the predominantly smallholder farming systems, which generally include a combination of cropping with livestock

[Editor’s Note: As is the case with most information distributed by ECHO Asia, agriculture is not a one-size-fits-all approach. We encourage our network members to think carefully about some of the options available and how they might fit into a particular environmental context, cultural context, or project. We would also encourage you to try these first in a low-risk setting (such as a Small Farm Resource Center or other similar farmer project) to work out the proverbial “kinks” before fully extending to farmers.]

Panicum maximum (synonym *Megathyrsis maximus*)

Common Name: guinea grass

Crude protein: 6-25%, depending on age and N supply

Description:

P. maximum is an upright grass very suitable for cut-and-carry situations. It is generally adapted to locations with a short dry season, and should be irrigated in areas encountering a long dry season. This species includes both short varieties (S Types) and tall varieties (TM Types). The latter varieties are available in Southeast Asia as Si Muang, also known as Tanzania or Purple Guinea, and the larger Mombaça Guinea (see the "References and Further Reading" section below).

Mombaça Guinea can be up to 1.65 m tall with long leaves up to 3 cm wide. Research suggests it is up to 28% more productive than Tanzania Guinea. It has reasonably good drought and cool tolerance. Also, in line with the higher productivity mentioned above, it provides greater potential live weight gain for cattle than other *P. maximum* varieties (Cook et al, 2005).

Tanzania, or Purple, Guinea has a somewhat broader adaptation than Mombaça Guinea, but has only moderate drought and cool tolerance. Figure 1 and Figure 2 illustrate the physical characteristics of the two varieties readily available in Southeast Asia.

Establishment:

These varieties can be established by directly sowing seed or by transplanting divisions from older, more established plantings at the commencement of the wet season. *P. maximum* is most simply and rapidly established through rooted cuttings. To do this, lift the established plant and pull apart tillers, making sure there are roots present on each tiller. Trim excess leaves to minimize moisture loss and to give plants a greater chance of establishment.

If planting from seed, be sure you are using a known and reliable seed source. Plant approximately 5 kg of seeds per hectare, in rows about 50 cm apart, to a depth of no more than 2 cm. *P. maximum* seeds are small, and planting deeper than 2 cm is likely to result in inconsistent germination and poor stand establishment. For more information regarding establishment see Stür, W.W. and Horne, P.M. (2001).

(above) **Figure 1:** *Solid stand of Tanzania or Purple Guinea on raised beds in a former rice field in Kandal Province, Cambodia (source: Stuart Brown 2011). (below)* **Figure 2:** *Left - Tanzania grass flowering; Right - Mombaça grass (source: Cook et al 2005).*

Management:

P. maximum is a reasonably "hungry" feeder in terms of nutrients. In smallholder single-species stands used for cut-and-carry, use of animal manure will help maintain a stand of *P. maximum*. However, for greater productivity, inorganic fertilizers may be necessary. According to Cook et al (2005), *P. maximum* will require maintenance fertilizer if consistently cut and fed to animals. Infertile soils may require the application of between 200 and 400 kg/Ha of N per year.

Varieties such as Mombaça Guinea can be cut every 6 weeks in the wet season and every 8 to 10 weeks in the cooler dry season. Depending on location in Southeast Asia, irrigation may be necessary to ensure continued growth and leaf development.

Weed control is critical. Target weeds for removal especially during germination and early establishment, and after cutting. Nutrient management is also important to ensure the valuable grass stand remains productive and does not offer opportunities for weed encroachment.

For more information refer to:

Tropical Forages – *Panicum maximum*: http://www.tropicalforages.info/key/Forages/Media/Html/Panicum_maximum.htm

Tropical Seeds – Mombaça Guinea: http://www.tropseeds.com/mombasa/

Tanzania Guinea: http://www.tropseeds.com/tanzania-guinea-grass/

Brachiaria species hybrid (cv. Mulato II; Cayman)

Common name: brachi hybrid, brachiaria hybrid

Crude protein: from 10-17%, depending on soil fertility

Description:

Mulato II has a semi-erect growth habit and is an artificial hybrid cross between *Brachiaria ruziziensis*, *B. brizantha*, and *B. decumbens*. It has a greater degree of drought tolerance than *Panicum maximum*. Mulato II is widely adapted to tropical acid soil conditions, and performs best between pH ranges of 4.5 to 8.0; it is more tolerant to high aluminium levels than many other grass species.

cv. Cayman is another *Brachiaria* hybrid species *[Ed Note: "cv." stands for cultivar, or cultivated variety, which is a named variety with a specific set of traits that makes it distinct from other cultivars and varieties]*. It has similar production characteristics to Mulato II, but is more resistant to moist soil conditions over a longer period of time. Cayman is more likely to produce well in seasonal circumstances in which the soil is not necessarily flooded but remains moist over a number of weeks, often during the peak of the main wet season.

Establishment:

Brachiaria is generally established from seed if it can be purchased through a reliable source, and tends to have a high germination rate with rapid establishment. A seeding rate of up to 5 kg per hectare is deemed suitable for a solid stand of *Brachiaria*, with rows planted approximately 50 cm apart. Figure 3 shows a solid stand of *Brachiaria spp. hybrid cv. Mulato*, illustrating its upright and leafy characteristics.

Brachiaria can also be established through rooted cuttings, similar to *P. maximum*, ensuring a very rapid establishment and allowing the plant to compete with weeds.

Management:

The *Brachiaria* species are most often used as cut-and-carry varieties in Southeast Asia, due to their upright nature and to the smaller plots available to most smallholder farmers. Depending on stand condition and prevailing environmental circumstances, these varieties can be cut every six weeks with close monitoring of soil fertility.

Brachiaria hybrids will respond quickly to the application of nitrogen. If available, the application of manure will also be beneficial. Grass stands should be [monitored for signs of nutrient deficiencies](), and fertilizer or manure should be added accordingly.

For more information refer to:

Tropical Forages – *Brachiaria* spp. hybrids: http://www.tropicalforages.info/key/Forages/Media/Html/Brachiaria_spp._hybrids.htm

Tropical Seeds – Mulato II: http://www.tropseeds.com/mulato-ii/; Cayman: http://www.tropseeds.com/cayman/

Figure 3: *A solid stand of Brachiaria hybrid cv. Mulato (source: Cook et al 2005).*

Figure 4: *Clumping characteristic of Paspalum atratum (source Cook et al 2005).*

Paspalum atratum

Common name: atratum; paspalum

Crude protein: between 5 and 10%, depending on soil fertility

Description:

Paspalum atratum is another upright leafy grass very suitable for cut-and-carry feed, similar to the species described above. It requires a moderately fertile soil, but will tolerate low fertility acid conditions if nutrient management is addressed. It is extremely useful for sites that encounter occasional water logging in the wet season, but is generally not suited to long dry seasons, where a more drought tolerant species such as the *Brachiaria* spp. hybrids may be more suitable.

P. atratum has leaves that are soft and highly palatable when young, but that tend to become coarse and less palatable when older. *P. atratum* is best suited to frequent cutting, (resulting in more rapid plant growth), producing an excess of young leaves for quality animal feed. Figure 4 highlights the clumping nature of *P. atratum*.

Establishment:

As with other species, *P. atratum* can be established easily by rooted cuttings or by seed. If establishing from seed, use between 2 and 5 kg per hectare, plant it in rows approximately 50 cm apart, and ensure that weed control is maintained during the critical germination and establishment period.

Management:

This species is very tolerant of frequent and low cutting, but is best managed by allowing moderate regrowth before cutting. Cut approximately every six weeks in the main growing season and every eight weeks in the dry season.

For more information refer to:

Tropical Forages – *Paspalum atratum*: http://www.tropicalforages.info/key/Forages/Media/Html/Paspalum_atratum.htm

Tropical Seeds – *Ubon Paspalum*: http://www.tropseeds.com/ubon-paspalum/

Figure 5: *Mature stand of Pennisetum purpureum (source Cook et al 2005).*

Pennisetum purpureum

Common name: elephant grass; napier grass

Crude protein: varies according to age of regrowth and soil fertility, but can range between 9.5 and 19.7%

Description:

This is a tall grass species that forms large clumps similar to sugar cane. It can grow to over three metres tall if left to mature and form canes. It spreads through rhizomes or by rooting at nodes, and will form new plants when nodes touch the ground.

P. purpureum is reasonably drought tolerant, but only after forming an extensive root system. Otherwise it performs best for leaf production in areas with high rainfall and a short dry season. All of the cultivars in this family require high fertility for persistence, and production will decrease under declining fertility. Figure 5 shows a mature stand of *P. purpureum*, ready to be cut for maximum leaf yield.

Establishment:

This grass can only be established by fresh stem cuttings, with at least two nodes buried in the soil to ensure root development. Seeds produced from *P. purpureum* hybrids are generally either of low viability or sterile, depending on the variety.

Management:

P. purpureum requires a highly fertile soil to maintain productivity. Therefore, care must be taken to ensure fertilizer—particularly nitrogen—is adequate for continued high leaf production. Often this species is grown close to animal enclosures, so that manure can be regularly applied. However, livestock manure alone will not be sufficient to maintain this species.

For more information refer to:

Tropical Forages – *Pennisetum purpureum*: http://www.tropicalforages.info/key/Forages/Media/Html/Pennisetum_purpureum.htm

[Editors' Note: ECHO Asia has received and propagated a cross of napier (Pennisetum purpureum) with pearl millet (Pennisetum glaucum), which was bred by the Thailand Department of Livestock Development and dubbed "Pakchong 1" or "Super Napier" and claims to have up to 16-18 % crude protein. For cuttings, please contact echoasia@echonet.org.]

Stylosanthes guianensis

Common name: common stylo; stylo

Crude protein: between 12 and 20%

Description:

The leguminous *S. guianensis* produces high quality feed for all classes of livestock. It can be fed dry or fresh, or can be processed into hay or a leaf meal for storage and later use. It is a short-lived perennial (living two to three years) that grows as a small shrub across a wide variety of soils and environmental conditions. It stays green well into the dry season.

S. guianensis is predominantly used as a cut-and-carry species, but is also useful in a long-term pasture system if left to produce seed and if rotational grazing is implemented. Figure 6 shows the soft leaf and stems, which are highly suitable for fresh animal feed.

Establishment:

S. guianensis is best established by seed. Most varieties produce seed prolifically in the dry season. Approximately 5 kg of seed per hectare is sufficient to establish single-species stands. Plant in rows of approximately 40 cm apart to facilitate harvesting and weed control.

Management:

Take care to ensure that the frequency between cuts is neither too short nor too long. If the species is left to grow tall and woody, the plant may have too few growth points from which to re-establish. Plants perform best when cut about 15 cm from the ground, to allow for low multiple growth points to develop (see Figure 6). Future cuttings can be made on an approximately eight week cutting schedule, depending on moisture and plant development.

For more information refer to:

Tropical Forages – *Stylosanthes guianensis*: http://www.tropicalforages.info/key/Forages/Media/Html/Stylosanthes_guianensis_var._guianensis.htm

Tropical Seeds – Ubon Stylo: http://www.tropseeds.com/ubon-stylo/

Arachis pintoi

Common name: pinto peanut

Crude protein: between 13 and 25%

Description:

This is a very attractive, low-growing legume with an impressive daily display of yellow flowers. It is a high quality feed for all classes of livestock, and can withstand aggressive grazing or cutting. However, it requires a reasonably fertile, well-structured soil, and will need irrigation unless grown in areas with little or no dry season.

A. pintoi is a ground cover that also fixes nitrogen. As a ground cover, in time it can help exclude weeds from orchards. Being a ground cover species, *A. pintoi* does well with moderate levels of shade under trees. As mentioned, *A. pintoi* is a very useful species for orchards; it also forms a good association with *Gliricidia sepium* in pepper plantations (see Figure 7).

Establishment:

If good quality seed is available, this species will generally establish well. Planting from seed allows the plant to develop a robust root system. However, seeds deteriorate quickly if not planted in a timely manner. It is often better to develop the species in an orchard through rooted cuttings from well-established stands of *A. pintoi*, ensuring that stolons are cut with sections showing some root development.

There is another reason for establishing new stands of *A. pintoi* through cuttings rather than seed. *A. pintoi* seed is actually produced underground, similar to its relative the peanut, and it is difficult to harvest the seed correctly without loss or damage to the plant (see Figure 8).

Management:

A. pintoi does not require the addition of nitrogen fertilizer; however, in certain low

Figure 6: *Stylo ready for first cut (source Cook et al 2005).*

Figure 7: *Arachis pintoi as a ground cover under pepper. Note the use of Gliricidia sepium as a live support (source Cook et al 2005).* **Figure 8:** *Arachis pintoi showing nut formation (source Cook et al 2005).*

fertility soils, the stand may require the addition of phosphorus and some micronutrients.

The species is well-suited to low cutting, but take care that cutting does not allow the opportunity for weed incursion; clumping grasses in particular will begin to dominate. In terms of a grazing environment, *A. pintoi* forms a good association with the grass species listed above.

For more information refer to:

Tropical Forages – *Arachis pintoi*: http://www.tropicalforages.info/key/Forages/Media/Html/Arachis_pintoi.htm

Tropical Seeds – *Arachis pintoi*: http://www.tropseeds.com/arachis-pintoi/

Leucaena leucocephala

Common name: leucaena

Crude protein: up to 30%

Description:

L. leucocephala is a versatile legume species that has been naturalized in Southeast Asia. It is a long-lived tree legume very suitable for planting near smallholder farming households, and stays green during the dry season. This species has multiple benefits for smallholder farming systems, and it can be used as high quality, high protein leafy feed for ruminant livestock; a living fence; and firewood and construction material. *L. leucocephala* can be cut frequently and aggressively.

Establishment:

Leucaena is best established from seed. However, it generally develops slowly, so be sure to protect young plants from animals and from weed incursion. Seeds have a hard seed coat and should be scarified to ensure seed germination. Methods of scarification vary; for example, you can immerse seed in near-boiling water for up to 5 seconds and then immediately dip into cold water, or you can individually clip the small pointed end of the seed with scissors, to open the seed to moisture.

L. leucocephala is not particularly tolerant of acid, infertile soils. However, in my experience, this species is more tolerant than suggested in the literature. It is often found on the sides of roads in the lowland rice zones of Cambodia and within weedy urban areas of Phnom Penh, areas with soils that are usually acidic and somewhat low in fertility. If you work in a challenging environment, it is worth trying this species.

Management:

This species is extremely tolerant of low and frequent cutting. To aid in harvesting leaf and stem for livestock, the plant is commonly coppiced at approximately 1 metre and allowed to form multiple stems at a convenient height. Figure 9 shows the coppicing ability of this species.

L. leucocephala does not typically require inorganic fertilizer. However the addition of manure from livestock will benefit the trees.

For more information refer to:

Tropical Forages – *Leucaena leucocephala*: http://www.tropicalforages.info/key/Forages/Media/Html/Leucaena_leucocephala.htm

Figure 9: *Leucaena leucocephala; note the regrowth from a low coppice (source Cook et al 2005).*

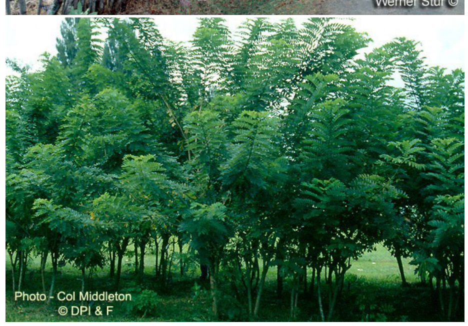

Figure 10: *Classic living fence possibilities (source Cook et al 2005).* **Figure 11:** *Gliricidia sepium, showing high yield of leaf biomass (source Cook et al 2005).*

[Editors' Note: ECHO Asia offers two types of Leucaena through our Seed Bank. Please be aware that, even though it is naturalized in many parts of Southeast Asia, it has the potential of becoming an invasive species.]

Gliricidia sepium

Common names: gliricidia

Crude protein: between 18 and 30%

Description:

G. sepium is another medium-sized tree legume that has a variety of uses in smallholder farming systems. *G. sepium* is commonly used as a living fence around household gardens, where the leaf and stem can be cut and added to compost. It is also a useful, high-yielding leafy legume supplement for livestock (see Figure 10). Some report that cattle and buffalo need to be "trained" to eat *Gliricidia* due to its smell, but it will be readily consumed if mixed with other forages (Horne, P.M. and Stür, W.W. 1999).

Cook et al (2005) suggest that *G. sepium* is suitable for living fences; cut and carry feed for livestock; firewood; shade and protection of seedlings in nurseries; and climbing plant support, particularly for pepper production.

G. sepium can be grown in a wide range of environments, including the acid soil landscapes common in the region. However, it will generally not tolerate wet or waterlogged soils for any length of time.

Establishment:

G. sepium originated in Central America. It has been naturalized across Southeast Asia in areas suitable for its development, and readily produces seed in areas with a defined dry season. To establish it, plant stem cuttings of about 1.5 metres in length, directly and uprightly placed in their final location. With adequate moisture, leaves should appear within four weeks. To make a living fence, use live stakes, placed according to the space requirements of the fence supports.

If establishing *G. sepium* by seed, scarification is not necessary. High germination rates are common. Seeds can be planted in a nursery, either in a seed bed or in individual seed raising bags for establishment at other sites. Plant seeds no deeper than 2 cm.

Management:

For use as a feed source, cut *G. sepium* approximately eight months after establishment. For highest productivity, cut at a height of about 1 metre every three months, depending on moisture availability. *G. sepium* is leguminous and fixes nitrogen, so it should not require additional fertilizer except for occasional application of manure. Figure 11 highlights the large biomass produced rapidly by this species.

For more information refer to:

Tropical Forages – *Gliricidia sepium*: http://www.tropicalforages.info/key/Forages/Media/Html/Gliricidia_sepium.htm

Seed Sources

Ubon Forage Seeds
(agent for Tropical Seeds)

Faculty of Agriculture,
Ubon Ratchathani University,
Thailand 34190
Office: +66 (45) 353506
Email: michaelhareubon@gmail.com
www.tropicseeds.com

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E-mail: echoasia@echonet.org
www.echocommunity.org

References and Further Reading

Connell, J., Stür, W.W. and Horne, P.M. 2010. Forages and farmers: case studies from South-East Asia. ACIAR, Canberra and CIAT, Vientiane. ACIAR Monograph No. 142. 120 pp. [Online] Available: http://aciar.gov.au/publication/mn142

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ECHO Asia Agriculture and Community Development Conference: Speakers List

The 2015 ECHO Asia Agriculture and Community Development Conference will be happening from October 6-9, 2015 in Chiang Mai, Thailand. The theme for this conference will be "Equipping Workers."

ECHO Asia is looking forward to bringing together a wide and diverse assemblage of NGO workers, agriculture missionaries, development agents, farmers, and organizations from across Asia for a time of mutual learning and encouragement that will bring forth an abundance of practical applications.

To provide an idea of some of the speakers and topics that will be featured in the morning plenary sessions:

- Samuel Gurel, CEO of Torch Coffee, will discuss coffee as a development tool and niche agriculture product in a talk entitled "The WHY Behind Coffee Development."
- Keith Mikkelson, the Executive Director and co-founder of Aloha House and Natural Farm, as well as the author of "Sustainable Agriculture in the Tropics," will be giving a talk entitled "Natural Farming: A Key to Higher Production with Reduced Inputs."
- Tom Love, Agriculture Advisor at USAID, will be giving a talk about the nature of value and how it is created, entitled "The Mystery of Value."
- Siem Sun, manager of the Improved Indigenous Livelihoods program for International Cooperation Cambodia, will be discussing livelihoods improvement through development and giving a talk entitled "Community Solutions to the Changing Context of Livelihoods in Northeastern Cambodia of Indigenous Minorities."
- Dr. Paul McNamara from the University of Illinois and Director of the Modernizing Extension and Advisory Services (MEAS) will share about lessons learned from agriculture extension best practices.
- Dr. Peter Quesenberry from Christian Veterinary Mission and the Mekong Minority Foundation, as well as author of the book "Where there is No Animal Doctor," will discuss livestock and community development and give a talk entitled "Livestock Bridges to Community Development and Livestock Emergency Guidelines and Standards."
- Mother and daughter team, Wanpen Channarod and Phicharinee Suksree, innovative farmers from Nakhon Sawan, Thailand, will share about recent innovations in the System of Rice Intensification (SRI) and lessons learned.

To learn more about the upcoming ECHO Asia Agriculture and Community Development Conference and to register for the event, please see the advertisement on page 12.

A wide range of workshops covering topics such as organic free-range poultry, chicken feed management and creation, aquaponics, vertical gardening, seed banking and saving, potential underutilized plant species, natural resource management plans, small farm resource centers and more.

Morning sessions will involve hands-on workshops at a local hotel and afternoon sessions will be hosted at the Yayasan Abdi Satya demonstration farm.

The cost is $180 per person (shared room) or $270 (single room), and includes: 3 night's accommodation at the hotel, conference fees, breakfast, lunch, and dinner for 3 days, transportation to the farm center, and coffee breaks.

March 3-5, 2015 Serdang Bedagei, Medan, Indonesia





Visit ECHOcommunity.org to Register

YAS YAYASAN ABDI SATYA

ECHO Asia Impact Center

Philippines Sustainable Food Production Workshop

May 12-14, 2015

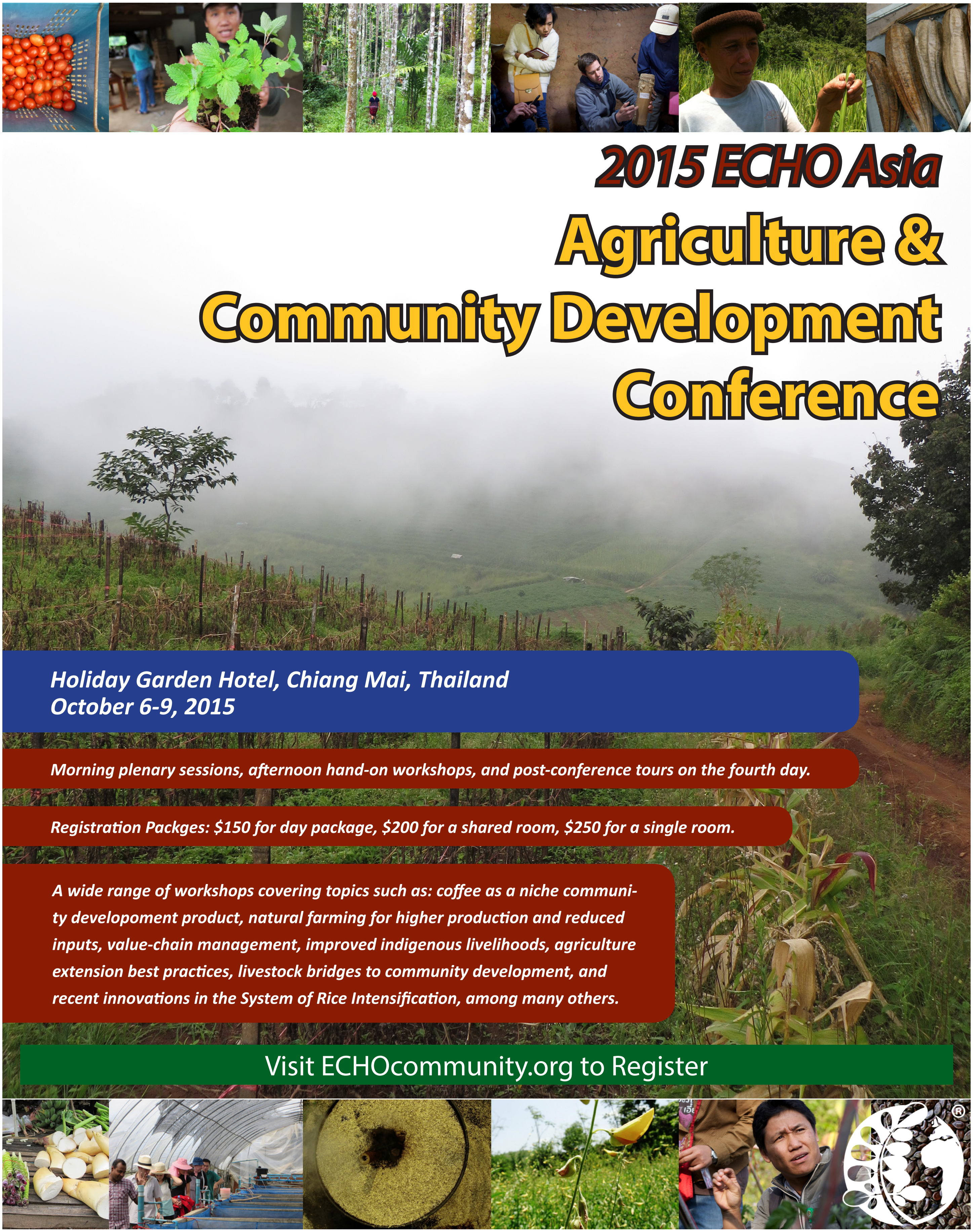
Puerto Princesa City, Palawan, Philippines

Hosted by the ECHO Asia Impact Center & Aloha House

A wide range of workshops covering topics such as: Natural Resource Management, Soil Fertility of Tropical Soils, Foliar Fertilizers, Small-Scale Livestock Production, Perennial Vegetables of the Tropics, Aquaponics, the System of Rice Intensification, Mushroom Production for Profit, Intensive Nursery Management, Dairy Processing, and more. All participants will participate in a seed exchange and receive a tour of the Aloha Farm.

The cost is $135 per person and includes: all conference fees, lunch, and coffee breaks for 3 days. There will be an optional additional post-workshop tour to the Aloha Ranch on Thursday May 15th for $55.

Visit ECHOcommunity.org to Register


2015 ECHO Asia
Agriculture &
Community Development
Conference
Holiday Garden Hotel, Chiang Mai, Thailand
October 6-9, 2015
Morning plenary sessions, afternoon hand-on workshops, and post-conference tours on the fourth day.
Registration Packges: $150 for day package, $200 for a shared room, $250 for a single room.
A wide range of workshops covering topics such as: coffee as a niche community developoment product, natural farming for higher production and reduced inputs, value-chain management, improved indigenous livelihoods, agriculture extension best practices, livestock bridges to community development, and recent innovations in the System of Rice Intensification, among many others.
Visit ECHOcommunity.org to Register