ECHO Asia Notes

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Edited by Abram Bicksler and Rebecca Garofano **June 2014 | Issue 21**

SRI Innovations
Note from the Editors

SRI (the System of Rice Intensification) was developed in Madagascar in the 1980's and has since spread around the world. Today, the benefits of SRI are being demonstrated in over 50 countries. As an agricultural system, SRI emphasizes the cropping principles of: 1) reduced plant populations, 2) improved soil conditions, 3) improved irrigation methods for root and plant development, and 4) improved plant establishment methods. SRI often requires approximately three years of transition from conventional rice farming practices. However, once the new practices are established, practitioners of SRI often see dramatic yield increases over the course of several years. The principles of SRI have also been adapted for other crops, together referred to as the "System of Crop Intensification."

As with all agricultural techniques, no silver bullet exists; no single approach will work in all situations. There will always be crop, climatic, cultural, and environmental differences at play. ECHO Asia believes that SRI should be approached as a suite of best practices to be tested and adjusted in particular contexts and situations, in order to maximize its potential. It should not be followed as a cookbook-type approach to agriculture. That said, there can be a certain amount of synergy when several SRI practices are used together, so that the combined yield is more than it would be with each practice individually.

This ECHO Asia Note (#21) contains four articles that present various techniques and tools being employed in Central Thailand and Nepal to boost farmers' efficiency and productivity, in both conventional and SRI rice production. The first article, by ECHO Asia staff member Boonsong Thansritong, highlights recent observations from an SRI training symposium in Nakorn Sawan. The second and third articles are translated from the Thai Natural Agriculture Journal and highlight "SRI Farming Innovations" and "the SRI Roller Planting Marker," which have the potential to increase farmers' productivity and efficiency for both SRI and conventional rice production. The last article, "Learning from Farmers" by Rajendra Uprety, is reprinted by permission from Farming Matters and is about successful SRI adoption and adaptation in Nepal.

For more information about some of the technical aspects of SRI, see:

- "Improved Rice Production- System of Rice Intensification" ECHO Blog
- IFAD's Page on System of Rice Intensification
- Cornell University's SRI-Rice Page
- ECHO Asia Notes #2
- A page of resources from LEISA's Farm/AgriCultures Network Blog
- The LEISA/AgriCultures Global SRI Page

Very special thanks go out to Rajendra Uprety and Farming Matters Magazine (part of the AgriCultures Network), as well as to Komsan and his team with Thai Natural Agriculture Journal for letting ECHO Asia reprint these very informative articles.

Featured in this AN

The ECHO Asia Impact Center operates under ECHO, a non-profit Christian organization that helps you help the poor to produce food in the developing world.

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We hope you enjoy this special SRI edition of ECHO Asia Notes.

Abram Bicksler &
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Observations of SRI in Nakorn Sawan, Thailand

by Boonsong Thansrithong, Agriculture Program Manager, ECHO Asia Impact Center, Thailand

I recently had the opportunity to travel from Chiang Mai, Northern Thailand, to Tambon Thamai, a town located in Nakorn Sawan Province, about 500 kilometers from Chiang Mai. Nakorn Sawan is located in central Thailand, where Thailand's four great rivers meet (the Ping, Wang, Yom and Nan). The purpose of my trip was to visit Wanpen and her daughter Pijarinee. This mother-daughter pair have been growing rice using SRI for several years.

A picture of Nakorn Sawan, with the confluence of the four rivers. Picture by Jida Jirwatchradetch.

Where these four rivers meet, one finds flat land and rich soil. This region is well known throughout Thailand as a rice production area. Rice farmers in this area are able to cultivate rice year round. Some farmers will cultivate two crops of rice, while many cultivate up to three. Most commonly, farmers grow the variety 'Korkor Forty-Nine,' a brown brown leafhopper resistant variety that matures in 107 days. This variety produces a good yield and farmers are able to grow it three times per year. Some rice farmers also produce jasmine rice.

In Nakorn Sawan, rice is typically established using one of three methods: broadcasting, hand transplanting, and mechanical transplanting. Each method has strong and weak points. Broadcasting saves time, but requires more seed (maximum amount needed is about 125 kilograms/acre). Machine transplanting is quick and uses less seed (about 40 kilograms/acre), but the machine is expensive. The traditional method, transplanting seedlings by hand, requires the same amount of seed as the machine, but with added labor input.

Farmers using the traditional planting method are faced with three main problems: the quantity of seed that is required, the cost of labor, and the high cost of inputs. Solutions that enable farmers to overcome these three main challenges will be of high interest for farmers in this area (and likely elsewhere, too). Kularb Kerdsawad, the village head man, explained to me that farmers in this area typically apply fertilizer at a minimum of 20 kilograms/rai/crop (50 kilograms/acre/crop) and harvest rice at 800 – 1,200 kilogram/rai/ crop (2,000-3,000 kilograms/acre/crop). With this method, rice will stand in the paddy water until just a couple weeks before harvest, when the farmer will dry the paddy to make harvesting easier.

In reality, rice is not a water plant; it is traditionally grown in water for ease of weeding and weed control. Each rice seed has the potential to produce more than twenty tillers (each tiller consisting of a new stalk with roots and leaves). However, with the traditional method, seedlings are transplanted in bunches and tillering potential is lost due to competition between adjacent rice plants. The System of Rice Intensification (SRI), as promoted by Norman Uphoff and others, suggests that yields can be maximized by using the following practices: 1) transplant young, single seedlings to increase growth potential and reduce competition, 2) avoid trauma to the root when transplanting, 3) give rice wider spacing to maximize growth potential, 4) keep paddy moist but not always flooded (alternating between wet and dry), 5) actively aerate the soil, and 6) enhance soil organic matter.

SRI was first tried by farmers in Thailand over ten years ago. However, many farmers struggled to avoid trauma to the seedlings and to transplant young seedlings using human labor. Additionally, trying to draw lines (for even spacing of the transplants) was difficult and required labor and time.

In response to these challenges, several farmers began to practice the "parachute method" of rice transplanting, in which rice seedlings are "parachuted" into their place in the paddy using a throwing motion. Further advances on this have been created around Thailand, including a "dart transplanting method with roller planting marker line drawing" developed by Wanpen, the farmer in Nakorn Sawan whom I went to visit. With Wanpen's innovations (methods ideal for SRI farming) a roller planting marker machine is used to make very straight lines throughout the field; these lines can then be used for spacing rice transplants, which are thrown like darts at the appropriate target. Both the dart method and rolling planter marker machine will be explained in further detail in the Thai Natural Farming Journal articles included in this ECHO Asia Note. Below, I will explain how Wanpen has utilized both innovations in her SRI practices.

Wanpen Seedling Preparation

Many different substrates can be used for growing rice seedlings. Wanpen uses forest soil for her seedlings. She harvests forest soil, then breaks the soil into a powder and keeps it in a bag until she is ready to use it. She believes that the forest soil contains all the nutrition that rice seedlings need, with an ideal soil structure that makes it easy to dart the seedling. Forest soil is often cheaper than compost from the market, which costs about 4-5 THB/ Kilogram ($0.12-$0.15 USD/kg).

To produce the dart rice seedlings, Wanpen soaks the seed in salt water (with enough salt in the solution that an egg placed in the solution half floats and half sinks) to separate bad seed. The good seed will sink while the bad seed will float. After removing the bad seed, she soaks the good seed in normal water for one day, then lets it sit out of water for a day to help the rice germinate. A white dot developing on a grain of rice is an indicator that the root is developing.

For conventional rice, which typically uses 10-15 seedlings per planting hole, Wanpen places the forest soil in a plastic tray with 434 holes, and places several seeds in each hole. She then covers the entire tray with 80% black shadecloth netting. The black shadecloth will help to prevent the seeds from splashing out when the tray is watered. Depending upon the amount of space available, she can start the seedlings either under a shadecloth enclosure (watering once a day) or outside (watering twice a day). Adequate soil moisture must be maintained while the seeds are germinating.

Rice will germinate and grow up through the shadecloth netting within 4-6 days. Wanpen removes the shadecloth when the rice has grown through the netting and is about 3-5 centimeters high. The seedlings can then sit in the nursery until the farmer requires them (for conventional rice, the seedlings may be as old as 30 days at planting).

For SRI seedlings, Wanpen uses the same kind of tray, but will fill each tray hole with half the amount of soil and place one seed in each hole. Each hole is then covered with soil and black shadecloth, and treated similarly to the conventional rice seedlings. SRI seedlings will stay in the tray for only 12 days before being transplanted into a paddy field.

(Above) Forest soil, (Below) seedlings in tray.

No-Burn Paddy Preparation

In Thailand and other rice-growing countries of Southeast Asia, the paddy is commonly burned to clear the stubble and any remaining residue in order to help speed the preparation process. In addition to creating air pollution, burning the paddy negatively impacts the soil by volatilizing nutrients and burning off organic matter, which is necessary to create healthy soils. The farmers around Nakorn Sawan have adopted a no-burn paddy preparation method, which helps to ensure the health of their soils by maintaining organic matter and nutrients, reducing air pollution, and allowing them to plant again in a timely fashion. For more information about uses of rice straw and why ECHO Asia does not advocate burning of paddy, see the ECHO Asia Note "The Amazing Effects of Rice Straw" by Winfried Scheewe (2010).

The farmer group in Nakorn Sawan advocates the following preparation:

- Apply microorganisms (IMOs, EM or others at about 1L/rai (2.5L/acre)), then immediately flood paddy for about ten days.
- After ten days, turn the soil over (using a tractor or water buffalo).
- Let paddy sit for about five days, to allow microorganisms in the flooded paddy to complete the fermentation of the stubble.
- Plough the land once again.
- Level the land, including a drainage line at the side of the paddy or at the proper place.
- Draw lines with roller planting marker machine to mark the transplantation targets.

No-burn paddy preparation.

Transplantation of rice seedlings using Wanpen's dart method

The farmer group in Nakorn Sawan uses the following method for transplantation of rice:

- Remove the seedling trays from nursery.
- Place the trays in a bag (rice bag or animal feed bag, etc.) to keep the seedlings cool and moist.
- Transport seedling trays to the paddy field.
- Each darting person should roll up the seedling trays and place them in their side bag. Typically, each person can carry 3-5 trays.
- Make straight lines across the paddy with the roller planting marker tool, using a string line as a guide. Lines should be spaced 30 x 16 cm.
- "Targets" are formed where perpendicular lines intersect. Now people can begin to throw seedlings like darts at the cross section targets. To minimize risk of injury, darters should keep their backs straight and walk forward.
- The darting method, an innovation specifically designed for SRI, requires 90 trays/rai (225 trays/acre).
- Wanpen's family and enterprising farmers have begun micro-enterprises by growing and selling seedlings for darting at 15 THB/tray($ 0.50 USD).
- The cost of seedlings grown in trays for one rai is (15 THB x 90=1,350 THB, or 3,375 THB/acre)($112.50 USD)
- For the SRI method, the paddy should be dried out for 5-7 days after planting.

Paddy preparation and dart transplanting.

Paddy Maintenance

The farmer group in Nakorn Sawan uses the following practices for maintaining their SRI rice paddies:

- 15 days after transplanting, the farmers apply nitrogen at a rate of 10 kilograms/rai (25 kilograms/acre).
- 50 days after transplanting, the farmers apply NPK at a rate of 10 kilograms/rai (25 kilograms/acre).
- Farmers weed when necessary. Those using SRI often employ a cono-weeder to simultaneously weed and aerate the soil, improving microbial activity.
- The farmers use proper water management for the crop, according to SRI principles.
- The farmer group in Nakorn Sawan let Azolla grow in a lower trough at the edge of a paddy (see picture). When the paddy is being prepared, Azolla can be gathered and protected along the paddy side. When

the time comes to flood the paddy after transplanting, Azolla will spread out all over the paddy (Pijarinee and Wanpen method). Azolla is a green manure cover crop that is capable of fixing nitrogen, and has a C:N ratio of 8:13. It is also a very good natural weed control, because it can cover the water surface, blocking sunlight and inhibiting weed growth. Azolla is also beneficial because it is able to absorb heavy metals from dirty water.

Azolla along paddy and in paddy.

- Dry the paddy 2-4 weeks before harvest.
- Harvest the abundant rice!

Kularb, a village head man, asserts that even 40-day-old seedlings can be used with the SRI method, but there will be fewer tillers than when rice is transplanted at 12 days old (seedlings with 3 leaves). In his experience, if conventional rice produces an average of 14 seedling tillers with 150 seeds per tiller, it is capable of producing 1,000 kilograms per rai or 2,500 kg/acre. He found that when using SRI ('Riceberry' variety), one plant could produce nearly 40 seedling tillers (even during the dry season), amounting to a nearly threefold increase in grain.

Wanpen and her daughter not only produce seedlings (single SRI seedlings and multiple conventional seedlings), but can also be hired to dart other farmers' rai with her seedlings. She will charge 1,800 THB per rai (140 USD/acre) for rice darting labor. Ten darting laborers can dart 7 rai/day (2.8 acres/day), allowing her to make a revenue of 12,600 THB/day and paying each worker 300 THB/day.

Final Reflections

The farmers in Nakorn Sawon have created a great system. In addition to growing rice for their own harvest, they have also started growing rice seedlings for the government's rice department. Growing rice with SRI is a very good way to keep breeds pure, due to the fact that each clump or planting station is produced from one seed, allowing farmers to more easily remove any seedlings that do not express desired traits. Also, when grown using SRI practices, rice plants produce seed of good quality and weight, with good germination.

Mother Teresa once said, "I can't do what you can do and you can't do what I can do, but together we can do a great thing." Billy Graham noted that the Christian life is not a program but a process. I have often heard that development also is not a project but a process. From my own experience, I would like to conclude that the adoption of SRI in

Kularb, the village headman, counting his tillers.

Thailand has been an evolving process. At first, we tried very hard to practice single transplantation, but it was difficult. The farmers of Thailand developed the parachute method, but the rows and column spacing was difficult to control. Finally, Wanpen, the Nakorn Sawan farmer, developed the darting method that I have shared with you today. I hope you find useful for your own agriculture practices.

SRI is not a fixed system, but a process. We need to focus on the flexible system and not approach SRI as a cookbook "silver bullet" approach. SRI can be adapted to each of our unique contexts.

Useful Links

- IFAD's Page on SRI
- Cornell University's Page on SRI
- Wassan's Page on SRI
- SRI India
- Video about SRI in the Mekong Basin

Increase Yields and Save Money with Innovative SRI Tools

by Nanthanit Anusassananan
reprinted with permission from the Natural Agriculture Journal, March 2014
translated by the ECHO Asia Impact Center

The System of Rice Intensification (SRI) is a promising rice-farming methodology that is able both to lower production costs—of seed, fertilizer, chemicals, and water—and to increase yield by enabling each rice plant to reach its full potential. However, the SRI approach involves transplanting young seedlings, a labor-intensive practice that farmers are often resistant to adapt. This article will introduce appropriate SRI tools that save both time and energy, making the technique more accessible to (Thai) farmers.

Phana-Ngam pictured with the the SRI tools he has developed.

Weekday Vocational Teacher and Weekend Farmer

Currently, the average Thai farmer is over 40 years old. That does not mean young people are completely ignoring rice farming. Chunawat Phana-Ngam, for example, the child of a Banpog, Ratchburee farmer, is both a vocational college teacher and a weekend rice farmer. He would like to grow organic rice for personal consumption and to sell to friends or those interested in healthy food. He looks for new techniques that make rice cultivation simpler and more cost-effective. He has tried many methods: broadcasting, direct seeding, transplanting, and parachute rice transplanting. In his experience, transplanting is the most appropriate. He has also found that by alternating wet and dry conditions to stimulate the rice, the SRI technique can help to reduce costs and increase yield.

For the past two crop cycles, Phana-Ngam has planted Jasmine rice using SRI on 12 of his 50 rai (2 of his 8 ha), producing 65-70 buckets per rai (1,625 – 1750 kgs per acre). He also planted 'Riceberry' rice, a healthy and popular variety. Even though he grew this rice in a location where water was difficult to control, he produced a good yield. During the most recent crop cycle, his farm was damaged by four storms. His Jasmine rice was able to remain upright, while his field of broadcasted 'Supanburee 1' [Ed: another rice variety] was flattened by the first storm. Neighboring farmers were amazed.

Developing the SRI Tools

SRI requires transplanting, which is difficult and labor-intensive work. SRI is also weeding-intensive *[Ed: whereas traditional paddy production relies upon standing water to kill weeds, SRI alternates wet and dry periods, which has the potential to encourage weeds to germinate and grow, , but also has the potential to increase microbial break-down and release of key soil nutrients, improving plant health and yield].* Phana-Ngam developed a convenient and fun tool to make the work of weeding easier. The tools that he produces are uncomplicated and easy to make. In the past, he used a more complicated imported tool, but found it difficult to use because it was designed for different conditions. Phana-Ngam modified this tool, making it suitable for Thailand's paddies. He developed both a rotary weeder and a grass cutter that fit between the SRI rows.

"I modeled the grass cutting tool after a Japanese grass cutter which cost about 7,000 Thai Baht ($230.00 USD). This tool was made from fiber plastic. It is expensive and not well-suited to the Thai landscape, so I applied its useful principles and designed one myself. To make this tool, I used only simple iron. Attached to the cutter is a shield that prevents damage to the rice while weeding. I made a simple blade by heating it and bending the iron material. In the end, the machine only cost about 300 Thai Baht ($10.00 USD) to make, but it works similarly to the Japanese machine I had been using.

"I also made small rotary weeder machines for weeding and loosening the soil structure between the SRI rows. I weed the rice at day fifteen (after planting). This rotary weeder buries weeds in the soil. Organic farmers could then also apply microorganisms to help speed up the decomposition process….The rotary weeder will weed five times faster than pulling out the weeds by hand, which involves having to bend down and may cause back pain. With just five machines, paying five people 300 baht per day for wages, we will still save a lot of time and labor," says Phana-Ngam.

Phana-Ngam's grass cutter and rotary weeder.

Phana-Ngam also produces an SRI rolling marker tool with his vocational college students. "If we do not want to use a transplanting machine, we must mark the rows ourselves [in order to plant in straight lines]. Some people use rope to draw the lines, but it is inconvenient. Some people use a harrowing comb to draw a line, but in order to create the proper marking, it has to be used twice—one time in each direction. The rolling marker tool I developed only has to be used once, because it marks the horizontal and vertical spacings simultaneously]. You then transplant the rice seedling at the target mark. Your rice will then grow in straight rows, which is easy for weeding, either by implement or by hand." *[Ed: if your rows are crooked, it is easy to damage the rice when passing by it with a weeding implement.]*

Most of Phana Ngam's paddy tools are light and easy to use. He had previously used

tools that hook up to larger machines, like paddy tractors, but they were not appropriate for the Thai mud paddy. Phana-Ngam had to change his way of thinking, so he turned back to simple tools.

"It is research," says Phana-Ngam. "I wanted to find the easiest tool to use in our rice paddies, because every tool was too heavy. I had invested in a 10,000 Thai Baht ($333.00 USD) ploughing machine, but it did not work well. When you rake the mud it sinks because it is so heavy, so I turned back to normal, simple, and light tools. If I become tired, I just move it aside and take a break. We should also work together. Working alone is boring and is not fun, but when you work with friends, you get the work done faster and have more fun."

Design for Development

The early tools that Phana-Ngam developed weren't perfect. When he or other farmers used the tools, problems occurred. This didn't worry Phana-Ngam, because when problems occurred, he adjusted and further developed the tool. Phana-Ngam commented, "The tools I made were not perfect. I do not produce these tools to sell, but to solve a problem. Whoever faces a problem always wants to find a solution. I was able to brainstorm with a large group of people—the more people that trial our product, the better. Not only do I benefit, but they do too. I do not produce these tools for business, but for development. Now my rice farmer friends are happy."

[Ed: A growing number of people in Thai society have day jobs and farm on the side for supplemental income]. These "weekend farmers" use Phana-Ngam's tools and have helped to fix the weak points and problems, leading to design of a new tool with better potential than the former model. These tools will help Thai people practice rice farming sustainably.

Ideas for the New Generation of Farmers

Rice farmers in Thailand need to know what weekend farmers already know: "Don't ask, don't wait, just do it." Do not ask for solutions from the state, because this has often led to problems. Do not wait, but act immediately. Farmers are able to survive because of their self-reliance. Phana-Ngam is a good example in how he grows rice: first for his own consumption and then for direct sale to consumers. "I have 50 rai (8 ha). I sell directly to people from 10 rai (1.6 ha). I sell only some to the rice mill. I try to produce organic rice. Because I have successfully established a customer base for my rice, I can see a new future for myself as a farmer. I think that if farmers keep selling their rice to the rice mills, one day there will be no more rice farmers. Only new farmers that develop new practices, organize customers and markets themselves, research consumers, produce quality products (rather than focusing solely on quantity), and sell directly to the consumers, will be able to survive."

The SRI weeding tool fits well between SRI rows.

"I would like to see farmers with mini rice mills in their houses, milling rice once a week. Small mills may be less efficient than big mills, but what kind of rice do we eat every day? We don't know the quality of the rice we consume. If you eat my rice, you know where it comes from and you know that it's of high quality. You can order processed rice from me (de-husked or milled) or you can buy non-milled rice from me at a cheaper price and mill it yourself at your home. If you mill it yourself, you will get rice bran and rice husk as well. Rice husk can be used as fuel for gasifier stoves. This is a complete system: you get quality rice to eat, and I save time by selling rice to you before de-husking."

Chunawat Phana Phana-Ngam represents the "new farmers" who see their role as producing food for the Thai people. They have ideas for the government. "I would like to see whoever becomes governor support the farmer directly. I want to see the government help farmers decrease rice-farming costs; help lower the price of tools, equipment, and machines; and provide the right knowledge, such as information about soil quality. One of the main factors affecting rice farmers is the soil. If the soil is good, whatever you grow will grow well and be healthy, but if the soil is bad, whatever you grow will not grow well. How can farmers improve the soil; how can they lower their costs? Who should farmers sell their rice to? The government should support farmers by helping to lower farm costs in action, not only in policy."

Tools like Phana-Ngam's help farmers farm with meticulousness and attention. They are the most efficient way to produce high quality rice. These appropriate tools directly benefit the farmer by lowering costs and labor inputs. Consumers receive high quality rice. The environment also benefits, because these tools assist farmers to lower their dependence on chemicals in rice production.

SRI Roller Planting Marker

by Preeyachaya Klaythuan
reprinted with permission from the Natural Agriculture Journal, March 2014
translated by the ECHO Asia Impact Center

Targeting a Better Rice Farming Future

The System of Rice Intensification (SRI) is becoming more popular in Thailand. Both new and experienced farmers are excited to learn about improving rice systems rather than just focusing on high yields.

The upper central region of Thailand, especially in Nakorn Sawan, has rich soil and flat stretches of land along the river. This area has good conditions to cultivate rice, especially to produce rice for seed. Most of the rice seed used in central Thailand is from this region.

Current SRI Trends in Thailand: Growing Popularity and Commercial Use of SRI

If SRI is practiced on 1 to 5 rai (0.16 – 0.8 acres), the work can be done by family members or by shared labor between neighbors, a common practice. However, for farmers producing pure-bred rice seed or commercial seed with SRI, the detail of the work is very demanding. If farmers don't possess adequate skill, they may not produce quality pure-bred seed, which results in lost time and opportunity.

Wanpen Channarod *[Ed: Wanpen Channarod is also mentioned in Boonsong's reflection]* is a farmer from Thamai, Chomsaeng Nakorn Sawan. She cultivates rice on sixteen rai (7.2 acres), producing single and multiple seedling clumps for rice paddy planting. In addition to using SRI methods to produce these seeds, she also made a roller marking tool that is now used for commercial SRI production in Nakorn Sawan province and surrounding areas.

[Ed: The roller marking tool makes it easier to plant rice in straighter rows, increasing efficient use of land space and reducing damage to plants when the plot is weeded with a mechanical weeder.]

"I had already practiced SRI for many years when one day the company asked me to plant SRI rice for seed on 60 rai (24 acres)," says Wanpen, "with the conditions that the rice plants should be planted in rows and equally spaced. At first, I did not accept the contract. I thought about how to plant SRI seedlings in even rows. I could not eat and sleep, I thought about it day and night. Finally, the design came to me. My brother, who is a technician, built it and tried it on the job. With 60 rai (24 acres) in the contract, I knew it would make a big difference, but would also be an invaluable experience."

Making Ordered Lines in SRI Fields

Creating the first prototype involved much trial and error. From the beginning, Wanpen continually modified the tool, in order to address problems that arose, improve convenience, and increase speed and ease of use. At the same time, she was still completing the work according to the contract with her customer.

After that first contract, she continued to use the roller marking tool, together with the traditional rope technique to define plant spacing. *[Ed: Traditionally, with SRI, rice has been spaced using a rope with knots tied into it, stretched across a field; the knots show where plants should be placed.]* However, the tool needed modification because the rolling metal structure was not strong enough. She tried to build it with PVC, but it was still not quite right. With the PVC addition to the model, she tried to make a hole at the cross bar so that the operator could see where the tool was making marks in the mud more clearly, but the machine was still too heavy and it would sink into the mud. It required a lot of energy to make the tool roll, which was a waste of both time and strength. Finally the current model with its steel bar structure was developed.

Wanpen's Roller Planting Marker Development Model

Wanpen's roller planting marker was developed from her experience. When a problem occurred, she would alter and develop the tool according to the problem and rice variety.

Wanpen's tool was designed to be lightweight, easy to handle and convenient to use. The handle was designed so that the tool can be pulled. The tool makes parallel and perpendicular lines to mark the planting locations, optimizing space between rows so that the rice is easily organized in lines without using too much energy.

Measuring Space According to Rice Species and Tillering

Because Wanpen grows SRI rice for commercial use, she needs to have several roller planting marker tools with different-sized wheels. Which one she uses depends on the tillering habits of the rice variety she intends to plant. Her roller marking tools are 30x30 cm., 16x30 cm., and 25x25 cm, depending upon the need. *[Ed: SRI rice is traditionally planted with 25X25 cm or wider spacing].*

Farmers demonstrate the roller planting marker and SRI method in Nakorn Sawan.

Once marks have been made with the tool, rice seedlings can be planted. The fields must not be too wet, or the marks can easily be lost before rice seedlings are darted [Ed: Darting is a form of rice planting—see associated article in this issue]. After two weeks, the rice seedlings will be well established and growing in orderly rows.

Rice Established in Rows Makes Weed Control Easy

Planting in orderly rows for SRI will also help with weed control, which is important for paddy management. With traditional rice farming methods, weeds are difficult to manage. If farmers walk through traditional rice paddies, they risk damaging the plants. Because SRI is planted in consistently spaced rows, farmers can weed the paddy with very little damage to the rice.

Two Strong Farmers: Mother and Daughter Work Together

Even though Wanpen has a team to plant her commercial SRI paddies, her daughter Pijarinee Ruksri (Aae), a recent university graduate, also produces rice seedlings for her mother.

The weekend farmer network *[Ed: The "weekend farmer network" is a concept mentioned in the SRI Tool Innovations article. It is the concept that many Thai farmers hold full time jobs but continue to farm on the weekends.]* has also created and developed the "single rice seed seeder," a tool made of double layers of acrylic. The upper layer has 434 holes, according to rice seed size. The bottom layer has identical holes, but overlaps with the upper one. The rice seeds are spread on the upper layer and shaken horizontally so that the rice seeds drop into the holes. The acrylic tray, with holes aligned, is placed on top of a prepared seedling tray. Remaining empty holes can be planted manually. This technique helps seed trays easily and efficiently (one minute per tray.)

Wanpen uses the area around her house as a rice seedling nursery. Some of the seedlings that she produces (either from seed brought by customers or from her own seed) are sold to farmers. Some are used as replacements in fields after initial rice establishment. Current favorite rice species amongst her customers include: 'Riceberry,' 'Hormnin,' 'Hormsukothai,' 'Hormlanna,' and 'Gorkhor 49.'

SRI Transplanting Tools

by Chunawat Phana-Ngam
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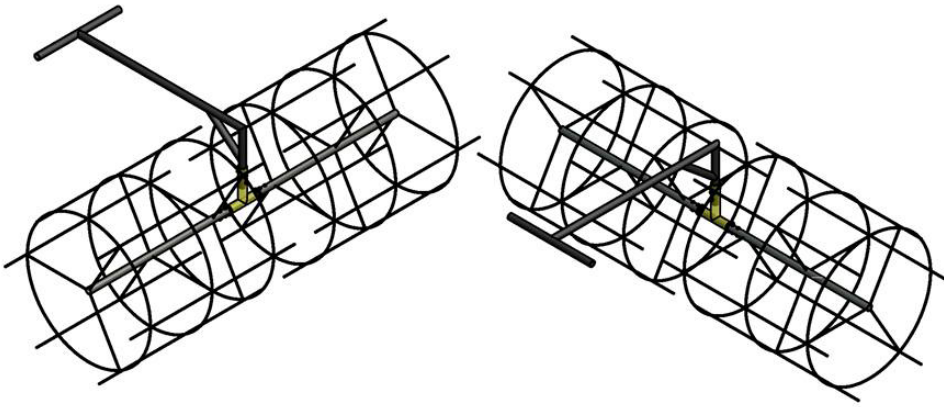
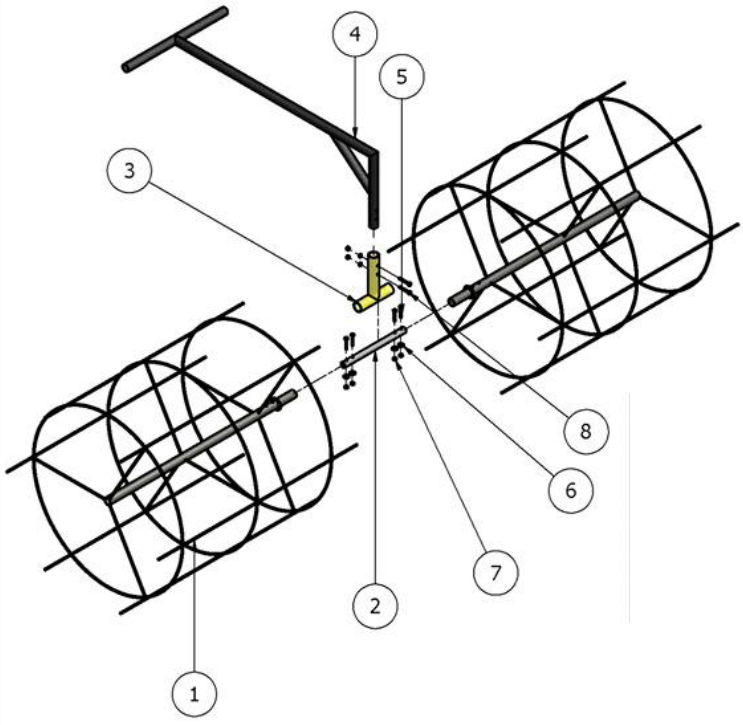
translated by the ECHO Asia Impact Center

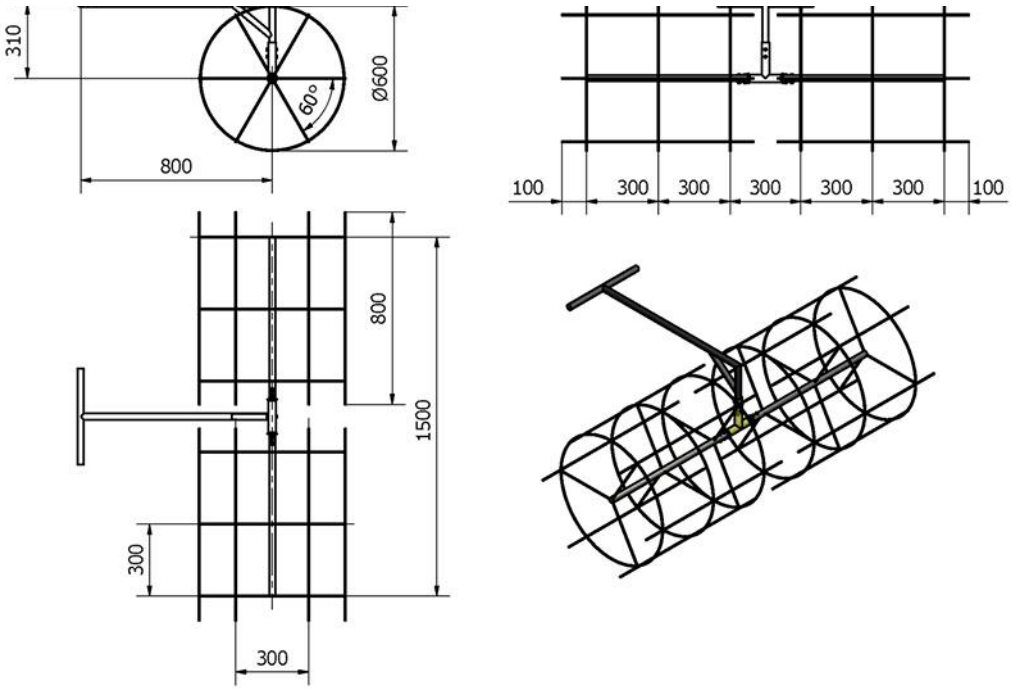
SRI Rolling Marker

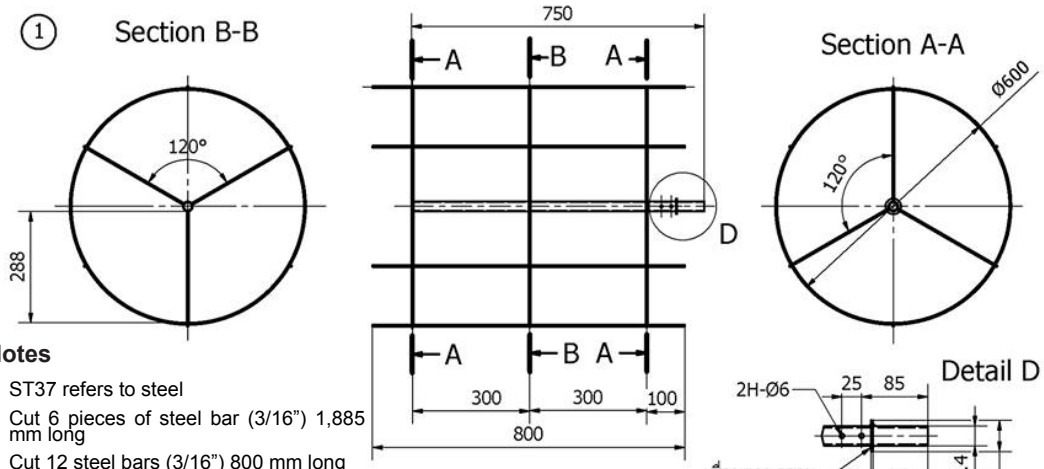


The SRI rolling marker is a machine used to replace ropes and harrowing combs when marking out lines for transplanting rice into an SRI system. One limitation is that in wet conditions, the marks can fade.



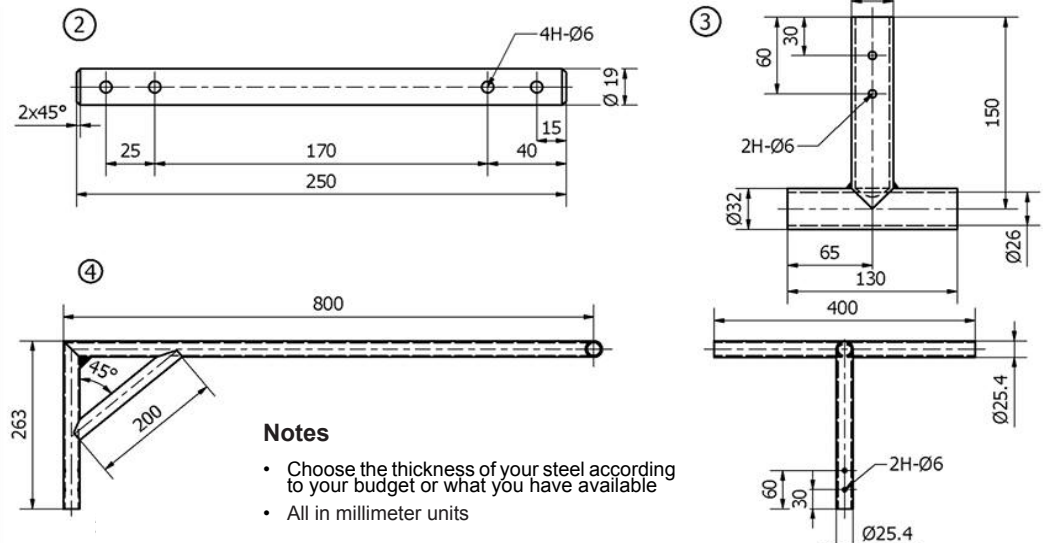
No.	Amount	Detail	Material
1	2	Roller	Steel bar 3/16"
2	1	Shaft	ST37 Steel
3	1	T Shape	ST37 Steel
4	1	Drag Arm	ST37 Steel
5	4	ISO 4017-M 6X35	Standard Design
6	6	ISO 4017-M 6 ISO 8738-6	Standard Design
7	6	ISO 4034-M6	Standard Design
8	2	ISO 4017-M 6X40	Standard Design





Notes

- ST37 refers to steel
- Cut 6 pieces of steel bar (3/16") 1,885 mm long
- Cut 12 steel bars (3/16") 800 mm long
- Cut 18 steel bars (3/16") 288 mm long
- Weld at the appropriate point
- All in millimeter units



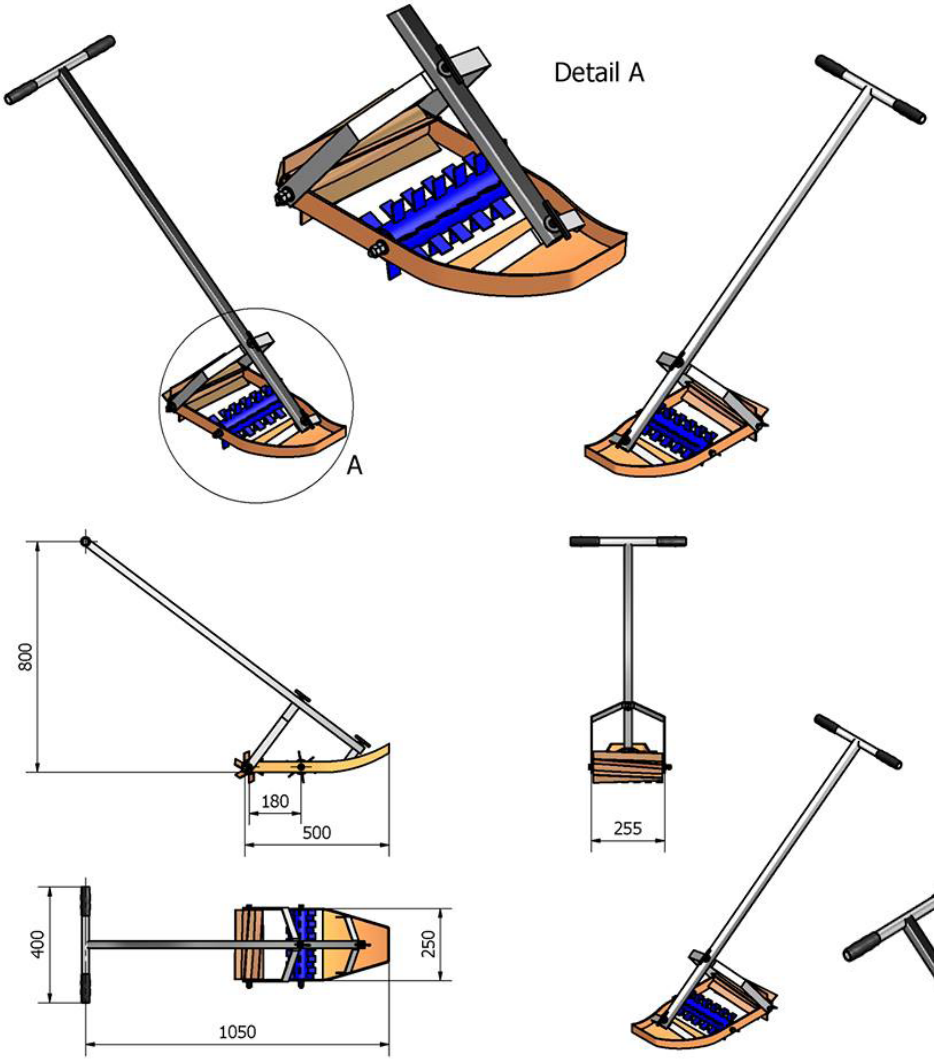
Notes

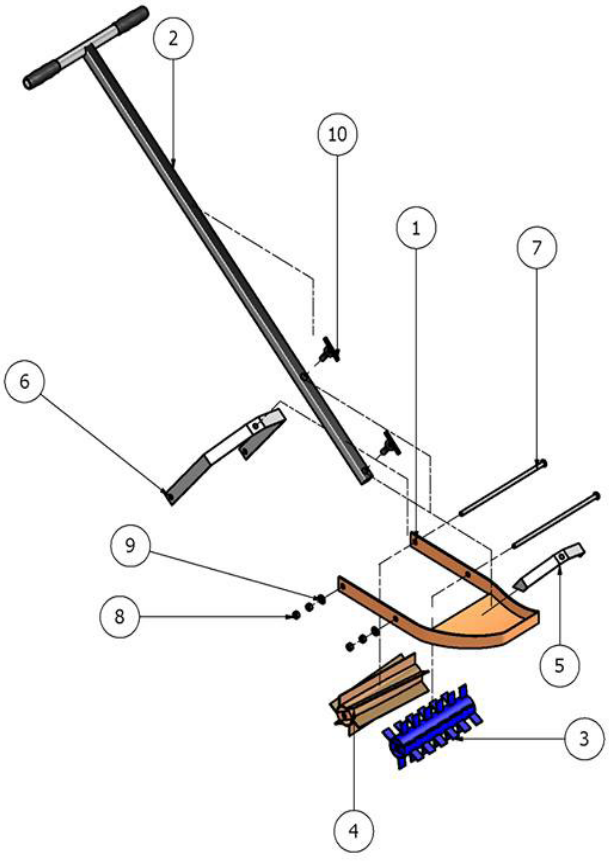
- Choose the thickness of your steel according to your budget or what you have available
- All in millimeter units

No.	Amount	Detail	Material
1	1	Shaft	ST37 Steel
2	1	Shaft	ST37 Steel
3	1	T Shape	ST37 Steel
4	1	Drag Arm	ST37 Steel

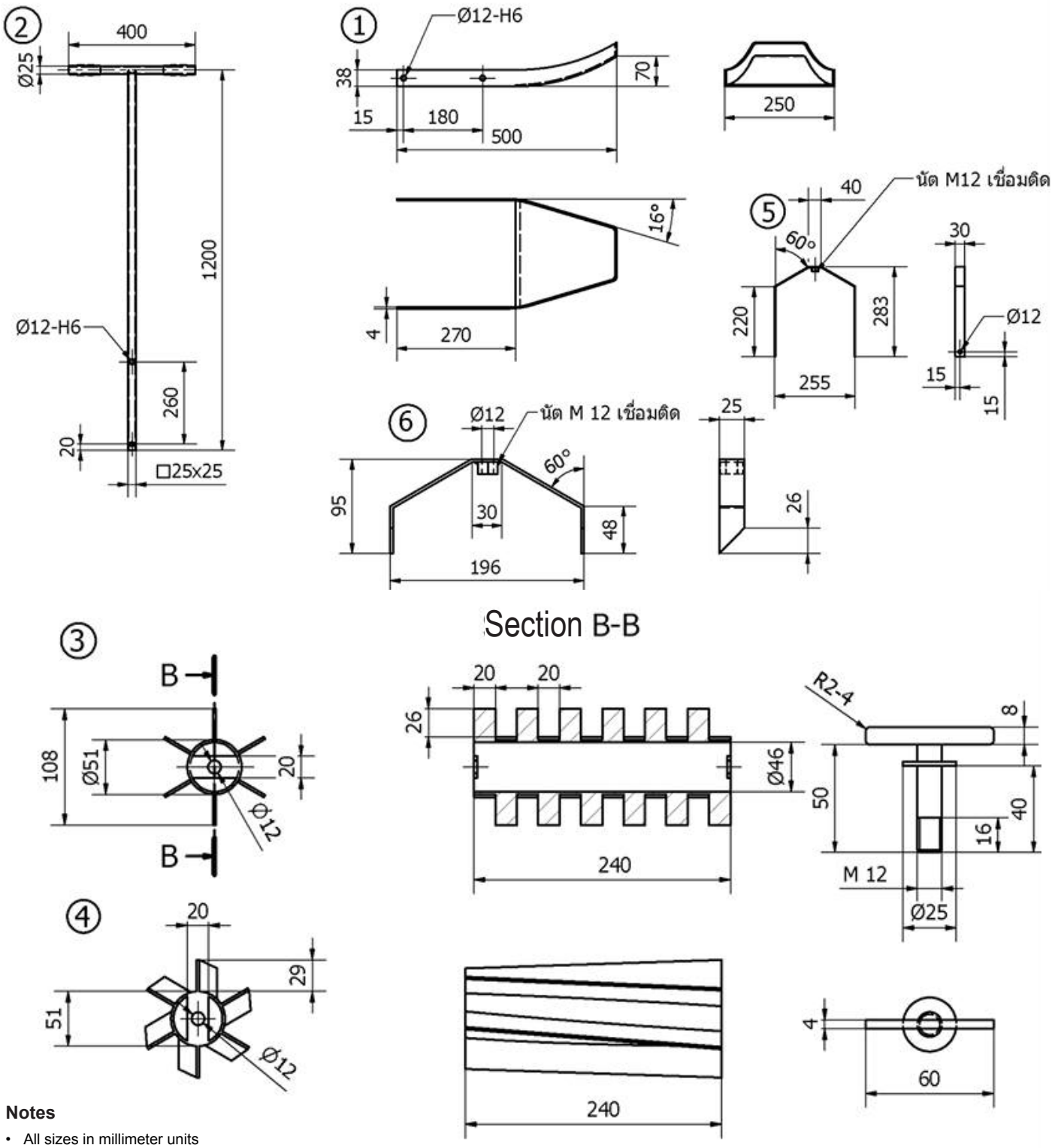
Rotary Weeder

This tool is modeled on Japanese technology. The front portion is bent to prevent the tool from sinking into the mud.





No.	Amount	Detail	Material
1	1	Body	Iron Bar 3/16”
2	1	Push Arm	ST37 Steel
3	1	Rotary Thrasher	ST37 Steel
4	1	Rotary Chopper	ST37 Steel
5	1	U1	ST37 Steel
6	1	U2	ST37 Steel
7	2	3/8” - 11”	
8	4	3/8”	
9	2	ASTM F 436-3/8”	
10	2	Screw Iron	



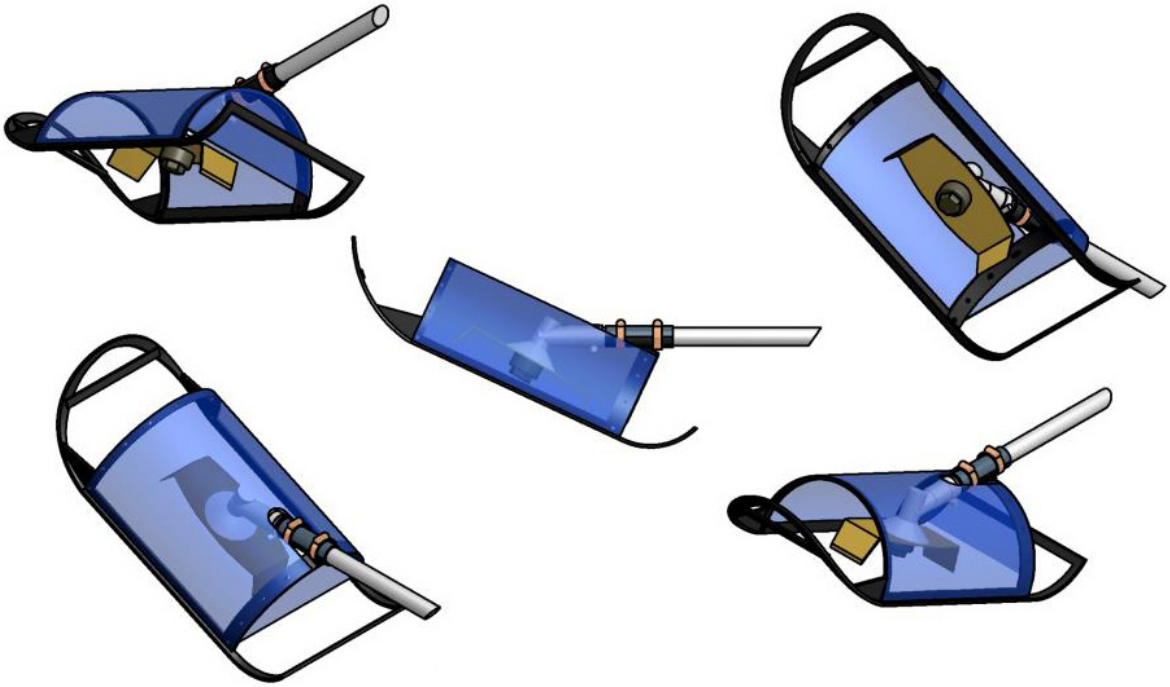
Notes

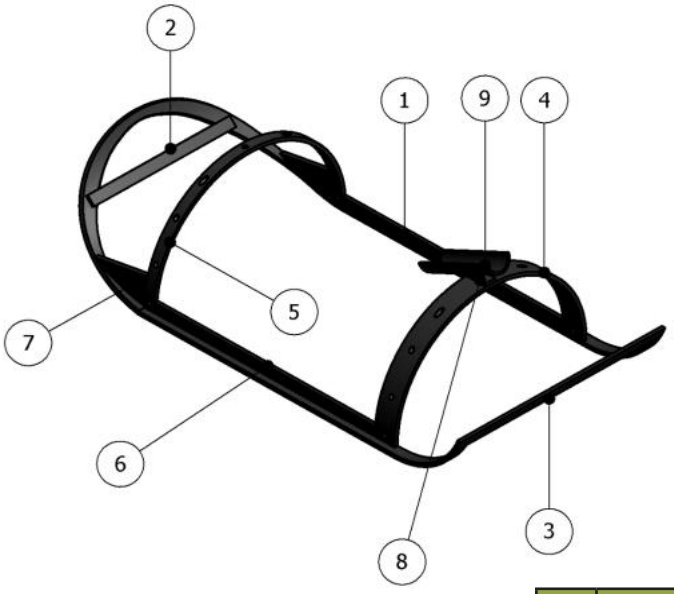
- All sizes in millimeter units
- Size is adaptable
- No. 4, iron bar 1”, cut angle as needed
- Weld at the appropriate point

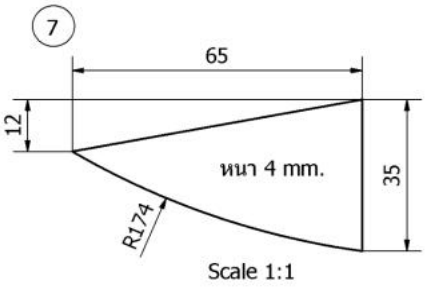
No.	Amount	Detail	Material
1	1	Tool Body	ST37 Steel
2	1	Pushing Arm	ST37 Steel
3	1	Rotary Trasher	ST37 Steel
4	1	Rotary Chopper	ST37 Steel
5	1	U1	ST37 Steel
6	1	U2	ST37 Steel

Grass Cutter

This machine is inspired by Japanese technology. The original was made of plastic but the adapted version is made of metal, which is cheaper and easier to find.



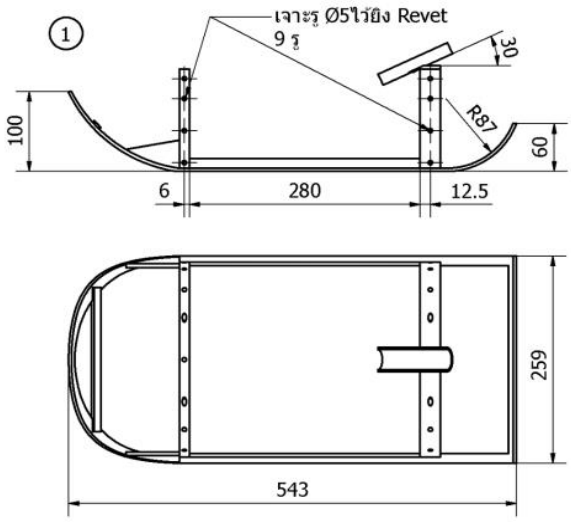


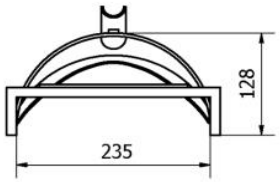


Notes

- Change size as needed
- No 9., cut a round piece of metal in half
- Weld at the appropriate point
- 4t x...x... is the thickness x width x length

No.	Amount	Detail	Material
1	1	4t x 12 x 1200	ST37 Steel
2	1	4t x 12 x 180	ST37 Steel
3	1	4t x 12 x 235	ST37 Steel
4	1	4t x 12 x 387	ST37 Steel
5	1	4t x 12 x 387	ST37 Steel
6	1	4t x 12 x 280	ST37 Steel
7	2	4t x 12 x 65	-
8	4	4t x 12 x 50	-
9	2	Steel bar Ø 25 x 95, cut in half	-

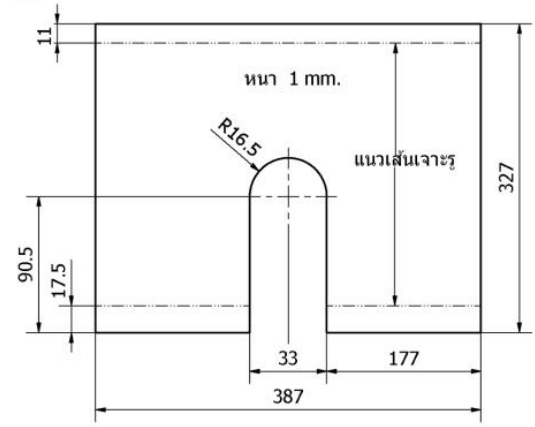




Notes

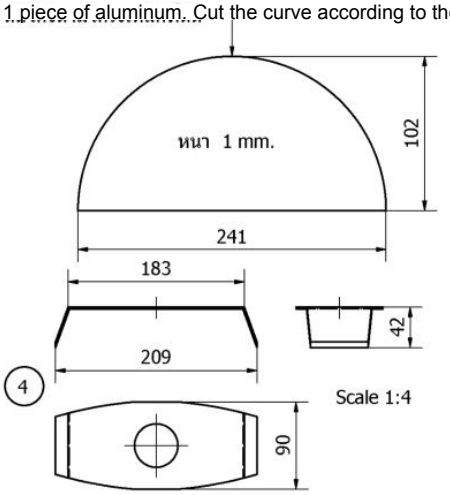
- All sizes are in millimeter units
- Pierce the holes, measure the size according to the machine you have
- Cut the curved section as appropriate
- Weld at the appropriate point
- The size can be adjusted as needed

2 1 piece of aluminum



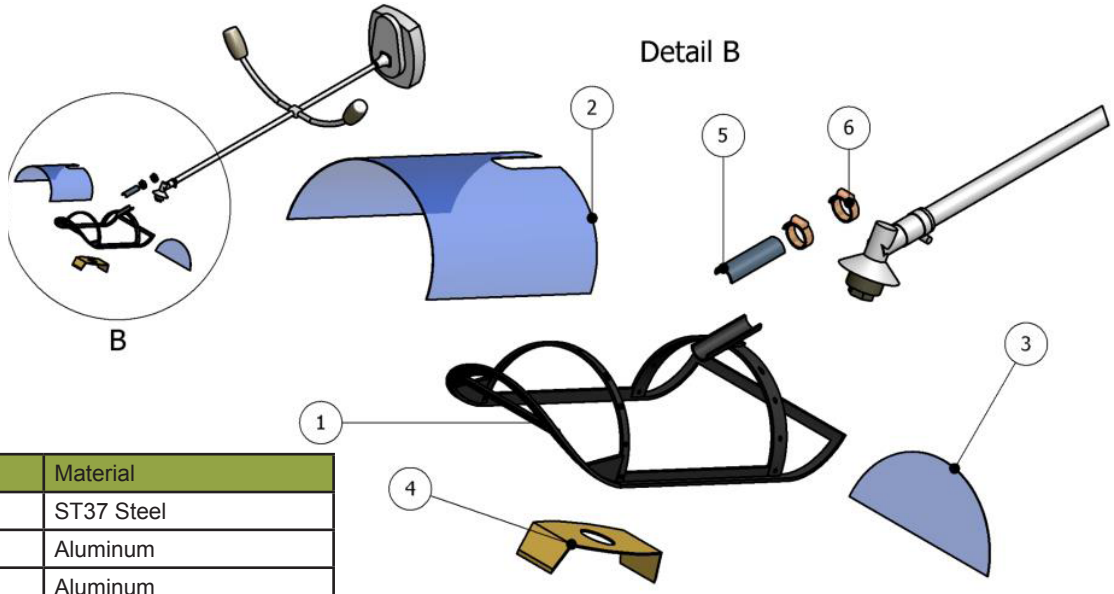
3 1 piece of aluminum

1 piece of aluminum. Cut the curve according to the existing frame.



Notes

- It is not necessary to use aluminum; use material that is local and easy to find
- Purchase a normal straight blade and cut according to the design
- Blade must be made from strong metal
- Change size as needed



No.	Amount	Detail	Material
1	1	Iron Body	ST37 Steel
2	1	Cover	Aluminum
3	1	Cover	Aluminum
4	1	Blade	Steel C45U
5	1	Support Plate	ST37 Steel
6	1	Clamps 1”	ST37 Steel

Notes

- Cut two pieces of rubber and place together to prevent wear

Learning From Farmers

by Rajendra Uprety
reprinted from Farming Matters, March 2013

It was an afternoon of 2002 when I first read about SRI. As an extension officer in the District Agriculture Development Office (DADO), I started promoting SRI in the following years in the district of Morang, Nepal. Over this time I observed hundreds of attractive SRI fields and spent some years as a SRI activist. Looking at the results, I've learnt that different farmers face different problems, and that they adapt all techniques to suit their diverse circumstances and needs.

The media and local "champions" have played a vital role in promoting and disseminating SRI in Nepal. In 2004, SRI was introduced in Morang with the specific objective of increasing yields. DADO used the Farmer Field School approach to train a range of farmers in SRI techniques; trainees included land owners, share-croppers and farmers leasing land, and farmers with a variety of water sources.

During the interactive field meetings, SRI seemed compatible with the reality of the region's resource-poor farmers, the scarcity of fertilizers and their use of different rice varieties.

Yet, through working with these farmers over a period of time, researchers and extension staff learnt that their agro-ecological and socio-economic contexts often differ, and that the newly learnt SRI strategies are applied differently, according to context.

The demand for rice has been growing in Nepal because of population growth and the purchasing power of part of the population, and helped by better transport facilities. Rice has become a government priority. However, the very same social and economic changes have also led to new income opportunities for people in the rural areas, and as a result the cultivation of rice is less attractive.

Although the majority of the farmers continue to grow rice to secure their household's food needs, they are also involved in other agricultural and non-agricultural income-generating activities. The new generation of farmers is more interested in high-value vegetables, fruits and cash crops.

A detailed field study in Morang in 2008 showed that SRI does increase rice production, but its adoption was limited. The reliability of access to water, the distance between the house and the field, land ownership, and the availability of labour and training were the main factors determining the farmers' strategies, and hence influencing the dissemination of SRI.

Harvesting time: farmers' knowledge and aspirations are the best determinants of success. Photo: Rajendra Uprety.

Having an unreliable water supply, farming in swampy lowlands, or cultivating rice on rented or distant fields, were all obstacles to adopting SRI. Most SRI farmers used the family as a source of labour, whereas most large-scale farmers, depending on hired labour, were not interested in SRI as its labour requirements are time-bound.

Overall, the determining factor was the perceived importance of rice production within the farmer's wider range of agricultural and non-agricultural income-generating opportunities. This study suggested that rice intensification was only attractive to a relatively small portion of land-owning rice farmers with a low dependency on hired labour.

Variations in field management

Yet we also saw that farmers employed different field management strategies to incorporate SRI into their farming systems. Few farmers used all six of the SRI practices introduced in the training sessions (young seedlings, single seedlings, wider spacing, alternate wetting and drying irrigation, mechanical weeding and use of compost). But these modified methods appeared to be even more successful than the "standard" SRI system, producing an average yield of 5.7 tons/hectare.

By maintaining regular interactions with the farmers, researchers and extension agents learnt what works and what does not. We found that the farmers with most productive fields used younger and fewer seedlings of photo-insensitive varieties, spaced wider apart. The type of land and the availability of water greatly influenced which approaches the farmers chose.

A majority of farmers only used SRI methods in the higher parts of their field. Farmers used younger seedlings in areas where irrigation and drainage can be controlled better, responding to the evidence that transplanting young seedlings in water-scarce areas is more risky. Water availability also determines the timing of land preparation and transplanting. When the rains are late, or when water is not available, the preparation of the field is delayed while the seedlings continue to grow in the seedbeds.

Secondly, mechanical weeding appeared problematic. Although farmers used fewer seedlings and wider spacings, they were not laid out in the straight lines or square patterns necessary for mechanical weeding. Weed management, manual or mechanical, requires sufficient and skilled labour. Mechanical weeding was found to produce higher yields, but most of the farmers complained about the inefficiency of locally-made weeders. The heavy equipment was not suitable for the predominantly female workers.

Third, many farmers did not follow the advice to use compost (alone or with fertilizer). Sometimes there was not any (or

enough) compost available, especially as dung is often used as fuel. Other factors that constrained the use of compost included the distance to the field, land ownership, and the expected yield returns. The use of bullock carts in the area is in decline, limiting farmers' transportation options.

Moreover, farmers prefer to apply the available compost on high-value crops such as vegetables and spices. Another notable finding was that the poorly producing farmers in the study area used more fertilizers than required. By contrast, the farmers who had attended the training sessions had reduced their fertilizer use.

Finally, we saw that farmers did not follow the recommendations of the national research systems. Only 22 percent of the rice fields in Morang were planted with the recommended varieties. In well-irrigated (and thus less vulnerable) areas, the recommended varieties performed better and were adopted by farmers. But they were less popular in the more vulnerable fields.

In addition, the low straw yield of the recommended dwarf varieties makes them less attractive for farmers who have animals. They prefer the taller varieties which also provide straw that can be used as fodder. Also, while long duration and low-producing Basmati varieties were grown by some farmers due to the high price they fetch, they were not popular among small-scale and marginal farmers, who cultivate rice for home consumption. The most popular varieties were not recommended by the research system, but had been selected and disseminated in farmer-to-farmer networks.

Working together with farmers, we all saw what works and what does not work. Photos: Rajendra Uprety.

Learning from farmers

Introduction of SRI during the DADO training sessions helped both farmers and extension workers to learn from the rice fields and from each other.

Extension workers saw that their own recommendations were not followed, and started a process of reviewing the techniques with the farmers. This broke the traditional one-way deliverer recipient system of learning.

After joint trials and learning, mutual interactions became more common. Such interactions helped re-shape the general recommendations of the extension staff. When DADO began making recommendations based on farmers' suggestions, other farmers became more interested in testing and disseminating the new approaches.

SRI was found to be effective – but not necessarily interesting for all farmers and all contexts. Farmers tried to re-shape it according to their agro-ecological and socio-economic conditions, choosing some of the practices best suited to them and their particular fields.

This taught us, as an extension agency, to rethink our technology dissemination process for medium and small-scale farmers, and begin providing them with a set of options. These options are intended to be varied and flexible enough to allow farmers to choose from them according to their particular situation.

If the government and other supporting services want to increase the benefits that farmers can get from SRI techniques, they need to address the issues that influence farmers' decisions. Improving water distribution systems and their reliability can be beneficial for farmers with fields in lowland, swampy or poorly irrigated areas.

Another option is to help farmers to access more suitable mechanical weeders. Nutrient management strategies can also be improved by looking at the supply of fertilizers and by providing intensive training on the use of manure. We constantly try to keep in mind that a training package needs to be designed according to local needs. And the production of rice needs to become an economically attractive alternative to other sources of income.

Farmers' knowledge and livelihood aspirations are the best determinants of success in the field. This study found that farmers are the best selectors of varieties: participatory variety selection and dissemination approaches are clearly the best strategy to introduce promising rice varieties. A diversity in varieties and cultivation methods is an essential component of rice farming. Especially in countries like Nepal, where the majority of rice farming is still rainfed, it is important to understand and appreciate the agro-ecological and socio-economic diversity of rice farming systems.

About the author: Rajendra Uprety worked as senior agriculture officer in the Department of Agriculture, Nepal and is now a Ph.D. candidate at Wageningen University.

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Seeking Applicants for ECHO Asia's National Volunteer Program

ECHO Asia is looking for talented individuals to enroll in our National Volunteer Program. The aim of the program is to give Asian leaders, development workers, farmer-leaders, etc., hands-on training at our ECHO Asia Seed Bank in the basics of sustainable agriculture, appropriate technology, seed banking, and a host of other ECHO Asia techniques and services. This program is open to nationals of Asian countries who are actively engaged in agriculture or community development and wish to further their knowledge base and application of sustainable development techniques. Volunteers should demonstrate: a commitment to agriculture and/or community development by previous work experience; the ability to work independently, yet while part of a team; the possession of critical thinking skills; and the ability to engage with and live in a diverse community of Thai nationals and foreign workers.

Volunteers will be accepted on a rolling-basis and the length of the program can be tailored from 3 months-1 year. Volunteers will stay at the ECHO Asia Seed Bank, on the grounds of the Upland Holistic Development Project, in Mae Ai, Thailand. Volunteers must be able to speak English and/or Thai and be able to work outside at all times of the year. Organizational or church affiliation is desired, but not absolutely necessary. As this is a volunteer program, most of the training will be hands-on, and training will mainly be provided while assisting the seed bank staff with daily operations.

ECHO Asia will provide housing for the volunteer and a small monthly stipend. The individual or affiliated organization/church will be expected to write a letter of recommendation for the individual, cover all visa costs and processing fees to receive a visa for the Kingdom of Thailand, provide transportation to/from the Seed Bank, and cover any other costs the individual may accrue during the program.

To request an application, please e-mail echoasia@echonet.org.

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