RTC-TH Apr 2013 Update 2

Community-based environmental education for the self-sufficiency and sustainability of small rural family farms

ชุมชนตามสิ่งแวดล้อมศึกษาเพื่อการพึ่งตัวเองและยั่งยืนชนบทขนาดเล็กครอบครัวฟาร์ม

You may post questions / comments to the Discussion area of our website

www.neighborhoodlink.com/org/rtcth E-mail: rtc2k5@gmail.com

Water Awareness

We saw a recent article stating that Americans use 8,456 L / 2,000 gallons of water per person daily. This is twice the global daily average (if such statistics have any real meaning). Some studies claim that more than half the people in the world cannot get to clean drinking water at least once a day. Water is essential to life, for humans and just about all other living organisms on Earth. Most people we know don't give it much thought. Many just expect water to be there when they need it. During the Thai New Year festivities, the public water supply in our village was shut off during the day. We never got a very clear explanation why. But the action was more than enough to give us pause to think about our water supply.

The water restrictions had minimal impact for us. As a habit, our family often by-pass the modern shower for the more traditional Thai "splash bath". Water is stored in a large container. We scoop the water to get wet, soap up, then scoop water to rinse off. Until the public water system came to our village a few years ago, our well and bottled water were the norm. Well water was used for washing and the flush toilet. Bottled water was for cooking and drinking.

We "stockpile" water in the bathroom for a splash bath.

Even with public water connected to the house, our family still uses bottled water for cooking and drinking (at least 60 L in the outer kitchen, and 100 L in the house. The traditional habits are the norm for our family. During heavy rains, the well water gets cloudy (downright muddy sometimes). However, it clears up long before our bottled water supply runs out. [**Note:** We get our bottled water delivered weekly.]

In This Issue

Bottled water in the kitchen for cooking

Bottled water in the main house for drinking

Category	Amount	% Use
Food	4,228 L /1,000 gal	50%
Energy	2,536.8 L / 600 gal	30%
Products	845.6 L / 200 gal	10%
Home	845.6 L / 200 gal	10%

Adapted from a CTC graphic; www.changethecourse.us

Most of us learned the Hydrologic Cycle in school. This natural and endless cycle provides the water we need to survive. It operates universally and continuously behind the scenes. Most of us never consciously see it. Most urban dwellers are unaware of their public drinking water supply source. Most people turn on a tap and expect good, clean water to flow. We flush the toilet without really thinking of where the wastewater goes. It is simply a case of "out of sight, out of mind". In rural Thailand, people live closer to Nature. Most are very aware of their local environment (though they are divided in their actions in caring for it as stewards). As Mark Twain observed: Some men worship rank, Some men worship heroes, Some worship power, Some worship God, and over these ideas, they dispute and cannot unite. But they all worship money." Unfortunately, for many, money takes precedence over the environment.

In our rural village, we use our gray water to irrigate the garden, trees and plants around the house. We are fortunate to have this freedom.

The ideas of privacy and water rights of compounds and confounds efforts in water conservation. One neighbor might limit water use to conserve. Another may use more, empowered by the idea that they paid for it and have the right to use it as they please. If they can profit from it (as in irrigating and producing more crops than their water conserving neighbor), they take the short-term view and go for the money. They let others worry about the future.

We don't think washing a car in the river is conservation

In Thailand, there have been individuals who set personal goals for themselves, especially during the hard times of the economic collapse of the late 1990s. We recall hearing of a displaced executive and his wife challenging each other to see who could use the least amount of water for a bath. Certainly, arid and semi-arid regions of the world will experience (if they haven't already) severe stresses over limited water supplies. Even Thailand's seasonal monsoon regions may need to prepare for longer droughts (especially at the fringes of the monsoon areas). More and more people may be forced to re-examine their water use as supplies or access to clean drinking water fails to meet local demand.

Soil Erosion Self-Assessment

Soil erosion is a natural environmental process. It is the main enemy for farms. It cannot be stopped. The idea is to reduce soil erosion to a minimum. This enables farmers to avoid some environmental degradation. The goal is to keep the farm productive. In the long run, it enables the farm to be a legacy for the next generation. This is one functional definition of sustainability.

Soil erosion is the main threat to many farms in Nan

For Nan Province, in Northern Thailand, the principle environmental agent of erosion is water. The purpose of this article is to help farmers quickly recognize the potential and actual threat of soil erosion to their farms. We will focus on the simple field observations without getting into the technical details and measurement procedures. The main idea is to make people realize when there could be trouble. They can either call for help (via local government resources such as the Land Development Office or other relevant agencies) or learn to take remedial action via RTC-TH self-help lessons. (**Note:** We do not provide consulting services but prefer to empower farmers via community-based environmental education. Contact us via email rtc2k5@gmail.com and we can point you to specific lessons.)

A quick look at 3 items will tell you if there is a soil erosion problem on your farm: 1) the color of flowing water; 2) the terrain of your farm; 3) the vegetative cover on your land.

Look at the color of flowing water in your local rivers. Since rainfall and water levels in some rivers change with the seasons, periodic observations are necessary. The photos below show the Nam Yang near our farm during the dry season (low flow) and the rainy season (peak flow). Most farming in our area is rain fed so the rainy summer monsoon season is the prime planting and growing season. The muddy colored river water is due to the high amount of soil particles carried away from farms in our area. On the sloping land of Nan Province, this means newly cleared forest may become unsuitable for farming in a year or two. Soil losses on slopes exceeds than new soil formation. The initial loss of the forest cover leads to almost certain land destruction. Without deliberate efforts to protect cleared slopes, the land will not develop suitable soils, and erosion will accelerate. Surface runoff often creates flooding. Sediments clog streams and rivers; perhaps even bury fields at lower elevations. Ultimately, the local and regional hydrologic cycle is negatively impacted. It can take many years to create a layer of topsoil suitable for farming (about 30 cm deep). Severe erosion can remove it all in less than a season.


Clear water during the dry season


Muddy water during the rainy season.

Water flowing off our farm is "milky"; not totally clear

The next flowing water to observe is the water leaving your farm. The key is to notice if the water is clear or muddy. The muddier the water, the more soil erosion is taking place on your farm. The photo on the left shows the water flowing off our farm in the rainy season. It is not perfectly clear. The "milky" appearance is due to very fine sediments in the water. This is about as good as it gets for minimal soil erosion. [**Note**: If water is flowing ONTO your farm, notice its color. There could be erosion taking place upstream / upslope from your farm. In this case, look for any water from you farm that flows to the incoming water. If the water leaving your land is clear, that's good. If not, then you have soil erosion problems.]

To reduce soil erosion on your farm, you must closely examine the terrain. Most farms are not totally flat, moderately sloping, or steeply sloping. Each farm may have a variety of slopes for different parts. Our farm has a little of each.

Our farm terrain is like a series of steps ranging from fairly level ground (rice paddies with the fishponds slightly higher); the orchards on gentle to moderate sloping land, and the terraces on moderate to steeply sloping land. The government protected forest forms the upslope boundary of our farm.

As a rule of thumb, the steeper the slope, the greater the potential for soil erosion. Generally, flat or level ground has a slope of about 0-3% (3 % slope means the land rises 3 m each 100 m of horizontal distance). Gently sloping land has a 3-8% slope. Moderately sloping land ranges from 8-15%. Anything more than 15% is considered steep.

The flat to level land has the lowest potential for soil erosion. But that does not mean it is trouble-free. This could be a the low spot. Water might accumulate here. This can cause soils to become waterlogged. Check to see if silt or sediments are deposited here from adjacent higher ground. That indicates soil erosion may be occurring on the higher ground.

The process of erosion begins with the impact of the rain drops. This loosens soil particles. As more rain falls on the slope, a thin film of water forms. As the water flows down slope, it carries away the loosened particles. The amount of water and the slope angle determine the flow velocity. A greater the velocity increases the capacity of the water to carry larger particles. This accelerates soil erosion.

On sloping land, look for rills and gullies. Rills form as water begins to flow in a small shallow channel going downhill. They can be only millimeters to centimeters in width and depth. Gullies form when a number of rills join. Gullies can be tens of centimeters to several meters width and depth.

Rills are small enough to step on.

Gullies are large enough to step in.

Vegetative cover on the land plays a key role in preventing soil erosion. Research estimates of all the rain falling on the forest area ~ 25% becomes runoff (actually reaching the ground), 25% evaporates directly from water drops on leaves, and 50% undergoes evapotranspiration.

The main watershed for our farm is the government forest on the upslope farm boundary. Although the forest is protected by law, it is no guarantee the forest will remain in untouched. Disease or fire could destroy it even if no one takes a chainsaw or an axe to it. As insurance, we decided to plant more trees on the upper terraces to extend the watershed.

We get little or no irrigation water. Our farming is primarily rain fed. Our fish ponds, rainwater harvesting, and soil moisture storage are our water supply.

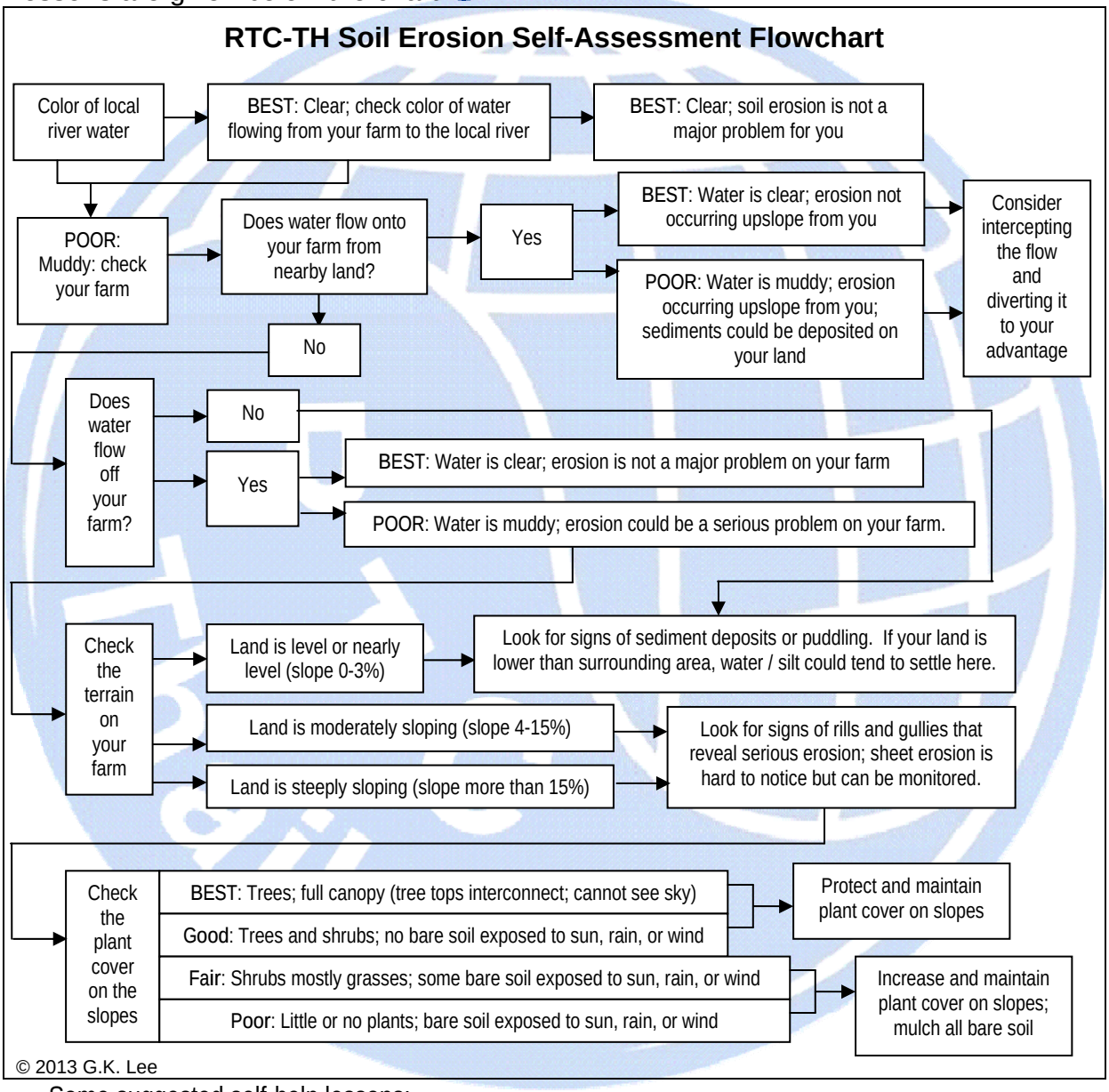
Water flowing from the forest floor onto our farm is less milky than the water flow off of our farm. Very little erosion takes place under the forest canopy. This is an important lesson for farmers: Natural vegetative cover and plant litter on the ground and the underlying soil act as a sponge for rainfall.

Since most farms won't have full forest cover (i.e. interlocking tree canopies), the Historical experience worldwide shows that deforestation exposes soils to erosion, removal of nutrients, and overall environmental degradation making it difficult for the forest to re-grow. Human activity (e.g. farming and grazing) make it nearly impossible for the forest to return. Raindrops striking bare soil loosen particles. Erosion begins. Water flowing over sloping land removes the particles. This can happen evenly all over the slope. Sheet erosion can slowly and uniformly remove the soil in thin even layers. It can go unnoticed until it is too late. If more water flows of the surface, small channels (rills) appear. They can be small (mm in width) and grow to several centimeters wide. They can join other rills farther down slope, much like the smaller branches of a tree converge at the trunk. Eventually gullies form. These can be meters wide and deep. At this point, the land becomes difficult to farm. So much soil may be lost that farming is no longer possible.

Some of the steep hillsides cleared in our area

next best thing is to ALWAYS cover bare soil with mulch. Many farmers plow before planting their crops. Plowing destroys vital soil structure and pulverizes the soil. This essentially prepares the soil for erosion. (**Note:** When you consider the time Nature takes to build soil structure, it seems senseless to destroy it. Rather, farmers should nurture and maintain soils on their farms. In the long run, this will be less expensive in financial and environmental terms.)

Below is a summary flow chart for soil erosion self-assessment. It briefly shows the observations to make to help identify soil erosion on farms. Some suggested lessons are given below the chart.



Some suggested self-help lessons:

- How to measure slope angles: *RTC-TH Natural Terrain Study Guide*, Section 2.1.3, pp. 15
- Soil Sampling: *RTC-TH Natural Terrain Study Guide*, Section 3.1.3.2, pp.25-35.

The *RTC-TH Natural Terrain Study Guide* is available as a PDF at www.neighborhoodlink.com/RTC-TH_Tech/pages.

If you have questions, you can post them to our website discussion section (www.neighborhoodlink.com/org/rtcth/) or contact us by email (rtc2k5@gmail.com).

Overview of Effective Soil Management

Rice crop stubble in our fallow pasture

Although soil erosion cannot be totally prevented, there are many ways to reduce it to a manageable rate. The idea is to keep soil erosion slower than your ability to maintain and even to "grow" more soil.

The main soil erosion agent for our area is water. Wind has not been a major factor. A closer looks shows that rain drops hitting bare soil and surface runoff are our main concerns.

Effective soil management involves all aspects of the soil on your farm: erosion management, soil structure, soil texture, and soil chemistry. The more you do to maintain and improve the soil, the more productive the farm. Learning about the natural biodiversity of the local ecology goes a long way to help reduce the costs of soil management. Natural systems tend to be self-rgulating and self-sustaining. Th ekey to synch agricultural activities to better balancw tih the natural systems. Currnet industrial farming tends to stress the enivronment and disrupt the natural systems.

Basic Effective Soil Erosion Reduction	
Problem	Remedial Action
Bare Soil	• Cover with Mulch: If possible, lay down a thick layer of mulch 15-20 cm deep. • Leave Crop Residues in the field; do not burn them. • Do Not Plow: Practice no-till or low-till methods. Plowing destroys soil structure, pulverizes the soil making it easier for water and wind to erode it. Plant following contours rather than planting rows up/down slope. • Contour Cultivation: Plant crops along the contours rather than directly up and down the slope. • Make Tree Wells: Create a small shallow depression around each tree to catch and hold rain water. This increases soil moisture for the tree. If your orchard is on a slope, make small water diversion channels along the contours to direct water to the tree wells. • Make Swales: If you don't have an orchard or trees, create swales (small shallow elongated depressions) along the contours. On sloping land, make small water diversion channels along the contours to direct water to the tree wells.
Surface runoff onto your land	Intercept and Divert the Flow: Cut a trench to divert the flow to gently follow the contour of your land. If you have tree crops on the slope, divert the flow into a tree well around each tree. The well can be small or as large as the diameter of the tree crown. This gives the water time to seeping into the ground. This soil moisture could be a reserve for the tree in the dry season. If you don't have tree crops, dig swales (shallow depressions) along the contours. Water will fill the swale and soak into the ground. This helps to increase soil moisture. Fill the swale with mulch. It will eventually compost and help improve the moisture holding capacity of the soil.
Surface runoff on your slopes	• Rills: (See "Intercept and Divert the Flow" above. Plant Grass Strips along the contours. These slow water flow down slope; the roots help to anchor the soil. "King Grass" (Vetiveria zizanioides) is available free from the Agriculture Dept. The roots grown 45 cm deep. Cutting the tops off the grass gives you a ready supply of mulch to cover any bare soil. • Gullies: Make small check dams using bamboo to make an open mesh. Place leaves and grass behind the bamboo mesh. The idea is to slow the velocity of water flowing in the gully. As the water slows down, it deposits sediment behind the check dam. Placing a series of check dams in each gully could eventually help fill in the gully. Once that happens, do two things: 1) put a new check dam between the previous check dams that are backfilled with sediments; 2) plant something to anchor the soil behind the check dam. Eventually the gully can become a planted flow path. Plant King Grass parallel to the gully to keep water from flowing into the gully.
Mulching and composting	Mulch and compost add organics to the soil. This improves soil structure and soil moisture retention. Add any fallen / spoiled fruit to the compost. This is an important way to return nutrients and trace elements to the soil. The more organic material you add to the soil, the more earthworms will thrive. They are free "soil tillers" who actually help improve soil structure and quality. If you have orchards, place pruned branches in piles between the trees. After the leaves fall from the cut branches, remove the branches and compost the leaves in place. The next year, compost in a different spot. After a while, you will have composted the soil in the orchard.

Farm Scrap Wood Projects

When cutting teak logs for lumber to build the new carport, the scrap trimmings were piled high. These scraps are of irregular dimensions with varying thicknesses along their length. We moved the scrap to the farm hoping to make good use of them. If nothing else, they can become firewood.

Since the rainy season is approaching, we searched through the scrap pile to make some useful projects. The first was a raised plank walkway to the outdoor kitchen of the partially rebuilt farm house. As you can see, finding straight planks is a challenge. There are some gaps and open crevaces; after all its made with scrap wood.

A wood plank walk to the outdoor kitchen.

A loading dock and steps to the farm house.

The second project was a loading dock and steps for the farm house. The loading dock was planned to match the height of the pick up truck's opened tail gate. This makes loading/unloading the truck much easier and safer on our backs.

Shop Scrap Wood Projects

The carport scrap wood pile is steadily shrinking. We came up with a couple more projects to use some of the remaining remnants.

We are planning some small scale solar projects for the farm. These use a small, light-weight solar panel to power a small submersible pump. The panel needs to be adjustable for solar altitude and azimuth. It won't require a heavy duty bracket, so we made one using some scrap wood and an empty tuna can.

We don't have the solar panel yet. The mounting panel is left for custom fitting later. But a block of wood in the tuna can provides a reinforced pivot point for the solar altitude locking bolt. The solar panel mounting bracket attaches to the block through the tuna can's outer wall. The vertical shaft can be rotated to adjust for solar azimuth.

Solar altitude adjustment ranging from 0° (horizontal, dawn or dusk) to 45° to 90° (vertical, directly overhead)

We weren't happy with the flimsy sheet metal stand for our solder iron. It kept tipping over and created a safety hazard. So we took some scrap wood and an empty tuna can. Now the soldering iron tip is kept from accidentally touching anything on the work bench.

Some scrap teak turned into a rack to hold our assorted files and specialty drill bits (8 half-round, 10 round, 8 flat, 6 triangular, 2 square, and 5 specialty files, and file handle; a counter-sink bit, and 6 titanium Step Drill bits). Prior to this, we had to search through a cluttered tool bin for the files. The drill bits were buried in a tool bag. They never seemed to be around when we needed them. Now, they are in plain sight and easy reach.

Our Water Supply Holding…so far

With one month plus to go until the usual end of the dry season, our farm seems to be noticeably greener than our neighbors. The Long 'an orchards are the main reason. Apparently our water management plans worked well enough for the east, central, and west orchards. In contrast to others in the area, our Long 'an are setting fruit despite the drought. The wood apples and mangos are also doing well.

A big surprise was the appearance of the first pineapples along the driveway! In the past, we've been treated to pineapples from some neighbors or bought some in the local markets. It will be nice to have a touch of Hawaii on our farm.

Mangos bagged along the farm driveway

Baby pineapple near the farm gate.

Cute Clouds

Whenever the sky is clear and white puffy cumulus clouds are around, we make a conscious effort to take a break and look up. It is a simple way to get a break from work. In addition to the relaxation, it gives us time to pause and ponder the wonder and beauty of nature (and besides, it's just plain fun!)

Mouse jockey on a snail

Baby elephant napping on a cloud.

Bird sitting on a nest

Dog playing with a baby elephant

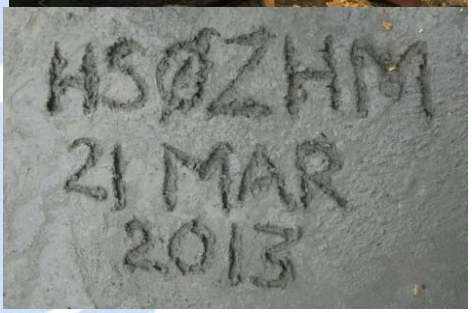
New Tip-up Mast at Ban Na Fa

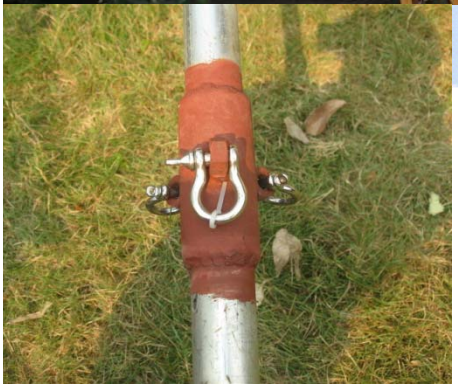
We made a second antenna mast to go with the new enclosed carport for Sparky and Sam. The small diameter mast would not support a person climbing it to service the antennas. So we opted for a tip-up design adapted from a school flag pole. This also gives us the option to lower the antenna in severe winds.

The tip-up mast is near the new enclosed carport.

The tip-up mast base is a large tire filled with concrete (similar to the tower / mast unit). The estimated weight is 335 kg / 737 lbs. The base cross bars of tip-up mast firmly anchors it in the concrete.

We leveled the ground, positioned the tire on a plastic sheet, and braced it for the concrete pour (timed with the pouring of the carport floors). We did the final check for vertical alignment after the concrete pour.





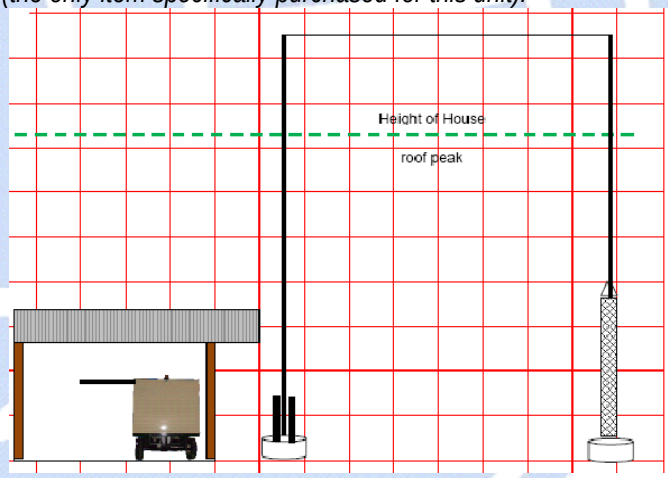
The tip-up mast is oriented so when the mast is lowered it clears the trees in the garden. The mast is 40 mm diameter steel pipe, 10.3 m tall with 3 welded sections. We have the option to guy the mast if needed. We recovered 3 stainless steel shackles from our remnant sailboat hardware inventory for the guys. The limited space may preclude anchors for the guy lines. So lowering the mast in high winds may be more practical. We plan to mount a Thai-made aluminum Slim Jim VHF antenna at the top of the mast.

The mast tips down for easy access and maintenance. (Yes, we planned the tip down angle to fit between the fruit trees in the garden; honest!)

We installed a weatherized-truck be at 9.6 m AGL (above ground level) to match the hoist height of the tower / mast. Then we can set up the HF wire antenna between these masts (see diagram below).

We made the weatherized truck using steel rod left over from the carport project, the bottom section of an empty plastic deodorant bottle, and a pulley (the only item specifically purchased for this unit).

The HF antenna plan called for trying to use wire antennas. Not only are they low cost; they perform well, too. Since we tend to have more room than the typical city-dwelling ham, wire antennas are a viable option. [**Note**: In town, the main constraints were power lines near and within the business property boundaries.] In the village, the power lines are at the street side of the property about 15 m from the tip-up mast.



The new tip-up mast will be topped off with a Thai-made aluminum Slim Jim VHF vertical antenna. The antenna is 1.75 m tall, with a PVC stem. A wood dowel core reinforces the PVC stem where the pipe clamps attach it to the mast.

The Thai Slim Jim VHF antenna (144-146 MHz)

Na Fa Station masts (red circles) and our farm (yellow circle) in the Nam Yang river valley.

Na Fa Station masts under a hazy red-sun rise morning in the dry season of northern Thailand

Preliminary rigging test of a 8.71 m random wire antenna between the tower/mast (left) and the new tip-up mast (right) looking toward the river. Broadside lobes are oriented toward 006° and 186° True Azimuths (Central US and Central Sumatra respectively). Designed height 9.6 m AGL; Actual height is slightly lower due to wire sag and flexing in the wind.