RTC-TH Jun 2012 Update

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

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The Rainy Season Begins

The rains appeared in Nan about the second week of May. Forecasts called for widely scattered thundershowers with some areas of intense rainfall all across northern Thailand.

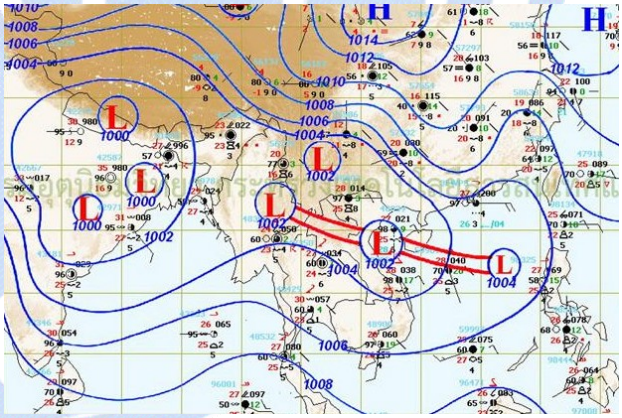
We didn't notice the first typical "monsoon trough" showing up on the weather charts until about 23 May. The rain for the early part of the month came from scattered brief thundershowers. About mid-May there were several power outages (some lasting several hours). There were longer periods of light to steady rain during the late night to early morning hours. There were no reports of any local flooding.

An approaching thundershower darkens the sky.

Ironically, about 8 km away (in Ban Na Fa), residents reported frighteningly intense thunder and lightning. Heavy rain poured down. But again, no local flooding occurred. The rains are welcomed after the drought conditions that prevailed in prior months.

Many families are preparing for the planting season. We are still finalizing our wish list for the crops we will plant.

Rain brings the sound and beauty of splashing water.



A fairly typical map representation of a "monsoon trough." Winds come from the SE over the Andaman Sea bringing warm, moist air to northern Thailand for monsoon rains.

Weather map used from the internet under the educational fair use clause

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2012 Rainfall Score Card

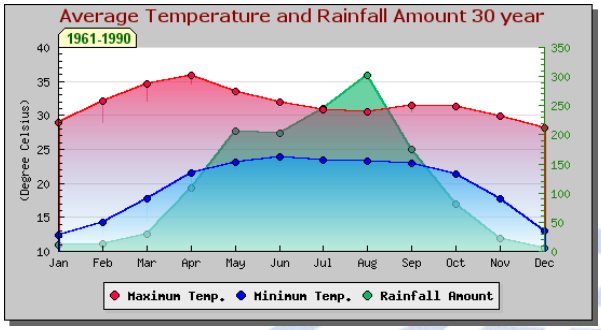


Image from the internet: educational fair use clause

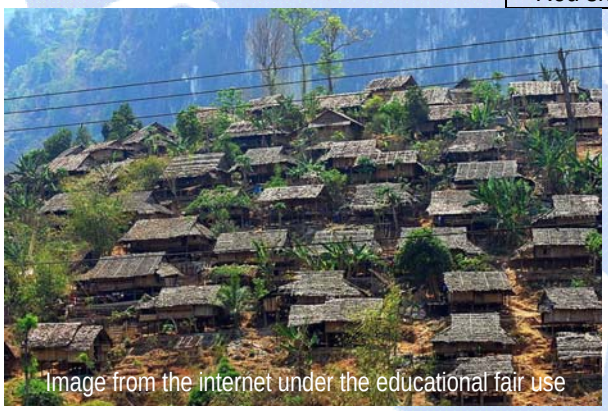
The chart on the left shows the 30 year climate summary for Thawangpha. The table below shows the numerical data (e.g. average rainfall and number of rainy days for each month) for the 30 year average (climate summary), for 2011 and the score card for 2012. The May data have been posted to the score card.

So far, 2012 began with more than 11 X the normal monthly rainfall. That was followed by 2 months of below average rainfall totals. A drought was declared in Nan Province. Up to May, the number of rainy days in 2012 is less than the 30 year average. Yet the rainfall accumulated total for the first 5 months of 2012 is 51.56 mm above the 30-year mark and 26.15 mm more than the same period in 2011.

A recent UN report on refugees indicates the future will see more refugees (both international and domestic).

	30 Yr Average		2011		2012	
Month	Rainfall (mm)	Rainy days	Rainfall (mm)	Rainy days	Rainfall (mm)	Rainy days
Jan	11.0	2	1.52	3	17.78	3
Feb	12.6	2	14.48	2	1.01	1
Mar	29.2	3	69.33	6	31.24	2
Apr	108.0	9	98.55	10	163.32	8
May	206.2	17	208.53	22	205.21	10
Jun	202.4	17	396.20	17		
Jul	244.1	21	340.87	19		
Aug	302.3	22	321.05	18		
Sep	175.6	16	371.08	20		
Oct	80.4	9	147.57	7		
Nov	22.7	4	8.12	2		
Dec	5.9	1	0	0		
Total	1400.4	123	1977.3	126		

Blue Box = northern Thai SW Monsoon Season
Green shading = data above 30 year average for Thawangpha
Red shading = data below 30 year average for Thawangpha



Mae La Refugee camp on the Thai-Myanmar border.

The UN cites continued conflict and human rights abuses as the main factors. Population pressure, food security concerns, water scarcity, climate change, and natural disasters also figure into the mix. These all intertwine in complex relationships making it difficult to find solutions. Africa and Asia sit high on the list of places where refugee numbers will be growing faster than other places.

There are no easy answers to the problems of the rising world population and the inability of many developing countries to produce sufficient food for their people. Climate change figures prominently as a driving force in some natural disasters along with more frequent weather extremes that negatively impact agriculture.

Local farmers should consider smaller, more local and sustainable alternatives to massive government irrigation projects as a means to continue farming. Smaller distributed systems may be able to reduce the impact of massive infrastructure failures.

Some Energy Thoughts

In planning our farm operations, energy is a major concern. Modern farms need energy to help offset labor costs. It is a juggle act to find the proper mix of people, machinery, budget, and energy to operate effectively. Like it or not, modern life includes electricity.

Nations need electricity to develop. The economy of Thailand and many countries is built around consumers and consumer products using electricity. Demand for electricity grows in both industrial and residential sectors. The cost for electricity will most likely increase over time. The best defense individual consumers have is conservation: We need to be as energy efficient as possible. Studies show ***energy efficiency can result in 50% savings*** relative to the cost of producing more electricity. For our farm plan, this means we must first try to reduce our consumption of electricity BEFORE thinking of ways to produce our own electricity on the farm.

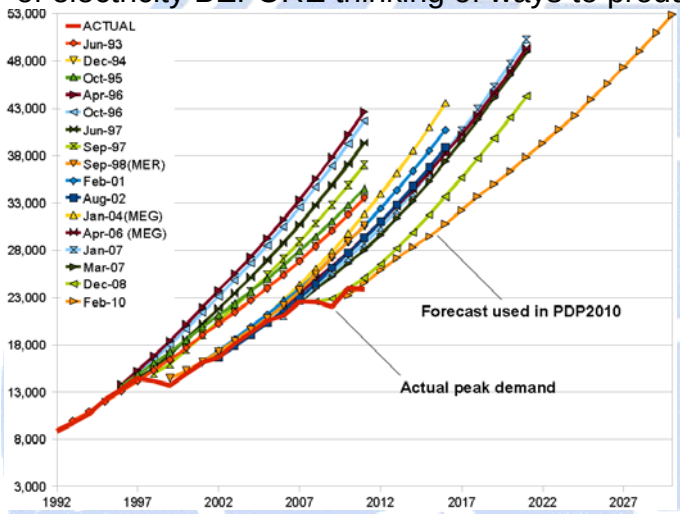


Figure 1 from Apr 2012 report by Greacen & Greacen

For any national electric policy the challenge is to estimate the demand growth and then develop a plan to meet it. The algorithm used to project growth in Thailand is exponential (the curve moves upward in an ever steepening curve into the future). Greacen & Greacen examined current Thai government projections for electricity demand and actual demand from 1993-2010. They found the government projections are often way over the mark (sometimes by a factor of 3).

Greacen & Greacen then plotted the actual and forecasted MegaWatts / year increases in power generating capacity. Again, forecasts were not a good reflection of reality. The net result is Thailand's power generating planning can be seriously misguided by ineffectively allocating resources concerning power generating capacity.

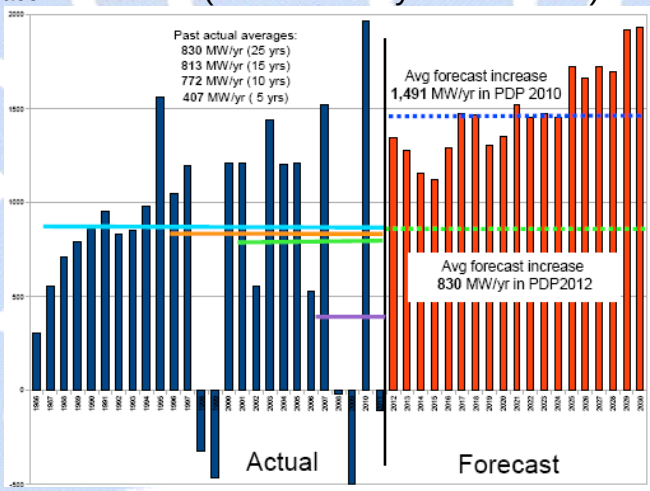


Figure 1 from Apr 2012 report by Greacen & Greacen

Another problem area is the cost accounting used in the planning process. At present, environmental factors are not included as they have no assigned economic value. This can lead to decisions to acquire lower costing systems at the expense of the environment and public health. Of course, the realities of corruption, power and influence often puts the poor and marginalized portions of the population at risk. Industrial centers need power, help drive the economy and have the ability the pay. Poorer remote areas incur higher costs to deliver electric services and have lower profit potential. This is a key reason why the RTC-TH leans toward energy self-sufficiency for small rural family farms.

Rethinking Our Farm Energy Plan

In addition to water and soil, farms need energy to function. In the spirit of self-sufficiency and sustainability, the RTC-TH created the I.F.S. (Independent Fuel Systems) program. A central theme of IFS is to reduce / eliminate the use of fossil petroleum fuels and to develop and use on-farm renewable energy resources.

It has been about 5 years since we made our first farm energy plan under the IFS (Independent Fuel Systems) program. Our original plan was centered on growing Jatropha curcas as a straight vegetable oil (SVO) replacement fuel for fossil diesel. The SVO would drive low compression diesel generator set to make electricity for our farm. The surplus generated electricity was to be sold to the Thai government via the VSPP (Very Small Power Producer) program.

On-farm electrical generation was to supplement the solar PV panel to provide electrical energy. The solar PV system was to provide 12 VDC power for lighting, the RTC-TH EmComm radios, and weather station equipment. Backup power was needed for low sun / no sun periods of up to 4-9 consecutive days. Some possibilities were to recharge 12 VDC batteries using 220 VAC line power (when available), in vehicles, and diesel powered generator.

Fire used to clear brush from neighboring land destroyed our J, curcas experimental crop.

Change in Plans: A recent fire wiped out our *Jatropha curcas* crop on at the detached Hill Top site. Investigators reported a land clearing fire got out of control. The fire spread rapidly in the very hot, dry conditions and set off an uncontrollable blaze that destroyed our experimental crop. Re-starting the *J. curcas* crop will take about 3 years. However, over the past few years, the Thai government withdrew support for *J. curcas* as a renewable energy source. Also, international opinion shifted away from J. curcas as an effective renewable biofuel. We don't intend to discuss the merits / demerits of the issue. Suffice it to say we still see potential for self-sufficient sustainable use for this plant as a straight vegetable oil (SVO) not as a biofuel. In terms of commercial production and finance, we can't comment. Our focus is not commercial agriculture, and the economies of scale for self-sufficiency and sustainability are very different from commercial operations. As with most things in life, individual circumstances determine the appropriateness of applying any particular technology or system.

The set back in the area of *J. curcas* also negates emphasis on the Very Small Power Producers (VSPP) program in our IFS program. We had hoped the VSPP

could enable small farmers or farm villages to earn money by farming for energy. After all, the price for energy will most likely increase and not be fluctuating as much as traditional agricultural commodities prices. For now, we are out of the running.

The Status Quo: The fire that destroyed the farmhouse in Jun 2011 severely impacted our farm's electrical energy system.

- **220 VAC 5 amp Power Line:** We temporarily lost use of the limited 220 VAC 5 amp line from Ban Sali where it terminated at our farm house. The damage was confined to the service entrance at the house and the first pole out from the house. It was critical to restore the 220 VAC service on the farm for the hot season so we could run water pumps to irrigate selected trees and garden beds. [**Note:** This line is the result of negotiations with Ban Sali villagers to extend the line from the last power pole in their village, across private land to our farm. We provided cooperating land owners with annual help to keep the ROW (right of way) clear and help do some brush clearing on their land. We must also annually inspect, maintain, and repair the line. [Note: PEA (Provincial Electric Authority) needs to have 5 permanent households on the road between Ban Na Fa and Ban Sali before they will extend the power grid between the two villages. So far we have been the only farm to build and occupy a house on the farm as per the PEA requirements.]

Limited 220 VAC 5 amp service line from Ban Sali to our farm.

- **Water Pumps:** There are 3 small 220 VAC water pumps on the farm. All 3 are used to pump from shallow wells. Two are connected to pipes for watering plants and garden bed. The third pumps the water supply line for the trees along the driveway. We are considering 12 VDC solar powered pumps as a future alternative.

These small water pumps move water from shallow wells to the orchards and selected garden beds for irrigation and watering in the dry season.

The solar PV panel survived the fire.

solar PV system. We are getting price quotes for replacement parts

- **220 VAC Fish Pond Bug Lights:** The West and East Fish Ponds each have a single light for attracting bugs to feed the fish in the ponds. This is part of the on-farm renewable alternative fish food supply. We hope to expand this effort by increasing the number of lights over the ponds.

Our charcoal kiln at the East Orchard.

- **Engine Powered Machinery:** Lost in the fire were two pieces of equipment driven by gasoline engines: a large weed/grass cutter and a spray pump. [**Note:** When hiring day laborers to cut weeds/grass, they used their own equipment. But we must supply the fuel. So careful coordination is needed to buy gas only when needed in quantities that will be fully used up for a job. We do not store gasoline on the farm. We want to reduce or eliminate having to use gasoline powered technology on the farm.]

- **12 VDC Solar PV System:** The fire destroyed the charge controller and the deep cycle 12 VDC battery for the free solar photo voltaic (PV) system we got via a Thai government program. The solar PV panel was not lost in the fire. We hope to get that back into service as the primary power supply for the Getting Real On-farm Weather (GROW) station. The plan is to combine the RTC-TH EmComm amateur radio station with GROW to optimize the use of the

A bug light over the West Fish Pond.

- **Cooking Fuel:** Wood and charcoal are the primary cooking fuels at the farm. We have our own charcoal kiln in the East Orchard. The main feed stock for the kiln is the fallen wood from the forest area and cuttings from the annual orchard pruning. The present systems are very inefficient in terms of combustion. We have hopes to increase the efficiency to reduce emissions from the kiln.

Gasoline powered weed / grass cutter.

Future Needs: Plans are being developed for a new farm building. We hope we can start this effort the Fall 2012 dry season. A major part of the planning involves the new farm building's energy systems. The planning is made complex as the structure must serve multiple functions (including but not limited to): 1) Farm Operations Center; 2) Training Class Area; 3) Soils Analysis Lab; 4) Plant Research Nursery; 5) General Workshop; 6) Garage; 7) GROW / EmComm Radio Station; 8) Store Rooms; 9) Solar Deck; 10) Antenna / Mast Deck; 11) Residence. Each activity has different power / energy requirements. The table below is an overview of the possible electrical needs.

Function	Lights			Outlets														
	Indoor	Outdoor	Floods	Indoor	Outdoor	Computer	Scanner, flat	Scanner, film	TV/DVD	Fan	Battery charger	Refrigerator	Freezer	Blender	Microwave	Roaster oven	Coffee maker	Air conditioner
Farm Operations Center	X			X		X				X								
Training class area	X			X					p	p								
Soils Analysis Lab	X			X						p								
Plant Research / Nursery	X			X	X					p								
General Workshop	X			X						X								
Garage	X	X		X	X					p	p							
GROW / EmComm Radio	X	X	X	X	X	X	X	X		X	X							
Store Rooms	X			X						p								
Solar Deck		X	X		X													
Antenna / Mast Deck		X	X		X													
Residence	X	X	X	X	X				X	X	p	X	O	X	X	X	X	O

Notes: X = must have p = shared portable unit O = optional

The farm house (circa summer 2006) had limited 220 VAC 5 amp service.

It is clear that a 220 VAC 5 amp service line will not be able to handle all of these needs. This plan looks to the future when a larger amp service is available. For now, we are considering 12 VDC solar powered LED (light emitting diode) systems for all building lighting. We are investigating whether the higher initial costs will be offset by lower life-cycle costs as LEDs use 10% of the power needed for conventional lighting. Going solar also means we can get started with some of the power needs even though limited to 220 VAC 5 amp service.

The next stage for the electrical planning is to do a detailed spreadsheet of the power needs for each piece of equipment associated with each function. This will define the power needs for the electrical system. Once this is done, we can try to examine the priority of the functions and various combinations of functions to determine an installation sequence compatible to the work load on the farm.

IFS Guidelines: The RTC-TH energy goals are to:

- Reduce use of and dependence on fossil petroleum fuels.
- Strive to be as energy self-sufficiency as possible using renewable energy from on-farm resources.

The functional definition of sustainability is tempered in reality. It is hard to do anything 100%. The King's Theory suggests that people try to be a self-sufficient as they can relative to their circumstances, means, and ability. So we will try our best to economize and build a "good" life on the farm. The hope is to attain a manageable balance that will significantly reduce energy consumption and labor intensity of traditional Thai farm life. By working with nature, we think we can find a comfortable middle ground and a good life. The summary table below shows some of our ideas in the area of alternative practices affecting farm energy consumption.

Present Action / Activity		Possible Energy Saving Practice
Solar PV panel 12 VDC system	Repair the solar PV system damaged in the fire to power the GROW and EmComm stations	• Test the solar PV panel • If panel is OK, replace the charge controller and deep cycle 12 VDC battery lost in the fire.
	220 VAC back up battery charging of 12 VDC for no sun / low sun days	• Hand crank or bicycle pedal powered generator for short term emergency battery charging if 220 VAC power is out • Use reserve battery power from Sparky and Sam • Absolute last resort: use fossil fuel vehicle to recharge the 12 VDC batteries for the radio and weather stations
Grass / weed cutting with gasoline powered equipment.		• Heavy mulching to reduce weed growth. • Interim cutting BEFORE weeds go to seed • Burn barrels / rings for small concentrated burning of especially noxious weeds / seeds. • Examine the feasibility of using electric weed cutters powered by solar recharged battery packs
220 VAC bug lights over West and East Fish Ponds		• Replace 220 VAC fluorescent lights over the West and East Fish Ponds with solar powered LED lights. • Deploy solar LED bug lights on the Central Fish Pond. • Make portable solar LED bug lights for the holding ponds in the Central and West Gullies.
Charcoal kiln		Modify the existing kiln for effective heat recovery cooking / drying / water heating • Make food drying rack / cage over the top of the kiln. • Make roasting baskets to be buried in the sand bins on the sides of the kiln to roast potatoes, yams, pumpkin, peanuts, etc. • Wrap copper tubing around the steel charcoal kiln barrel to heat water.
Cooking in charcoal stove, open fire grate or solar cooking box		Make a biochar kiln / stove combination. • Make this unit for use on the farm; and if successful, consider making copies for other family members. • Integrate cooking (stir fry) and roasting / baking, hot water heating by effectively recovering excess heat from the unit. • Use the solar cooking box to reduce wood and charcoal use. If successful, make and use solar cooking box to reduce LP gas for cooking in village and town sites or as back-up for no sun days.
220 VAC power for 3 water pumps on shallow wells		• Replace with solar powered 12 VDC water pumps. • Consider making these modular for portability especially for firefighting or supplementing the drip irrigation system.

Present Action / Activity		Possible Energy Saving Practice
Water faucet / hose watering (driven by 220 VAC water pumps)		• Reduce power and water use by using solar powered 12 VDC water pump with small tank cart • Integrate with small drip irrigation systems set for garden beds and trees to replace hose watering by hand • Use deep drip pipe irrigation on any new trees planted on farm
220 VAC distribution lines / sockets on farm		Make a portable battery cart with a solar powered charging system • A portable solar PV battery charging system could be used to supply 12 VDC power for portable water pumps and tools anywhere on the farm. It can also be used for irrigation or fire fighting. • The cart can be used to demo solar power at schools and meetings.
220 VAC submersible pump for fish pond aeration (only 1 at this time)		• Change to use a solar powered 12 VDC water pump • Make separate portable units for use in other ponds as needed. • In an emergency, can be used as a fire pump with the various water tanks on the farm (when aeration unit is detached).
220 VAC "on demand" electric shower hot water heater		Make solar hot water heater to eliminate the need for an electric "on demand" water heater. • This can be a simple coiled hose flat collector without a storage tank; just direct gravity feed hot water to the shower faucet. Mix with cold water in bucket for splash bath. • For winter, consider an insulated glass covered box for the flat coil collector. Could add reflectors to concentrate sunlight to compensate for sky and sun angle conditions.
Buying bottled water and boiling water for drinking		• Solar water distillation unit to purify water for human consumption • Storage tank to build up reserve water supply for no sun / low sun conditions (estimated 4-9 day water supply capacity) • Consider reflectors / concentrators to enhance production
Plans electricity generating (originally using Jatropha SVO to fuel low compression diesel generator set)		The loss of the Jatropha crop on the Hill Top put us back 3 years if we start over again. We need to re-assess this approach. • Check on biogas digester to power a gen-set to make electricity • Effluent from the biogas digester can be used to grow duckweed for animal feed and other by products added to our compost.
Hand pump backpack spray can (lost in farmhouse fire)		• Replace with powered pump backpack spray can • Modify to use solar rechargeable battery power supply • Can be used for multiple purpose, including fire fighting
Design solar cooling experiments to reduce need for fans and air conditioning	Possible "refrigeration" unit	• Use a solar chimney and unglazed nested clay pots with wet sand and evaporative cooling unit • Need to determine feasibility of overall chimney height and clay pot sizes to achieve specific storage temperatures
	Hot air exhaust system	• Solar chimneys and ducting to evacuate hot air from under roof areas • Need to determine chimney height for optimum updraft/lift to drive the removal of hot air
	Possible "air conditioning" unit	• Underground tunnel (1+ m below grade), about 30m long linked to solar chimney to draw air through cooling tunnel and into house • Intake vent should be lower elevation; secured against pest entry.
Security lighting	Exterior building lighting; none at this time	• LED lighting to illuminate entry ways. Be sure to position away from actual entrance to minimize bugs swarming around doors. • Consider motion sensors to turn on lights as needed at night.
	Spot light; none at this time	• LED spot light rather than quartz halogen spot lights to save energy and reduce heat from the lamp.

A Typical Roadside Market

It is very common to find small markets sprouting up to serve the needs of locals. Traffic congestion peaks at morning, noon, and evening shopping times, so drive carefully.

Traffic gets congested as shoppers come and go

For some farmers, any patch of ground will do.

Selling cooked food on banana leaves in the open air.

Obviously the front row is the prime place to be

Some markets are informal like a swap meet (no buildings or just poles and tin roofs). Some towns will build a more permanent structure, but they are basically open air and the vendors come daily to set up and take down their goods. The abundance and variety of food in Thailand is a contrast to some other nations.

Daily fresh fish cleaned and cooked.

Fresh catfish waiting to be asked home for dinner.

Urban Agriculture on the Map

Kasetsart University and the German University of Freiburg, with funding from the German Agency for International Cooperation (GIZ) launched a V-GIS project (Vegetable-GIS) to map urban and peri-urban agriculture in Greater Bangkok. This information can be significant to the food security and This food production is vital to the impoverished residents who often lack regular jobs or steady income.

Many developing countries face similar problems of rising urban populations living in poverty, difficulties or shortages of transport of food from rural areas to cities, loss of agricultural produce due to lack of refrigeration, storage, and handling capacity.

Producing food in urban areas can help alleviate some of these problems. Reducing the distance from farm to fork also means savings in energy/fuel costs and air pollution related to transportation.

Current urban planning often lacks clear policies and provisions for agriculture. This project makes V-GIS available free to researchers, urban planners, and government agencies. As with many issues and concerns, awareness if the first step to recognizing and defining the problem. Maps are essential to understanding the spatial and temporal aspects of human activity on the face of the Earth. [**Note:** Several years ago we used the term “urban agriculture” in the US. A faculty colleague in Economics told us the term was oxymoronic.]

Studies predict urban populations will continue to grow. Demand for food will also increase. Changes may be more dramatic in the more impoverished parts of the world where more rural poor will seek to find jobs in cities. Some progress has been made in some shanty towns to get the urban poor to grow food via “sack gardening” to help meet some of their needs.