ECHO Development Notes

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Rethinking a Basic Assumption in Ag Development: Risk Aversion vs Hunger and Exhaustion

by Dick Tinsley with Dawn Berkelaar

Dr. Dick Tinsley is an Emeritus Professor from Colorado State University with decades of experience as an advisor to smallholder agriculture development projects. Dick has worked in numerous locations across Asia and Africa, and is the author of the book Developing Smallholder Agriculture: A Global Perspective. He also manages the website www.smallholderagriculture.com, and teaches a continuing education internet course called Challenges to Smallholder Agriculture (http://villageearth.org/training-and-consulting/online).

In this article, Dick shares that, generally speaking, farmers plant crops later than recommended, and that the general assumption for why they do this is to avoid risk. However, he argues that another and perhaps more plausible explanation is that they simply do not have enough energy to do the work required to prepare a field for planting on time. Before implementing a rural development project, Tinsley encourages change agents to take the time to determine if the beneficiaries can afford or otherwise have access to sufficient calories and other essential dietary needs to complete the daily tasks expected of them.

Introduction – A Questionable Assumption

In my opinion, there has been a fundamental oversight in the basic approach to agriculture development over the past 40 years. In the mid-1970s, on-farm researchers casually observed that smallholder producers delayed their crop establishment for up to eight weeks, with an average crop establishment of one month after the initial rains or other seasonal starting event. This was confirmed by averaging some of the initial farm record results.

The observation led to an assumption that smallholder farmers were risk averse and waiting for more assured rainfall, and that they inefficiently used the natural resources available to them. These were and remain mostly assumptions, suppositions, or hypotheses that have become deeply entrenched in development literature without any real proof or verification. Economic development for smallholder communities, while emphasizing technology development through small plot trials and an effective extension demonstration education program (to inform producers on the potential of new techniques), often fails to take into account the hours that farmers are physically able to devote to field work. The importance of early planting is emphasized, but without awareness of the operational resources that will be needed and of the availability of those resources to extend a technique from a small plot to a full farm within acceptable time limits.

Figure 1. *Photo from the Philippines showing an 8-week spread in cropping. In the middle, buffalo are being used to prepare the land. Seedbeds are at the top right, while already transplanted fields are visible at the top of the photo. Photo by Dick Tinsley.*

The Reality of Time Constraints

The basic problem was underestimating just how long a family takes to establish 1.5 ha of land. If the estimate is only two or three weeks, then the initial assumption would be correct and it should be possible to improve economic well-being by promoting earlier crop establishment, etc.

However, if a more accurate estimate is up to eight weeks—with the farmers working as hard as possible from the first opportunity—then the extended crop establishment period will render the farmers too late for most follow-up management practices such as hand weeding or effective use of recommended fertilizer rates. After eight weeks, the weed infestation and loss in potential yields will be substantial. The problem stems from limited resources to manage the land in a timely manner. In this case, it would be difficult to enhance the economic well-being of the smallholder without first enhancing the operational resources available for smallholders to manage their lands. In academic and development circles, it seems fairly easy to determine the labor and other resources

Featured in this EDN

ECHO is a global Christian organization that equips people with agricultural resources and skills to reduce hunger and improve the lives of the poor.

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required to complete a task (e.g. 300 person-hours of labor to manually prepare land; 60 person days to transplant 1 ha of rice). However, it seems considerably more difficult to determine if that labor is available within a smallholder community. Labor can be provided by family, casual workers and even migratory workers. It is also a mobile resource that moves through a smallholder community and may be better evaluated on a community basis than on an individual farm basis. In the development community or within a development project, who is responsible for determining if farmers have access to the resources needed to implement the development recommendations that are promoted for the smallholders' benefit across their farms?

In some cases, other family members assist with farm labor. However, steps should be taken to ensure that children are able to attend school, which is unlikely to happen if they are working full time in the field. And if a man's wife has substantial essential domestic tasks to do, such as fetching water and/or firewood, cooking, and nurturing children—that take priority over assisting with field work—it is unlikely that she will be able to provide much assistance with the field work.

The Caloric Energy Balance

Another factor may contribute to prolonged crop establishment that continues well beyond the projected time: the limited diet available to smallholders during critical times of high manual labor needs, such as basic crop establishment at the beginning of the growing season. Undernutrition and malnutrition are recognized as major concerns in smallholder communities; consider the oft-mentioned boilerplate that smallholders produce only sufficient food for six months. Many efforts to alleviate poverty focus on reducing nutritional deficiencies, in terms of protein, vitamins, minerals, etc. Yet **rarely is hunger recognized as a potential major impediment to the development efforts**.

Many smallholder farmers experience undernutrition in the form of a major deficit in the "caloric energy balance," which compares the number of calories a person is expected to exert in implementing a development program, and the number of calories the person has access to. Smallholder farmers may have access to only 2000 kilocalories when they need in excess of 4000 kilocalories to complete a full day of diligent field work. As a result, farmers may have only enough caloric energy to work three or four hours a day, which will substantially increase the time or days required to complete different agronomic tasks, and which will seriously limit the farmers' ability to take advantage of innovations that are promoted for their benefit—particularly labor-intensive innovations.

If smallholders produce only enough to feed their families for six months, they will be running out of food just as the next growing season begins. It may be impossible for them to consume sufficient calories to undertake a full day of crop management field work. If it takes 2000 kilocalories just for basic metabolism to meet daily subsistence needs, and an additional 220 kcal per hour for sustainable field work, a person would need to consume at least 4000 kcal to work a full 10 hour day. (This excludes the heavy digging associated with initial manual land preparation, which could increase the energy requirements even more.) If farmers are not able to consume this amount, they will be unable to complete the day's work and be forced to come home early in the afternoon to recover from exhaustion. This could give the appearance of "idleness."

A typical diet would be 500 g/day of uncooked rice, which is the average per capita consumption in Myanmar and represents the highest average daily rice consumption in the world. This would provide only about 2000 kilocalories. Even at the low consumer prices found in most developing countries, a person living near or below the World Bank's oft-quoted US$2/day poverty index would have to spend the majority of his or her income just to meet the 4000 kilocalories required for a full day of field work. To meet this energy requirement would require either 1.1 kg of maize, or 1.1 kg rice, or 1.1 kg wheat flour, or 2.5 kg cassava, or 4.6 kg sweet potatoes, or 3.3 kg of plantains (these weights refer to uncooked amounts). This diet would supply enough energy, but would not provide the protein, essential minerals and vitamins that are necessary for a person to be healthy enough to endure a full day of agricultural field work. These other nutrients have to come from meat, fish, beans, vegetables and fruits that are normally more expensive than starchy foods—so purchasing and consuming them would most likely result in a reduction in overall calories. This in turn would reduce the amount of work that could be expected from that individual. Thus, before any effort is made to mobilize "idleness," it would be appropriate to determine if the individuals have ready access to the upward of 4000 kilocalories that would separate idleness from hunger and exhaustion.

Figure 2 shows the volume of food listed above for various staple energy sources. For an individual to purchase a 4000 kilocalorie portion in various developing countries it will cost anywhere from US$0.30 to US$1.99 depending on the country and staple food involved (see http://lamar.colostate.edu/~rtinsley/Table1-Price4000Kcals.pdf).

Figure 2. *Amount of various staple foods that each correspond to 4000 kcal of energy. Photo courtesy of Whole Foods, Fort Collins, Colorado.*

In a classroom exercise using consumer price comparison lists, when all foods were considered for a more complete balanced diet, the total of available calories was reduced to approximately 3000 kilocalories. (3000 kcal/day is slightly higher than the case studies in a recent ODI Paper "On Improving Nutrition for Smallholders." In that paper, the five case studies list kcal/day ranging from < 2000 to nearly 3000 kcal/day.) Subtracting the 2000 kilocalories needed just to sustain the body's biological activities, the kilocalories available for field work could be 1000 or less—leaving less than four hours' energy for field work. Isn't this consistent with what is often observed when visiting smallholder communities? Often visitors arrive in the late morning, when many farmers will have already completed the four hours of field work that their diet permits. These farmers will be heading home, exhausted, having started their work early in the morning. Some essential domestic chores will still need to be done, such as obtaining water for the household, perhaps getting fire wood, cooking meals, nurturing children, etc. These activities would be an additional drain on the calories that are available for field work.

To see a detailed analysis of a potential Caloric Energy Balance in Ethiopia (done by a workshop participant), see this link: http://lamar.colostate.edu/~rtinsley/EthiopiaDiet.html. The result of the analysis was

similar to the conclusion of this article: based on wages, food prices and number of family members needing to eat, a farmer is unlikely to have enough energy to do more than 4.6 hours of field work per day. This is consistent with the casual labor work day in neighboring Kenya, which is set at 5 hours/day. With a 5-hour work day, it would seem possible for someone to work a double shift, but this does not happen and is not encouraged by hiring farmers. One farmer that was interviewed indicated that if a person worked a double shift, they would be unable to work the following day.

Subsistence Supplies

While consumer prices are the most readily available data to collect for this analysis, and US$2.00 per person per day is the accepted standard definition of poverty according to the World Bank, smallholder producers usually produce most of the food they consume, particularly the staple foods that are the primary source of calories such as those shown in Figure 2. However, the amount of subsistence food that is available is more difficult to determine, and would be more variable within a specific host country and between individual farmers. I do have an estimate from farmers in Malawi, who indicated that they reserved about four 50-kg bags of maize per person for personal consumption. This would amount to roughly 200 kg/yr or 547 g/day, which would provide 2030 kcal/day as the primary source of dietary energy. Four bags of 50 kg each per person is very consistent with the Millennium Villages Project, which allocates 1.1 tons of maize per family of 5.7 people. This amounts to 193 kg/person/year or 529 g/day, which provides 1930 kcal/person/day. At this rate, the stored food would be sufficient to sustain a person, but would not allow him/her to undertake substantial field work.

Labor-saving Interventions

Instead of proposing labor-intensive interventions, enhancing the operational resources available to smallholder farmers can result in a substantial increase in economic well-being. A good example is the retirement of the water buffalo in favor of the power tiller for rice cultivation in Thailand and other parts of Asia, a shift that took place concurrent with the "green revolution" and helped it to succeed. Use of power tillers reduced the crop establishment period by half and allowed small scale farmers to expand their holdings, diversify their farm enterprises and enjoy some comfort items such as refrigerators, motorcycles, TVs and VCRs. With rice production under control, Thai farmers were able to undertake many of the value-chain cash enterprises envisioned in development projects, such as contract vegetables for the Japanese market, or poultry and pig production suspended over fish ponds. The conversion from water buffalo to power tillers was self-financed and took place completely under the radar screen of the development community. It remains little recognized by the development community trying to extend the "green revolution" from Asia to Africa. The latter emphasizes research into improved technology and enhanced access to inputs, but fails to extend this to enhancing operational resources to expedite crop establishment and land management.

Figure 3. *Sri Lanka couple manually preparing their rice paddy. How many calories are they exerting? How long will it take to complete one hectare?*

Enhancing resources that are available for land management often involves access to mechanization. Most likely when using four-wheel tractors, this will not be in terms of direct ownership by farmers, but rather contract availability via small family-owned village-based support service providers that have a symbiotic association with the smallholder producers. There appears to be considerable demand for these services, even in remote parts of Africa where manual field operations continue to dominate. In Zambia, farmers have expressed an interest in such services and can even quote the price for it. The prevailing price in 2005 was ZK 100,000 (US$20) per hour. During this hour an operator could custom till between 0.25 and 0.50 ha. Similar quotes can be obtained in Uganda, Malawi, Nigeria, Ghana and Kenya. In Egypt, Pakistan, Iraq and Afghanistan, most land preparation is done by individually owned 65 hp tractors such as the Massy Ferguson 165 (and has been for several decades). The importance of such contract tillage appears to take place under the radar screen of the development community, which remains fixed on the idea that maintenance of machinery is beyond the capacity of smallholder communities with limited education. Perhaps they are thinking of the difficulties with public sector mechanization units, and unable to distinguish public sector from private sector. Perhaps the development community can rethink this, and instead facilitate a community-based approach based on symbiotic relationships within villages between producers and local family-based support service providers. This might require some adjustments to the institutional credit system, for example, to assist with the purchase of tractors and initial operating costs.

Village grain mills are another good option to consider, if they are not already available. They might reduce women's domestic drudgery, and increase their ability to remain in the field longer each day or to arrive more refreshed and better able to manage the farm enterprises.

Improving access to domestic water would have a marked health impact; the time saving would also allow women to pursue other economic opportunities for the benefit of their families, including assisting their husbands with field work.

More Implications for Development

If the argument in this article is correct, and has been since the beginning of the rural development effort some 40 years ago, then instead of delaying cultivation, farmers were most likely starting their crop establishment at the first opportunity when the monthly rainfall variable approached 100%, and continuing as fast as their available energy would allow. **Rather than being risk averse, smallholder farmers are and have always been mandatory risk takers, with their very survival dependent upon taking these risks.** If their available diet limits the hours they can work each day, and thus extends the crop establishment period well into the time when potential yields may be rapidly declining (particularly for maize in Africa), then any delay will reduce potential yields and put their very survival at risk. Given the critical need for subsistence production and the amount of field work that is clearly needed, what is the more realistic scenario for anyone seen idling away the

afternoon in the village? Are they being risk averse, or hungry and exhausted?

Limited dietary energy's drag on farm management does not even account for the two or three times a year farmers suffer a bout of malaria and cannot work for a couple days, the times they get dysentery and lose another day, and the increasing impact of the HIV/AIDS epidemic that casts a dark shadow over rural Africa and the available labor.

As crop establishment is delayed and has to be integrated with weeding and other mid-season crop husbandry activities on early established parcels of land, farmers will compromise on quality management in favor of cultivating a more extensive area. This is a very rational economic decision, but can give the impression that farmers have limited knowledge of best management practices and need to be taught the best management practices. In actuality, they may be well versed in such practices but not have sufficient labor to fully adopt them.

A few other items to note: first, the typical smallholder farm size of 1.5 ha, that appears common in many developing countries, may represent the outer limit of what a farmer can manually manage, rather than the availability of land within the community. Second, the midday siesta, common in some countries as an opportunity to escape the heat of the day, might equally be due to exhaustion from exerting all the available calories and a need to recover from the exhaustion.

Conclusion

The bottom line is this: before implementing a rural development project, take the time to determine if the beneficiaries can afford or otherwise have access to sufficient calories and other essential dietary needs to complete the daily tasks expected of them. If not, compute the number of hours that can be expected and adjust the area over which the promoted technology can be extended within the anticipated time limits. It is really not a very time-consuming or complicated exercise, and could provide more realistic expectations of the potential for introduced technologies to expand across a production area. Be somewhat cautious about using hired labor. Often the casual labor pool consists of other farmers, who on any given day and for a variety of reasons opt for doing casual labor instead of working their own fields. Working as casual laborers will use significant amounts of energy and may leave these farmers depleted when it comes to working their own fields. As development change agents, the goal should be to increase well-being (economic and otherwise) across the host community, rather than to enhance one cooperating individual at the expense of others.

While it may seem trite to claim that you cannot expect a hungry person to work very hard, isn't that what the rural development effort has been doing for the past 40+ years? Until it is fully recognized and appreciated that smallholder farmers are most constrained by the availability of labor, and that the extent of this prevents them from obtaining the production potential allowed by the natural resource environment, there will be major limits on the long term sustainability of many development efforts.

A Compendium of Free Online Courses, Books and Other Resources

by Dawn Berkelaar

No matter how much you have tried to learn before taking on an agriculture project, gaps in knowledge are inevitable. You might even be working in the area of agriculture without any formal training in the subject.

ECHO shares helpful agricultural information through our ECHOcommunity.org website, and we also offer courses in Tropical Agriculture at our Florida campus. Taking a course can be advantageous, because information is presented in a logical and sequential way. But people do not always have the resources needed to travel and take a course.

The internet is almost unbelievable in its power to make information widely available. It is also making information organized as coursework more and more accessible. In this article, we highlight a number of free opportunities for learning online.

Online Courses

*Note that information in most of these courses will not necessarily be targeted to tropical agriculture. In the list below, the first few courses are marked TE (primarily temperate), TR (primarily tropical) or N (not primarily oriented toward any climate).

Rodale Institute. Rodale Institute has an online course for those who want to transition from conventional to organic farming. It includes sections on soils, crops and marketing. Even if you do not want organic certification in the USA, many of the principles will be helpful to people interested in learning about organic agriculture. N. www.rodaleinstitute.org/course

Sustainable Agriculture Course from Sustainable Agriculture Research and Education (SARE). N. www.sare.org/Learning-Center/Courses-and-Curricula/National-Continuing-Education-Program/Course-1-Sustainable-Agriculture

OpenCourseWare (OCW). More than 120 universities worldwide are part of the OpenCourseWare (OCW) movement. OCW provides free access to course materials that include "syllabi, video or audio lectures, notes, homework assignments, illustrations, and so on."

The OCW consortium includes many schools in the United States, including MIT (Massachusetts Institute of Technology), Tufts, Johns Hopkins, Michigan State, Michigan, Notre Dame and Utah State. Internationally, schools in China, Japan and Spain are part of the consortium. For information, see www.ocwconsortium.org and www.ocw.mit.edu. The sites allow users to search for relevant courses. Some that I thought looked interesting include: The Challenge of World Poverty; Food and Culture; Social Issues and GM [Genetically Modified] Crops; and Information Technology and Global Development. Some of the courses available through the MIT site have been translated into different languages.

Open Culture (www.openculture.com/freeonlinecourses). This site lists over 550 free online courses from some well-known and respected universities. The courses are from a wide range of disciplines. For example:

- Geography (Food and the Environment; Geography of World Cultures; Globalization)
- Political Science, International Relations, and Law (Faith and Globalization—one instructor is author and well-known theologian Miroslav Volf)
- Biology (Fundamentals of Biology; Biochemistry; Genomes and Diversity; Genetic Engineering in Medicine, Agriculture and Law; Molecules and Cells)
- Chemistry (General Chemistry; Organic Chemistry)
- Engineering (Direct Solar/Thermal to Electrical Energy Conversion Technologies; Introduction to Engineering)
- Environment and Natural Resources (Global Warming: Understanding the Forecast)
- Mathematics (several introductory courses about statistics)
- Public Health (Epidemiology and Control of Infectious Diseases)
- Business (Principles and Concepts; Marketing 123)

Learn Languages for Free (www.openculture.com/freelanguagelessons). If you want to learn a new language, this site has links to free courses for over 40 languages. The courses originate from a variety of sources, including the Peace Corps and the BBC (British Broadcasting Corporation).

Coursera (www.coursera.org/). 33 universities have partnered with Coursera to offer online courses. These courses seem to be offered periodically at specific times—so if you find one you are interested in, you can enter an e-mail address and wait to be notified the next time it is offered. One example of a course I found online is An Introduction to Global Health.

I recently took a Coursera course called Health for All through Primary Health Care. I was very impressed. The course was taught by Henry Perry, a professor at Johns Hopkins University in the United States. Perry has extensive experience in the field of Primary Health Care, and shares a passion for the subject that clearly goes beyond mere academics. The course included online lectures (if bandwidth were not available to view lectures, transcripts of the lectures were also available, as well as pdf versions of the PowerPoint slides). Readings (available online) and sometimes YouTube videos were assigned in conjunction with the lectures. Each week, participants completed a 10-question multiple choice quiz. Two reflection papers were also assigned during the five-week course.

A unique aspect of Dr. Perry's course is the requirement for each participant to peer review reflections from four other randomly assigned course participants. The marking scheme was clearly outlined. Participants were from literally all over the world, so the peer review and an online discussion forum were great ways to learn from and about other participants' experiences. For this course (and most in the Coursera network, I expect), lectures were given in English and assignments were also expected to be in English.

MOOC (www.mooc-list.com) is "a complete list of massive open online courses (free courses) offered by the best universities and entities." It includes courses through a number of different initiatives, including Coursera. Course categories can be easily browsed. Two that look especially interesting and relevant for ECHO network members are Sustainability of Food Systems: A Global Life Cycle Perspective and Health for All through Primary Health Care.

Khan Academy (www.khanacademy.org) is a website where you can watch free online lessons on YouTube. Each online video is approximately 10 minutes long. Topics are weighted heavily toward science and math, but also include economics, cosmology and astronomy, and some topics from the humanities. Computer science videos are the latest Khan Academy offering. While very few of the online videos pertain to agriculture specifically, some that might be helpful to our readers are in the area of biology (e.g. photosynthesis; genetics; CAM plants [CAM stands for 'crassulacean acid metabolism'; these are plants uniquely adapted for arid conditions]), chemistry (e.g. periodic table; acids and bases) and organic chemistry. The material in the videos tends to be at the level of a high school course or first year university course.

Note: Generally, in order to participate in a course online, you will need to create an account with the respective host organization. The username and password that you create are then used to log in and access the course in which you enroll.

Other Online Information Sources

ATTRA-National Sustainable Agriculture Information Service. From the website: "ATTRA was developed and is managed by the National Center for Appropriate Technology (NCAT) through a cooperative agreement with the United States Department of Agriculture (USDA) Rural Business Cooperative Service. ATTRA's resources include a free hotline for sustainable-agriculture producers; a free "Ask an AG Expert" service; more than 400 publications, most of which can be downloaded for free; databases; webinars; funding opportunities; and more.

"The ATTRA website home page, www.attra.ncat.org, now features a "Mobile" view, which automatically appears when smartphone and tablet users visit the site. Although the "Mobile" view offers the same features as the regular "Desktop" view, it's friendlier for a smartphone-size screen. Rather than the website's regular graphic layout, which is designed to be easy to navigate on a computer screen, the Mobile view is laid out in a vertical "headline" style. When users click on one of the features, more choices appear."

Though geared toward North Americans, much of the information on the ATTRA website is more broadly relevant.

Humanity Development Library. We have mentioned this resource before. From the website: "The Humanity Development Library is a large collection of practical information aimed at helping reduce poverty, increasing human potential, and providing a practical and useful education for all. This version, 2.0, contains 1,230 publications--books, reports, and magazines--in various areas of human development, from agricultural practice to economic policies, from water and sanitation to society and culture, from education to manufacturing, from disaster mitigation to micro-enterprises. It contains a total of 160,000 pages and 30,000 images, which if printed would weigh 340 kg and cost US$20,000. It is available for free online at www.nzdl.org/hdl, and on CD-ROM at US$2 for distribution in developing countries. The actual library software is also available free of charge.

"The objective of the Humanity Libraries Project is to provide all involved in development, well-being and basic needs with access to a complete library of around 3,000 multidisciplinary books containing practical knowhow and ideas. We invite many more

development organizations to share their useful publications, to help distribute these libraries, and to participate in this humanitarian project.

"The editors of this collection are Human Info NGO, HumanityCD Ltd, and Participating Organizations. Contact us at Humanities Libraries Project, Oosterveldiaan 196, B-2610 Antwerp, Belgium, Tel 32-3-448.05.54, Fax 32-3-449.75.74, email humanity@humaninfo.org."

One real benefit of the Humanity Development Library CD-ROM is that the information can be searched and used even without access to the Internet. Information in the Humanity Development Library collection can be searched in five different ways:

- search for particular words that appear in the text by clicking the Search button
- browse documents by Title by clicking the Titles button
- browse documents by Subject by clicking the Subjects button
- browse documents by Organization by clicking the Organizations button
- browse documents by Collage by clicking the Collage button

Free Online Books

The Online Books Page (http://onlinebooks.library.upenn.edu/) lists over 1 million free books on the web. It links to ECHO's own *Amaranth to Zai Holes: Ideas for Growing Food under Difficult Conditions.*

Biodiversity Heritage Library (www.biodiversitylibrary.org/Default.aspx) is a "consortium of natural history and botanical libraries." Most of these are older books that are in the public domain. Books can be searched for by topic, title, author, date or collection. They can be read online or downloaded in several formats (including PDF). Examples of titles include *Tropical Agriculture: The Climate, Soils, Cultural Methods, Crops, Livestock, Commercial Importance and Opportunities of the Tropics* and *Elements of Philippine Agriculture*.

Cornell Historical Literature of Agriculture (http://chla.library.cornell.edu). Cornell's Historical Literature of Agriculture (CHLA) is a website of more than 2000 full textbooks and some journals that are well indexed and searchable, all dealing with pre-WW II agricultural methods. Examples include *Iroquois [a Native North American tribe] Uses of Maize*; *Baking at High Altitudes*; and *Practical Treatise on the Potato*.

The Soil Biology Primer, a book by Elaine Ingham, can be read on the web at soils.usda.gov/sqi/concepts/soil_biology/soil_food_web.html. Information gleaned from the author of this important book was shared in *EDN* 96, in an article by Danny Blank called "A Fresh Look at Life below the Surface."

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UPCOMING EVENTS

Update! ECHO International Agricultural Conference

December 10 to 12, 2013, Post Conference Workshops December 13

ECHO Global Farm, North Fort Myers, FL

This year marks the **20th Anniversary** of the ECHO Conference in Fort Myers! The theme for this year's conference is **Impact Options for Lasting Change** focusing on some "tried & true" methods and highlighting their progress over the years. Plenary speakers will include: Danielle Nierenberg, Keith O. Mikkelson, Dr. Ricky Bates, Ruth Tshin, Dr. Norman Uphoff, Larry Smoak, Robin Denney, Joy Phillips & Danny Blank.

Post Conference Workshop topic options include: *Tropical Natural Farming: Water, Soil, Plants and Man* with Keith Mikkelson, *Raising the productivity of your fish pond by making use of what resources you can find locally* with Randy Bevis & Paul Noren and *Demystifying Permaculture* with Brad Ward and Colin Richard. (Additional fee applies.)

New this year! As part of the free seeds we offer during conference, we will offer special seed "bundles" to meet various needs of your project. This will help take some of the guess work out of your seed selection process.

Tropical Agricultural Development I: The Basics

January 13-17, April 7-11 & July 28-Aug 1

ECHO Global Farm, North Fort Myers, FL

Those preparing for short- or long-term involvement in agricultural development internationally are encouraged to participate in this one-week course. Participants will gain an introduction to aspects of poverty and community development. They will also receive instruction on proven agricultural practices and practical techniques, systems and technologies to meet agricultural and nutritional needs of small-scale, impoverished farmers. A significant part of the time will be spent touring different aspects of the farm. There is also opportunity for visits with staff and study in the ECHO library.

ECHO Asia Seed Banking Workshop

Dates: January 21-23, 2014

Location: Chiang Mai, Thailand

Program and Topics: The workshop will include plenary sessions offered by professional development workers, researchers, and business persons related to the following topics:

- The importance of seed saving,
- Community seed selection and improvement of local varieties,
- How to conduct a community seed swap (workshop participants will also participate in a seed swap with one another during the event),
- Seed banking Practicum I: Planning, Production, Harvesting, Cleaning, and Drying, and
- Seed banking Practicum II: Storing, Inventory, Testing, and Village Level Techniques.

Site Visits: Attendees will participate in two field trips during the workshop:

- An afternoon visit to Mae Tha organic farming community to learn about their local seed selection and saving methods, and
- An overnight trip to ECHO Asia's seed bank to learn about the operation of a small-scale seed bank, and about ECHO's ongoing research geared towards community-level seed saving.

To receive more information about the workshop, contact echoasia@echonet.org. The cost is 2900 THB, which will include all training, 6 meals, 1 overnight at the ECHO Asia Seed Bank, and transportation for site visits.

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2013 Okra Observation Trial

by Brian Lawrence

Okra (*Abelmoschus esculentus* (L.) Moench), part of the Malvaceae family, is grown for many reasons including fiber, oil, and the edible flowers and pods (*EDN* 81). Okra has been cultivated for centuries and remains a very important food crop in many parts of the Middle East and West Africa (FAO stats); varieties have been selected for pod shape, color, and yield. Okra readily adapts to different locations while still providing an ample supply of food (*Lost Crops of Africa II: Vegetables*).

Our goals with this trial were to observe morphological differences of plant habit and leaf shape, and to find out which varieties produced the most pods within the shortest amount of time after planting. Plants were spaced two feet apart, in groups of 8 to 10, in raised beds covered with plastic mulch. They were fertilized three times a week with 16-3-16 [percentage N (nitrogen): P (phosphorus): K (potassium)] fertilizer, applied through drip irrigation lines at a rate that supplied 1.5 pounds of N per 100 feet of bed space. Twice a week, on Tuesdays and Fridays, observations were made and pods longer than 2.5" were cut and gathered. Pods were harvested from 5 July to 5 August, 2013. Results are most relevant to early-season production, as time constraints made it impractical to continue harvesting beyond the 5th of August.

Results

Plant traits: We found definite variation, both in the production of pods and in overall morphology. One okra variety ('Sarajevo') had many prickles on the leaves and pods, making harvest uncomfortable. Some plants only grew pods on very tall vertical shoots ('Arka Animaka', 'Pusa Makmahli', 'Parbhani Kranti'), while others assumed a more bush-like habit with many branches full of pods ('Jade', 'Burgundy', 'Gumby'). Large, healthy leaves made finding the pods difficult ('Ever Lucky', 'Greenie', 'Clemson Spineless', 'Borneo', 'Lee Dwarf'), while highly lobed, narrow leaves made harvest of pods easier ('Prelude').

Pod production: Top producers were open-pollinated varieties 'Pusa Makmahli' and 'Gumby' (Figure 4). Some of the earliest producing varieties were of Indian origin, including 'Pusa Makmahli' (Indian Agricultural Research Institute; Hope Seeds) and 'Parbhani Kranti' (Marathwada Krishi Vidyapeeth, Parbhani). In a previous (2003) ECHO variety trial, 'Parbhani Kranti' produced more of its pods early rather than later in the season. 'Parbhani Kranti' performed similarly in 2013, but with far fewer pods than 'Pusa Makmahli'. However, 'Parbhani Kranti' has an advantage in its resistance to Yellow Vein Mosaic Virus, while 'Pusa Makmahli' is susceptible (IARI).

Other early production leaders were 'Gumby,' a variety acquired from Hope Seeds in Missouri, and 'Burmese,' a variety originally from Myanmar. During the trial we received a higher than average amount of rain, which could make these observations particularly helpful for individuals working in high rainfall climates. Had the trial been continued, some of these varieties could have also produced pods later in the season.

New Seed Bank Offerings

Special thanks to Mike Mueller with Hope Seeds, for supplying ECHO with seeds of 'Gumby' and 'Pusa Makhmali.'

The variety 'Gumby', originally selected from another variety in Florida in the 1980s, was reselected by Hope Seeds and has been maintained at their Missouri location since 2002. According to Hope Seeds, "'Gumby' is earlier than many standard types with a shorter plant, yielding very good quantities of medium green smooth velvety pods.… [A] shorter plant with more narrow leaves [makes] the fruit easier to view and harvest."

The variety 'Pusa Makmahli' originated in northern India. Hope Seeds' selection has been maintained at their Missouri location since 2004. They share, "'Pusa Makmahli' is a quick-maturing type on a short plant with tender light green five-ridged fruit. Plants may be grown in containers and are compatible with other patio plants; in-ground spacing may be 2-3 seeds per hill on 18" rows or hills. The plant will begin producing at just over 1 foot and [in Missouri] will reach a height of about 6 feet at full maturity."

As noted earlier, 'Burmese' is a variety from Myanmar that compared well–in terms of early yield–with other varieties offered by ECHO.

Those registered with ECHO as agricultural development workers may request a complementary trial packet of one or several of the okra varieties from the ECHO Florida seedbank. Visit ECHOcommunity.org for information on how to register. We encourage you to conduct your own trials, perhaps comparing varieties from ECHO with those from other seed sources to which you have access.

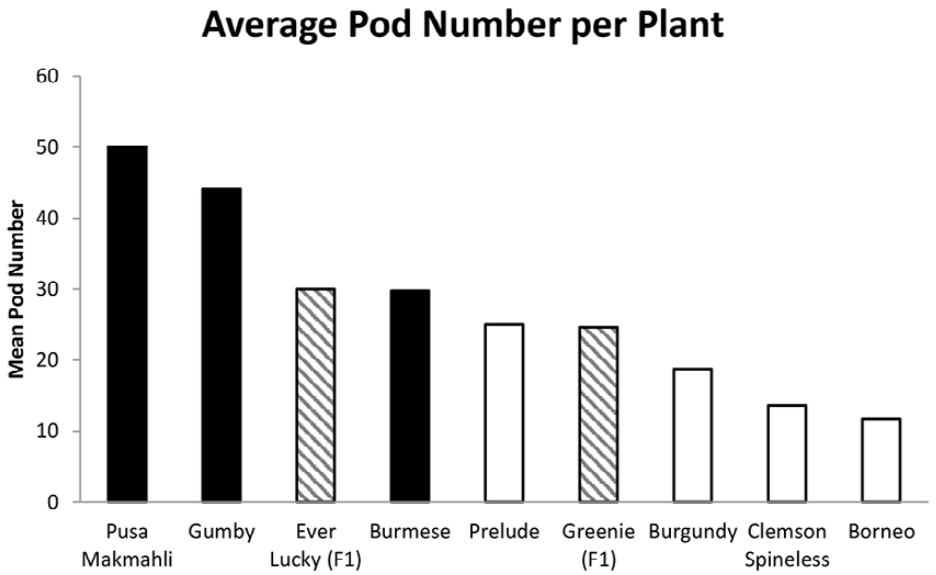


Figure 4. *Average number of pods of select okra varieties, produced during the first three months of growth. Varieties of okra were grown in the summer of 2013 and pods were continuously collected during the trial period. Varieties in black represent additions to our network seed catalog; white bars represent varieties currently offered. Hybrids (currently offered) are shown with hash marks.*

ECHO Asia

The **latest issue of *Asia Notes*** (Issue 18, September 2013) contains the following articles:

- Greetings from the New Director of the ECHO Asia Regional Impact Center (by Abram Bicksler)
- The Participatory Approach: Illustrations from Experience (by Douglas Fraiser)
- Seed Bank Additions (by Abram Bicksler)

Companion Plants. You will notice that the latest issue of *Asia Notes* contains an article about new seed bank additions. Three new types of seeds are now available from the ECHO Asia Seed Bank. They are not "typical" ECHO seeds, because they are not edible. However, they are flowers that form the basis for Integrated Pest Management, increase biodiversity in garden plots and farm fields, and offer market potential. The three flower species now available from ECHO Asia are **cosmos** (*Cosmos sulphureus*), **marigold** (*Tagetes erecta*) and **zinnia** (*Zinna elegans*). For more information about these flowers, see the article in *Asia Notes*.

ECHO East Africa

Seedbank Update. We have secured a small store room nearby that will serve as our seedbank. The recent Tanzania Agricultural Society fair offered the chance to make new contacts with regional seed suppliers, and we are working on compiling a database that can help network members access the seeds they need. Will you help improve our database? Where do you source seeds? Fill out our brief survey and share your experiences. https://echocommunity.site-ym.com/?SeedSurvey

Staff Transitions. Amy VanNocker finished her one-year assignment to help establish the ECHO East Africa office here in Arusha. During her time here, Amy helped to organize the February 2013 ECHO East Africa Symposium. She also worked to develop the demonstration gardens at our office, organize the conservation farming forum in northern Tanzania, and establish ECHO East Africa's seed collection and resource library.

We are pleased to welcome Mr. Charles Bonaventure (called "Bonny"), as a long-term Technical Advisor for ECHO East Africa. Bonny worked with the Tanzanian government since 1986 before joining World Vision Tanzania in 2004 as Agriculture Trainer. For eight years, he served with World Vision Tanzania in various capacities as Team Leader of Food Security Project, Policy Review Officer, and Program Coordinator. Prior to joining ECHO, he worked with Global Service Corps. Bonny comes from the Kilimanjaro region and is blessed with three children. He holds two bachelor degrees in Horticulture (Tanzania) and Rural Development (The Netherlands). Bonny joins ECHO with a passion for agricultural development and practices that will reduce hunger, improve livelihoods, and increase community resilience.

Learning through Exchange Visits. ECHO EA Impact Center recently facilitated several trainings of groups brought by development partners from around Arusha. ECHO Technical Advisor Amy VanNocker shared about keyhole gardens with a group of students from nearby Olsiligi Secondary School. ECHO EA Director Erwin Kinsey discussed sloping land technologies with a group of village leaders, farmer leaders, and trainers from the Tengeru Horticultural Training Institute, World Vision Tanzania, Global Service Corps, Save the Rain, and the National Pest Control Unit, all who serve communities nearby to the ECHO EA Impact Center. Local farmer Simon Kutingala also shared knowledge of conservation farming with neighbors. Experienced farmers regularly face the adverse impacts of climate change and unreliable rainfall and respond by their own innovations.

Exchange visits are some of the most effective ways of sharing technologies among farmers and other change agents. In cases where advance notice is given, ECHO invites researchers, trainers and other key farmers to join in the stimulating discussions, as there is mutual asking and answering of technical questions, respecting farmers' knowledge as well as that of the 'experts'. Sharing on many different levels helps to break the traditional top-down extension approach, leading to stronger interactions with extension agents, and to better results.

South Africa Research Update

by Tim Motis

Does a planting basin, like a zai pit, make much of a difference in soil moisture on a sandy soil? Because water leaches through sand rather quickly, you might expect that planting depressions would not have a significant impact on soil moisture. With the soil in ECHO research plots in South Africa being comprised of 87% sand, it was important for us to address this.

To do so, we measured volumetric water content (VWC) over time, to a 12 cm depth in the zai pits. Within a given amount of soil, VWC is the ratio of the volume of water to the total soil volume. Expressed in terms of percent, the VWC at saturation will equal the percentage of the soil that is pore space. The VWC of a saturated soil is typically around 50%.

Overall, the growing season was dry, with only 485 mm of rain received. Even with 111 mm of supplemental irrigation, limited primarily to early-season applications to ensure sorghum seed germination and crop establishement, the combined amount of water (596 mm) was consistent with semi-arid conditions [in which annual rainfall averages as high as 700 mm (CASL, 2006. Arid and Semi-arid lands: characteristics and importance. Community Adaptation and Sustainable Livelihoods)].

The data are summarized in Figure 5, which shows soil moisture with 1) non-manured flat ground, 2) non-manured zai pits, and 3) manured zai pits. A few key points are:

Even though soil moisture tended to be higher with non-manured pits than non-manured flat ground, the difference was not that large. This was expected, since rainwater passes quickly through a sandy soil, regardless of the water catchment capacity of the zai pits.

Adding manure to the zai pits substantially increased soil moisture, in comparison to plots with no manure, up until 83 days after the pits were dug (nearly 2 months after sowing sorghum seeds in the pits).

Differences in soil moisture were more pronounced early than later in the season, likely an effect of early-season sprinkler irrigation for crop establishment. By day 137, coinciding with sorghum harvest, soil moisture was nearly the same with all treatments. This could be an effect of the zai pits filling in with sand over time, increased crop demand for moisture over time, and/or less and less rainfall towards the end of the rainy/growing season.

The most important observation here is that **the targeted placement of manure, in a zai pit, greatly increased moisture retention near crop plants**. These results illustrate the beneficial role that manure can have in improving soil water-holding capacity. In dry environments where irrigation is not an option, maximizing the efficiency of rainfall harvested in planting pits can be crucial to the success of food crops. Furthermore, targeted applications of manure provide an added benefit of increased soil fertility (see EDN 119-5).

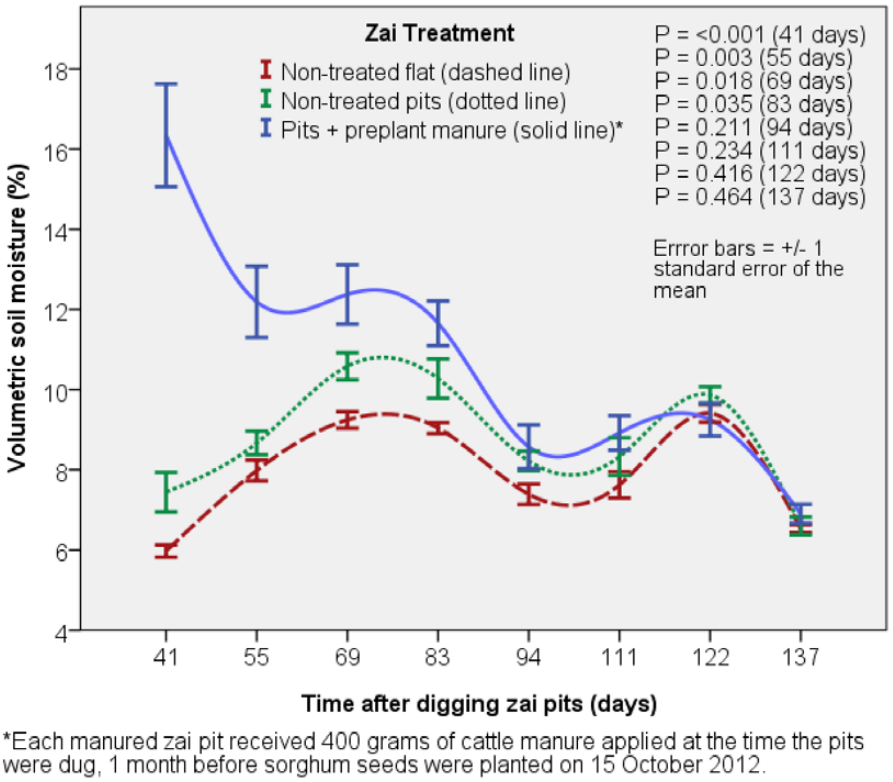
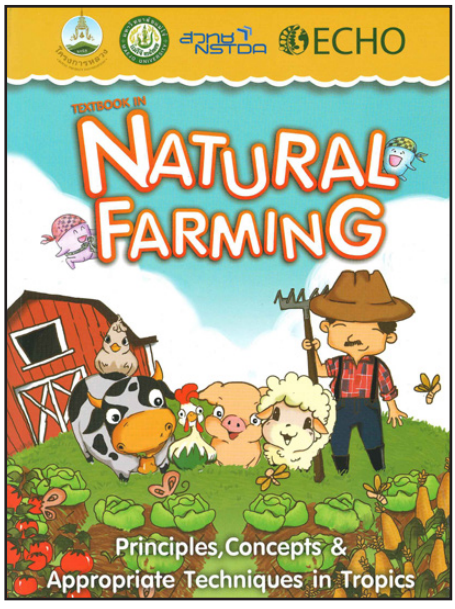


Figure 5. *Soil moisture on flat ground versus zai pits, from 41 to 137 days after the pits were dug during mid September, 2012. Data are the average of four replications.*

BOOKS, WEBSITES AND OTHER RESOURCES



Natural Farming

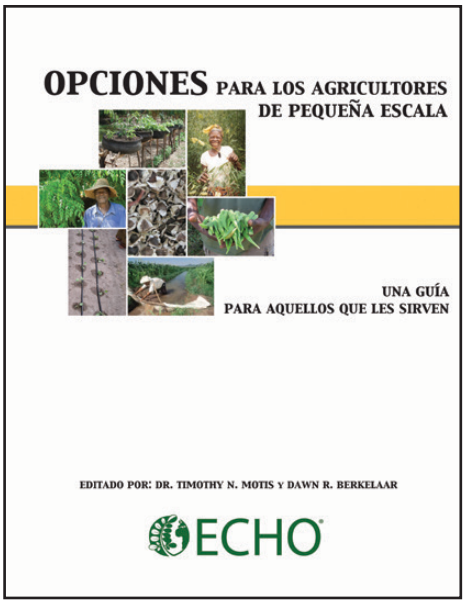
Reviewed by Rick Burnette

In Chiang Mai, Thailand, during the late 1990s, I became aware of farming practices that utilized beneficial microorganisms to enhance small farm resources and production in the tropics. Such techniques, enabling soil recovery and improving small-scale crop and livestock production, blended tropical inputs with compatible natural farming ideas from Japan and Korea. The techniques stimulated considerable interest among local agriculturists, and it was not long before Thai farmers were reporting related benefits. Unfortunately, at the time there was very little accessible scientific information to back up many of the various claims or to explain the results.

However, Dr. Arnat Tancho at Maejo University in Chiang Mai began to investigate these microbial-based farming approaches. Combining scientific references with research findings, he has enabled Thai agriculturists to consider the use of local, cost-saving inputs that, beginning with the soil, can increase farm production while reducing waste. In the process, Dr. Arnat has increased farmer awareness about the vital role of microorganisms in farm practices, including soil improvement, crop production, vermiculture and livestock nutrition. These approaches, supported by scientific references, were presented in his popular Thai-language book called *Applied Natural Farming*.

To extend the benefits of the book beyond Thailand's borders, ECHO is pleased to have facilitated the translation of the *Natural Farming* book into English. We are grateful to the National Science and Technology Development Agency for permitting and coordinating the production of the English edition. Offered at a level that is suitable for persons who use English as a second language, the English version of *Natural Farming* is already serving as a helpful reference for farmers, agricultural development workers and educators throughout Southeast Asia and beyond.

The English *Natural Farming* edition is 340 pages and includes color photos and educational graphics as well as tables that do a very good job of summarizing information. To order, go to www.echobooks.org



Spanish Translation–*Options for Small-Scale Farmers: A Handbook for Those Who Serve Them*

ECHO is pleased to announce the Spanish translation of *Agricultural Options for the Poor: A Handbook for Those Who Serve Them*. The new title is *Opciones para los agricultores de pequeña escala: una guía para aquellos que les sirven.* Translation and printing of the book were made possible with support from the SG Foundation and Tyndale House Foundation. *Opciones* is filled with practical options for those working to assist smallholder farmers and urban gardeners in the tropics and subtropics. The book features material from *EDN* and from technical notes, written by experienced practitioners, on agricultural systems that they have implemented in the field and that have been adopted by thousands of farmers.

The new book is available for purchase from ECHO's bookstore (www.echobooks.org). It is priced at $19.95 per copy. *Amaranth to Zai Holes* continues to be freely available online (www.ECHOcommunity.org).

We hope that this book will provide helpful perspective and practical project options that, ultimately, will lead to improved livelihoods of smallholder farmers in Spanish-speaking areas. Please let us know if any particular practice or technique from the book contributes to your efforts to serve the poor, or if you have related items to share for possible mention in *EDN*.

PLEASE NOTE: At ECHO we are always striving to be more effective. Do you have ideas that could help others, or have you experimented with an idea you read about in EDN? What did or did not work for you? Please let us know the results!

 Selected material from EDN 1-100 is featured in the book *Agricultural Options for the Poor*, available from our bookstore (www.echobooks.org) at a cost of $19.95 plus postage. Individual issues of EDN may be downloaded from our website (www.ECHOcommunity.org) as pdf documents in English (51-121), French (91-121) and Spanish (47-121). Recent issues (101-121) can be purchased as a group from our bookstore (www.echobooks.org). Earlier issues (1-51 in English) are compiled in the book, *Amaranth to Zai Holes*, also available on our website. ECHO is a non-profit, Christian organization that helps you help the poor to grow food.