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Anthropology as a Tool for Facilitating Agricultural Development

by Joel R. Matthews, PhD.

From the Editors: Joel Matthews has often written to us in response to articles in EDN. His comments are always insightful. Now we are glad to share an article by Joel, sharing ways that tools used in cultural anthropology can also be used to facilitate people-centered agricultural development. Joel has worked, taught and researched in West Africa, and currently teaches in the department of Engineering Technology at Diablo Valley College.

Introduction: Worldview, culture, and development facilitation

Most international development assistance comes from wealthy regions such as Western Europe, and countries such as the US, Canada, and Japan (Development Initiatives Poverty Research 2017). Unfortunately, most of these development initiatives have been relatively unsuccessful. Paradoxically, it may be the very fact that aid workers tend to come from countries of relative affluence that limits their effectiveness in poorer countries. This article examines ways that social science, particularly the tools of cultural anthropology, can facilitate first-world development initiatives that more closely align with the principles of people-centered sustainable development. (Not all sustainable development is the same. David Korten (2002) contrasts "conventional" sustainable development, which is focused on national economies and economic growth, with "people-centered" or "alternative" development, which focuses on the empowerment and wellbeing of relatively powerless individuals and communities. In my estimation, ECHO network members tend to fit comfortably within the alternative approach, but each facilitator must understand the implications of his or her philosophy of development.)

Why do aid workers hailing from wealthy countries sometimes undermine effective development facilitation in poorer countries? My experience suggests that these aid workers tend to hold incorrect assumptions, which are based on conditions in their home country. Paul Hiebert explains this type of cross-cultural misunderstanding by asserting that the fundamental division between "modern" and "traditional" societies makes communication between these groups difficult (Hiebert 2008). In order to understand this phenomenon, we must examine worldview and culture.

Figure 1. Discussing farming opportunities with a group of dryland millet farmers in Niger. *Source: Joel Matthews*

Culture consists of a collection of ideals and behavioral norms that allow members of a particular community to function in that setting. Cultural values include ways of eating (e.g. with hands vs. with a fork), definitions of modesty (one-piece swimsuit vs. a hijab), and modes of communication (drawn-out story telling vs. abbreviated texting).

Worldview, on the other hand, can be understood as the framework through which members of a particular culture perceive reality. For example, the worldview of western-educated people typically leads to the assumptions that reality exists objectively, and that the world functions according to the principles of physics and chemistry rather than by spiritual energy, karma, or astrology.

Differing interpretations of reality explain why, for example, western-educated facilitators tend to explain success or failure of farming ventures in terms of knowledge, techniques, and plants, while members of communities in non-western or developing countries may explain failure in terms of malevolent spiritual forces or social discord (Bradshaw 2002, Myers 2011, Verhelst 1990). While a modern worldview allows scientists to discover universal laws that govern cause and effect, it also tends to reject explanations that are not based on those laws. (Christians, however, accept the laws of physics while acknowledging that the universe is a created, and thus a spiritual domain.)

To hold a more expansive understanding of reality, we must reject some of the rigid naturalistic assumptions of modernity, and recognize that Newtonian physics does not, and

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cannot, represent all of reality. This philosophical shift reduces our need to confront the values and ideals of others as faulty, because we acknowledge that other ways of understanding reality can be as valid as our own. In fact, this acknowledgement is an important key to facilitating the complex process of community development that includes mental, spiritual, and social aspects. (This is why learning is at least as much a part of successful facilitation as teaching.) In the remaining sections of this article, I outline a process that will contribute to a deeper understanding of the development context, leading to higher levels of sustainable transformation.

A basic outline of anthropological fieldwork techniques adapted to development facilitation

1. Pre-field investigations. The first step in gaining an understanding of the field context is to study appropriate literature. Agriculturalists naturally study the agricultural context, but are less likely to examine cultural issues. However, unless facilitators plan to work in a laboratory it is quite impossible to separate culture, values, and worldview from agriculture. I suggest that would-be facilitators take a basic cultural anthropology course that includes fieldwork techniques, or start their own reading program. This is necessary because facilitators are, first and foremost, cross-cultural workers. It is a good idea to begin a reading program with an introductory text such as *Cultural Anthropology* (Haviland 1993), then move to specific field techniques such as *Participant Observation* (Jorgensen 1989), *Case Study Research* (Yin 2003), or *Finding Culture in Talk* (Quinn 2005). These general texts have not changed much over the years, so older, cheaper books such as the ones listed here are adequate. Facilitators should also be familiar with basic development texts by key thinkers such as Robert Chambers, and development critiques written by native scholars, such as *Dead Aid* (Moyo 2009), and *Africa Unchained* (Ayittey 2005). Finally, it is important to read books and articles detailing the history of development in the region. This last category of literature helps facilitators avoid the common error of proposing a particular solution without awareness of what has been tried before.

Suppose that, upon discovering that many rural Haitians suffer from malnutrition, a Canadian graduate student decides to establish community gardens in Haiti. If she simply reads all she can find regarding plants and techniques appropriate to the region, she will be unprepared to deal with Haitian realities. If she is like many facilitators, she may assume that demonstrating technical efficiency will be enough to cause folks to line up to begin their own gardens. Once in the field, however, she may be perplexed by the reticence of local inhabitants to adopt her methodologies. At this point several options will present themselves to her: she can dismiss Haitians as backward and unmotivated; she can redouble her efforts to change people's perceptions; or she can seek to understand why people are ambivalent toward her. The latter approach will allow her to understand the choices and reasoning of rural Haitians. Once she achieves this, she can seek to present new ideas in ways that are compatible with the realities on the ground.

2. Discussions with development professionals. It may not always be possible to find a development professional that is familiar with your proposed context, but you should be able to find a cross-cultural worker that has experience with a related people group. Missionaries are often the most helpful because they aim at deep cultural understanding. You will want to hear stories from the field before going abroad, and have a chance to ask questions or share ideas. You will also want to discuss issues with cross-cultural workers once you arrive on location.

Returning to the case of the community garden advocate, let us assume that she finds an experienced cross-cultural worker with whom to discuss community gardening in Haiti. What questions should she ask? First and foremost she will want to hear examples of what might have gone wrong with previous projects. For example, if a planned maternal nutrition center in the capital city did not materialize, she will want to understand the barriers to its success. She may discover that the project focused on technical aspects of maternal nutrition while ignoring important cultural issues. The resultant gap in understanding may have precipitated mistrust.

3. Participatory Observation. Once you have arrived on location and have secured the necessary permissions, you will naturally want to get to work. Many facilitators tend to be in a big hurry, not realizing that important aspects of facilitation include establishing a foundation of cultural knowledge, language acquisition, and friendships. Without cultural knowledge, you will constantly offend and confuse people. Without language, you will not communicate. And without friendships, even if you can communicate, people will have little interest in talking to you, let alone following your advice. Field anthropologists use participatory observation to learn about their surroundings and to gain the trust of local people. This technique involves immersing yourself in the context to such a degree that, if possible, you eventually become part of that context.

For example, while I was teaching at a university in Kenya, my son wanted to play soccer with the university team even though he was an outsider (he was neither Kenyan nor a student at the university). During practice he sat down and watched the Kenyans play. The first two days he was ignored, but on the third day a couple of guys were kicking the ball around after practice and he fetched it for them. After that they invited him to kick the ball with them. Soon he was talking with various members of the team, gradually learning Swahili words. Finally after about three weeks he was invited to practice with the team, and within about three months (apparently forgetting that he was neither a Kenyan nor a university student there), he was formally invited to join the team. The keys to the entire process were humility, patience, observation, learning, language acquisition, and friendship building. This is exactly how the process of participatory observation works.

4. Unstructured Interviews. Once you have learned basic cultural norms, picked up rudimentary language skills, and built trust, you will be ready to begin systematically gathering information. You may want to hire a local assistant to help conduct interviews.

Figure 2. A millet farmer experimenting with irrigated gardens in Niger. *Source: Joel Matthews*

Unstructured interviewing is another key technique used by field anthropologists to gather information, particularly when looking to develop a hypothesis or to test a theory. Unstructured interviews are relatively open-ended discussions that focus on a limited number of topics, and they are very different from surveys.

For example, where a marriage surveyor might ask, "How many times a week do you argue with your spouse?" a fieldworker conducting an unstructured interview might ask, "How do you deal with conflict in your marriage?" As can be seen, a survey allows the rapid checking of boxes (which usually highlights issues that the surveyor has already decided are important), but the unstructured interview involves narrative discussion and discovery. Ideally, you will record unstructured interviews so that lengthy responses can be reviewed later; however, obtaining permission to record interviews requires a high level of trust.

Hausa farmers in West Africa allowed me to record unstructured interviews, which averaged 20 minutes each, only because I was known and trusted by them. Interestingly, the local Hausa women did not trust my female Hausa assistant, and preferred to talk to me without her. This is a testimony to the power of friendship and trust. [If you notice people are hesitant to talk, look for and try to remove barriers to trust and communication. Cultural and gender dynamics may influence how freely people are willing to communicate.]

5. Debriefing with key individuals. Once you have conducted interviews you will need to do some analysis. This step is crucial for developing and testing hypotheses, without which you will not increase your understanding beyond a cursory level. You will want to hire a few local people who speak the language and who also possess enough formal education to help with analysis of the interviews. Debriefing is an iterative process; after each discussion of observations and tentative conclusions, you return to interviewing with a greater understanding of the issues, which in turn allows you to ask more insightful questions. Typically this process is repeated until "data saturation" is achieved, which means that no new information or insights are gained.

One feature of any community is the division between powerful and powerless individuals, and local leaders typically maintain control of major activities and priorities in a way that reinforces their control. Meeting with someone who knows and understands the issues can help you see these invisible structures buried within every community. Without this key knowledge, we as facilitators may wind up promoting the wrong activities.

Figure 3. A Hausa facilitator demonstrates the productivity advantage of *Zai* (right) over traditional (left) millet farms. *Source: Joel Matthews*

For example, my discussions with village women revealed that among the rural Hausa, the separate societies of men and women make it difficult, and possibly counterproductive, to ask men and women to work together. Nigerien women informed me that they never collaborate with men on business ventures because their husbands, brothers, or uncles would appropriate the profits. Similarly, I discovered that men are rarely involved in rotating savings and credit associations (ROSCAs) because the men's money boxes "have termites." I also found that, whereas women wanted activities that bound them together as a group, men wanted activities that they could carry out on their own. Without a proper debriefing, a facilitator is unlikely to perceive these subtle issues.

6. Facilitating a vision statement. Working as development facilitators should not be a platform to promote our pet ideas. Rather, we should focus on facilitation, which means helping community members assess *their* activities in terms of *their* vision for the future, and then helping them achieve that vision (Chambers 1983, 1997). This does not bar facilitators from introducing new plants and techniques, or presenting ideas such as how the Bible can be used to guide decision-making, but we should play a supporting, rather than a directing role. You may need to facilitate discussions detailing a vision for the future because without a clearly articulated vision, groups will find it difficult to organize their priorities and activities. Be sure to bear in mind what you have learned regarding social divisions within the community. Avoid mixing vulnerable subgroups with dominant groups, which will inevitably steer the vision toward the benefit of the latter. If you mishandle the process, you may worsen inequality by subjugating vulnerable groups to local elites. On the other hand, if you skip the process altogether, you may wind up leading the community down *your* path to the future, rather than *theirs*.

Final steps in development facilitation

Let's assume that a facilitator wanted to help a functioning women's gardening cooperative improve their productivity. She would want to spend several days observing the women's gardening activities while discussing motivations, decisions, plant varieties, technology, marketing, etc. Very few indigenous women's groups would be comfortable allowing a stranger to follow them around asking questions. However, once the facilitator had learned the language, achieved cultural competence, and developed friendships, she would very likely be offered an invitation to do just that. This is the point at which facilitators can suggest new ideas that fit with farmers' goals.

For example, while working among a group of farmers in Niger, West Africa, I suggested *Zai* holes, bee hives, and live fencing, all of which had been successfully established on my experimental farm. Although some farmers adopted *Zai* (Figure 3) and bee keeping, they never adopted live fencing (Figure 4).

This was a disappointment, since live fencing can protect gardens from animals and thieves, and can also provide

Figure 4. Researchers harvesting poles from a live fence on my experimental farm in Niger. *Source: Joel Matthews*

much-needed fire wood, building materials, fruits and nuts, and animal forage. Nevertheless, I had to let that go. In the end, it is more important to facilitate a process than a specific set of activities, because once community members understand and control that process, they can steer their future in any way that suits them. That is, after all, the whole point of people-centered sustainable development.

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Invasion of the Fall Armyworm

by Gene Fifer

Figure 5. Fall armyworm larva. *Source: Russ Ottens, University of Georgia, Bugwood.org* *Creative Commons Attribution License*

Fall armyworm (*Spodoptera frugiperda*) is a common pest in the Western Hemisphere affecting many commercial crops, most importantly maize. This voracious Lepidoptera (grouping of insects that includes butterflies and moths) was first detected in Central and Western Africa in 2016 and has quickly spread throughout the continent. Fall armyworms thrive in tropical and sub-tropical climates but also spread to colder areas after overwintering in areas without severe freezes. Adult moths spread quickly via strong winds (Capinera 2005).

Thousands of hectares of cropland have been affected in Togo, Nigeria, Ghana, Malawi, Zambia, Namibia, Mozambique, Uganda, Zimbabwe, and Western Kenya and Tanzania (Organic Farmer 2017). Field corn and sweet corn account for most of the economically significant losses, but sorghum, cotton, millet, peanut, rice, soybean, sugarcane, and wheat are susceptible, thus affecting both incomes and food security. The situation is so dire for smallholder farmers in Malawi that President Mutharika declared a state of disaster and mobilized government agencies to assist farmers and subsidize pesticides. Crops in Malawi most affected are maize, sorghum, and millet (Mumbere and Mtuwa 2017).

As adult moths disperse, females lay eggs on crop foliage. The eggs hatch in only two or three days. The larvae burrow into foliage (especially buds and new growth), corn silks and ears, and stalks (Figure 7). Larvae feed for approximately 14 days, drop to the ground, burrow 2-8 cm into the soil, then start their pupal stage. The adult moth emerges after 8 or 9 days, thus starting the cycle again. This short life cycle (25 days total) allows for several generations per crop cycle, leading to immense damage throughout the growing season (Capinera 2005).

Fall armyworms resemble other species of armyworms and corn earworm (*Helicoverpa zea*), but are distinguishable by coloration and markings. The moths have a 30-40 mm wingspan and are dark grey with mottled spots on the wings (Figure 6) (Organic Farmer 2017). Mature larvae can vary in color from tan to green to black, but have three white or yellow hairlines running down the back with darker stripes on the sides (Figure 5). They are not rough to the touch, lacking the small spines of corn earworms. The pupae hide in the soil in a 20-30 mm cocoon (Capinera 2005).

Synthetic insecticides are most commonly used for fall armyworm management in large-scale mono-crops in the US, including organophosphates and carbamates. Due to multiple generations and continuous crop damage, spraying schedules tend to be long and expensive. Over the years, fall armyworms have also shown resistance to some of these insecticides. This growing resistance and the health risks to humans, non-target insects, and animal populations led to the development of several organic and biological controls (Yu 1991, Capinera 2005).

Neem-based pesticides and pyrethrum are natural chemical options (Organic Farmer 2017). Applications of the bacteria *Bacillus thuringiensis* (Bt), the fungi *Beauveria bassiana*, and various Baculoviruses impair

Figure 6. Fall armyworm adult (moth). *Source: Lyle Buss, University of Florida, Bugwood.org* *Creative Commons Attribution License*

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Figure 7. Fall armyworm in maize. *Source: Charles Bonaventure*

feeding or reproductive functions of larvae (FAO 2018). Parasitic wasps and flies can be released into fields to interrupt the life cycle. Naturally occurring predators include beetles, earwigs, soldier bugs, and many bird species; to promote natural predators, avoid spraying wide spectrum insecticides that can negatively affect them (Capinera 2005).

A promising control strategy for fall armyworm and several other pests is a push-pull intercropping technique in which crops that naturally repulse or discourage pests are intermixed with the main crop, while a crop attractive to pests is planted outside the crop field. An effective push-pull companion cropping system for maize uses *Desmodium intortum*, commonly named greenleaf desmodium, planted in the corn rows as a short, climbing legume (Figure 8). Like other legumes, desmodium plants fix nitrogen with the help of bacteria in their roots (which may improve maize yields). Desmodium can be used for forage and fodder, along with maize stalk crop residues after harvest. *Desmodium intortum* emits a chemical that repels several caterpillar species, including fall armyworm (Midega *et al*. 2010, 2018).

The "pull" part of the strategy utilizes fodder grass species, often vetiver (*Chrysopogon zizanioides*) or *Brachiaria* spp., as a border crop around the maize field to attract the adult moths. The moths lay eggs on the trap crop, but the larvae's survival rate is low on vetiver grass (Berg *et al.* 2003), resulting in decreased populations. This strategy has been found to reduce larvae by over 80% per maize plant, and to increase maize grain production up to 2.7 times the production of mono-cropped maize (Midega *et al.* 2018).

Figure 8. *Desmodium intortum* intercropped with maize. *Source: Holly Sobetski*

Improved maize harvest is only partially attributable to decreased fall armyworm damage and reduced populations of other

From the Frontlines

Dan McGrath is an independent consulting entomologist, and a retired professor from Oregon State University. Over the past couple of years, he has worked for several organizations including USAID. He told us, "Since 2016, my focus has been on fall armyworm in Africa. I happened to be in West Africa shortly after the fall armyworm landed on the continent (and blew up). As the insect has spread throughout Africa (about 40 countries), I have moved along with it, sharing what we learned during the earlier stages of the outbreak."

Dan shared some information about fall armyworm (FAW) in an e-mail list. Excerpts are below, shared with his permission:

"My primary focus is the introduction of two concepts, 1) the untreated control, and 2) the power of replication. The challenge of fall armyworm is that it is complex. Foliar damage is dramatic, but depending on the timing, it may or may not result in significant yield loss. A well-timed tropical rainstorm kills small worms and can clean up a problem. As a result of the complexity of the insect/maize interaction, a lot of false positive results are spread among the small-holder farmers. Part of the NGO community is so dedicated to low-input, organic agriculture that they run with these false positives and encourage smallholder farmers to spend thousands of hours on control methods that may not be worth their time.

"We are setting farmers up with pheromone traps and instructing them on how to assess risk of crop damage (field scouting) and coupling these activities with simple paired comparisons replicated across several farms. In other words, they take four sticks and some string and cordon off an area where they do not apply the soapy water, where they do not pluck worms by hand, and compare the yield at the end of the season.

"I recommend that you take a hard look at the push-pull planting systems, originally designed for maize stalk borer. Organic activists insist the same system works with fall armyworm. This needs more rigorous testing. It may be a good approach for smallholders, but we need to be sure that it is worth the labor and the costs. Just because smallholders do not deal in "cash" for their inputs, does not mean that their labor is without value.

"We have some lab results for botanicals that need field testing [Neem, *Azadirachta indica*, was one of the most effective in the lab]. There are certified organic materials that work, including *Bacillus thuringiensis.* Multiple applications are required.

"First message: Don't panic. We are in the middle of a plague. All plagues come to an end. Plagues result when insect pest populations first arrive, following a series of weather events, and ahead of the diseases and natural enemies that would normally regulate their populations.

"West Africa is entering into its third year of the FAW plague. There are signs and growing evidence that the plague is beginning to subside. The insect diseases and natural enemies of the African armyworm (*Spodoptera exempta*) are beginning to switch over onto the recently arrived fall armyworm.

"In East Africa, they are entering into the second year of the plague. Generally, the second year is the worst. The FAW population has become established, but the regulation of the population has just gotten started. In time, FAW will settle down. When it does, there will be high pressure years and low pressure years, just like the African armyworm. Tell the growers that in time, things will settle down."

caterpillar species. The push-pull system also reduces striga (*Striga hermonthica*) weed infestation, and improves soil health through nitrogen fixation, increased soil organic matter, and erosion control. Desmodium seems to exude an allelopathic chemical that weakens striga (Khan *et al.* 2002, Midega *et al.* 2010).

Additional costs and challenges must also be considered. Total labor costs are higher in the intercropped push-pull system due to additional planting and weeding time, and seed cost and lack of seed availability can exclude some farmers. However, total revenue may exceed the initial investment, especially when the benefit of increased livestock forage is considered. Subsidies and extension services need to be inclusive so that farmers of all incomes and farm sizes are given appropriate, in-context training and resources (Midega *et al.* 2010).

The challenges facing farm families threatened by crop losses from fall armyworm and multiple other pests are escalating across Africa. FAO offers a mobile app called the Fall Armyworm Monitoring and Early Warning system "to identify, report the level of infestation, and map the spread of this destructive insect, as well as to describe its natural enemies and the measures that are most effective in managing it." ECHO resources on Integrated Pest Management can be found here.

An excellent worksheet on fall armyworm identification and scouting protocols can also be found at ECHOcommunity. This worksheet was created by Neil Rowe-Miller and Putso Nyathi with Mennonite Central Committee, through their partnership with Canadian Foodgrains Bank promoting conservation agriculture in East and Southern Africa.

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ECHOES FROM OUR NETWORK

Millipede Damage after First Rains

Insights from Senegal

Noah Elhardt works with Beersheba Project in Senegal. In August, 2017, he mentioned in a Facebook post that farmers were transplanting millet seedlings into their mulched field (Figure 9) as a strategy to combat millipede attacks, which he said often decimate young seedlings in fields that were seeded later than the very first rains. ECHO contacted Noah for more information, since we have heard from other farmers that also deal with millipede damage.

"A neighboring farmer tried some FFF techniques a couple of years ago, after seeing them work on the farm. He seeded a week or two after the first rains, and lost his entire crop to millipedes. He hasn't tried FFF since.

"This year, our communal class plots at the project are flourishing: beans, sorghum, millet and corn alike. All of these were planted the day of the first rain. Many of our interns (who have their own FFF plots) were running a little behind, and didn't get their seed into the ground until a week or more later, at which point they had nearly 100% loss on millet and sorghum and medium losses on beans, mostly to millipedes. Those interns that sowed millet early and heavy were able to get a good stand. From what we've observed, the millipedes come out in mass about a week into the rainy season. If you have seed in the ground before the rain (as local farmers here do with millet) or if you are ready to seed with the first good rain, I think you can get ahead of them. Otherwise, they can be pretty devastating. Several farmers/interns have commented on a link between mulch and millipedes, but I'm not yet able to define what that link is. It is certainly possible to have success with lots of mulch (we would have lost our entire corn crop this year without it!), but I think timing of seeding and/or mulching might be critical if millipedes are a problem.

Figure 9. Transplanting into a mulched field. *Source: Noah Elhardt*

"We asked Benoit, the former intern with the longest experience with FFF, if he has any problems with millipedes. He said yes, he does. How does he combat them? He kills every millipede he sees with his hoe. I guess he spends a lot of time in his field."

Noah gave an update in late September. "To review, we lost some of our millet and most of our sorghum fields that were planted more than a week after the first rains this year to millipede predation during the seedling stage. This has been a problem here in the past, both on and off our farm. Because these were FFF plots, our interns didn't want to waste the compost-filled, mulched *Zai* holes. As we were thinning

other, successful millet and sorghum fields (those that had been seeded with the first rain), many interns opted to take the plants that were thinned (ripped out of the ground), top them (remove the upper shoot portion), and transplant them into their failed FFF plots.

“11 days into the rainy season, we underwent a 3-week dry spell. Otherwise, this has been an average rainy season in length (3 months) and rainfall (~500 mm). We transplanted on days 32 to 35 (first rain after dry spell). We probably would have transplanted sooner had rains allowed.

“Despite undergoing significant transplant shock (again, these were plants ripped out of a field, not gently transplanted from a nursery), both the millet and sorghum plots produced a harvest. Because of heavy bird predation on most of our plots, I won't have meaningful data on comparative grain production. However, as you can see from the photos in Figure 10, the transplanted plots are significantly shorter than, and physiologically behind, the direct seeded plots, but are still producing a reasonable harvest. I would wager that the transplant shock could be reduced by starting seedlings in a nursery, and that transplanting them earlier in the rainy season (if the nursery is seeded before the onset of rains) would allow for a longer growing season and would offset the impact of transplant shock. This would also allow one to get a few weeks ahead of the weeds!”

Figure 10. Direct seeded millet (top) and transplanted millet (bottom). *Source: Noah Elhardt*

Insights from Uganda

Millipedes have also been an issue in Uganda. Bill Stough gathered and shared some information with Bob Hargrave:

“The millipedes come out (rather plague like) and eat the planted seeds, in the ground before they germinate. They particularly devastate beans (almost totally), but also the maize and cassava. With cassava they eat the areas which should be the budding place, so nothing shoots. They seem to come predominantly in one geographical area, the immediate community. Adjacent areas are not affected. I couldn't ascertain whether the soils differed in the neighboring villages. They come after the long dry season (it is in a bi-modal region), almost immediately following the initial rains. Thereafter through the year they are not a problem. In the short-rain season they are not a problem.

“This has happened as long as people can remember. They simply plant and lose a substantial percentage of their crops, and that's the way it is. Coming off the dry season and moving into the hungry time, they have little choice but to just take their chances. They seemed to think that the millipedes liked to live under the mulch blanket. I couldn't get a sense if they thought the mulch blanket increased the problem. But for sure they burrowed into the ground and targeted the seeds. Virtually every Farming God's Way plot lost their beans completely in an initial implementation. Interestingly, one man had a bumper crop of beans from his three rows, and no problems with his maize. He had planted before the rains, and almost immediately after he planted there was a very large rain. He had good germination and good harvest, and no loss to the millipedes. (He had actually failed to follow instructions to wait to plant until after knowing the rains had come for certain; we don't recommend dry planting due to the risk related to the unpredictability of the rain actually coming, and the possibility of losing the seed.)

“There seems to be something out of balance going on.

“Questions and thoughts offered: What is their primary food source - is there something of an answer in the fact that the millipedes are there at the start then gone? Has their real food source arrived? Could a delayed planting by 10 days or longer be the answer? Another mechanism to validate is SCALE - is this mulch blanket acting as the only available cover in the FGW fields, the only true climatic climax ecosystem available? So is the scale too small to be an indicator of pest activity?

“Neem, one of the best natural pesticides available, has been suggested as a solution. Other organic pesticides are great repellants which should work on millipedes. There is a good one [*Producing Food Without Pesticides*] by Lowell Fuglie.

“But I'm really feeling there is something off in the ecosystem—one factor being that it was an issue during traditional methods prior to the introduction of mulching.”

Research related insights

Tim Motis found a thesis by Ernst Ebregt on millipedes and sweet potato weevils in Uganda (http://edepot.wur.nl/41168).

Tim commented, “I can see where it would be hard to design a research effort around an event that only occurs such a short time during the year. If you do try any of the trapping or baiting interventions in Ebregt’s thesis, I would be very curious to hear how they work.”

Quoted below are some potential measures that appear towards the end (page 150-151) of Ebregt's thesis:

"Handpicking of millipedes

"During early morning hours and cloudy/ rainy days in the beginning of the first rainy season (for example in north-eastern Uganda in March/April), millipedes can be seen moving around in abundant numbers. By then they can be easily collected by means of handpicking.

"Trapping millipedes

"Millipedes are generally active during the night. During daytime, they hide themselves in refuges. Preliminary research has been done, catching millipedes with baited pitfall traps, and with the help of piles of heaped grass/sweet potato vines or roof tiles.

"Baited pitfall traps

"In a preliminary experiment by the author, baited traps were planted in a sweet potato field. ‘Extracts’ of groundnut, sweet potato, cassava, and maize as well as molasses were used as baits. However, the baits and their constitution should be improved and other promising suitable baits should be tried out as well... Follow-up field experiments with baited pitfall traps in sweet potato, groundnut, maize and cassava fields should be done.

"Grass heaps as 'traps'

"In another preliminary experiment, it appeared that piled grass in heaps, originating from a cleared sweet potato field, functioned as biological 'traps'. The advantage was that local, low-cost material could be used. Heaped piles of sweet potato vines also did well. Field experiments should be designed and carried out.

"Roof tiles as 'traps'

"In another preliminary field experiment, roof tiles appeared to be hiding places for millipedes during daytime. However, during hot sunny days, millipedes dug themselves in the soil and were difficult to retrieve. A disadvantage was that roof tiles were rare in the village. The efficiency of roof tiles or other possible devices, which function as a 'traps', should be tried out in the field.

"Use of botanicals to control millipedes

"... In preliminary research in north-eastern Uganda, extracts of the neem tree (*Azadirachta indica*), goat weed (*Ageratum conyzoides*), African marigold (*Tagetes* spp.), tobacco (*Nicotiana tabacum*) and chilies (*Capsicum* spp.) were used. So were ash and goat droppings soaked in urine. These showed poor results due to logistic problems and dry weather conditions. Laboratory and field trials to determine the repellent and insecticidal effects of extracts of local plants on sweet potato weevils and millipedes are crucial. Such trials can be used to assess the relevance of control options, which fit in an integrated crop production and pest management approach in sweet potato, groundnut, maize and cassava."

FROM ECHO'S SEED BANK

Patience and Passion

by Gene Fifer

Passionfruit can take 12 to 18 months to fruit after planting, but patient care will be rewarded with beautiful flowers and tasty, aromatic fruit. Passionfruit is similar in flavor to guava. Its juice is enjoyed on its own or mixed with other tropical juices, and the pulp is used in sauces, gelatin, candies, jams, ice cream, and pastry fillings. The ovoid fruit is 4 to 7 cm in diameter and contains high levels of vitamins A and C.

Figure 11. Passionfruit flower and leaves. *Source: Stacy Reader*

There are both purple (*Passiflora edulis*), and yellow (*Passiflora ligularis)* forms of passionfruit. Both kinds of passionfruit are called by other common names, including granadilla, maracuja peroba, and linmangkon. Purple passionfruit is best suited to subtropical climates, whereas yellow varieties grow best in hotter, more humid tropical climates. Fruits of the purple form, as the name implies, turn dark purple or black when they mature. The skin also wrinkles when the fruit is mature.

If growing passionfruit from seed, you will need to let the fresh seed ferment a couple of days in its pulp. Alternatively, you can scarify the seed to break its seed coat. When large enough, seedlings can be planted or grafted to a variety known for productivity and disease resistance. Passionfruit vines have shallow but spreading root systems, and must be watered adequately to ensure flowering and fruiting. They require good soil fertility to produce large harvests. Passionfruit vines flower and fruit year-round in warm climates, but flowering will be disrupted by water stress, low soil fertility, weed competition, short daylight hours, and/or cool temperatures.

Vines grow best on trellises and fences. Prune them frequently to maintain vigor, to promote flowering and fruiting, and to cull insect- and disease-damaged plant tissue. Passionfruit plants are susceptible to many insects and diseases, including passion vine mites and leafhoppers, stink bugs, thrips, weevils, beetles, red scale, aphids, nematodes, Septoria spot, Phytophthora blight, and Fusarium wilt. This susceptibility weakens vines, so they should be replaced after 5 to 8 years. Grafting onto disease-resistant rootstock improves vine longevity. Development workers who are members of ECHOcommunity.org may request a complimentary trial packet of seed (visit the ECHO Global Seed Bank online for more information).

Figure 12. Purple passionfruit fuit. *Source: ECHO Staff*

For further reading

Morton, J. 1987. Passionfruit. p. 320–328. In: Fruits of warm climates. Julia F. Morton, Miami, FL.

PROTA4U. Plant Resources of Tropical Africa.

CABI. *Passiflora ligularis.*

BOOKS, WEB SITES AND OTHER RESOURCES

Refugee Resources: Building for the future in refugee camps

by Gene Fifer

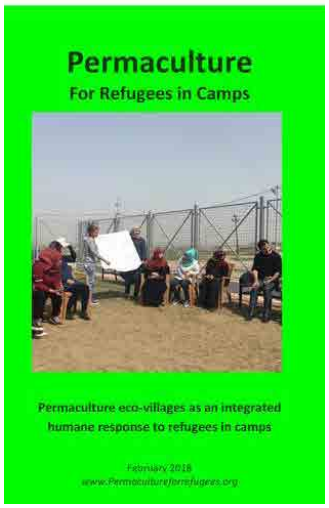
Over 65 million people worldwide are refugees according to the United Nations. Displacement by conflict and persecution not only destroys homes and community, it also disrupts schooling, jobs, culture, and traditions. Refugee camps thrust desperate people into overcrowded and chaotic conditions. Even so, ways can be found to build community, instill resilience, and empower the vulnerable.

Here we highlight three organizations working with refugees in camps to address problems in creative ways. Permaculture for Refugees is a group dedicated to bringing the ecological design and community development principles of permaculture to displaced people. Their publication, *Permaculture for Refugees in Camps*, focuses on how camps face the same problems as villages, neighborhoods, and cities everywhere. The issues of safe drinking water, waste disposal, shelter, food security, education, healthcare, and livelihoods can be addressed in collaborative, creative, and empowering ways that might have been untraditional in their communities of origin. Businesses and services that might typically be owned and operated by an individual or family might be better addressed by groups and associations in a camp environment.

Examples range from sports and play areas for children; camp beautification and community gardens; collection and efficient use of water and fuelwood; savings groups and business incubators; and child and adult education. Shared crises can lead to a cooperative spirit to build consensus around priorities, goal setting, and group problem-solving. Camps result in new neighbors, so learning about each other's skills and talents is critical.

PermacultureForRefugees (P4R) has released their first booklet in a series to bring permaculture solutions to refugee situations. **Permaculture for Refugees in Camps** is a 20-page how-to guide outlining a positive approach to transforming refugee camps. It is the culmination of ideas, experience and knowledge based on discussion, writings, research and the shared experience of the founding members of the P4R working group. The document is edited by Ruth Harvey and Rowe Morrow.

The booklet reframes the period of limbo in camps, from enforced idleness and desperation to a time of learning and building relationships with land and each other. Working from ethics, it introduces eco-design methods. It presents principles and strategies that can empower disenfranchised communities and give them permaculture skills and knowledge to take into the next stage, whatever it may be.



The Lemon Tree Trust cultivates community by promoting urban agriculture, demonstration gardens, and doorstep gardens with displaced people. Trees for the Future teaches a land restoration model called The Forest Garden Solution that can apply to land surrounding refugee camps, and that is especially important for the food security of the long-term displaced. These three organizations provide innovative ideas for refugees in camps and new approaches for re-establishing their communities back home.

Further Reading:

Gardens of Hope

Urban Agriculture and Forced Displacement

Transforming Land, Transforming Lives

Agroforestry for Refugee Camps

One Shot: Trees as Our Last Chance for Survival

UPCOMING EVENTS

ECHO Florida Events:

Location: ECHO Global Farm, USA
Presented by: ECHO

Tropical Agriculture Development: The Basics
July 23-27, 2018

Introduction to Underutilized and Tropical Crops: Growing, harvesting, preparation
September 10-14, 2018

ECHO's 25th Annual International Agriculture Conference
November 13-15, 2018

More information and registration details can be found on www.ECHOcommunity.org.

ECHO Asia Events:

Myanmar Seed Saving Workshop
June 5-6, 2018
Location: Sustainable Agriculture Training Center Nyaung Tagar Village, Hmawbi, Yangon Region

ECHO East Africa Events:

Best Practices to Improve Nutrition in Dryland Areas Symposium
August 7-9, 2018

Location: Naura Springs Hotel, Arusha, Tanzania

ECHO West Africa Events:

West Africa Regional Forum (in French)
May 8-11, 2018
Location: Ouagadougou, Burkina Faso

Nigeria Workshop I (in English)
May 22-25, 2018
Location: Jos

Nigeria Workshop II (in English)
May 29-June 1, 2018
Location: Ibadan

Please contact Noemi Kara (knoemi@echonet.org) for more information on these trainings.

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!