

Dear friends of ECHO,

Thank you for your interest in research that addresses challenges faced by small-scale farmers. We envision a growing network of research-minded individuals and organizations involved in varying forms of research, from informal side-by-side comparisons of treatments to fully randomized and replicated trials, that helps defeat hunger. This Research Newsletter will update you on research happening at ECHO and provide opportunities for engagement.

RESEARCH UPDATES

ECHO Asia

Enhancing Food Security in Northern Thailand: Characterization, Cultivation, and Adoption of Neglected and Underutilized Species

by Gracie Carter, PhD candidate in Plant Sciences at the University of Tennessee, Knoxville

Upland smallholder systems in Northern Thailand are increasingly vulnerable to food security risks due to climate variability, soil degradation, and declining agroecological diversity. Integrating neglected and underutilized species (NUS) into local agroecosystems provides a promising pathway to address these challenges while also improving dietary diversity and system resilience. NUS, particularly leafy vegetable NUS, offer significant potential to address malnutrition and contribute to agroecological sustainability, yet remain insufficiently characterized and underrepresented in mainstream horticultural research and extension efforts.

In collaboration with ECHO Asia, I've been conducting research that aims to fill knowledge gaps, address agrifood system weaknesses, and promote adoption of NUS by (1) identifying leafy vegetable NUS that have potential to improve food security among Northern Thailand smallholders and (2) determining evidence-based horticultural practices that optimize production and adoption of select NUS in Thailand and the wider Southeast Asia region.

My research employs a two-phase participatory approach consisting of a participatory rural appraisal (PRA) and participatory research trials. Through this approach, farmers are engaged not only as participants, but as co-researchers, ensuring findings reflect both scientific and local knowledge. The phase one PRA was conducted in January 2026 with three upland Karen villages located across varying agroecological zones. The purpose was to establish an understanding of the study communities' food security conditions, characteristics, norms, challenges, and relationship to NUS. PRA results were used to identify two community-selected NUS for phase two horticultural research trials: vegetable fern (*Diplazium esculentum*) and hor-wo (*Elsholtzia communis*). Phase two began in May and is ongoing, consisting of the following research trials:

Vegetable Fern Study

Vegetable fern (*Diplazium esculentum*), locally called pak kood (Thai) and plo-ple-dor (Karen), is a nutritious perennial fern widely enjoyed across Northern Thailand. However, increasing land use restrictions and climate variability have made wild harvesting more difficult, particularly in the dry season. Successful home garden cultivation could provide families with year-round access and a source of additional income, but optimal

growing conditions for resource-limited smallholders remain poorly understood. To address this, the research uses a participatory Mother-Baby Trial design. The “Mother trial” at ECHO Asia tests two shade levels crossed with five organic amendment treatments, measuring growth, yield, water use efficiency, and nutritional quality. “Baby trials” established in participating farmer home gardens across the three study villages test a simplified subset of treatments, with farmer qualitative assessments to be collected at the conclusion of the study. Together, the two trials aim to produce cultivation recommendations that are both scientifically grounded and validated through farmers’ own experience.

Hor-wo Study

Hor-wo (*Elsholtzia communis*) is a culturally important annual herb used by Karen communities in Northern Thailand as both a spice and a side-dish vegetable. Villagers across all three study communities report declining yields, which they attribute to restrictions on traditional rotational shifting cultivation (RSC). A key component of RSC is the burning of a fallow field prior to planting to prepare the soil, and the residual ash is considered essential for optimal hor-wo production. Many upland Karen villages now fall within protected national park boundaries, and open burning is increasingly prohibited. Hor-wo likely benefits from some combination of a post-burn fertility spike and an increase in soil pH, among other factors, but the exact role of ash is unclear. To characterize the soil conditions hor-wo needs to thrive, soil samples were taken of unburned fields, burned fields, and home gardens across upland villages. To investigate whether ash amendments can serve as a practical substitute to open burning, rice husk ash and bamboo ash were applied at two application rates in both acidic and near-neutral soils to assess germination success and seedling vigor.



Vegetable fern trial at the ECHO Asia Impact Center (top) and in the home garden of a participating farmer in San Din Daeng village (bottom).

Simple Ways to Check Seed Moisture before Storage

by Shaun Snoxell

Seeds that are too wet do not store well. If orthodox seeds are not sufficiently dried prior to storage, they are at increased risk of fungal growth, pest damage, or premature germination. Maintaining seed viability during storage can be challenging in tropical environments, where high humidity and temperature speed up seed deterioration. The majority of seed savers globally estimate seed moisture based on personal experience. However, high seed moisture is a common problem for seed storage. This creates a need for practical, low-cost methods that can reliably indicate whether seeds are sufficiently dry for safe storage.



Pros and cons of direct and indirect methods for assessing seed moisture.

within 1%. The equipment is a moderate, one-time expense that would be feasible for many seed savers. The process is easy and reasonably quick. Some expertise is needed to convert the observed eRH (equilibrium relative humidity) readings into seed moisture content estimations.

Testing Salt and Vinegar as a Natural Herbicide

Adapted from a study by Krit Suriyachaipun, Wipho Toecheer, Saeng Seiamrai, and Shaun Snoxell

Weeds are a persistent challenge at the ECHO Asia Impact Center, where farm staff aim to manage the farm organically. The team had developed its own low-cost weed spray from salt and vinegar, two ingredients that are cheap and easy to find in rural Thailand, and set up a simple trial to see how well it actually works. Three formulations were each mixed into 20 liters of water: low (2.5 kg salt, 0.5 L vinegar), medium (5 kg salt, 1 L vinegar), and high (7.5 kg salt, 1.5 L vinegar). Each was sprayed once, at 1 liter per square meter, on three 1 × 1 m plots of weedy lawn. Soil was tested before and after for pH, electrical conductivity (EC), and extractable sodium.



Partial weed control 12 days after application. *Photo: ECHO Asia Staff*

The medium and high formulas completely killed *Desmodium triflorum* and *Axonopus compressus* within 10 days. Hardier, deep-rooted weeds such as *Imperata cylindrica* and *Cyperus rotundus* showed leaf burn and partial dieback but began regrowing after about a week, and every plant treated with the low formula survived. The medium formula performed as well as the high formula at a lower cost (2.9 vs. 4.4 baht, or about US\$0.09 vs. \$0.14, per liter). Even so, it offers no cost advantage over synthetic herbicides, which are also inexpensive and widely available in Thailand.

Soil pH and EC stayed within normal, non-saline ranges. Extractable sodium, however, rose from

25 ppm to between 142 and 220 ppm depending on the formula. That is a moderate level that may already affect sodium-sensitive crops, and repeated applications would likely push it high enough to harm most crops. Given the limited effect on many weeds and the risk of sodium buildup, the team concluded that these recipes have limited potential for weed management. Results like these help others weigh an option honestly before investing time, money, and soil health in it.

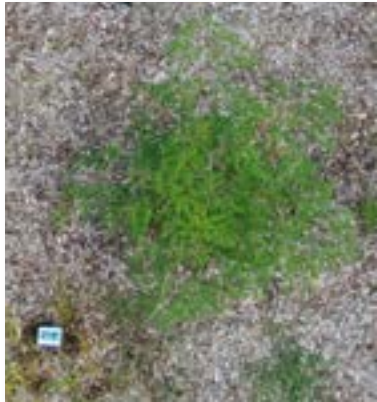
ECHO's Florida Site

Intercropping and pruning for *Moringa oleifera* pod production

Moringa is a fast-growing, underutilized perennial that produces nutrient-dense leaves and pods. Much of the research done with moringa has focused on production of leaf biomass that can be dried and used to supplement the nutrition of traditional foods. This research focuses on the often-overlooked, tender pods used in South Asian cooking. Named moringa varieties such as PKM-1 were developed for optimal pod-related factors like yield, length, and tenderness.



Moringa seedlings planted late June 2026.



Aerial drone images of a single moringa tree (left) and ImageJ processing of leaf area based on color threshold and in-photo calibration.



Trees grown for pod or seed production need to be spaced further apart than those for leaf biomass. Trees that we are growing for seed production, for example, are spaced about 3 m apart within and between rows. We wanted to assess the feasibility of intercropping to make better use of the space between moringa trees. We also want to know if pruning results in pods being formed closer to the

ground, and thus easier to harvest, while also enhancing pod production in comparison to no pruning. We started a trial in June 2026 that will assess pod production with and without katuk as an understory crop and with and without pruning. We are utilizing drone photo capture to approximate canopy coverage using ImageJ processing. We anticipate having results to present for the IV International Symposium on Moringa, to be held 6-9 October 2027 in San Diego, California.

IV International Symposium on Underutilized Plant Species

The proceedings (Acta Horticulturae 1460) for the IV International Symposium on Underutilized Plant Species have now been published! The symposium was held by ECHO in October 2025 under the auspices of the International Society for Horticultural Science (ISHS). You can explore 42 articles covering keynote, oral, and poster presentations.

Here are links to access research and details of the event:

- Titles and abstracts: View the full collection of research articles directly via <https://ishs.org/ishs-book/1460/>
- Symposium overview: Access the proceedings and event dates/details on the ISHS Event Page: <https://ishs.org/symposium/625/>

Content includes perspective on the relevance of underutilized plants and their role for rural and industrial development, as well as scientific reports on aspects of nutrition, post-harvest processing, crop management, environmental adaptations and requirements, and genetic resources. Full-text articles are available via purchase or ISHS member download credits.

WAYS TO PARTICIPATE IN RESEARCH

The 2026 ECHO International Agriculture Conference (EIAC) is coming up fast! It will be held in Fort Myers, Florida, November 10-12, and will include a poster session and an on-farm research walk.

Present a Poster at EIAC 2026

If you have experimented with an innovation or practice, or have lessons to share from a project, a poster is one of the simplest ways to get that knowledge in front of people who can learn from it and build on it. The poster session gives delegates another way, alongside talks and workshops, to exchange ideas, and you will have time to talk with others about your work one-on-one. Posters should relate to small-scale agriculture or community development and feature practices that are affordable and can be carried out with local resources. We welcome three kinds of posters:

- **Research summaries** share findings from any level of experimentation. This fits scientists, graduate students, and student researchers, as well as practitioners reporting on farmer field trials, observation trials on project sites, or survey results.
- **Development project summaries** share lessons learned from carrying out agriculture-related projects, such as how well a particular approach, production practice, or appropriate technology has worked.
- **Crop evaluations** describe how a crop, whether a grain, tree, fruit, vegetable, forage, legume, or neglected and underutilized species, has performed or been taken up by farmers in your part of the world.

To participate, complete the [Poster Submission Form](#), which includes an abstract of up to 250 words, **by November 2, 2026**. ECHO staff will review your submission and let you know when to move ahead. All presenters need to be [registered for the conference](#). Presenters design, print, and bring their own posters and cover those costs; ECHO provides the display space, easels, and mounting supplies. The form also lets you say whether we may post a PDF of your poster on [ECHOcommunity.org](#) afterward, so your work can keep reaching people long after November.

Most posters are built on a single PowerPoint slide, no more than 120 cm (48 inches) wide or tall. To make it easier, ECHO offers [single-column](#) and [double-column](#) templates. Readability matters most: use high-contrast text, one or two simple fonts, and graphs or photos in place of long tables. Give viewers the gist and save the details for conversation. Full guidance is on the [ECHO Poster Guidelines](#) page, and you can browse past examples at [edn.link/posters](#).

Share What You Have Learned in an ECHO Publication

Whether or not you can join us in Florida, consider writing up your experience for an ECHO publication so it can reach practitioners across the network. [ECHO Development Notes \(EDN\)](#) share practical, field-tested information on growing food under difficult conditions, including

a regular “Echoes from Our Network” feature written by network members. [ECHO Research Notes](#) report the results of first-hand trials by ECHO staff and network members alike, and [Technical Notes](#) explore a topic in more depth. ECHO welcomes community contributions to all of these. Start with the [Author Instructions](#) page, then download the [submission template](#), which has headings, fonts, and style suggestions, along with an [example submission](#). A short training video on ECHO’s writing style and recent issues are available on the [ECHO Publications](#) page. Trials that turned out differently than expected, like the herbicide trial above, are just as welcome as successes.

Best regards,



Tim Motis, Ph.D.

Global Research and Publications Director

ECHO Inc.

To correspond with ideas and feedback about the topics of this newsletter, email publishing@echonet.org.



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ECHO is a non-profit Christian organization.

For further resources, including networking with other agricultural and community development practitioners, please visit our website: www.ECHOcommunity.org. ECHO’s general information website can be found at: www.echonet.org.

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