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Gracious Greetings from the New Regional Director of ECHO Asia

by Dr. Eduardo A. Sabio

Dear colleagues, friends and subscribers, you may have known that in the past couple of months, the leadership of ECHO Asia has been vacant due to the departure of my good predecessor, Dr. Abram Bicksler. That is not the case anymore. I am pleased to inform you that I have been designated recently as the Regional Director of ECHO Asia. And such, it is my pleasant task and distinct privilege to greet you all on behalf of my team based here in Chiang Mai, Thailand.

With deep gratitude, I wish to thank you all ECHO network members for continuous support of and participation in this ECHO Asia Notes published quarterly. Without your valuable participation, this newsletter would not sustain its wide readership and distribution, as well as its value addition to the different endeavors that we do as farmers, community development workers, teachers, managers, researchers, educators, social entrepreneurs, missionaries, trainers, leaders and others. To a significant degree, our inspiration and motives behind this quarterly publication hinge on our collective interests for information sharing, resourcing, networking and learning with and from each other. This is a public good that we, together, contribute to the greater society.

My greetings would be incomplete without introducing myself to all of you. Early on in my professional career right after completing my Bachelor of Science Degree in Agriculture from the Central Luzon State University in the Philippines, I got involved in Applied Research and Extension work in village communities dealing directly with farmer-cooperators. In working with these farmers, I learned a great deal of lessons and wisdom. Having been groomed with a technical lens for crops, insect pests and diseases by my University education, I came to discover the profound significance of human and social dimensions of people and communities in development work, and this newfound perspective told me that there is much more I need to know. This exposure was a wake-up call and thus

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a strong craving for more learning ensued. Shortly thereafter, I decided to pursue my Master's Degree in Development Management from the University of the Philippines, with cognate courses in rural sociology and extension education, with the aim of equipping myself in an interdisciplinary manner.

Equipped with a combination of technical knowledge and skills in agriculture, management of development programs and projects, and sociological discipline, I continued work in the field of community development, dovetailed with Action Research and International Training. As I delved into community and agricultural development programs and projects with various NGOs, Government Agencies, Research Institutions, the Academe and community-based organizations in and out of the Philippines through trainings, technical assistance, and action research, I recognized the need to build my capacity further. With a Fellowship grant from the International Institute of Rural Reconstruction (IIRR), I pursued my doctorate degree at Cornell University in the USA with a major field in Adult and Extension Education, and minor fields in Development Sociology, and International Agriculture and Rural Development.

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The ECHO Asia Impact Center operates under ECHO, a non-profit Christian organization that helps you help the poor to produce food in the developing world.

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My academic background, coupled with community-based practical experience, has equipped me with solid theory and practice in the fields of rural and agricultural development, training and learning, adult and extension education, development sociology, natural resources management, and action research. More specifically, I possess competences in program and partnership development, program and project management, participatory monitoring and evaluation, community-based education, community organizing, growth and development of community organizations, agro-enterprise development, livestock development, and sustainable agricultural chain development.

Prior to joining ECHO, I held the offices of Regional Director for Rikolto (formerly VECO), based in Vietnam; Country Director for Heifer International in the Philippines; and Program Head for the International Institute of Rural Reconstruction in the Philippines. My participatory, holistic and sustainable development paradigm has partly been shaped by professional experiences in at least a dozen countries in Asia, Latin America and Africa.

ECHO Asia is in a particularly exciting juncture at this time, with our Seed Bank recently relocated to our new Small Farm and Resource Center just about 25 minutes away from the heart of Chiang Mai. With this new site, our ability to conduct on-site trainings, applied research trials, seed production, as well as hosting conferences, is greatly enhanced. In addition, towards the latter part of this year, we plan to start-up a Regional Impact Team for South Asia. These twin initiatives are driving heightened enthusiasm among us here at the Asia team, for we will be able to contribute more to ECHO's institutional goal of Multiplying Impact through Direct Training and Global Resourcing.

I enjoin all of you to keep actively in touch with ECHO Asia to further enliven our network, and nurture this form of social capital which we all continue to benefit from.

Finally, I look forward to meeting most, if not all of you, directly and indirectly, as we journey together to empower our undernourished brothers and sisters in Asia with sustainable hunger solutions. Wishing peace and prosperity to all of you!

Preventing Insect Damage of Stored Seed Using Low-Cost Control Options

by Brian Lawrence[1], Abram J. Bicksler[1] and Kimberly Duncan[1]

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[Editor's Note: The following article comes out of research conducted by ECHO Asia staff and is a condensed version of an article that was recently published in Agronomy for Sustainable Development, an international peer-reviewed journal. The original article can be read on the Agronomy for Sustainable Development website.]

Introduction

Seed saving in sub-tropical and tropical climates is challenging. Without equipment designed to maintain dry and cool environments, the quality of seeds may quickly deteriorate. High temperature and humidity during storage increase seed metabolism and encourage the proliferation of seed-eating insects (Lale and Vidal, 2003; Upadhyay and Ahmad, 2011). Technologies such as refrigerators, dehumidifiers, and pesticides can help prevent these seed-damaging conditions, but may not be available to smallholder farmers in the tropics. Traditionally, many locally available treatments have been used to prevent insect pests. These treatments, typically added to seeds prior to storage, are meant to poison, damage, or discourage movement of insects around the seeds. Some treatments may effectively reduce insect growth, but they may also damage seed viability; it is important to identify which treatments are effective and appropriate for use by farmers. ECHO Asia research staff analyzed five low-cost treatments to determine their effectiveness in preventing the growth of a common seed storage pest called cowpea bruchids (*Callosobruchus maculatus*) in stored Lablab bean seeds (*Lablab purpureus* L.). In keeping with previous ECHO research by Croft et al. 2012, each treatment was also analyzed with and without vacuum sealing.

Seed pests like cowpea bruchids are difficult to detect, since they lay eggs on developing seeds in the field (Figure 1A) and hatch during storage to consume the mature seeds (Chauhan and Ghaffar 2002). The bruchids rapidly multiply under warm and humid conditions. Within a short period of time, they can consume large amounts of stored seeds, which otherwise would have been used for food or for planting the following year (Figure 1B). However, like all insects, bruchids cannot complete their life-cycles without oxygen (Ahn *et al.* 2013). Vacuum sealing can be used to reduce available oxygen to insects during storage (Van Huis 1991; see Figure 1C). The goal of this experiment was to explore low-cost seed treatment options along with vacuum

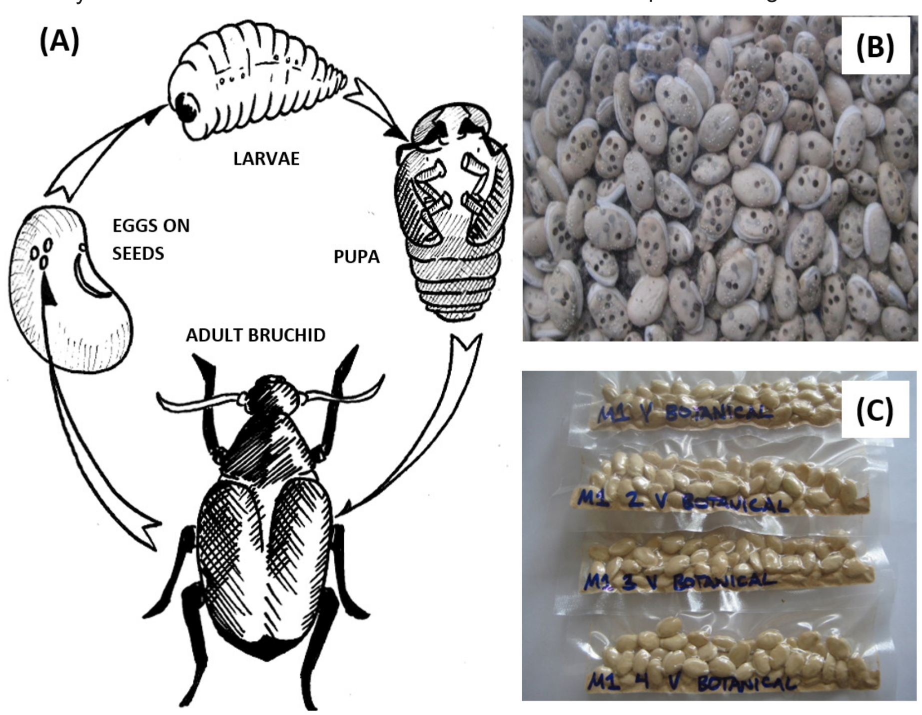

Figure 1: *The lifecycle of bruchid insects (A), the visible damage on seeds (B), and lablab seeds within bags during the trial (C).*

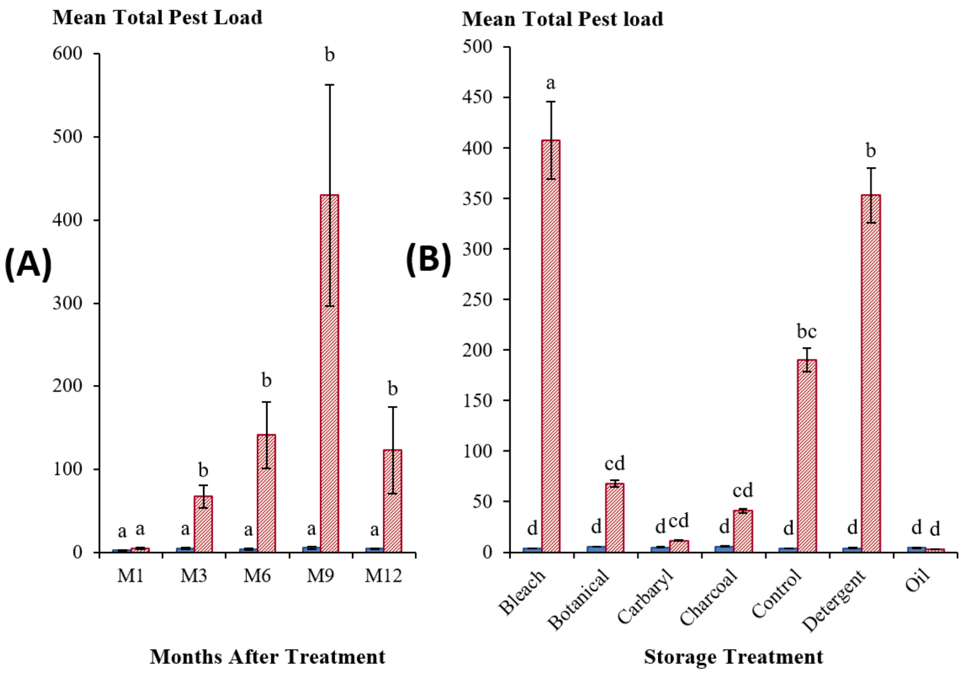

Figure 2: *Effect of vacuum sealing versus no vacuum sealing across all treatments combined (A) and effect of storage treatment (B) on bruchid presence between vacuum-sealed (solid blue) and non-vacuum-sealed (red stripe) seeds after one year. Vacuum sealing (blue stripe) prevented bruchid population growth throughout the study. Bleach and detergent did not prevent bruchid population growth, while the galangal, carbaryl, charcoal, and oil showed promise in preventing bruchid growth. Treatments with different letters are significantly different (P < 0.05) using Fishers least significant difference test.*

sealing, to determine how they affect the growth of bruchid insects and whether or not they maintain seed viability.

How We Set Up Our Experiment

We evaluated six different low-cost control options that are used when storing seeds in tropical environments; each of the treatments was suggested to us by an ECHO network member. For each treatment, some bags of seed were sealed under vacuum and others were sealed inside plastic bags without vacuum. The treatments were also compared to seeds without any additional treatment, both vacuum sealed and not, as controls. The treatments included:

1. 10% bleach solution, used to wash the seeds prior to storage;
2. Powdered galangal root (*Alpinia galanga* (L.) Willd.), mixed with seeds prior to storage;
3. Locally purchased carbaryl, combined with seeds prior to storage;
4. Pulverized bamboo charcoal, mixed with seeds prior to storage;
5. Powdered laundry detergent, mixed with seeds prior to storage;
6. Vegetable oil commonly used for cooking, mixed with seeds to coat them prior to storage.

We divided lablab seeds into plastic bags and applied the different control options. Over the following year, we evaluated the bags of seeds for bruchid presence and viability approximately every two months. We measured insect presence, or total pest load, by counting and adding the numbers of bruchid eggs, larva, adults, and insect holes called ‘windows’ on damaged seeds. We also tested seed viability each time, by testing the germination rates of the seed. We measured seed vigor by counting how many days it took until 50% of seeds germinated (this is important because uniform emergence of seedlings in the field matters to farmers, who frequently rely on specific periods of rainfall to plant their crops).

Results of the Experiment

Vacuum sealing proved to be overwhelmingly effective (Figure 2, A and B; results for vacuum sealing are in blue, beside the red-striped bars). Vacuum-sealed bags consistently prevented bruchid eggs and/or larvae from maturing and subsequently damaging the seeds. Vacuum sealing also maintained seed viability; after one year of storage, vacuum-sealed seeds maintained germination levels of 75-80%, while seeds that were not vacuum-sealed, and kept within plastic bags had germination rates of 65-70% (Figure 3A, page 4).

The low-cost treatments that were not vacuum-sealed showed varying levels of effectiveness ($P < 0.05$) against bruchid presence (Figure 2B). Bleach and laundry detergent were the least effective, while galangal powder, carbaryl, charcoal, and oil held bruchid populations at lower levels than the control. Only the oil treatment was statistically significantly lower ($P < 0.05$) than the control. The oil treatment reduced bruchid numbers equally well when samples were vacuum-sealed and when they were not vacuum-sealed. However, because of the oil’s negative effect on seed viability, is not a recommended control strategy (Figure 3B, page 4).

Seed viability did not differ significantly ($P > 0.05$) between vacuum-sealed and non-vacuum-sealed bags until the final sample month (Figure 3A). However, by the conclusion of the study, vacuum-sealed bags maintained initial viability, while non-vacuum-sealed bags showed some reduction (Figure 3A). The six treatments showed definite differences ($P < 0.01$) in seed viability throughout the study (Figure 3B). The bleach treatment reduced seed viability and also did little to prevent bruchid growth. While the oil treatment effectively prevented bruchid growth, it greatly reduced seed viability. All other treatments were comparable to the control, and did not cause any noticeable change in seed viability.

Both non-vacuum-sealed and vacuum-sealed seed samples had a similar pattern for seed vigor, measured in days that seeds took to reach 50% germination (Figure 4A, page 4). The spike at month 6 (M6) might be due to the cooler weather and to seasonal changes of less light and humidity. The subsequent downward trend, to fewer required days of germination, makes sense because warmer, springtime conditions occurred in the later portion of the trial. Individual treatments had little effect on the mean number of days it took for seeds to reach 50% germination. Seeds from all the individual treatments were affected by seasonal weather conditions in month 6 (Figure 4B, page 4).

Conclusions

Storing seeds by vacuum sealing them is a very effective means of preventing seed

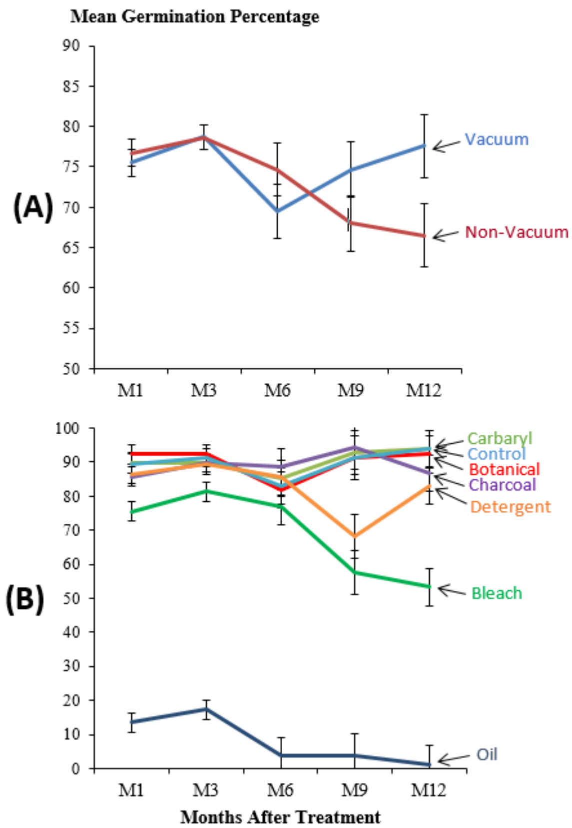

Figure 3: *Mean seed germination rate between vacuum-sealed (blue line) and non-vacuum-sealed (red line) samples (A), and between seed treatments over one year (B).*

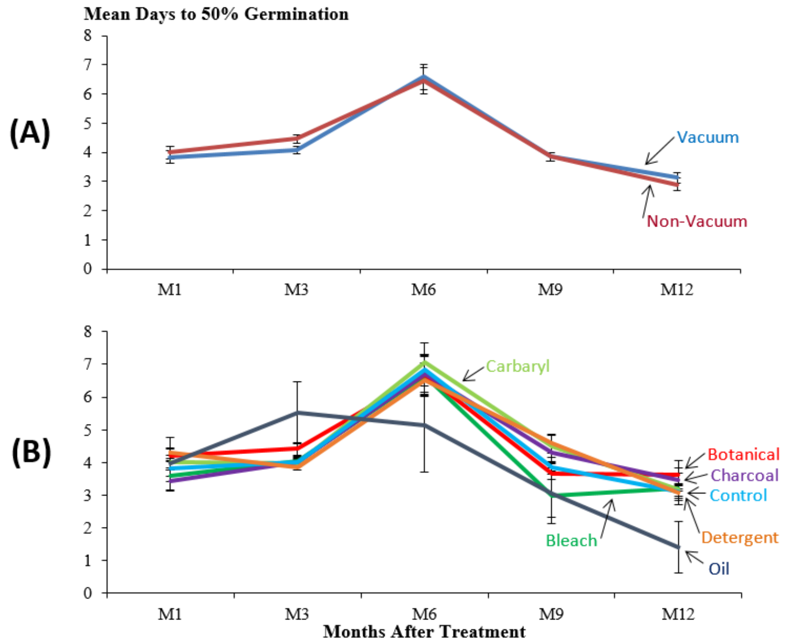

Figure 4: *Mean time to reach 50 percent germination between (A) vacuum-sealed seeds and non-vacuum-sealed seeds, and (B) treatments over one year.*

loss. The vacuum environment maintains seed viability over time. It also prevents the growth of insect populations that feed on stored seeds. One can create a vacuum inexpensively using appropriate technologies such as a bicycle pump, which can be reconfigured to pull air from containers.

If vacuum sealing is not a feasible solution in a particular context, several of the treatments described in this study appear to reduce bruchids while maintaining seed viability; these include carbaryl, charcoal, and galangal powder. The oil treatment also effectively prevented insect growth, but is not recommended as it greatly reduced seed viability.

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Rice Hull Gold: 10 On-Farm Uses of Rice Hulls

by Patrick Trail
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[Editor's note: During the establishment of our own Small Farm Resource Center here at the ECHO Asia Impact Center in Thailand, we have benefited greatly from the surrounding rice production 'waste products' (rice hulls and straw) that are readily available to us. Adding credence to our own favorite motto of 'use what you have to make what you need,' this locally available 'waste' product has been a tremendous resource, leading us to summarize for our network some of the many benefits and potential uses of this economical resource.]

Introduction

One of the great challenges of sustainable agriculture is the sourcing of adequate and affordable organic (*carbon based*) resources that can be used on-farm for the production of food and feed. Utilizing composts, manures, mulches, and other organic inputs from the farm is a challenge on its own, and the production of each often requires its own input of materials. These are materials that are often in direct competition of each other on the farm and a challenge to supply completely with smaller land holdings or available labor. A mulch for example, may be in direct competition with livestock fodder, thus making it a challenge to feed it out while still producing enough mulch. Using some of that same material to produce a compost or a fuel becomes even more challenging still.

After visiting many diverse small-scale farms in the region, it would seem that the most successful ones appear to share one common approach, and that is the identification of an available organic 'waste' product acquired off-farm and used as an input on-farm. One farm in the Philippines acquires fish scraps and waste from the local fish market and turns it into a fish-meal protein source to supplement livestock feed. Another farm in Thailand acquires large quantities of vegetable waste from local markets to supply its vermicompost system. Other farms are benefitting from their proximities to breweries, mills, and processing plants to acquire a wide variety of resources that are being used to create compost, biochar, and feed supplements among other things.

This article will summarize the many potential on-farm uses of one widely available 'waste' by-product that is readily available in many parts of the tropics: rice hulls.

Rice Hulls at a Glance

Rice hulls (or husks) are a by-product produced during the milling of rice (*Oryza sativa*) and are commonly considered a 'waste product' in many rice growing regions. Rice hulls are the tough outer layer of the rice grain, biologically referred to as the 'lemma', and hold low nutritive value compared to the grain (endosperm) itself. Rice hulls are not to be confused with rice bran; hulls detach from the grain in the first step of milling with the bran being milled separately to produce 'polished or white rice' (Figure 2). Rice bran has considerably higher nutritive value than rice hulls overall and are considered a more valuable by-product than that of the hulls, which are often discarded or piled to rot.

10 Potential On-Farm Uses of Rice Hulls

1. Compost Production and Soil Improvement

Perhaps the most obvious and common use of rice hulls is their use as a soil amendment, typically in the form of compost production. The primary advantage of using rice hulls is their availability in large quantities, and their ability to bulk up and increase the volume of compost that can be produced. Rice hulls provide a dense source of carbon which, when composted, can increase the water and nutrient holding capacity of soil, improve soil aggregation, porosity, infiltration, and many other key beneficial soil physical characteristics.

Keep in mind that rice hulls are high in carbon and should be mixed with additional nitrogen-rich materials such as green matter and manure in order to make a well-balanced soil amendment. It is worth noting that the high percentage of carbon provided by rice hulls makes for a good soil conditioner but does not in and of itself provide high amounts of plant essential nutrients needed for uptake. That being said, rice hulls must be mixed with other nutrient rich materials to make high quality compost to be used as a fertilizer. Rice hulls can also be mixed with cow or poultry manure simply to aid the ease of applications (Figure 3, page 6).

*Disclaimer: Applying rice hulls directly (without composting) to the soil repeatedly over time can bind up soil nitrogen. Soils must maintain a healthy balance of carbon and nitrogen, known as the C:N ratio. Rice hulls have a very high C:N ratio; over time as microbes work to break down this carbon, they will consume available nitrogen, potentially limiting its use by plants.

Figure 1: *Rice hulls (husks), a by-product of milling rice (*Oryza sativa*).*

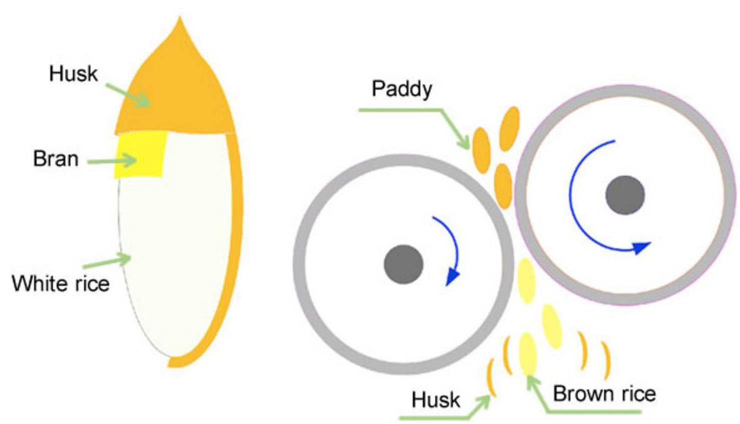

Figure 2: *Basic illustration of the rice milling process, with the individual separation of rice hulls (husks), bran, and white rice grain (Rice Knowledge Bank).*

Figure 3: *Farmer in northern Thailand using rice hulls (and a laundry basket) to improve the spreadability of poultry manure.*

2. Biochar Production

Turning rice hulls into a useful soil amendment can be taken one step further with the production of 'biochar'. Through the process of 'pyrolysis' (burning in a low oxygen environment), any carbon-based material can be transformed into charcoal. Charcoal is a highly porous and stabilized form of carbon that can be used to improve soil fertility when combined with other nutrient sources. This additional step of mixing, or 'ageing,' charcoal with nutrient sources such as manures and compost is what makes 'biochar' unique (see Dr. Michael Shafer's article in ECHO Asia Note #35) . On its own, a carbon based material serves little purpose to a plant in terms of providing it with carbon (remember plants take their carbon out of the atmosphere during photosynthesis, not from roots in the soil). However, these highly porous materials act as a sponge and when 'aged' are capable of holding and housing numerous other plant essential nutrients, water, and microbes, making it extremely valuable as a soil amendment/conditioner (see Bryan Hugill's article in ECHO Asia #9).

Different forms of activated charcoal and biochar can also be used in the filtration and purification of water. Several resources exist on the construction of different bio-sand water filters used for household consumption, including systems that are capable of removing synthetic chemicals such as pesticides and pharmaceutical residues (Kearns, 2014).

There are numerous methods and appropriate technologies currently available for producing biochar on the farm, including several designed specifically for the use of rice hulls.

3. Fuel and Briquette Production

Using simple appropriate technologies, rice hulls can be mixed with other carbon-based materials found on the farm and pressed into 'briquettes' that can be used as an alternative fuel source to firewood and charcoal (Figure 4). This simple process is highlighted in ECHO Technical Note #85 entitled Briquette Presses for Alternate Fuel Use. Rice hulls can also be used directly as a fuel source and do not necessarily need to be pressed into briquettes to be of use, this process simply adds value and can be used to produce briquettes for income generation. Several gasifier cook-stove models currently exist that are designed to run on rice hulls as a fuel source. Many of these models are designed to burn cleanly and efficiently, and even produce pyrolized rice hulls as a waste product that can be turned into biochar.

4. Supplemental Construction Material

Rice hulls can be used as a supplemental construction material in natural or sustainable building techniques such as earth-bag (Figure 5) or rammed-earth technology (Tosi, 2017). Rice hulls are useful in that they provide a natural material used for adding volume and bulk, they do not easily break down over time, and typically do not harbor molds or fungus due to their inability to absorb moisture. In addition, rice hulls are good insulators and are an extremely lightweight material.

5. Bedding for Hog/Chicken Deep Litter Systems

One of the more common uses of rice hulls in Asia is in animal husbandry, most commonly as a source of livestock bedding. Deep litter pig systems and deep litter chicken systems are common, and bring several benefits over conventional systems (see echocommunity.org's collection of resources). As a bedding material, rice hulls provide excellent drainage and can maintain a mostly dry environment compared to other materials while helping to improve the comfort and living conditions for livestock (Figure 6). Rice hulls can help to absorb smells and foul odors, create limited dust, and can eventually be removed and used as a soil amendment. Regular application of microbial sprays such as EM (Effective Microorganisms) and IMO (Indigenous Microorganisms) will aid

Figure 4: *Environmentally friendly briquette made from rice hulls at the Aloha House Farm, Philippines. (*Photo credit: Abram Bicksler*).*

Figure 5: *Earth-bag seed storage room under construction at the ECHO Asia Small Farm Resource Center. Bags are partially filled with rice hulls.*

Figure 6: *Deep litter pig production system using rice hulls as a primary bedding material, Aloha House Farm, Philippines.*

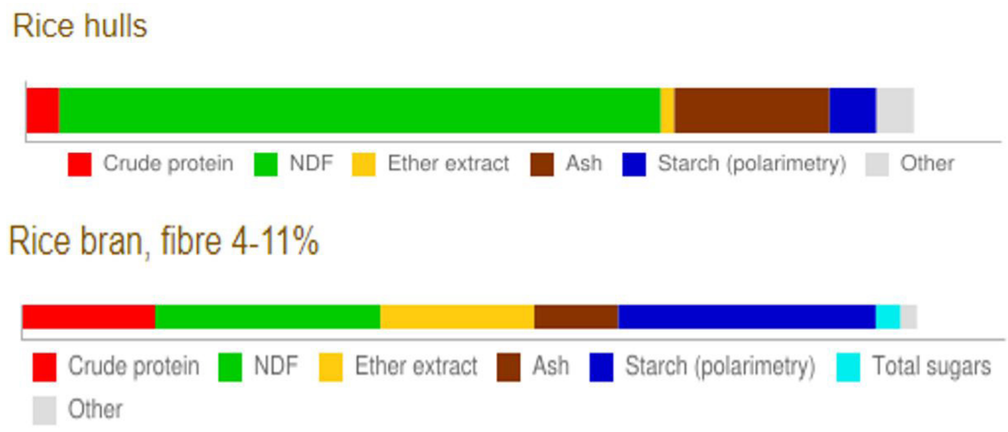

Figure 7: *Nutritive value comparison of rice hulls and rice bran (AFRIS, 2002).*

in the breakdown of pathogens and nutrients in these systems.

*Disclaimer: Deep litter bedding materials to be used as soil amendments should be given additional time to compost once removed from the pen, as they can be considered 'hot' (high salt content) and potentially harmful to seedlings. It should also be noted that these materials can have high pH values due to high sodium content from manure and urine, good for acidic soils but detrimental if pH is already high (>7).

6. Livestock Feed Supplement

In terms of a livestock feed material, rice hulls are considered a low value roughage. Protein content of rice hulls are generally low (~3.8% dry matter), while crude fiber is high (~40%), and are thus used as a 'filler' and sometimes for stimulating appetite. Though rice hulls are generally considered a low-value feed material, it is important to note that they can be included in small amounts (up to 15%) in ruminant and hog feed concentrates (AFRIS, 2002). Research has shown that grinding or steaming of rice hulls leads to higher digestible energy intake while ammonia or urea treatment of rice hulls can also aid in the digestibility and nutritive quality of rice hulls (FAO). These are common practices and can make an economic concentration to feeds considering the low cost of rice hulls. It is important to note the considerable differences between rice hulls and rice bran, the latter having higher overall nutritive value.

7. Potting Mix Production

Rice hulls can make an excellent base material for those that seek to produce their own potting mixes on the farm. Rice hulls, when mixed with other materials (compost, manure, soil, etc…) provide volume, drainage, and porosity, characteristics essential for growing sensitive seedlings of vegetables and fruit trees (Figure 8). Rice hulls can provide a cheap and available alternative to perlite, which can be expensive or hard to come by in some regions. Once again, rice hulls are limited in their ability to supply nutrients to the plants, and used in this case as a soil 'medium' rather than a source of fertility.

To increase the effectiveness of rice hulls in potting mixes, it is recommended that they be sterilized to prevent the spread of fungal and bacterial pathogens in the nursery setting. Smoked or parched rice hulls, and pyrolized (biochar) rice hulls will bring added benefits when used to make potting mixes (AVDRC, 2000).

8. Mushroom Production Substrate

Mycelium can be propagated by inoculating any number of different substrates, and what is typically used often depends on what is locally available or affordable. Hardwood sawdust and straw are two of the most common substrates used for growing mushrooms worldwide, but a variety of other options exist including, coconut coir, manure, old coffee grounds, and yes… rice hulls. Oyster and Milky mushrooms have been shown to grow on rice hull only substrate, as well as mixed rice hull substrates.

Like most substrates used for mushroom production, rice hulls will need to pasteurized or sterilized before inoculation to avoid competition of other mold and bacterial contaminants. This typically done using a large drum and boiling water, but can also be achieved through solar pasteurization using this innovative solar styrofoam box method (see Dr. Tapani's article in ECHO Asia Note #33). While certain mushroom varieties may be produced using rice hull only substrate, it is recommended that rice hulls be mixed with other materials, such as sawdust, in order to improve the moisture holding content. It has been pointed out that mushrooms (oyster) will produce well on the first flush using rice hull only substrate, but will not hold moisture long enough for subsequent flushes to do well.

9. Growing Medium in Hydroponics/ Aquaponics Systems

Growing plants in a 'soilless' system such as in a hydroponics or aquaponics system requires the use of a 'growing medium'. Different materials can be used depending on the system, and are necessary to support the root system and hold the growing plants upright. Common materials used include coconut coir/fiber, grow rocks, perlite, sand, styrofoam, pebbles, and other various inert materials. The objective of the growing medium is not to supply the plants with nutrients (they are taken up and provided from the water), but rather as a physical aid to the structural growth of the plant itself. Rice hulls are a practical option as they do not absorb water and breakdown very slowly over time. They are also a good option for those looking to use a natural material. It is recommended that parboiled rice hulls be used as they are a sterile material, and will avoid harboring harmful pathogens that could jeopardize the closed hydroponics/aquaponics system.

Figure 8: *A potting mix for seedlings made up of rice hulls as a base material.*

10. You Tell Us!

ECHO's strength lies in its network members and the ideas in which you generate from practical experience in the field. We would love to hear from you about the ideas and technologies that you find most practical. Have you found other uses for rice hulls that we might like to hear about? Or other practices and innovations related to this topic? Stay in touch and let us know!

Conclusions

None of these ideas are necessarily novel, and are likely being employed already in many of your contexts. The aim of this article is to remind our readers that 'using what we have, to make what we need' can make a significant difference in smallholder farm settings, and using common 'waste' products such as rice hulls can be not only practical and productive, but profitable too. Promotion of such techniques may even lead to the valorization of rice hulls in your area, which may offer rice producers (of which there are many), an additional income source, while turning a once-considered 'waste' product into something of value to all.

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Upcoming this Month: Highlands Myanmar Seed Banking Workshop

Save the Date & Seeking Input for ECHO Asia Conference 2019!

May 2019 LEAD CoP Event -- UPDATE!

Caring for Creation, Caring for Communities:
Faith and the Environment in Language, Education and Development Work

8-11 May 2019 / Ubud, Indonesia

When? 8-11 May 2019 (4 days)
Where? Bhuwana Ubud Resort, Ubud, Indonesia.
How much? Before 1 March 2019: 150 US Dollars per person. From 1 March 2019 until registration closes: 200 US Dollars. This fee covers all event materials, lunch and snacks for 4 days, and the field visit trips.

Please note: all accommodation and travel costs must be arranged and paid for by participants themselves. Visit the event page for more information.

Call for Articles & Insights

If you are new to the ECHO Asia network, we wanted to highlight a few things that you may find add value to your free membership to ECHOcommunity.org and can help you be more effective.

1. Please do remember that a "Development Worker" membership entitles you to 10 free trial packets of seed per year! If you would like more seed packets or larger quantities of some seeds (especially green manure/cover crops), we do have additional seed packets and bulk seeds for sale, and our seed bank catalog is available online.
2. Please also know that besides being written in English, our ECHO Asia Notes are translated and available for free download in Thai, Khmer, Burmese, Mandarin, Bahasa Indonesia, Vietnamese, and Hindi languages.
3. Additionally, we have a special place in the Asia section of ECHOcommunity for additional technical resources, free book downloads, and presentations from past ECHO Asia events and workshops.
4. If you have never joined us for an event, please consider doing so- there are several events happening in 2019 and we would love for you to join! Please go to the events page of ECHOcommunity.org to learn more.

In addition to using our information, we strongly encourage you to provide feedback to us in order to better know how to serve you and help us to refine our resources and delivery.

We encourage you to share success stories, lessons learned, insights, Facebook posts, etc. with us to keep us abreast about what you are trying and what is working in your context.

Additionally, if you have any ideas or would like to write an article for an upcoming ECHO Asia Note, we invite you to do so! Thank you for reading, and please do stay in touch!

Sincerely,

Patrick Trail

Patrick Trail, M.S., CCA
Research Coordinator & Agricultural Trainer

Daniela K Riley

Daniela K. Riley, MBA
Office Manager