

## Technical Note # 16

# A Beginners Guide to Small-Scale Tropical Agriculture

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*all photos taken by ECHO Staff  
unless otherwise noted*



Small Farm in Viet Nam Highlands. Source: Larry Yarger

## INTRODUCTION

So you want to help people in the tropics. Beautiful! The tropics are waiting for you. No matter what your abilities, you can make life better for others in the tropics. Your concern for the physical and spiritual well-being of people can be translated into fruitful service. Your first asset is your good will, your willingness to serve.

As you begin to get acquainted with the tropics, you will find that **common problems include production and the use of food**. Among the poor, those that most need your help, obtaining one's daily bread is a constant concern. This is not only a question of eating. It is first a matter of **production**, second of **distribution and storage**, and third of **preparation of meals and balancing the diet**.

It is highly probable that when you arrive in the tropics you will not have all the knowledge you need of food production and use in order to help the poor-- in the tropics-- with their priority needs. It does not matter what experience and training you may have had in your temperate homeland; you cannot be fully prepared in advance. *Don't let this discourage you. It is normal.* Frequently, however, to accomplish your purposes you will need to help others with their needs to better produce and utilize food.

The tropics are different from the temperate zones. While in theory it might be possible to produce food crops all year round, in reality a wide range of biological and social factors determine what crops are produced and during which seasons. The soils are formed by different processes than those of the Temperate Zone. They tend to be acidic and heavy (clayey), with low natural fertility; but there are numerous exceptions. Day length is short during part of the year, but never as short as in the Temperate Zone during winter. Day length is longer 6 months later, but never as long as in the Temperate Zone during the summer. Many tropical plants are sensitive to length of day, and flower in response to even small differences.

Time and length of the rainy season vary. The most common weather pattern in the tropics is the monsoon, characterized by drought during short days and rain during long. However, tropical climates vary from almost dry all year (semi-arid or desert) to rainy almost all year.

Crops of the tropics are generally distinct from crops of the Temperate Zone. When they are the same, the varieties can be vastly different. Methods of producing them are varied and usually there are small-scale methods. Even the layout of the garden is different, often with an irregular and undisciplined mix of trees and vines with mostly perennial vegetables. Add to this, differences due to local customs, food preferences, and personal preferences and you will quickly understand that the tropics are not like “home.”

This is a problem only if you make it so. If you try to teach in the tropics the patterns and customs that you are familiar with, you will almost always fail. Therefore, your task will be first to *learn the techniques that local people are already using*. In so doing your respect, understanding, knowledge and abilities will grow, and you will pave the way towards improvement of existing local techniques. It can help you become a small-scale food production expert.

## NATURE OF SMALL-SCALE TROPICAL AGRICULTURE



**Figure 1.** Crops like this durian may be seasonal and provide only part of the year. Source: Larry Yarger

The scale of agriculture in the tropics ranges from the small household farm to very large farms. Tropical agriculture is usually labor-intensive, seldom machinery-intensive. Large farms, sometimes called plantations, are often concerned with production of crops that can be exported. Large and medium sized farms are always concerned with sales and making a profit.

On the other hand, small-scale agriculture has a dual purpose: **subsistence** (feeding the family) and **marketing** (cash or barter). Food that is produced on the subsistence farm is itself a savings in that cash on hand need not be expended. However, subsistence is more than just a way of life. It is often the only alternative a family has. Food produced on the small farm is often not just a financial matter, but a matter of life or death. This is one reason that small farmers often follow traditions rigidly and dislike change. The price of error is too high.

Crops grown on the small tropical farm are usually basic subsistence crops: grains, legumes, roots and tubers. These crops are the best ones to grow to sell for they are the crops used in large amounts by others. Traditionally little attention is paid to fruits and vegetables. Fruits are often neglected because they are so abundantly produced, at least in season, and surpluses are difficult to sell (See Figure 1). Their dietary value, chiefly in terms of vitamins but sometimes carbohydrates and oils, is seldom appreciated. Vegetables, as they are known in the temperate regions, are

produced in even less quantities than fruits (in the tropics), although there are exceptions. European vegetables are often inadaptable, but can be produced in the highlands, or during the cool season, or when varieties adapted to heat or other specific problems become available.

Many tropical vegetables are seldom if ever seen in the temperate regions. Because the newcomer to the tropics does not recognize them, he may wrongly assume that the local people do not grow vegetables. Many of these are the young and tender leaves of shrubs, trees and vines. Some are wild but protected, and others are conscientiously planted. Any one of them is likely to be many times more nutritious than lettuce. Some tropical vegetables have many edible parts including young leaves, shoot tips, flowers, tender pods, immature seeds, dried seeds, and roots or tubers. People often know the uses of other local vegetables. They may be ignorant of many uses of introduced plants.

When starting out, experimentation with very obscure tropical plants is not advisable (See Figure 2). The properties of most plants that have a great deal of potential for the small farm are known and described somewhere (though often in publications which are difficult to get). The first place to start is always by learning from local people. Then look for plants that may be unknown in your location, but are important in other parts of the world.



**Figure 2.** Common crops such as Maize and Cowpea are good ones to begin with. Here they are integrated and mulched, two useful production practices. Source: Larry Yarger.

You can learn about many of these plants in past issues of *ECHO Development Notes* (EDN) or ECHO Plant Information



Sheets, both available for free on [ECHOcommunity.org](https://ECHOcommunity.org). Seeds for many of these are available from ECHO's Global Seed Bank and Asia Seed Bank. But remember, learning from local people is always the best way to start!

Small-scale tropical agriculture is also characterized by small amounts of available resources, especially purchased inputs. While labor tends to be abundant, it might be committed to other tasks. Purchased fertilizer or pesticides might be out of the reach of the small farmer. Some small farmers may lack even the most elementary of hand tools. Techniques you introduce should ideally be capable of reaching down to the lowest, and yet afford opportunity to those who can take advantage of advanced technology

It is appropriate here to discuss what some consider a resource - credit. Indeed, there are many places where agriculture is deemed impossible without credit. As a general rule, the larger the farm the more easily credit can be obtained. Yet, credit implies an obligation. The farmer, small or large, assumes an obligation every time she accepts credit. The obligation is hard, absolute. Yet, her ability to pay is soft, full of risks. *Small farmers are usually better off when they do not engage in the time-dishonored activity of borrowing.* Without borrowing the farming risk is the same, or less, and the profit is the same or greater. You must decide whether credit is a resource or liability.



**Figure 3.** Integration of Ducks and Fish, utilizing the same space for both. Source: Larry Yarger

Tropical agriculture on a small scale is an adaptation. In many respects it is the result of an “evolutionary” process, the growth and change of the small farmer in response to the physical and social environment she faces. Change is a never-ending process. Agriculture may need to change rapidly sometimes, or not all at other times. The techniques of small-scale agriculture should not be considered primitive. They might be adaptations to reality. They should not be considered sacred and unchangeable either, because change is inevitable. Change represents opportunity: for innovation, for experimentation, for winning cooperation, and for bettering the life physically and spiritually.

Finally, small-scale tropical agriculture represents **integration**. In the sense used here, *integration is the use of one resource to stimulate the production of an “unrelated” output.* As simple examples, integration might be the use of crop residues to increase animal production, and the use of manures to increase crop production. Integration is a way of maximizing outputs (food for

the family, farm products for sale, etc.) and minimizing inputs (purchase, labor). Integration on small tropical farms is often lacking, even when possible. Integrating is one of the easiest ways to contribute to the welfare of the farm family, and may cost no more than some thought and discussion or a small demonstration. Some ideas of integrating activities are given below:

- Use of moveable cages where animals might feed on and destroy weeds, scratch the soil, and deposit manure in garden areas. This can be done with moveable cages on tethers.
- Restraining chickens from household gardens.
- Use of crop residues as litter in animal cages, and subsequent use as compost.
- Weed control with mulches that are later incorporated into the soil as compost.
- Off-season green manuring with appropriate species.
- Disposal of human waste in deep pits later planted to trees.
- Use of crop residues as fuel, as building material (roofing, etc.), and as clothes.
- Use of animal furs or skins as clothes and shoes.
- Location of animal pens and outbuildings under fruit trees or over fish ponds (See Figure 3).
- Use of wood ashes (potash) as fertilizer and in soap making.
- Use of trees with edible products as fence posts. Rat control with poisonous seeds of fence trees and insect pest control with a water infusion of the leaves. (*Gliricidia sepium*).
- Uses of crop plants for a variety of compatible uses.
- Location of farming facilities to permit labor saving.
- Planting crops taking into account the amount of family labor that will be available later

In most cases farmers have integrated many aspects of their operations. However, on almost all farms there are still-to-be-discovered opportunities.

***Integration cannot be practiced until the non-integrated elements of a system are understood!***

## SOME COMMON PROBLEMS

### Water

Water is almost always a problem with small-scale agriculture in the tropics. The availability of water will determine what crops can be grown and at what seasons. However, availability of water to the plant is conditioned by many factors, especially the nature and treatment of the soil. The field of water management is complex, and therefore only generalities can be given in this publication.

Excess water can damage crops by flooding, excluding oxygen from the soil, loosening roots causing lodging (falling over) of plants, leaching away nutrients, eroding soil, stimulating weed growth, and basically making fieldwork difficult. The first solution to excess water is to reduce its effects by providing better systems of drainage (ditches, furrows, raised beds or planting mounds).



**Figure 4.** S.A.L.T. (Sloping Agriculture Land Technology) hedgerows help maintain soil moisture and prevent erosion. Source: Larry Yarger.

Lack of water is a constant problem. One solution is to use irrigation. If this cannot be done, loss of water is partially controlled by turning the soil, terracing, water catchments, mulching, cover crops, incorporating organic material in the soil, etc. Drought conditions require the use of appropriate crops (millet is more drought resistant than sorghum; sorghum, more than maize). Some crops have drought resistant varieties.

You will find that some soils, such as alluvial clays in lowland rice paddies retain water so well that some crops can be planted and grown to maturity after rain ceases, without the addition of more water.

***You can expect that small farms will need water management systems to maximize production.***

### Weeds

Weeds are a major problem on every tropical farm, large or small. As living plants they compete with crop plants for space, light, water and nutrients, thereby reducing yield. Furthermore, they usually produce their seeds before cultivated crops do, thus assuring their future. Seeds of many species live for years in the earth, and cultivation to destroy existing weeds brings previously buried seeds to the surface where they can germinate. Weed control is a major subject. A brief guide to weed control has been printed by ECHO and is available [here](#).

The major goal of weed control is to reduce the competition with the cultivated crop. The elimination of weeds from a field is virtually impossible. Often when one pesky species is controlled, another arises to fill its niche. Practical control is achieved by one or a combination of several mechanisms, which include principally disruption of germination, reduction of the rate of growth, or killing the weed outright.

It is almost always possible to improve weed control on the small farm. Better weed control will almost always improve yields. Yet, you should be aware that weeds can be tolerated in some situations. It may be uneconomical to control them, especially if they are few in number, not very competitive, or only present as the crop is maturing.

***A good rule of thumb for the timing of weed control is, “Do it as early as possible.”***

### Soil Fertility

Problems with the fertility of the soil are almost always present on the small tropical farm. Only on those farms of exceedingly rich soil where primary or secondary forest has been cut does one occasionally find fertility that cannot be improved. Soil fertility problems vary in terms of nutrients that are lacking. A **soil analysis** may be helpful, but is often not adequate. It will not measure other equally important factors such as the availability of nutrients that are present (this is determined in part by the form in which they are held), or the texture of the soil. It appears that the field is very complicated. And it is! *The best analysis of the soil may be a small-scale trial of its ability to support crops.*

Nevertheless, some very important generalities can be made. No matter what the nutrient problem of the soil, improvement can be made by the addition of **organic matter** (any remains from dead plants and animals). This material is best used if



**Figure 5:** Composting structure - Honduras. Nearby crops take healthy advantage of the benefits.  
Source: Larry Yarger.

first **composted**. This is feasible in the home garden, but may not be feasible on the farm. Useful results can be obtained when the organic matter is incorporated into the soil, or even when applied as a deep layer on top of the soil as mulch. For best results large amounts are needed. It is difficult to apply too much. Organic matter for composting or applying to the field can be obtained from a variety of sources. These may include hay, straw, hulls, leaves, dead weeds, market refuse and used animal bedding.

The most useful organic material is composted **animal manure**. This is due to the fact that animal manures contain nitrogen, a primary nutrient in soil and crop fertility. Unless lush and green, crop refuse often contains abundant carbon, but little nitrogen.

Applying some nitrogen in the form of manure or as chemical fertilizer is desirable. Growing a crop that can later serve as organic material, a **green manure/cover crop** is a very good practice. The best ones of such crops are legumes, including the vigorous velvet bean and the hyacinth or lablab bean.

Where sufficient organic matter is not readily available, **mineral fertilizer** will almost always improve yields. When no guidelines are available, equal parts of nitrogen, phosphorus, and potassium can be used. The first application of 100 kg/hectare gives the most dramatic response. Since crop growth may be limited by factors other than fertility, very high rates (e.g. 1000 kg/hectare) are seldom economical on the small farm. Too high rates of mineral fertilizer, especially nitrogen, may even reduce crop yields. It will result in crops that are too soft, have too little roots or tubers, or are susceptible to drought.

***To maintain a healthy soil, return what you take from it in the form of organic matter from compost, crop residues, mulch, animal manure or green manure/cover crops.***

## Appropriate Species and Varieties

It is often the case that a newcomer to a rural area tries to help the people by quickly introducing a crop or technology which, through his experience, he knows is useful, but without first testing it there. This is a common error that each practitioner or teacher must be on guard for. Techniques developed elsewhere may or may not work out when transferred to another area. New crops are often ill adapted or not culturally accepted. Even new varieties of an acceptable crop may fail for numerous reasons. Nevertheless, the introduction of a better variety of an already commonly used crop can dramatically improve the welfare of the people. It is appropriate, therefore to look for innovations. *Remember that in most cases, innovations must be carefully tested in the immediate area before introducing them to the people.*

The testing of a new variety can be complicated or very simple. The simplest approach is to grow the new variety alongside the old, using the same techniques for both, and to harvest, eat, sell, and store both with the farmer. He will rapidly discover which is better. A more advanced approach is to become familiar with what other agencies are testing or developing, and test these materials first.

An even more complex task is to describe the deficiencies of existing varieties within the production systems, and to seek expert advice on which direction to proceed. Often a newcomer will see a problem without understanding it. Low yields, for example, may be caused by a large number of factors. High yields are utopian, and may be achievable only when all growing conditions are maximized or limiting factors are controlled. You may never achieve the maximum, but with improved techniques and better varieties you should be able to improve yields.

What should you do? Proceed cautiously. Find out what has been attempted. Find the rationale behind existing varieties and techniques, and proceed with caution. Look for new crop varieties. You may find them at the agricultural experiment stations, agricultural colleges and universities, ministries of agriculture in the region or country, and from your colleagues in similar situations. ECHO may also have crop varieties to suit your needs.

Finally, crop adaptation is often location and technique specific. Changes of area and of technique may change the crop variety desired. There is no end to the development of new techniques or the testing of new varieties. Don't expect to reach perfection, but strive for improvement.

***ECHO's Seed Bank provides trial packets of seeds that are ideal for evaluating a new variety. For more information online, go to the [ECHO Global Bookstore](https://www.echocommunity.org) or [ECHOcommunity.org](https://www.echocommunity.org)***



## Pests, Diseases and IPM

Every crop plant has its pests and diseases. You should familiarize yourself with the common pests and diseases of each crop. Their control is maximized through a system called **IPM** or **Integrated Pest Management**. While the crops, their pests and diseases may be somewhat different in the tropics, the principles of control will be the same. (See the *ECHO Technical Note, [Control of Weeds, Insects and Diseases on the Small Farm or Home Garden](#)*. Available for free on [ECHOcommunity.org](#))



**Figure 6.** This yellow sticky card and insect sweep net are handy tools for IPM scouting. Source: Larry Yarger.

The basis for IPM is called, **scouting**. Here you get to know your crops by walking your fields at regular intervals to keep track of their well-being. At the same time you make note of the insects and diseases that may be present in each crop. Pests and diseases can limit production of a given crop in a particular region. So you will want to know at what point a disease or a population of insects will begin to limit growth and production. This is called the **threshold**. It is at this point that you will want to consider some more-or-less drastic measures of control.

Controls come in various shapes and sizes, some are expensive and some may take special planning. They can be classified as follows: **preventative, cultural, mechanical, biological** and **chemical controls**.

In this order, they are listed from least to most expensive, and from least to most dangerous to the health of the farmer. They are, for the most part also listed as taking the most planning to the least, although there are arguments that can be presented otherwise.

**Prevention** is indeed worth a pound of cure in IPM. By using resistant crop varieties, maintaining healthy plants, providing sufficient moisture and fertility and removing dead and diseased plants and fruits one will usually find this the most satisfactory and least expensive control method.

**Cultural controls** include activities such as planting when the pests are not around, or planting when the weather and climate are less advantageous to pest growth. This takes more planning, but can save money in the long run.

**Mechanical controls** are those you can do by hand or with an implement like a hoe, such as picking worms off tomatoes or weeding.

**Biological controls** include the use of living organisms to control a particular pest. This includes the use of parasitic wasps and parasitic nematodes to kill insect pests. Unless found naturally in populations sufficient to work with, these can be somewhat expensive to obtain, especially in some remote rural areas.

**Chemical controls** have many disadvantages, and should be used as the last resort in pest and disease management. These controls can be dangerous to work with, can contaminate the farm, will likely kill beneficial insects, and can be costly. It is important to remember that home-made controls are also chemicals and many of them use dangerous ingredients, such as chilies, nicotine and rotenone – all natural, all naturally dangerous. Always take precautions when using such chemicals.

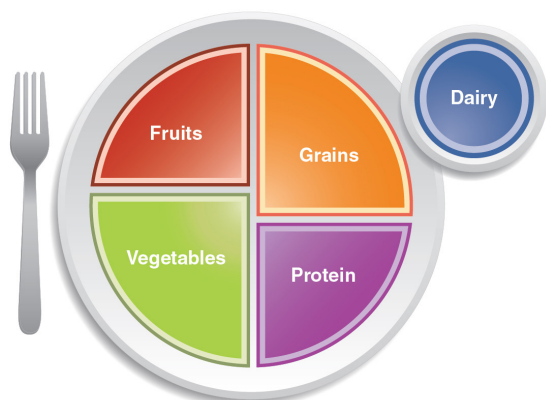
Be aware that these categories are not always cut and dry. Often you will have one control method fit into more than one category. For example, Bt or *Bacillus thuringiensis* is a biological control from the standpoint that it is a living organism, but since it is sold and applied as a solution, it might also be considered a chemical control.

Usually farmers know something about IPM, but may not have developed an integrated approach in which all knowledge available is incorporated into their system. There is great opportunity for progress on the small tropical farm through control of diseases and pests. Quite often the disease or pest problem occurs after harvest; thus special knowledge of appropriate harvesting and post-harvesting practices may be necessary.

## INTERACTION OF AGRICULTURE AND HUMAN WELFARE

Small tropical farm agriculture is intimately related to the health of the farm family. Ignorance and custom, as well as lack of food or facilities may interact with farming plans, food produced and methods of food use. Knowledge of good nutrition and good hygiene is desirable if farm families are to be helped. A newcomer who chooses to accept local customs uncritically may literally kill himself. By example and by teaching, farm families can be taught the basics of nutrition and hygiene.

## Nutrition



**Figure 7.** Food groups recommended by the USDA  
Source: [choosemyplate.gov/MyPlate](http://choosemyplate.gov/MyPlate)

Farm families often fall far short of eating balanced diets from the food groups (proteins and grains, vegetables and fruits and milk. See Figure 7). In the developing world, three kinds of malnutrition are evident, and are often combined: protein deficiency, carbohydrate deficiency, and vitamin and mineral deficiencies. Ample information is available in this field and is often printed in the local language and related to local customs. Publications are usually available from local government agencies.

Attacking only part of the nutritional problem is seldom the solution. An **integrated** approach is almost always necessary, including growing the right foods, producing animals, and using the foods properly. Good nutrition sometimes involves introducing foods into the diet that are not customarily used. This can be difficult because people don't change preferences easily. Some-times new foods can be incorporated into traditional dishes. Sometimes acceptance begins first with the children.

Crops with nutritional promise include high lysine maize (*Zea mays*) important for its balance of amino acids. There are highly nutritious leafy vegetables of many kinds such as moringa (*Moringa oleifera*), chaya (*Cnidoscolus aconitifolius*) and kangkong (*Ipomoea aquatica*) that provide vitamins and protein. Legumes such as winged bean (*Psophocarpus tetragonolobus*) and pigeon pea (*Cajanus cajan*) are important for protein and fiber, and soybeans (*Glycine max*) to make soymilk and meat replacers. Cucurbits such as luffa (*Luffa aegyptiaca* and *L. acutangula*) have high protein content in the young shoots and leaves, and the seeds of squash and pumpkin are rich in protein and oil. Pseudo-cereal grains such as amaranth (*Amaranthus hypochondriacus*) and quinoa (*Chenopodium quinoa*) are also important for protein, vitamins, minerals and fiber.

As in cases where starches such as cassava, rice and potatoes are abundant without a balance of vegetables, people in underdeveloped communities will often eat more than enough starches, thereby becoming undernourished in regard to protein, oils, vitamins, and minerals. This is often because such foods are readily available. These people need to learn new dietary habits.

***One can live in a gold mine, yet without knowing its value and how to properly utilize it one remains poor. The same holds true with agricultural crops.***

## Hygiene

Hygiene is the human value of cleanliness and how you take care of yourself and your family with respect to good health. Most commonly hygiene refers to cleanliness in cooking practices, drinking water, eating and cooking utensils, and bodily elimination.

The lifespan of rural people is often shortened due to poor hygiene. Diarrhea, a severe hygienic issue in rural areas is the number two leading cause of death in children under age five in the world (WHO, 2005). Some basic problems in hygiene might stem from: pigs and chickens excrement distributed in the yard, encouraging the presence of parasites and intestinal infections. Personal hygiene (use of toilet or latrine, bathing, washing before eating) may be difficult, neglected, or impossible for whatever reason. Proper precautions are not used for preparation, storage, or consumption of food. And water for drinking and bathing may be contaminated, all of which allow for the presence of disease-bearing organisms.

In advanced countries, standard hygiene practices are so common that their essential nature is overlooked. It can be dangerous to assume that rural conditions are equally valid alternatives. Good hygiene is always desirable and will make a life-or-death difference.

***Poor hygiene combined with poor nutrition weakens the body and invites deadly disease. Good hygiene removes and prevents deadly disease organisms from gaining a foothold in the body. Good nutrition strengthens the body to help overcome deadly disease organisms. Together, good nutrition and good hygiene are an unbeatable team!***

## Family Economy

Farm families, like many others, need money. The lack of money and other resources can lead to poor nutrition. Rather

than eating it, a lone pig on a small farm may be raised to sell only when there is great need. Eggs are collected not to eat, but to sell. Crops are selected for their marketable value, not for their nutritional contributions.

A good farming system integrates crop production (food, forage and fuel), animal production, and money making, with good health and hygiene. Interestingly enough, growing vegetables as a cash crop can sometimes increase on-farm vegetable consumption and improved health because there are so many nutritious, edible, though non-marketable culls.

## STEPS TOWARD IMPROVING SMALL-SCALE AGRICULTURE

Like many good things in life, improvement of small-scale agriculture is not easy. Since every region (and to a lesser extent every farm) is distinct, there are no automatic solutions to agricultural improvement on small farms. Nevertheless, from the experience of many people, a few principles can be instilled as follows:

### Stay Informed

Agriculture requires updated information. Follow this document with other publications that teach principles. Be sure to obtain a free subscription to *ECHO Development Notes* and access previous issues by becoming a member on the ECHO resource website: [ECHOcommunity.org](http://ECHOcommunity.org)). Enrich your library with publications of the country or region in which you serve. Seek out information in local universities, libraries, bookstores and agriculture extension offices. Many times local agricultural stores will have brochures or books for sale on particular crops, services or products. Do not believe that miracle solutions can be found or that any publication will solve all your problems. Information is a set of tools to be used judiciously.

### Develop Diagnostic Skills

The first step in improvement of rural agriculture is to ask the right questions so as to arrive at the right diagnosis. These might include (though not exclusively):

- What land is available, and what are its limitations? Who owns it?
- What crops are grown, at what seasons, with what techniques, and with what results?
- How are the crops harvested, stored, transported, and used?
- What crop residues remain, and what is done with them?
- What animals are produced on the farm, and with what techniques?
- What is done with the animals and their by-products?
- What do people eat? What would they like to eat?
- How is food prepared and stored?
- What parts of the diet are inadequate? Why?
- How does the diet change with the season of the year?
- How does animal production interact with human welfare?
- What do people buy, trade or share? Where do they get money for purchases?
- What markets exist for new products?
- What purchased inputs (tools, fertilizers, pesticides, etc.) are available?
- What is the general health of the people?
- What are the social and economic factors influencing distribution and marketing?
- What are the local infant mortality rate and life expectancy?
- Does the diet appear balanced?
- From what diseases do people suffer?

As the answers are compiled an impression will grow of the fundamental problems of the rural community. Some decisions will need to be made regarding the most important problems to be addressed as well as the root causes. The fundamental problems may not be agricultural.

### Select Feasible Alternatives

From this point, the discussion will concern only agriculture, the theme of this article. Other problems may be too numerous and complex to be discussed here, but they still merit equal or perhaps greater consideration.

From the diagnosis of the agricultural situation, several alternatives may be planned. The closer the alternatives are to current practices and needs, the more likely they are to be successful. Alternatives selected should be rational, based on knowledge and previous experience if possible. They may have experimental aspects to them, for example, in the sense



that one is not totally sure of the results. But by organizing alternatives that relate to or are real problems, there is already a great chance of success. Some alternatives you might consider include:

- A new crop or new crop variety
- An improved system of preparation of soils
- A different season of planting
- A changed physical arrangement of the plants
- A better way of fertilizing
- A nursery (if crops are transplanted)
- A new way to control weeds or pests
- Improved harvest or storage
- Better ways of food preparation
- New uses of crop residues

Similarly, additional alternatives may be sought for the animal or technical component of the farm.

## Test the Alternatives

Selected alternatives should be tried first in trial plantings completely managed by the practitioner – that is, you! These plantings can be set up in schools, churches, backyard gardens, rented fields, or at a small farm resource center (see the ECHO Technical Note, [Small Farm Resource Development Project](#)).



**Figure 8.** New crop varieties can be demonstrated to farmers in trial plantings managed by the practitioner.

It is important that they not be planted in the farmers' fields, yet. However, the new alternatives should be produced and demonstrated alongside plantings produced with the technology of the local farmers (See Figure 8). *As soon as possible, farmers should be involved in testing alternatives alongside their own plantings in their own fields, but only after they have seen success in your test trials.*

The same principles are applicable if the alternatives are storage or cooking techniques or any other aspect of production and use of food. Trials should be made for comparisons **before** a new technology is introduced. If the alternatives require new markets or marketing techniques, these should also be worked out **before** the alternatives are presented to the farmers.

## Involve Farmers to Verify Trials

After new alternatives have been demonstrated to be successful (*and not before*), they must be verified in the hands of the farmers. The farmer will put them into use in her own way and will find strengths and weaknesses not obvious to the practitioner. These verification trials accomplish a further purpose - a transfer of the technology to farmers. Usually the grassroots approach is the most useful in transfer of technology; but as acceptance becomes generalized, new doors may be opened for more formal training in agriculture, food processing, nutrition, and hygiene.

***Set up the first test trials on land that is not your farmers' fields. Be careful that they do not take any risk for trying out untested material. Use their varieties, their techniques and their input, but on YOUR land. In this way, if there is in any way a failure, the farmers will not be shouldered with loss.***

## CONCLUSION

What you have read up to this point will not happen overnight. It will take time, time to get to know the local people, time for them to get to know and trust you and what you have to offer. Become acquainted with who the people are and what they do. Diagnose first, select alternatives, try them out in small experiments - first under your control and then progressively with farmers. Promote that which proves to be better. Never give up, because improvement is always possible.

A foreign practitioner living and working in a remote village is closely watched. The people want to see what you have to offer, how it works and whether or not it is successful. As you get to know the people, let them know that you are experimenting and looking for new and improved variations for their benefit. Expect some disappointing results along with successes on your test plots. You'll be pleasantly surprised at the interest you will generate by being open with the people. If an idea is

successful, people will want to try it for themselves. Once they are sold on the new innovation, they will do all they can to get hold of it for their own!

Doing agricultural missions is not an easy task. Expect frustration. We once read that a farmer in the Philippines was able to multiply his cash income 15 times by planting disease-resistant tomatoes. But, he declined to plant them again because of social pressures from his less successful family and neighbors.

Many mission agencies with projects in evangelism, health, education, water, sanitation etc. hesitate to add agricultural projects to their program. Why? Because it is often much less clear what they should do to have a major impact in agriculture than it is in these other areas. It has been said that if you can provide clean drinking water and build latrines you take care of up to 80% of a village's health problems. Likewise, medicines already exist to treat most diseases in the developing world. But, if a community is "sick" because of farmers' poverty, it is much less clear what should be done.

Requirements for a satisfactory agricultural project include the following:

- It must involve no risk to local farmers who are already living on the edge.
- It must be something they are not already doing.
- It must make such a major difference that farmers will readily adapt the innovation.
- It must have a ready market (or be liked as food locally) if it involves sale of a product.

It's almost impossible to meet all of these criteria, and some projects have failed miserably. But, there have been successes and more well-prepared agricultural missionaries are needed. The following are a few ideas to keep in mind in preparation for a successful agricultural project. We've not elaborated on them and they are not all inclusive, but they are points that come up over and over again:

- Be committed to the people and the work.
- Effective change takes time.
- Get to know the people and their "felt needs".
- Live with them; learn their language and culture.
- Earn the right to work with them.
- Go as a learner, see why they do things the way they do (There's usually a reason for everything, even if it seems foolish at first).
- Be flexible; you may become involved in more than you expected (ex: reforestation, sanitation and health).
- Start small and be an experimenter.
- Identify naturally innovative farmers in the community and work with them.
- Keep things simple, pick a few important technologies and promote them until they are recognized as an improvement.
- Be patient!
- The nationals must own the project. If they are not involved in every aspect from start to finish, it won't work.
- Use local resources and appropriate technologies.
- As far as possible, the local people should provide the labor and materials needed.
- Teach folks to teach others and don't make yourself indispensable. You won't be there forever.
- Whenever possible work with the government, not against it.

All these help folks to keep their dignity, avoid dependency, and help assure sustainability. There are many technologies that have already proven themselves in particular cultural and climatic settings. These are well worth a trial in similar situations. But nearly everything will require some adaptations to the local situation.

## References:

"Diarrhoeal disease." World Health Organization (WHO). <http://www.who.int/en/news-room/fact-sheets/detail/diarrhoeal-disease> (accessed June 15, 2018).