FARMER EXPERIMENTERS
The Technologies They Develop on Their Own

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ABSTRACT

This paper reports on the results to date of a study of the technologies that more than 60 peasant farmer experimenters in Honduras have developed in the total absence of outsiders. This work was carried out with the support of funds from the International Development Research Centre, Ottawa, Canada.

During the 1980s and early 1990s, about 20 agricultural development organisations in Honduras began using PTD methods to encourage and train peasant farmers to become farmer experimenters (FEs). Most of the 30 or so programmes run by these organisations closed down after their normal period of 3–10 years of working in a given area. Many of the FEs continued to do PTD, experimenting with a wide gamut of different ways of improving their productivity or reducing their risks. Hundreds of FEs have been experimenting totally on their own, without any outside intervention, for up to 12 years after the closing of the programmes in which they had previously been involved.

In 1999, the Association of Advisors for a Sustainable, Ecological and People-Centered Agriculture (COSECHA) in Honduras decided to find out what technologies these FEs had been developing on their own and how these technologies can best be disseminated to other farmers. With the support of a three-year grant from Canada's International Development Research Centre (IDRC), COSECHA selected the 120 FEs around Honduras who were reputed to have developed the most interesting post-programme technologies. Then, COSECHA began systematically interviewing what will be a total of 80 of these FEs in order to learn of their technologies and then disseminate these among other FEs in central and southern Honduras. The technologies included were only those that the peasant farmers had developed on their own after programme termination and that had not been promoted or known within the country prior to the FEs' generation of the technology.

The study shows that FEs are capable of developing large numbers of very significant and original technologies, providing evidence that collecting and disseminating FE technologies in other nations around the world could be a very useful activity for institutions involved in agricultural development.

Top

BACKGROUND: PTD PROGRAMMES IN HONDURAS

Starting with the initiation of the World Neighbors-managed Guinope Integrated Development Program in January 1981, PTD has become a fairly widely used methodology for agricultural development in Honduras. Some 20 development organisations, including Catholic Relief Services, the Honduran Coffee Institute (IHCAFE), the Zamorano Panamerican Agricultural

School and the Honduran Ministry of Agriculture (MoA), taught farmers to experiment in at least 30 different programmes around the country. Many of these programmes ended in the late 1980s or early 1990s, with the result that Honduras is one the richest nations anywhere in the world in terms of its per capita concentration of FEs who have been working without any institutional support. Hundreds of small-scale peasant farmers in Honduras have continued to experiment and develop new technologies for up to 12 years after the outside agency terminated its work in the area. Rumours and individual case studies through the years suggested or gave evidence that some of these FEs were developing very interesting technologies that resulted in greatly increased yields or reduced unit costs.

Nevertheless, no institution had ever studied this phenomenon, either to learn how and why farmer experimentation has become sustainable, nor what technologies the FEs have developed and how these technologies might best be disseminated.

Top

THE STUDY

In 1999, IDRC offered COSECHA a three-year grant in order to conduct just such a study. For this purpose, Mateo Canas, an agronomist and the son of a peasant FE, has visited the FEs' homes and the fields where they are applying the technology they developed. During each visit, Mateo carries out an interview, which consists of an informal conversation in which he tries to make sure that each of a list of some 20 issues is covered. After each visit (which typically takes at least half a day), Mateo checks over the list of questions prepared at the beginning of the study to make sure that all have been dealt with, and asks those that have been missed.

The questions deal with such issues as what technologies the FE has experimented with and which ones seem to be successful (i.e. the farmer has continued to use). Detailed descriptions are made of each of the successful technologies, including a cost/benefit analysis comparing the technology with control plots. Data as to the elevation, rainfall, total size of landholding, slope of the fields etc are recorded. The farmer is also asked about other farmers' responses to, and adoption of, the technology. COSECHA also inquires into such issues as what the farmer feels are her/his limiting factors, whether s/he would be interested in working with certain marketing ventures, whether s/he would be interested in joining a nation-wide organisation of FEs and, if so, what the principle objectives of the organisation should be.

After most of the interviews have been finished, COSECHA will try out three or four methods of sharing the technologies discovered with other FEs in central and southern Honduras. These methods will include township-level exchange visits to other farmers' fields, township-level one-day conferences and a nation-wide conference of FEs. In each case, the FEs themselves will present to the other participants what they did in their experiments and the results they obtained. In each case, the cost per person of the event will be recorded and, several months later, the number of new experiments that the event stimulated will also be investigated in order to obtain a figure for cost/experiment stimulated.

Top

TECHNOLOGIES GENERATED INDEPENDENTLY BY PEASANT FARMERS

A Basket Full of Choices

Thus far, Mateo has interviewed 52 FEs from ten of Honduras' 23 Departments. These FEs

Thus far, Mateo has interviewed 52 FEs from ten of Honduras' 23 Departments. These FEs include farmers who had originally been trained by 17 organisations, ranging from 12 NGOs such as World Neighbors, COSECHA and FUNBANHCAFE (Foundation of the Honduran Coffee Bank) to three governmental and semi-governmental organisations – the MoA, IHCAFE and GTZ (German Agency for Technical Cooperation) – and two academic institutions (Cornell University and the Zamorano Panamerican Agricultural School). They also include seven women FEs, even though women in Central America, by and large, are not heavily involved in extensive cropping (that is, outside the homestead garden) until after the harvest, nor had they been trained to be FEs by the development programmes in the 1980s and early 1990s. Their increased involvement in more recent programmes should help increase the number of women available for this sort of study.

The 52 FEs have developed 82 technologies, mostly having to do with in-field agriculture, but including a small minority of post-harvest and food-preparation technologies. We have attempted to grade these technologies in three categories. Category A represents those technologies which seem valuable enough in terms of farmer benefits accrued and width of applicability among other farmers in Honduras that they would be worthy of further validating and then, depending on the results of the validation process, possibly dissemination to other farmers. Category B includes those technologies that might be worth validating, but which we would leave for doing so later. Category C includes those technologies that very likely are not worth disseminating, because they either provide so little benefit as to not be worth the effort, or they would very likely not be applicable to the situations of many other farmers. Although these are necessarily rather subjective evaluations, COSECHA does work with a list of 19 criteria for appropriate technology (Bunch 1982) that help us evaluate each one.

Of the 82 technologies developed by the 52 FEs interviewed, we have classified 39 as being in Category A (those worthy of further validation and perhaps dissemination). Of these 39, the following number pertained to each of the categories listed below:

Insect control	15
Fertilisation	10
Control of plant diseases	8
Weed control	2
Food preparation	2
Animal husbandry	2
Plant propagation	1
Green manuring	1
Soil conservation	1
Others	3
	45

The total number of technologies is greater than 39, because some of them included aspects of two categories. For instance, some foliar sprays work both as a fertiliser and to control insects or diseases.

This list shows that FEs have chosen to experiment with a wide variety of different technologies, including even some (e.g. food preparation) that are not commonly included within the purview of agriculture. Furthermore, the priorities that the FEs appear to have in their experimentation do not coincide very closely at all with the technological priorities of the programmes that worked with them. Whereas most of the programmes that worked with the farmers emphasised soil conservation and basic grain production practices (e.g. plant spacing), farmers seem to have established fertilisation and pest and disease control as their highest priorities. Thus, the farmers have established their own priorities as to which technologies they seek.

Of course, one might argue that the development programmes taught these farmers how to manage soil conservation and basic grain production so well that these factors were no longer priorities on the FEs' agendas. However, there are always new things to learn about crop production techniques and even soil conservation techniques. It also might be true that farmers find it easier to think of technologies that might control a certain insect than those that would, for instance, conserve their soils. Nevertheless, it is still likely that, at least to some extent, the difference between what was taught by the programmes and what the FEs subsequently experimented with is the result of either the programmes' having a longer-term vision than the farmers (probably the case with soil conservation), or the programmes' still not having perceived what the farmers' priorities are or are not (probably the case with basic production practices).

It is also interesting, however, that a few categories of technologies are totally missing in the list. Not a single FE experimented with the harvesting or use of water, even though many areas of Honduras have moderate to severe droughts; in much of southern Honduras, periodic and overall water shortages are without a doubt the limiting factor in the production systems of peasant farmers. Furthermore, experience with FEs in current programmes, since COSECHA began working with water harvesting in southern Honduras, shows major evidence that FEs are very interested in experimenting with water harvesting and more efficient water use, but none of these FEs are included in the study because this COSECHA programme is still in operation.

None of the technologies have to do with the introduction of new crops or the use of tree crops or agroforestry. The criteria used in the study, perhaps too restrictive, would not permit inclusion of the introduction of any crop that already existed anywhere else in Honduras. FEs probably did not experiment with new crops because the crops, in order to be included within the study, would have to be ones grown outside Honduras, in which case the FEs would have had considerable difficulty learning about them or obtaining planting material.

It is very likely that some categories of technology (e.g. water harvesting) were not the subject of farmer experimentation because farmers did not think that any solutions were within their grasp, or simply because working with such technologies had never occurred to them. Thus, agricultural programmes in the future should perhaps discuss with farmers, before they terminate their work in an area, what sorts of possible future technologies they might experiment with.

Another reason why certain types of technologies are missing among those generated by the FEs may be that farmers are aware of them and know that they could work with such technologies, but do not perceive these to be of a very high priority. For instance, in the case of tree crops, FEs are certainly aware that they exist and are profitable, but the many years one must wait before payback may make these technologies of lower priority than those with a quicker payback. This might also be the case with agroforestry systems, although farmers in southern Honduras in the FAO programme, which is emphasising dispersed trees, are experimenting quite a lot with various modifications of the dispersed tree system.

Top Technologies generated independently by peasant farmers

The 20 Most Promising Techniques

To give a flavour of the technologies themselves, plus an idea of the value they could have for other farmers, both within Honduras and further afield, here is a list of the 20 that appear most promising:

INSECT CONTROL:

1. Farmers observed that aphids died if dried out. They therefore tried using wheat flour diluted in water to spray on fruit trees in their nurseries and found that they could control

aphids and other similar sucking insects fairly easily this way.

2. Sugar water or slightly salty water, applied to the growing tip of the plant, was tried successfully as a way of controlling the corn borer.
3. One FE noticed that leaf-cutter ants did not like living near neem trees. By planting neem trees immediately over several troublesome nests of leaf-cutter ants, he was able to get rid of them (they moved their nest elsewhere).
4. A mixture of the leaves and bark of the mother-of-cacao tree (*Gliricidia sepum*) with insecticidal qualities was used successfully to control several Coleoptera that were affecting bean leaves.

FERTILISER:

5–8. Foliar fertilisers were developed by different FEs using either animal manure, mother-of-cacao leaves, the leaves of several common weeds, or wood ash (the last-mentioned also turned out to be of great use in preventing plant diseases).

9–10. One woman FE found that coffee pulp could be dried just by spreading it out to dry in the sun. Another FE found that mixing the wet coffee pulp with chicken manure or sawdust would also dry it out. Once dried, the coffee pulp is an excellent fertiliser, whereas it had previously just polluted the country's rivers.

DISEASE PREVENTION IN CROP PLANTS:

11. A solution of leaves of mother-of-cacao and eucalyptus was found to be very good as a fungicide for tree nurseries.
12. One farmer found he could apparently disinfect the soil in a nursery by cultivating the soil well and then covering it with clear plastic so it heated up thoroughly under the mid-day sun.

13–14. Both spraying crops with wood ash dissolved in water as well as placing wood ash around the stems of plants have been found to be effective in controlling various plant diseases, even very dangerous ones like late blight (*Phytophthera infestans*) in tomatoes and potatoes.

WEED CONTROL:

15. A very common but easily eliminated local weed called "*camalote*" was used to control other more serious and persistent weeds.

FOOD PREPARATION:

16. A local dish much like meat paddies can be made of the leaves of sweet potatoes fried in egg whites.
17. One woman FE made a wine that local people liked – from tomatoes.

ANIMAL HUSBANDRY:

18. A maize-based animal feed was made including leaves from *Tithonia* spp and eggshells, thereby increasing egg production.

PLANT PROPAGATION:

19. One FE found that by grafting neem material onto the locally available "paradise" tree rootstock, he could get much faster growth of neem trees at altitudes above 500 m.

GREEN MANURING:

20. Another FE found that, by intercropping jackbeans (*Canavalia ensiformis*) among his cassava plants, he greatly reduced his weeding time and increased his cassava productivity by over 25%.

It should be noted that these technologies could, in almost every way, be included under the label of low-external-input or ecological technologies and, in many cases, under that of totally

organic ones. They are also technologies that are highly appropriate for peasant farmers with little capital. By and large, the FE-generated technologies are extremely inexpensive (most require absolutely no cash output), they use locally available resources, they do not increase risk, they provide fairly quick and recognisable returns, most of them are highly cost-efficient and most of them are fairly widely applicable. Of course, some of the technologies in the second and third categories would not be as highly rated according to these criteria as would the technologies listed above. Nevertheless, this list shows quite clearly not only that peasant FEs can develop innovative technologies, but also that the ones they develop are highly appropriate for other small-scale farmers.

Top Technologies generated independently by peasant farmers

COMMUNICATION AND DISSEMINATION OF LOCALLY-GENERATED TECHNOLOGIES

Much interesting information for development programmes has emerged from the other questions investigated in the study. First of all, every one of the 52 FEs who were interviewed thus far expressed interest in learning more about agricultural technology. Much more surprising, every one of them stated that she or he would definitely be interested in joining a regional or national organisation of FEs or villager extensionists. They talked about how it was necessary to dialogue, to learn from each other and to join hands for their common good. Of the various possible objectives for such an organisation that were mentioned, by far the largest number of FEs felt that the primary objective should be to share and disseminate agricultural technologies, both those they had generated themselves and those generated by scientists and development programmes. The next two most often mentioned priorities were the need to work on developing markets for agricultural produce and the need to have greater influence on government policies so that these do not discriminate so much against the small-scale farmer.

COSECHA has done nothing so far to institutionalise the FE experience studied, or provide some long-term framework within which the FEs could continue to share technological information and work together towards accomplishing their other goals. Nevertheless, COSECHA – and World Neighbors before it – have made some isolated efforts to support the spread of FE innovations. Often, the factor that most limits such a spread of information is the cost of transportation that has to be incurred by farmers when they want to go to where representatives of different villages can meet together. Such an expense is minimal when compared to what most agricultural development programmes cost, but it can totally inhibit the rapid spread of FE-generated technologies. Therefore, the first requirement for achieving an ongoing healthy spread of these technologies would be the establishment of some possibly rather small but sustainable source of funding. For instance, after an irrigation project has been established, part of the water-user fees could be set aside for such a purpose. Or the earnings of a cooperative that are destined for educational purposes could be used. In Honduras, COSECHA has been thinking of setting up a large roadside farmers' market, with the charges for use of the market stalls destined to finance the national FE organisation. None of these possibilities, however, has actually been tried to date.

An organisation to support the sharing of FE technologies could, of course, be extremely simple, with no permanent office, one part-time worker to arrange meetings and cross-visits, and a very small budget.

Surprisingly, in view of the fact that many of the FEs have worked as paid villager extensionists (10 of the 52 are presently employed by some rural development programme), finding off-farm employment for themselves was not among the highest priorities cited by the FEs as a purpose for a regional or national FE organisation.

One of the most disappointing results of the study was that the technologies developed by the peasant farmers had not spread very far. In no case did an FE-generated technology spread to more than ten other farmers through the exclusive efforts of local villagers. Only in two cases had the technologies been disseminated widely: the use of coffee pulp as a fertiliser and the intercropping of jackbeans in cassava fields. However, in both cases, this wide dissemination occurred because NGOs happened to find farmers using the new technology and decided to disseminate it themselves.

We cannot be sure of the reasons for this lack of spontaneous dissemination. Certainly, one major factor is that most of the technologies were developed within the last two or three years. Therefore, there has not been much time for the technology to have been picked up by other farmers. A second reason is probably that most of the technologies generated by FEs in the Honduran case are the type that are not easily observed by other farmers. While soil conservation, green manure and animal husbandry technologies are often highly visible and therefore easily seen and tried by other farmers, these represent only four of the 39 technologies in Category A. The most common technologies discovered, such as in fertilisation and in pest and disease control, are difficult for other farmers to notice and impossible for them to apply without actually asking the practitioner what s/he is doing and how.

It may also be true that FEs, even those who have been farmer extensionists (perhaps 30% of the above group of 52 FEs), will not expend much effort to spread the technologies they themselves have developed. This is doubtful, however, because many of these farmer extensionists have continued spreading some technologies to their neighbours and the pride of personal discovery would seem to be a factor that would encourage them to spread their own inventions at least as fast as any other technologies. If it were the case that FEs are not spreading their own technologies, the role of NGOs and other development organisations in studying these technologies and spreading them to other areas of the country or world would become even more important.

Top

LESSONS LEARNT

This study leaves little question as to whether peasant FEs can develop, on their own, technologies that appear to have considerable potential for other small-scale farmers in the country, if not around the world. These technologies still need to be further verified (although two or three have spread widely across Honduras already, with the intervention of several NGOs), but their potential – according to established criteria of appropriateness and their economic cost-benefit ratios – would seem to be quite high.

Different organisations in Honduras have used different techniques to train FEs. In the course of the study thus far, we have noticed that organisations which had used the technique of maximising success in farmers' experiments during the first few experiments they did, had motivated far more farmers to experiment in the future than did the other organisations. In other words, achieving rapid and recognisable success among farmer experimenters right from the start is an important part of the total motivational process necessary for people to expend the effort to experiment frequently (see also Bunch 1982).

In some cases, development programmes will not be able to find any successful and validated technology already being used by any programme in a similar setting (in terms of ecology, culture etc). A programme may then have to experiment with several technological possibilities before working with the farmers. Nevertheless, as time passes, fewer and fewer programmes will find themselves in such a situation. Then, programmes that give high priority to starting a PTD process with future FEs selecting what to test from a list of potentially useful technologies

PTD process with future FEs selecting what to test from a list of potentially useful technologies – which can be quite a long list – might consider reducing the list to a fairly short one of technologies already proven to bring rapid and recognisable success in similar settings.

The technologies that farmers develop come from a wide spectrum of different aspects of agriculture. They are not necessarily just the result of local adaptive research, but may also include very basic research issues. Where the technologies that FEs develop do tend to be limited is in their short-term profitability. All technologies in all categories (except two or three involving tree species) were those that would provide fairly short-term and concrete benefits. None of them had to do with issues of sustainability, long-term soil quality or any other issue that did not involve some sort of return and one that would be perceived fairly quickly.

The study provides major evidence that the collection, validation and further dissemination of FE-developed technology may well be a very valuable activity for some researchers and/or NGOs to become involved in. COSECHA, IDRC and other related institutions will therefore use their abilities and means to disseminate ideas around the world through various printed media, information and communication technology, international conferences, and courses and workshops so as to spread information about this possibility and its usefulness.

Top

QUESTIONS FOR DEBATE

Autonomous spread of innovations developed by farmer experimenters:

While farmer experimenters have been found to continue experimentation long after PTD support projects ended, why have their findings not spread widely to other farmers, except with support again of an NGO? Are reasons given in the paper the real, or only, ones?

Farmer experimenters organise themselves

While all farmer experimenters expressed an interest to join a FE network or organisation during the study, has this been realised now? Is the outline of such network as in the paper realistic?

REFERENCE

Bunch R. 1982. *Two ears of corn: a guide to people-centered agricultural improvement*. Oklahoma City: World Neighbors.