MOTIVATING SMALL FARMERS, SCIENTISTS AND TECHNICIANS TO ACCEPT CHANGE*

By P. E. Hildebrand **, *Socioeconomia Rural, Insriruto de Ciencia Y Technologia Agricolas, Sector Publico Agricola, Guatemala, C.A.*
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SUMMARY

The reason for the resistance, on the part of small farmers, to accepting change is not one of motivation but rather one of not having available teclnology which is appropriate from these farmers' own points of view. Because of the location specificity of the agrosocioeconomic conditions of small farmers, and because they are not subject to the homogenising influence of tractors and capital, it is a much greater challenge to develop technology which they will be motivated to accept than it is to develop technology for commercial farmers. The most efficient way is by means of strong multidisciplinary teams who live and work in each area and who orient the technology development work undertaken for the small farmers in their zone. This implies a drastic change in the traditional role of many scientists now working on technology development and probably will meet with no small amount of resistance on their part. It may well be necessary to motivate scientists and technicians-as well as farmers—to accept change.

THE PROBLEM

The title of this paper suggests that small farmers do not accept change at rates which are considered adequate. 'Adequate' could be defined in any of several ways but it is not necessary to define it for our purposes. That these farmers are not changing their technology as rapidly as larger, commercial farmers is evident and will not be discussed, either. Rather, presented is an interpretation of the reason small farmers in developing countries do not accept changes in their current technology at rates which scientists, extensionists, politicians, academicians, bureaucrats or others deem adequate. Secondly, changes are proposed which can significantly modify this rate of acceptance. Admittedly, however, some of the suggested changes may well meet with the same resistance small farmers exhibit when presented with new ideas that would drastically modify their way of thinking and working.

First, it is necessary to define some terms which must be used, but which are vague or carry several connotations. The term *small farmer* will mean all farmers, regardless of the size of their holdings, who are not primarily commercial farmers, and most of whom, in developing countries, still use predominantly traditional technology. Since we are concerned here with technology, this is a much more utilitarian definition than one limited to size. 'Appropriate', as used in 'appropriate technology', is necessary and desirable to use, but it is not used in the accepted or most commonly understood context. *Appropriate technology* will mean that technology (or change) which (1) can be put into practice immediately and under farmers' present agro-socioeconomic conditions and (2) is acceptable to target farmers.

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** Present address: Institute of Food and Agricultural Systems, University of Florida, Gainesville, Florida 3261 1, USA.

The first criterion is a necessary, although insufficient condition to be 'appropriate'; the second reflects the difference between a third person's interpretation of farmers' agrosocioeconomic conditions and the farmers' own interpretation of the same things. In other words, it reflects the farmers' thinking and not macro- nor imposed micro-considerations as interpreted by outsiders. *Agrosocioeconomic conditions* are all those agro-climatic, economic, social, cultural or infrastructural factors or constraints which condition whether a farmer needs, desires, or can adopt any given change.

This discussion commences from the premise originally proposed by Schultz (7) which is widely, although not universally, accepted: small farmers are efficient in the utilisation and allocation of available resources among known technologies if they have been farming under stable conditions for some time. This implies that small farmers will-and do-accept change when the available resource base changes or new and appropriate technology becomes known. Otherwise, they could not be efficiently adjusted to the alternatives they now have. But it is important to understand that this efficient adjustment is in terms of the *farmers' own understanding and interpretation* of his situation and it is not necessarily efficient according to the perceptions of well meaning, but incompletely informed, third persons. Since it is not third persons, in a free society, who make choice of technology and resource allocation decisions, it is evident that farmers' actions need not reflect third person solutions, unless they are based on a near perfect conception of the farmers' situations.

A second characteristic of small farmers, gradually being recognised, is the high degree of location specificity of their agro-socioeconomic conditions. In commercial agriculture, the tractor and a strong capital base are effective homogenisers of what is otherwise a complex milieu. To persons who are trained or accustomed to being able to produce widely acceptable, tractor based technologies, this characteristic a strong barrier which hinders their effectivity in producing usable and acceptable results for small farmers. But it is also a characteristic that must be considered explicitly in any technology developing system if it is to produce technologies which small farmers will be motivated to accept.

If small farmers are not changing their production methods because they are not being offered appropriate technology when so many people are working to produce it for them, what is the problem? If it is agreed that small farmers are efficient in the allocation of their resources to known and appropriate traditional technologies, it means they have been motivated in the past to accept change. Hence, the problem is not one of motivation, as such. Rather, it is one of offering 'changes' which are *not appropriate as perceived by the farmers themselves.* It makes no difference to a farmer how a third person views any specific technology. If he, himself, does not feel it to be appropriate, he is not going to be motivated to accept it.

In turn, the problem stems from (a) having most top level technology 'generators', who are agriculturally trained and 'product' oriented, working on experiment stations or in other highly controlled conditions where they consider only a limited number of variables; (b) most of the 'transfer mechanism' generators, who are trained in the social sciences and are 'cause', but not product oriented, struggling with the vast quantity of variables which condition acceptance or rejection of technology at the farm level and (c) 'goal' oriented agricultural economists in the middle, complaining that the agricultural scientists do not consider enough of the variables in their work, but ignoring the pleas of the social scientists that including just the quantifiable variables is not sufficient, either. (This picture is complicated further because agronomists work primarily with soils and plants, which they are convinced are the most important components of agricultural production; sociologists and anthropologists work with farmers, whom for them are obviously the most important component, and economists work with desks and computers studying means of achieving specified (and frequently unrealistic) goals.) It is little wonder that the unfortunate extension or 'change' agent has little to offer small farmers even though he may be supported by an elaborate experiment station and an extension network manned by high level technicians. It is even less amazing that small farmers are not motivated to accept many changes that come out of such a system.
New technology development systems oriented toward small farmers are being written about and discussed and a few are in operation. One which has shown promise and is in use within a functioning national institution is that at ICTA (Institute of Agricultural Sciences and Technology) in Guatemala. This system has been developing over the last five years and is still changing as needed modifications are

visualised. It is not perfect, but it has been found to have some valuable characteristics and is being used as a model in some other countries. Very briefly, its most critical characteristics follow.

THE GUATEMALA MODEL

A work zone is defined, in so far as possible, on the basis of an area in which the majority of small farmers follow a similar, traditional agricultural system, or, in other cases, it may be the confines of a land reform project where most of the (artificially created) farms are quite similar. A team comprised of social scientists and the agricultural technicians assigned to the zone surveys the area to determine what the farmers do, how they do it and why they do it that way (that is, define the agro-socioeconomic conditions of the area). This team jointly analyses the results of the survey and makes recommendations concerning the technology to be developed.

Technology validation and generation is carried out both on experiment stations (about 20 % of the work) and on the small farmers' own farms (about 80 %). This work is divided into three general levels. (1) The Commodity Programmes (those identified with a commodity such as maize, beans, swine, etc.) conduct highly controlled trials on the stations and a few farms in the area. (2) A 'Technology Testing Team' (the technicians assigned to the zone) conducts technical trials under the supervision of the Commodity Programmes on a much larger number of farms and acts as a means of extending the exposure of the materials and practices throughout the zone. **(3)** The most promising technologies are then submitted to agroeconomic trials to help the team evaluate them further.

Ideally, the trials and evaluations through this stage are based on the technicians' understanding of the farmers' needs and criteria as obtained from the survey and from farm records which are initiated immediately following the survey. But, even though the technicians live in the area and work on the farmers' own land, they cannot make the final decisions as to the 'appropriateness' of the technology even after passing it through this exhaustive system. Therefore, the most promising technologies are passed on to farmers for their own evaluation. Here the farmers pay for inputs and furnish labour and the product is theirs. ICTA technicians obtain what information they can from these 'Farmers' Tests', but the farmers do the evaluation. The year following these tests by the farmers, ICTA makes a follow-up survey of the same farmers to determine whether they have adopted the technology, to what degree, and if not, why. If a sufficient number of the collaborators from the year before have adopted it of their own accord over a significant part of their own land, it is considered as 'acceptable' and is then turned over to the Extension Service as 'appropriate technology' for those farmers who use that same traditional agricultural system. (In Guatemala, the Extension Service is separate from the technology generating institute. Ideally, these two functions should form a continuum within a single entity.)

THE INTER-DISCIPLINARY SURVEY

One of the strengths of this technology generating system is the use of multidisciplinary teams to make the agro-socioeconomic studies of each new zone of work and to aid in the evaluation and interpretation of results. For survey, usually five social scientists (among them call be anthropologists, sociologists, economists or agricultural economists) are paired with agricultural scientists (among whom may be found both plant and animal technicians in entomology, breeding, pathology, physiology, etc.). Besides changing interviewing partners every day to reduce interviewer bias and increase cross-disciplinary interchange, the group meets each night to discuss the day's findings, make preliminary interpretations and modify the questionnaire if necessary. In order to be able to understand and interpret the small farmers' agro-socioeconomic conditions, it is necessary to consider all the factors which have an influence on what they do and can do. Hence, it requires a multidisciplinary team, with each member contributing his own specialty, but all subordinating to the common objective, to understand what the farmers are doing, why they are doing it that way (how they have adjusted historically to their agro socioeconomic conditions) and what is required in any new technology (proposed change) if it is to be accepted on a large scale.

The integrated, multidisciplinary concept continues beyond the survey. The agricultural technicians on the team help the technician from socio-economics who is assigned to the team in the collection of farm record data and he, in turn, helps in the field trial work. Because this team lives and works in the zone and because the work is almost exclusively on farms, the technicians have a great deal of contact with the farmers in the area and continue to learn about their conditions both because of dialogue with them and because they are planting under farm conditions. Hence, they are able to obtain a very good understanding of the agro-socioeconomic conditions of the farmers in the area.

But there is still a weakness in the system. In the original organisation of ICTA, The Commodity Programmes were given the primary responsibility for increasing the production of their commodities. Although this concept pre-dated the use of the multidisciplinary teams, it has persisted. As a result, even though multidisciplinary teams with a good understanding of the local conditions exist in each of the zones, they do not yet exert sufficient influence on the projects they carry out. Rather, they function in support of the Commodity Programmes. Hence, project orientation is not primarily in the hands of the personnel who best know each local zone, but in the hands of the Commodity Programmes who have national responsibility and cannot be expected to have an intimate knowledge of each location.

The National Agricultural Research Programme (PNIA) in Honduras, which is patterning its reorganisation partly after the ICTA model, has seen the weakness just described and is organising so that the multidisciplinary teams in each region have the primary responsibility for orienting technology development. This modification should also be made at ICTA. This type of reorganisation need not affect the strength of the Commodity Programmes which must have top level scientists to be able to respond to the need of widely different conditions throughout the country. But it will have to affect the concept of who supports whom within the Institute. Instead of conceiving that the Technology Testing Teams, Soil Management and Socioeconomics support the Commodity Programmes, it should be that Soil Management, Socioeconomics and the Commodity Programmes support the resident, multidisciplinary teams in each zone.

Organising along these lines will obviously infringe on the concept of specialisation which is traditional in agricultural research organisations. The principal requirement will be the need to upgrade the training of the people who comprise the multidisciplinary teams. At present, in ICTA, the Technology Testing Teams in each zone include only university--i.e. higher--graduate or lower level personnel and none with 'graduate' degrees (Ph.D. etc.) (except for the Regional Directors who are in charge of several zones and whose function is largely planning and administration). Honduras, on the contrary, is placing some of their top researchers at the regional team level. If the Commodity Programmes, where the top people are now placed in ICTA, are to respect the orientation coming from the zonal teams, it will be necessary not only to upgrade the level of training of these teams, but also to change the connotation which multidisciplinary work carries in many parts of the world--i.e. work done by undertrained generalists who have no strength in any discipline. As opposed to this 'non-disciplinary' concept, a multidisciplinary team should be composed of people who are strong in their own field, but who have enough confidence in their own work and enough respect for other fields that they do not feel the need to defend themselves from others, nor be afraid to make contributions in fields other than their own. (See the Appendix for some additional comments on multidisciplinary team efforts.)

Persons with this type of training and inclination are very scarce and will need to be produced in large numbers. The first attempt along this line of which the author is aware was the Cornell/CIMMYT programme, supported by The Rockefeller Foundation, that produced most of the group now working in PNIA in Honduras. Other programmes of a similar nature will have to be initiated. But in the meantime, great advances can be made even with the type of personnel now being used at ICTA in the multidisciplinary teams.

APPENDIX
COMMENTS ABOUT MULTIDISCIPLINARY TEAM EFFORTS

Individual-and some collective-action is being taken to bridge the differences generated by traditional scientific training in order to facilitate multidisciplinary efforts. Examples with which the author has had

recent contact follow. Christina Gladwin (4) is an agricultural economist who uses a methodology much more akin to anthropology than economics. Richard Hawood,' an agronomist, found it necessary to combine his field with economics and sociology in order to bring acceptable rice technology to parts of Asia. Robert Wergel (11) is an anthropologist who is working in the field of agronomy to help the International Potato Centre develop technology for this crop and Daniel Galt (3), an agricultural economist, is actively engaged in crop trials in Honduras. Examples of their work are listed in the references.

All of the above researchers have two things in common that are critical to the development of an efficient and functioning multidisciplinary team. They are well trained in their own fields, but they also have a working understanding of, and are not afraid to make contributions in, one or more other fields. This is a necessary characteristic of persons working on multidisciplinary teams. But alone, it is not sufficient. It is also required that the team members not feel the need to defend themselves and their field from the intrusion of others.

Another feature of a successful multidisciplinary team is that all members view the final product as a joint effort in which all participate and for which all are equally responsible. That means each of them must be satisfied with the product, given the goals of the team, and willing and able to defend it.

Returning to the generation of improved technology for small, traditional farmers, the team members must all be product-oriented (not just the agronomists). ('Product', as used here, refers primarily to the technology produced and not the commodity itself.) Also, all the team members must be willing to consider a wide range of variables and constraints and not leave these worries only to the anthropologists or sociologists. Thirdly, all members must be willing to spend some desk time considering alternatives and their consequences on the clients' goals and not leave this part of the task just to the economists. The agronomists should be capable and willing to criticise the economic or social aspects of the work, and the social scientists, the agronomic aspects. In turn, these criticisms should be used to improve the product so that all can be satisfied with the final result.

Failures of multidisciplinary efforts have frequently resulted because the teams were organised more as committees that met occasionally to 'co-ordinate' efforts, but in which the crop work was left to the agronomists, the survey to the anthropologists and the desks to the economists. In these cases there is not a single identified product but rather several products or reports purported to be concerned about the same problem. Perhaps the most critical characteristic required to achieve the success of a multidisciplinary team is identification with a single product *viz* a technological change in which all participate. The product can be complex and involve a number of facets but it should result from the joint effort of the whole team and not contain strictly identifiable parts attributable to individual team members.

In ICTA, the agronomists (who outnumber the social scientists by about 30 to 1) are concerned about there being too much influence by the socio-economic group in the work at the farm level. This is manifest in a certain resistance by the agronomists to identify too closely with the farmers (even with those on whose land they conduct trials). It also surfaces with respect to the evaluation of technology. The agronomist is much more comfortable if a final evaluation follows the farm trial phase of the work where it is the technician who makes the evaluation. The technician, then, decides if a technology is 'good'. If the farmer evaluates this 'good' technology and does not accept it, then the technician considers it a problem for the extension service, or of poor infrastructure, of low prices, or of lack of initiative on the part of the farmer himself, but it is not a problem for the agronomist, who has produced what he considers to be a 'good' product. In this situation, evaluation by the farmer is equated with influence by socioeconomists, who would tend to take into consideration more variables, including the present weaknesses in infrastructure, the price level, the farmers' capabilities, etc., in the development of a technology. They would do this so that the product of the team's efforts could be used immediately without the need to await development of other facets of the sector. In other words, in ICTA, we have not yet completely identified the kind of technological product we are to produce.

Even though we are a long way down the road, more needs to be done at ICTA to make the multidisciplinary teams, and the efforts of the entire Institute, more efficient. The top management of the

Institute (all of whom are biological scientists) agree that socio-economics must contribute directly to the generation of agricultural technology, a concept with which we fully concur. On the other hand, because of their own traditional training, they also tend to be apprehensive about too much influence from socio-economics and therefore are sometimes hesitant to provide the kind of support which could enhance the efficiency of the multidisciplinary teams much more rapidly. Hence another critical characteristic of a successful multidisciplinary team effort is the conviction of management and their understanding, dedication and support of the concept. Support at this level is required in order to counteract the traditional resistance initially found at the field level.

A final necessary component for creating successful multidisciplinary teams is long run stability of the government and/or its policies, so that management and staff of national institutes who are expected to develop technology for small, traditional farmers, and for which multidisciplinary teams are required, have time to work out the details so that they can function effectively.

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