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THE ROLE OF FARMER TESTING GROUPS IN RESEARCH AND EXTENSION: SOME EXPERIENCES IN BOTSWANA

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INTRODUCTION

Farmer participation in agricultural research and improving the linkages between research and extension have recently received much attention. Increasing farmer participation has been a prominent theme of numerous articles and workshops (for example, see Farrington & Martin, 1987).

In one part of Botswana (around Francistown), the Agricultural Technology Improvement Project (ATIP) has completed three seasons of actively involving farmers in the research process through farmer testing groups. More than 250 farmers, researchers, and extensionists have been collaborating to test some promising technologies for improving farm productivity through farmer managed, farmer implemented (FMFI) trials.

This paper reviews ATIP's approach to farmer participation and presents operational approaches for two types of farmer groups.

THE BOTSWANA SETTING

Botswana is located in the central part of Southern Africa and is a semi-arid country receiving 450-500mm of rain a year. Poor soils and a highly variable rainfall distribution between years, within years, and even between land areas in a village, create a harsh environment for rainfed crop production. Following six years of drought, farmers received more than double the 30 year average rainfall during the 1987-88 cropping season. With rain came pests and crop damage due to flooding.

Botswana's main sources of foreign income are diamond and beef exports. Approximately seventy percent of the population are limited resource farmers engaged in small mixed livestock - crop operations. Farm families generally rely on livestock (both cattle and small stock) and off farm activities, supplemented by government drought relief programmes, for their subsistence.

Average crop yields are approximately 250 kg per hectare, but many plots failed yearly during the recent six year drought. The mixed cropping system is based on sorghum with millet, maize, cowpeas, groundnuts and melons as secondary crops. The traditional cultivation system is to plant small areas by broadcasting seed and ploughing with a mouldboard plough. This is done after each planting rain for a period of four months. Oxen, tractor and donkey traction are used, with only half of the households controlling their own traction. Yields are low and

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farmers produce only about 30 percent of the country's basic grain requirements in an average year.

GROUP APPROACHES IN BOTSWANA

Groups (and committees) are a major feature of village life in Botswana. Most villages have a village Development Committee, a Parent-Teacher Association, a Social Health Committee, a Farmers Committee (to advise and assist the Agricultural Demonstrator) and one or more special purpose agricultural groups (drift fence, small stock dosing group, etc.). In 1975, an Agricultural Group Development Programme was established by the Ministry of Agriculture with the aim of broadening extension outreach. Agricultural Management Association Officers are posted to the Regional Agricultural Office and have primary responsibility for supporting Agricultural Demonstrators in helping farmers increase production through group extension methods and cooperative group action. Unfortunately, the majority of agricultural groups exist in name only (Ntseane, 1986).

Groups which have a specific focus and which provide individual benefits for members seem to have the best chance of success whether or not they have a formal legal organisation. Part of the reason ATIP testing groups appear to be popular is that they do have a focus and the benefits accrue to individual members based on their own input.

When groups are discussed in Botswana, and in most places, the image is one of a formal legally recognised organisation which exists to perform a specific function with all members providing an input to the group activity. A good example of such a group is an agricultural production cooperative. The ATIP testing groups are not organised in this way, but are instead associations of individuals who are working on their own trials and sharing their experiences with others. In a study of the Francistown Options Testing groups, Ntseane (1988) found that group members did not favour the formation of more formal legalised groups.

ATIP EXPERIENCE WITH GROUPS

In 1982, the Government of Botswana and USAID initiated the Agricultural Technology Improvement Project to conduct on-farm research (using two field teams), primarily in crop production technologies. The on-farm research programme of ATIP has had two primary goals: (a) to identify and test relevant, improved arable production technologies; and (b) to develop appropriate, low-cost methods for on-farm research and extension. ATIP took as its point of departure the farming systems approach to research. One of the corner stones of this approach is a "bottom-up" perspective of the research and development process (Norman, 1980).

ATIP began its research work by investigating modified tillage planting practices and by conducting an in-depth diagnostic study of the farming systems through a multi-year, multi visit study. Most of the trial work was aimed at answering technical questions and so was carried on in a researcher-managed and implemented (RMRI), and research-managed, farmer implemented (RMFI) mode. This type of trials work required a major investment of researcher time, so trials were limited to the most important problems. It was soon realised that the complexity of household-farm interactions required increased farmer involvement in the selection of technologies for testing, the design of trials, and the assessment of trial outcomes. The farmer needed to be included as a partner in the process, and not just as a client.

The emphasis for the last three seasons has been to promote the partnership of farmers, research and extension activities as other than clients. Farmers can contribute to research and extension from their experiences by communicating with researchers, extensionists and with other farmers. In addition, farmers can expand their horizons and concept of what is possible through this communication and through training activities.

One of the primary methods of attempting to increase the interaction with farmers and extension workers has been through farmer groups. ATIP has identified four types of farmer groups. Three groups—design groups, focused testing groups, and researcher-managed options testing groups--are discussed elsewhere (Norman et al., 1988). We have added a fourth group, the extension-managed options testing group to the topology (See Table 1). There are two types of farmer groups discussed in this paper, the researcher-managed options testing group and the extension-managed option testing group. The descriptions of the operations of the options testing groups given below are based on the Francistown ATIP team experience.

ATIP Francistown began researcher-managed options testing group work three seasons ago with a group of 12 farmers testing one technology in one village. The second year groups were formed in two additional villages, included 97 participants, and the number of technologies was expanded to five major and several minor technologies. During the current year approximately 130 farmers have signed up to test more than a dozen technologies in the three groups. ATIP and the extension service are completing the first season working with the extension-managed options testing group.

TABLE 1: TOPOLOGY OF FARMER GROUPS

CHARACTERISTIC	DESIGN	FOCUSED-TESTING	OPTIONS-TESTING
OBJECTIVES	Farmer involvement in technology design	Discuss farmers' own problems. Measure economic benefits. Farmer assessment.	Increased farmer and extension and extension involvement. Large scale assessment.
NUMBER OF TRAIL TYPES	1 to 3	4 to 6	10 to 12
TRIAL: PROPOSAL	Researcher	Researcher	Researcher
SELECTION	Researcher	Researcher/Farmer	Farmer
MANAGEMENT	Researcher	Farmer	Farmer
IMPLEMENTATION	Researcher/Farmer	Farmer	Farmer
QUANTITATIVE MEASUREMENT*	Most	Middle	Least
ASSESSMENT: RESEARCHER	Most	Middle	Least
FARMER	Least	Middle	Most
GROUP: SIZE	2-3 Farmers	10-15 farmers	25-40 farmers
NATURE	Homogeneous	Homogenous	Heterogeneous
SELECTION	Technical situation appropriate for design work	Socio-economic situation for targeted technology	Volunteers from village meetings
FREQUENCY OF MEETING	2-3 times a season	Monthly in season	Monthly in season

*. Relative to the other types of groups.

RESEARCHER-MANAGED OPTIONS TESTING GROUP

Objectives:

These groups are organised as a part of the overall research strategy of the ATIP Francistown team. The objectives for the groups are:

(a). To test a broad range of innovations (technologies) under FMFI conditions for increased productivity and grain yield dependability.

(b). To involve farmers and Agricultural Demonstrators (AD) in the systems/technology development process.

(c). To determine what types of innovations are most appealing to farmers with different resource situations (recommendation domains).

(d). To further refine the use of the group process for including farmer input into farming systems research.

Participants:

There are three primary sets of regular participants in each group:

(a). The ATIP research staff, composed of agronomists, agricultural economists, and animal scientists in Francistown; and ATIP village staff consisting of a senior technical officer and four to six enumerators and/or field assistants.

(b). The village AD.

(c). Village farmers who join the group.

Occasional participants include on-station researchers who are collaborating in particular trials; and district and regional extension staff (Regional and District Agricultural Officers, Crops Production Officer, and the Regional Manager of ALDEP -- a programme to provide equipment to resource poor farmers).

Procedures:

Between cropping seasons, the ATIP Francistown staff meet with regional and district extension officers, researchers at the experiment station, and village level ATIP staff to discuss plans for the coming year's research. Technologies to be tested by the farmer groups, as well as those to be tested in researcher-managed trials, are identified by these parties and form the basis for the ATIP work plan.

Approximately two months prior to the normal beginning of the cropping season (the on-set of rains), ATIP staff attend a traditional village meeting at which the Francistown staff and the senior technical officer in the village make a formal report describing the results of the previous years research (both researcher-managed trials and farmer group trials).

They also describe the plans for farmer group activities for the coming year, and invite anyone wishing to participate in the farmer group to attend the first group meeting.

Before the first group meeting, the Francistown staff hold a workshop for village staff to assure that all new technologies, particularly mechanical technologies, are understood and that the village staff can teach farmers how to use new equipment. Trial procedures are reviewed and data collection forms are discussed. Village staff are also asked for suggestions to make groups function more smoothly and efficiently.

Four to six weeks after the village meeting, the first farmer group meeting is held, chaired by the ATIP village senior technical officer. (The local AD and any interested district or regional extension staff or experiment station researchers are invited to attend farmer group meetings). At this meeting the Francistown staff review a wide range of technologies available for FMFI testing in terms of their uses and input requirements (See Table 2). These options include technologies previously tested in farmer groups, those tested in researcher-managed trials and ready for broader farmer testing, technologies (particularly seed varieties) which experiment station researchers wish tested, and technologies which the extension staff wish to have included. Farmers are encouraged to make additional suggestions.

The trial procedures are suggested by the research staff. The procedure is generally to have a side-by-side comparison (10 metre by 50 metre plots) planted on the same day. The technology being tested is in one plot, with the traditional broadcast, plough-down technology in the second plot. Variety trials involving two to five varieties are carried out in side-by-side plots, again planted on the same day and using the same planting method across plots.

Farmers are then asked to select one or more technologies which they want to test on their own fields. ATIP village staff record all trials selected, assist farmers in staking the trial plots, and provide seed, fertiliser, or other inputs required for the particular trial. Technologies involving new machinery and variety trials tend to be limited by material availability.

Typical technologies tested include: a tractor mounted plough/planter; an animal drawn two-furrow plough; a double ploughing/broadcast planting system; an animal drawn row-planter and two types of hand held row-planters; phosphate fertiliser; crop variety trials; the use of short season crop varieties to reduce the risk of crop failures; and the use of fodder crops.

In subsequent monthly meetings, the trial procedures are discussed several times and, where necessary, village staff visit farmers to assist in implementation (particularly with new equipment). During monthly meetings farmers report on trial progress, problems and their observations concerning the technologies. Francistown staff visit each trial at least once during the season to record details of the trial and assess the accuracy of its implementation.

Group meetings serve as a forum to address solutions to particular problems, such as insect infestations, and also allow senior extension staff and experiment station researchers an opportunity to discuss relevant topics with a group of farmers. These meetings often produce in-depth discussions between farmers and visitors, and have been responsible for the modification of some experiment station research, so that it more accurately addresses the farmer's actual problems.

TABLE 2: TECHNOLOGIES TO BE OFFERED FOR TESTING TO FARMER GROUPS, FRANCISTOWN AREA, 1988-89*

Technology	Uses	Conditions for Applications (and Timing)	Resources and Inputs Required (Labour, Cash)
Subject: Water Conservation			
A) Double ploughing	Reduce runoff & erosion, conserve water.	Preliminary tillage to be done a) on very early season rains(S/O) b) on dryer periods between rains NB: Not to be done after mid Jan.	Non restricted access to draught power. Will increase ploughing labour and draught use where animal draught only is used.
B) Contour ploughing	Reduce runoff & erosion. Conserve water.	Field contours should be marked before onset of rains.	Nothing extra (contouring done free by SCS (GOB).
C)Fallow	Conserve water between years.	Field not planted, weed control.	Chemical or mechanical weed control.
Subject: Crop Mixtures			
A) Mixing long and short crops and varieties.	Reduce risk of total crop failure due to early termination of rain.	Suggested mixes through season: 1) Before Dec 1 - 75% LS, 25% SS 2) Dec 1 - Jan 15 - 50% LS, 50% SS 3) Jan 15 onwards - 25% LS, 75% SS	Labour available for harvesting, drying from early Mar. onwards Purchase seed? Bird scaring may be necessary earlier than usual.
B) Annual forage crops	Provide supplemental dry season feed of good quality for for sale, milk production).	Livestock needs (eg early feeding of draught animals, fattening.	Planting labour in Feb.weeding in Mar. Seeds (free from ALDEP) Harvesting May-June.
Subject: Planting Methods			
A) Hand row-planter	Plough on poor soil water, plant on good moisture (for farmers without draught) - ensures good plant stand.	Anytime, best on good moisture. or completely dry soils. Good soil preparation required.	Well tilled seed bed. Sanitas hand row-planter or RIP. Extra labour at planting. (RIP to be emphasised)
B) Sebele row-planter and Nough planter.	Ensure good plant stand.	Requires good soil water condition. for effective use. Also requires understanding of mechanics. Use anytime before Jan 15 (plough/plant same time there after). Well trained draught power.	Sebele planter. Planting labour. Well trained draught power.
C) Improved harnesses, yokes, and animal care. Proper plough adjustment.	Improve efficiency of ploughing operations, improved animal well-being.	Throughout ploughing operations.	Improved equip. Knowledge of animal husbandry (small). Cost of equipment.
Subject: Weeding			
A) Inter-row weeder (modified Indian design and Zimplow design).	Reduce weeding time Increase timeliness of weeding.	Row-planting situation.	Donkeys, weeder. Depending on availability from Sebele.

TABLE 2: TECHNOLOGIES TO BE OFFERED FOR TESTING TO FARMER GROUPS, FRANCISTOWN AREA, 1988-89* (CONTINUED)

Technology	Uses	Conditions for Applications (and Timing)	Resources and Inputs Required (Labour, Cash)
Subject: Forages			
A) Annual forages Babala millet and lab lab	Provide supplemental dry season feed of good quality for early feeding of draught animals	Anytime but only on good moisture or completely dry soils. Good soil preparation required.	Well tilled seed bed. Broadcast and plough down or use Sebele row-planter. March weeding? May-June harvesting.
B) Perennial forages Buffel grass and Siratro	Draught animals, stall feeding, supplemental feeding selected livestock.	Land available for permanent pasture. Seed before Feb.15. Good soil preparation required.	Broadcast on well tilled seed bed cover with brush harrow. Seeds (free from ALDEP). Draught power, weeding labour (late season), harvest labour.
Subject: Manure/Chemicals			
A) Animal manure spread on fields	Increase soil fertility and moisture holding capacity.	Use on all soils in TAD.	Donkey cart, considerable labour for transport to fields and increased weeding.
B) Chemical fertilizer	Increase soil fertility.	Use P on all soils, use N on poor soils under higher rainfall conditions.	Transport for fertilizer to field, labour for broadcasting, and cash to purchase fertilizer.
C) Captan	Seed treatment for groundnuts. Protect expensive seed. Improve germination percentage.	Availability of Captan and G. nut seed. Farmer must understand basics of toxic chemical use.	Cost of Captan.
Subject: Crop Variety Testing			
A) Advanced selection of genotypes	Farmer evaluation of potentially improved sorghum and cowpea genotypes.	Availability of seed.	None extra.

*: LS = Long Season, SS = Short Season, TAD = Tutume Agricultural District

Late in the season the farmer group members participate in a field day. The field day is organised by the farmer group and ATIP staff with input, and sometimes exhibits, from extension. Selected trials, both RMFI and FMFI trials, are visited and the farmer on whose field the trial is located describes the trial and his/her observations concerning the trial. Farmers from other villages attend these field days as do district and regional extension staff and experiment station research staff. There is generally a very lively discussion of each trial.

When trials are harvested (by the farmer), the yields are weighed and recorded by the village staff. A final group meeting is held to discuss the results of each trial. The Francistown staff conducts a formal end-of-season survey of participants and analyses the data collected. This information, along with researcher and extension evaluations of the groups, are presented in a progress report for distribution to village staff, extension, experiment station researchers and other interested parties.

Training, Staff Commitment and Logistics:

Village level staff participate in a workshop to receive training in any new technologies and to practice with new equipment. Trial procedures, material distribution (seeds, machinery, etc.) and data collection procedures must all be reviewed and agreed upon. This usually takes place

in the context of a general workshop on the entire research programme, and involves one day at a central location and one or more visits to each village. One to two auditional field assistants are employed part time to assist in staking fields and other tasks to free more senior village level staff to make field visits and to train or assist farmers with implementing trials.

Group members receive training in trial implementation procedures, the theory behind the technologies (where appropriate), and the use of new equipment.

The village AD is invited to attend monthly meetings and to make any materials or equipment normally available through government programmes, available to group members. Other extension staff participate as they choose or by special invitation.

The Francistown staff are committed to planning meetings with experiment station and regional extension staff--part of the planning process for the entire research programme. The Francistown staff organises and conducts training for village staff, and one or more members attend each group meeting. The staff also organises the food and transportation for field days. But actual preparation is the responsibility of the groups. In addition, the Francistown staff devotes time to field visits to train village staff in assessing the trials, and to address specific problems which may arise.

Materials and equipment for the trials come from several sources. The research station provides seeds, fertilisers and some equipment for trials. ATIP provides other equipment for trials and support equipment, such as scales to weigh the harvest. To date, training costs have not been great as they are part of normal training activates. One of the major costs has been for field days, amounting to approximately US$400 per village for food. Transportation for Francistown staff, and for field days, is provided out of normal government funds.

Limitations:

Several limitations to the group approach, as we have used it, have been identified. These include:

(a). The farmer groups do not have an organisation apart from the research programme. They have been established as a part of the overall research programme and as such may not have a role to play after the project terminates.

(b). Farmer groups tend to serve as a focal point for extensionists and researchers to interact with farmers about subjects that are not part of the trial work. While this type of exchange is useful for all parties, it may become too extensive, and thus have a negative effect by taking time needed for actual trial work. The groups, because they meet on a regular basis, also become a focal point for allowing out-of-country visitors an opportunity to meet with a large group of farmers in one location. Again occasional visitors are helpful to the group, but too many detract from group activities.

(c). A continuing question is how much support, in terms of seed, equipment and other inputs, should be provided by researchers. It appears obvious that any new equipment, seed variety, or other input, which is not locally available, must be provided if farmers are to conduct appropriate trials. However, it may be argued that farmers should provide all locally available inputs. ATIP Francistown has taken the position that providing

small measured quantities of seed for standard size trial plots provides better comparisons, than having farmers provide their own seed and determine the quantity sown. It also aids in trial analysis, and seed quantities do not exceed 200 grams per plot for small grains, and 1 kg per plot for large seeded crops.

(d). A related question is when do farmers stop testing and start adopting? Farmers have indicated an interest in planting larger areas, with ATIP provided inputs. The problem then becomes one of determining when a farmer is conducting a large scale trial (which may deserve support) and when the trial is actually an adopted technology and should be fully farmer supported. There is an additional question of what to do when a piece of equipment is not locally available, but farmers wish to use it extensively.

(e). One of the problems associated with group trials is the desire of participants to have researchers visit the trial sites on a regular basis, as is done with researcher-managed trials. With a large number of farmers participating in groups, individual field visits by research staff are impractical. Yet there is a strong desire for such visits on the part of the participants.

(f). Having farmers select their own trials, rather than having researches assign trials, means that more popular options may be heavily tested, while other options are not tested at all. To date, we have accepted this as the price of allowing greater farmer input and freedom.

(g). Conducting trials may be very difficult for farmers who do not control their own draught power, e.g., many cattle were killed by drought, leaving some farmers with insufficient oxen to form a team. As a consequence, many farmers were forced to hire tractors. Tractor drivers were very reluctant to perform "small plot" work. So many farmers who signed up for trials were unable to implement them.

EXTENSION-MANAGED OPTIONS TESTING GROUPS

Objectives:

The extension service in Botswana is currently very committed to administering drought relief programmes. Thus, the traditional role of extending recommended agricultural technologies has been greatly reduced. The 1987-88 Annual Report from extension in the Francistown region states that virtually no extension was done this year and that 95 percent of AD's time was taken up with the administration of government relief programmes. Further, a single AD may have well over 500 households under his/her responsibility. Without a good communication system, many of the constraints these households face may go unaddressed. The farmer group approach offers a means of working with a number of farmers at one time, thus improving the efficiency of the AD. The objectives of the extension-managed farmer testing groups are:

(a). To provide a method for AD's to increase their efficiency by addressing a large number of farmers (on technical issues) at once, rather than having to make numerous individual visits to households and fields. (The group format allows the AD to perform a teaching function at the beginning of the year, and a backup function throughout the cropping season, through monthly meetings.)

(b). To provide a forum for researcher backup in extension activities.

(c). To provide a test to see if farmer groups are practical under extension conditions.

As was discussed above, ADs are officially encouraged to work with groups of farmers, but to date, the system has not been employed for the testing of extension recommended technologies in the Francistown region.

Procedures:

Prior to the cropping season ATIP staff met with regional agricultural officers to discuss establishing a pilot extension-managed options testing farmer group. With the Regional Agricultural Officer's approval, the DAO identified one extension area for the pilot group. The DAO and the AD from the area met with ATIP staff to discuss th group work. The Regional Crop Officer and the ALDEP manager were also included in the discussions. This group decided on a limited number of technologies, including types of equipment provided through the ALDEP programme, which were to be presented for testing. Logistical details were also arranged.

Just prior to the normal beginning of the cropping season, the AD asked the village headman to call a traditional village meeting at which he, and the ATIP Francistown staff, described the farmer group work in other villages and invited interested farmers to attend the initial group meeting to be held two weeks later. At the initial group meeting, the AD and ATIP staff discussed the technologies available for testing and how tests were to be conducted. Farmers were asked to indicate which tests they wished to participate.

At subsequent monthly meetings the implementation of trials was discussed. The farmers were asked to decide on their own how large to make the test plots, and to stake the plots accordingly. While side-by-side comparisons were recommended, many trials were implemented without a comparison, and so became demonstration rather than true trials. A field assistant was hired to assist the AD in working with farmers to collect data, provide seeds and equipment etc.

Monthly meetings to discuss trials were held Farmers described their trial experience, identified problems, and reported their observations on the trial to the group. The farmer group meetings were chaired by the AD. All meetings were attended by ATIP and district level extension staff. ATIP and extension staff visited all trials at least once during the season.

A field day was held near the end of the season. Farmers from other villages, extension staff (including the Director of Field Services) and research staff all participated.

Following harvest, the ATIP staff are currently conducting a formal end-of-season survey of participating farmers to obtain farmer assessment of the trials they participated in and the group activities. This information will be included with extension and researcher evaluations of the group activity in a progress report.

Training, Staff Commitment and Logistics:

The DAO and AD had the most time committed to this group. The AD needed training in group management and also in some of the technologies, particularly some of the equipment. This was provided by the ATIP staff on an informal basis. The field assistant hired to work with the AD did not receive any training, and so did not perform well. Better training is needed for both the AD and field assistant.

ATIP staff attended farmer group meetings and made field visits. Some equipment, seeds, etc., were provided by ATIP. Other equipment came from the extension programme.

Limitations:

In addition to some of the limitations listed for researcher-managed groups, the extension-managed groups has some unique limitations:

(a). Because of the limited time available for the AD to work with the group, and due to an untrained field assistant, the level of support to group members was low, and many trials were not implemented or were poorly implemented. Partly this is a function of the extension staff learning how to work with groups in an options testing situation.

(b). The approach is limited in that it does take AD time, a commodity in short supply due to other demands. There is also the risk of heightened farmer expectations, which many not be met.

Other limitations will probably be identified when the season's experiences are analysed.

CONCLUDING COMMENTS

The ATIP approach to farmer involvement in farming systems research is to attempt to integrate farmer participation into the research/extension establishment through the use of farmer testing groups to facilitate FMFI trials. The use of farmer testing groups has a number of advantages for the researcher and the extension agent.

(a). The researcher has limited time for conducting researcher-managed trials, and the FMFI trials conducted through the group format can expand the number of technologies being examined.

(b). The extension agent also has great demands on his/her time for administering drought relief and other government programmes. With limited time to devote to extension of technologies, the best use of the time is to work with groups of farmers. By having farmers testing the technologies, they are more involved than in traditional extension demonstration plots, and are in fact testing the recommended technologies for acceptability under local conditions.

(c). The communication and discussions between farmers, extensionists and researchers is increased. This is where farmers make a major input into technology evaluation and evolution. Farmers, through their choices of trials, also provide valuable information on what technologies are of interest to them. Research and extension staff receive early and continuing feedback on technologies.

(d). The inclusion of extension personnel in the research process means they have a chance to suggest modifications during the trials, and also become familiar with new technologies they will later extend.

(e). There are a number of advantages to joint farmer/research/extension field days. First, there is a great deal of interest when farmers describe their experiences and conclusions to other farmers. Second, inter-village competition can develop, lending an incentive to try new technologies. Third, extensionists and researchers can get added information, as farmers tend to ask more questions of other farmers than they do of researchers. Finally, the use of side-by-side comparisons facilitates discussion.

A number of problems encountered while working with farmer testing groups have been discussed above. Several additional issues can be raised.

(a). To date, statistical analysis of data collected on farmer trials has been minimal due to the small amount of hard data collected. The limited amount of data which can reasonably be collected from farmer groups is one reason why farmer group work must be part of a larger research programme--so that questions needing more intensive analysis can be handled by researcher-managed trials. The development of assessment tools and ways of collecting more statistically analysable data from the farmer group trials are important methodological concerns. The ability to generate hard data is important in legitimising conclusions based on farmer trials within the research establishment.

(b). The questions of determining an optimum size group, and keeping the group to that size are problems which remain. There is a need for group continuity but also it is desirable to have new farmers participate in the groups as they bring new ideas and involve a larger number of farmers in the development process.

(c). For many of the problems raised in group discussions there may be no identifiable solution that is technically and socio-economically viable. This lack of implementable solutions can be frustrating for all parties concerned.

None the less, farmer reaction to the farmer testing groups has been quite positive, and the approach has been beneficial in focusing research on farmer identified problems.

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