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MISCELLANEOUS REPORT

TWO OPERATIONAL APPROACHES TO PARTICIPATIVE TECHNOLOGY DEVELOPMENT USED BY THE AGRICULTURAL TECHNOLOGY IMPROVEMENT PROJECT, FRANCISTOWN, BOTSWANA

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BY

F. WOSMAN
G. HEINRICH

DEPARTMENT OF AGRIC. RESEARCH
MINISTRY OF AGRICULTURE
BOTSWANA

MID-AMERICA INTERNATIONAL
AGRICULTURAL CONSORTIUM
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ADDRESSES:

F/BAG 0033
GABORONE

P.O. BOX 10
MAHALAPYE

P.O. BOX 1C275
TATITOWN (FRANCISTOWN)

PREFACE

The Informationcentre for Low External Input Agriculture, Leusden, The Netherlands, held a workshop on "Operational Approaches in Participative Technology Development in Sustainable Agriculture" in Leusden on April 11 and 12, 1988. In a letter and working paper attached to this Miscellaneous Paper, the organizing committee presented "Concepts and Processes in Participative Technology Development" and asked for contributions describing approaches to participative technology development. This Miscellaneous Paper was submitted in response to that request.

TWO OPERATIONAL APPROACHES TO PARTICIPATIVE TECHNOLOGY DEVELOPMENT USED BY THE AGRICULTURAL TECHNOLOGY IMPROVEMENT PROJECT, FRANCISTOWN, BOTSWANA

by

F.D. Worman and G.M. Heinrich*

INTRODUCTION

The Francistown team of the Agricultural Technology Improvement Project (ATIP) is in the third season of working with farmer groups. Farmers groups have been used as an integral part of the team's research programme for three years. The team is also working with the Francistown Regional Agriculture Office (extension service) on the first year of a pilot extension managed farmer group.

The purpose of this paper is to report our experiences with farmer groups for use in an ILEIA sponsored workshop. Using the outline provided by ILEIA, this report will provide summary descriptions of the two operational approaches we have used (the first being more extensive as it is based on three years experience while the second approach is in its first season), followed by a more general discussion of our experience with participative technology development based on the questions posed by ILEIA.

This information is based primarily on the ATIP approach used in Francistown. The Mahalapye ATIP team has used a slightly different approach to group formation and involvement. A discussion of the overall ATIP approach, and the differences between the two teams, is contained in Norman, Baker, Heinrich and Worman, "Technology Development Farmer Groups: Experiences for Botswana", **Experimental Agriculture**, forthcoming. (Also as ATIP MP 87-10).

RESEARCHER MANAGED FARMER GROUPS

Desired output

These groups were organized as part of the overall research strategy of the ATIP Francistown team. The objectives for the groups were:

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

(b). To involve farmers and agricultural demonstrators (local extensionists) in the farming systems development process.

* Agricultural Economist and Agronomist, Agricultural Technology Improvement Project, Department of Agricultural Research, Botswana. The views expressed in this paper are the authors and do not necessarily reflect those of the Department of Agricultural Research or the Ministry of Agriculture.

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

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

Procedures

There are three primary sets of actors in the groups:

(a). The ATIP research staff, consisting 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 agricultural demonstrator.

(c). Farmer members of the group.

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

During the period between cropping seasons, the ATIP Francistown staff meets with regional and district extension officers, specialists 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 workplan.

Approximately two months prior to the normal beginning of the cropping season (the on-set of rains) a traditional village meeting is called by the village chief 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 activities to attend the first group meeting.

Four to six weeks later the first farmer group meeting is held, chaired by the ATIP village senior technical officer. (The local agricultural demonstrator 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 reviews a wide range of technologies in terms of their uses and input requirements. These options include technologies tested in farmer groups previously, 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 asked for additional suggestions. See list of technologies used in 1987-88 in Appendix A.

Before the first group meeting, the Francistown staff holds 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. The trials procedures are reviewed and data collection forms are discussed. Village staff are also asked for

suggestions to make groups function more smoothly.

The trials procedures are also discussed by the research staff (both village and Francistown). The procedure is generally to have a side by side trial (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 2 to 5 varieties are done in side by side plots, again planted on the same day and using the same method.

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 varieties tests tend to be limited by material availability.

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 trials. Village and 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 farmers actual problems.

Late in the season the farmer group members participate in a field day. The field day is organized by the farmer group and ATIP staff with input, and sometimes exhibits, from extension. Selected trials, both researcher managed and farmer group 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 and the Francistown staff analyses the data collected and prepares a progress report for distribution to village staff, extension, experiment station researchers and other interested parties.

Skills and means for actors

Village level staff require a workshop to introduce any new technologies, especially 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 additional field assistants have been 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. Finally the village staff must be available to weigh and record yields from the trials. The senior technical officer chairs the group meetings and the

training for this has been on-the-job, with suggestions by Francistown staff.

The village AD is asked 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..

Francistown staff is committed to planning meetings with experiment station and regional extension staff, part of the planning process for the entire research programme. The Francistown staff organizes and conducts training for village staff and one or more members attend each group meeting. The staff also organizes the food and transportation for field days, with actual preparation being 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 activities. 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 and risks

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

(a). The farmer's groups do not have an organization apart from the research programme. They have been established as a part of the overall research programme and as such will probably not continue beyond the life of that programme. In a basic sense the groups are new each cropping season. However, this does not preclude the inclusion of the group approach to research in extension activities or other formalized groups within the villages.

(b). Farmer's groups tend to serve as a focal point for extensionists and researchers to interact with farmers about subjects that are not part of the trials 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 trials 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 detracts from the 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 quantities of measured seeds for standard sized trial plots provides better comparisons than having farmers provide their own seeds and determine the quantity sown. It also aids in trials analysis, and seed quantities do not exceed 200

grams per plot for grains, and 1 kg per plot for large seeded legumes.

(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 full 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).Results from trials handled through a group format, provide limited data which can be used for in-depth analysis. There is thus a trade-off between obtaining farmer opinion and limited field data on a technology and obtaining the more detailed data provided by researcher managed trials which are amenable to more complex analysis.

(f).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 is impractical. Yet there is a strong desire for such visits on the part of the participants.

(g).Having farmers select their own trials, rather than having researchers 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 for allowing greater farmer input and freedom.

(h).Conducting trials may be very difficult for farmers who do not control their own draught power, eg. many cattle were killed by drought last year, 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.

Experience

ATIP Francistown began 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.

Resource persons

There have been a large number of the Francistown staff working with farmer groups. The following may be able to serve as resource persons:

Dr. G. Heinrich, Agronomist
Dr. F. Worman, Agricultural Economist
Mr. S. Masikara, Agronomist
Mr. B. Bagai, Senior Technical Officer, Maroba

All may be contacted through:

Agricultural Technology Improvement Project

P.O. Box 1027
Tatitown, Botswana

Annexes

Norman, Baker, Heinrich and Worman, "Technology Development Farmer Groups: Experiences for Botswana", ATIP MP 87-10, October 1987.

Worman, Heinrich, Masikara, Mabongo and Bock, "1986-87 Farmer's Groups Technology Options Testing Trial", ATIP PR F87-6, October 1987.

EXTENSION MANAGED FARMER GROUPS

Desired output

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. Further, a single agricultural demonstrator may often have well over 500 households under his/her responsibility. Without good communications systems, many of the constraints there 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 extensionist. The desired outputs for the extension managed farmer groups are:

(a).Test a limited range of extension recommended technologies under local conditions.
(b).Test a few researcher recommended technologies.
(c).Provide a test to see if farmer groups are practical under extension conditions.

(It should be noted that AD's are officially encouraged to work with groups of farmers in Botswana, but to date, the system has not been employed for the extension of 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 farmer group. With the Regional Agricultural Officer's approval, the District Agricultural Officer (DAO) identified one extension area for the pilot group. The DAO and the agricultural demonstrator (AD) from the area met with ATIP staff to discuss the group work. The regional crops officer and the ALDEP manager were also included in discussions. This group decided on a limited number of technologies, including pieces 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 chief 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 test or tests they wished

to participate in.

At subsequent monthly meetings implementation of tests were discussed. The farmers were to decide on thei own how large to make the tests, and to stake the plots accordingly. While side by side comparisons were recommended, many trials were implemented without a comparison, and so became demonstrations 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 have been held. Farmers have been asked to describe their trial experience, identify problems, and give the group their observations. ATIP staff and district extension staff have been present at all of the farmer group meetings. The meetings are chaired by the AD.

A field day, to which extension and research personnel and farmers from other villages have been invited, is planned for April. A post season farmer assessment survey will be conducted by ATIP staff to obtain farmer reactions to the group approach and their assessment of the trials.

Skills and means for actors

The DAO and AD have the most time commitment 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 has attended farmer group meetings and made field visits. Some equipment, seeds etc. have been provided by ATIP. Other equipment has come from the extension programme. A proposal has been presented to ALDEP to fund a regional level staff position to provide support and training for ADs working with farmer groups. This position will be very important if it is decided the approach is to be used in additional extension areas in the region.

Limitations and risks

Because of the limited time available for the AD to work with the group, and due to an undertrained field assistant, the level of support to group members has been low, and many trials have not been implemented, or were poorly implemented. Partly this is a function of learning how to work with groups.

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 are not met. Other limitations will probably be identified when the season's experiences are analysed.

Experience

ATIP and the extension service are in the first season working with this type of group.

Resource persons

The following Extension and ATIP staff have worked with the extension managed farmer group. All can be contacted through the ATIP address.

Mr. S. Masikara, Agronomist
Mr. M. Magallela, DAO Tati District
Dr. G. Heinrich, Agronomist
Dr. F. Worman, Agricultural Economist

Agricultural Technology Improvement Project
P.O. Box 10275
Tatitown, Botswana

Annexes

None.

GENERAL COMMENTS ON OPERATIONAL APPROACHES

1. Related to agro-ecosystems analysis:

General: The method grew out of a farming systems research project and remains an integral part of that project. For the first three years of the ATIP Francistown farming systems work the team composed of agronomists, agricultural economists, and animal scientists (both expatriate and nationals) tested -- research managed-farmer implemented and research managed-researcher implemented trials -- and modified existing extension recommendations which were not being widely accepted. Technologies proposed by the experiment station were also tested. Socio-economic surveys and monitoring were carried out in the three village area.

Two things became clear during this period. First, the package approach, using a single technology package, did not work in Botswana's harsh environment. The solution chosen to resolve this problem was to take a sequential decision making perspective. Because farmers make decisions throughout the cropping season, based on how the season develops, we tried to identify technology options which would be relevant under different season development situations. One obvious source of technology options was the farmers themselves. This led to the second problem, an increase in the number of technologies being considered, which increased the number of problems for researchers to address, with no increase in researcher resources.

Our response was to experiment with farmer testing groups, first because the groups allowed greater farmer and extension input into the research process and second because they allowed the testing of a greater number of technologies under a greater variety of situations than was possible with researcher managed trials. This testing was directed at determining if the technologies produced increased yield and improved yield stability. Thus ATIP Francistown began working with farmer groups as an integral component of the overall research programme. This group work was fortuitous as we have been increasingly requested to test technologies, particularly new varieties, coming from the experiment station.

There has been reasonable support within the regional extension organization and from on-station researchers for this approach.

1.1 Initially ATIP began working with a cross section of the three villages based on socio-economic criteria, i.e. wealth, male-female headed households, type of draught power, etc. When we began working with farmer groups it was in part because farmers who had not been working with ATIP trials were interested in having research trials on their lands. The decision was made to open the groups to any village member interested in participating. Our analysis of the socio-economic profile of the groups (1986-87) indicates that the group do not differ from the village in general. The Mahalapye ATIP team has made low resource households a focus for some of their group work. (See Norman, et al.) One of the reasons we opened the group was that we wanted a heterogeneity in test environments, including resource characteristics.

1.2 The goals for the earlier analysis were set before the farmer groups began and there has been little new analysis done after the groups began. Merging the objectives of the various actors for the farmer groups has been an iterative process beginning with researcher needs to expand research capability, the farmer's desires to have research on their land, and extensions interest in being included in the on-going research process. No formal setting of goals has really taken place.

1.3 The agro-climatic domain was determined prior to the ATIP Francistown team beginning work by the Ministry of Agriculture. The socio-economic domains within the farmer groups have been established through self-selection of the participants, and appear to be representative of the communities as a whole. Technologies have been contributed by all actors, but generally tend to be aimed at limited resource farmers, as that is the mandate of the ATIP project.

1.4 Extensive surveys and monitoring have taken place in the villages over a period of years (including prior to the farmer group formation). This has involved most aspects of the agro-climatic and socio-economic environment in which farmers operate. This process is related to the overall research programme and not just to the farmer group work.

1.5 Because the analysis process has taken place partially prior to the group formation and to a large extent as part of a large research project, there has been no effort to explicitly develop a capacity within the group to make this type of analysis.

2. Related to Networking:

Prior to the ATIP project, an extension network consisting of regional and district specialists supporting local agricultural demonstrators was in place. The ADs had advisory farmer committees, but mostly the committees were not functional, and AD (and higher level extensionists) time was largely occupied with administering drought relief programmes.

There is a history of village level meetings where all village members participate. Thus there is a history of participation in group discussion.

2.1 The farmer groups have been organized by the researchers through the village meetings and self-selection and do not have an organization of their own. The Mahalapye team has worked with groups that have their own organization and are chaired by elected leaders, rather than by ATIP staff.

2.2 Research staff have increased their group leadership abilities through practice. The research programme has been expanded through the group work, and farmers have increased their ability to test new technologies through comparison trials. Any increase in skills levels has taken place through experience.

3. Related to inventory of existing technology:

3.1 ATIP staff regularly meet with on-station researchers and with regional extension personnel as part of the programme planning process. Potential technologies are identified in these meetings for testing by the farmer groups. There is a continuing process of soliciting farmer ideas for technologies to be evaluated. This process, primarily through the monthly meetings, also identifies ways that technologies of interest to other actors need to be modified to make them acceptable to the farmers. A major part of the screening process is the actual farmer selection of technologies they wish to test. Observations made by ATIP staff, other research staff and extension staff, as well as informal discussions with farmers, and the regular group meetings all contribute to the technology identification and development process. The group meetings often produce a synergistic effect which is beneficial in discussing technologies. Field days involve farmers from several villages, and so the discussions tend to bring more divergent views to bear on technologies than single village discussions.

3.2 Farmers and researchers both have proposed modifications to existing recommendations and to on-station proposed technologies which have potential for making the technologies more acceptable under local conditions. Modifications of technologies may be tested in subsequent years.

4. Technology transformation:

4.1 ATIP staff solicit suggestions for technologies to be tested from on-station researchers, who may have a technology they wish to have tested under farmer conditions, and from extension staff at all levels. They also try to develop technologies to address needs observed in the field when no solutions are directly available "off the shelf". The group meetings offer a continuing forum for soliciting farmer suggestions for the design of new technologies or modification of existing technologies. Finally, ATIP staff suggest technologies based on research managed trials or on information from other sources. Actual trial selection is made by the farmers based on their own criteria. If a particular trial is important to an on-station research programme, farmers will be encouraged to undertake the trial if insufficient group members choose that trial.

4.2 The experimental design is suggested by the research staff (or the extension staff). The design is kept as simple as possible and usually consists of side-by-side plots -- one of the new technology, the other the traditional system -- planted on the same day. In variety trials side-by-side plots of from two to five varieties are planted, again on the same day and using the same planting method. Village staff assist farmers in staking plots to assure proper area comparisons and ATIP provides measured amounts of seed and any other inputs for each trial plot. Research staff demonstrate and discuss technologies, particularly new technologies involving equipment, during group meetings. In addition village staff are available to assist in trial implementation where new technologies are involved. Francistown and/or the village senior technical officers make field visits to verify if trials are properly implemented and to collect relevant trial data. Conclusions are based on yield data (weighed by ATIP

staff) and on farmer evaluations, both during group meetings and in a formal survey conducted by ATIP staff.

4.3 The actual trials are farmer managed with research or extension input when new equipment is involved. Researchers and extension staff may make suggestions during group meetings, but generally farmers are free to manage their trials.

4.4 At each group meeting, farmers conduct an informal analysis of their trials. During field days many farmers have an opportunity to observe and comment on a number of trials. A more formal analysis is completed by research staff and is based on reported farmer observations and the yield data which has been collected. Statistical analysis is minimal due to the small amount of actual hard data collected. The question of how much data 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.

4.5 Based on the increasing participation in farmer groups, and the interest of the regional extension staff, and local ADs, in starting farmer groups indicate that farmers and extension staff have drawn positive conclusions about the usefulness of the approach. There is evidence of on-farm testing of technologies before the farmer groups, but whether the group approach would continue in the absence of research staff is open to question. However, the continuation of some form of testing is almost certain.

5. Embedding technologies:

5.1 To date no great emphasis has been placed on formalized training. Village research staff receive training on all aspects of the research programme during a workshop prior to the cropping season. Farmers participate in demonstrations and hands-on training of equipment during group meetings. Informal training on group procedures was provided for the AD in the village where the extension group was formed. Training of village staff is done by the Francistown staff. Farmer group training is done by Francistown staff, village staff and occasionally by farmers themselves. No formal training materials have been prepared, although material on the group process is planned for this year (as part of a larger manual on the farming systems research process in Botswana).

5.2 Communications tends to revolve around the farmer group meetings. The various actors are encouraged to attend these meetings as often as possible. In addition researcher and extension evaluation meetings are held at the end of the season, and involve planning for the next season. Articles, with pictures, on the farmers group activities and field days have appeared regularly in the Ministry of Agriculture newsletter.

5.3 and 5.4 The major impact on suppliers has been in the area of equipment (and is only partly due to the group activities). ATIP has been working with improved donkey harness and with hand row planters, both in research managed trials and in farmer group trials. This equipment is presently being manufactured by the Rural Industries Innovation Centre, which is also working with private industries to secure additional manufacturing capability. The ALDEP equipment programme may be modified to include the hand row planter and donkey harness once final designs have been tested. In addition, a proposal has been submitted to ALDEP to fund a regional level

position to provide support to extension managed farmer groups, if the current pilot group is successful. The ALDEP staff has been included on a regular basis in group activities while the RIIC staff has been specifically approached by the ATIP staff to secure their participation.

5.5 There has been increased participation and interest in the group approach at all levels. Additional expansion of the extension managed groups is planned, but may be modified depending on the outcome of the current extension group trial. These groups are seen by the research and extension actors as basically tools for research or extension to increase their programme efficiency and applicability to resource poor farmers. The groups are not seen, at this point, as becoming self-sustaining farmer technology development efforts separate from research and extension. Rather, the aim is to include the concept of, and methods for obtaining, farmer participation in the formalized technology development effort (and organizations) within the country.

6. Utilization of new technologies:

We are attempting to assess the degree of technology adoption by finding out if farmer group participants are using tested technologies after two or three years. Or are they still "testing" the technologies. Some of the technologies have been "tested" by farmers who have not participated in the groups. At least one technology, the one originally tested by the first group, has been incorporated by a number of farmers, both in and out of the group, on at least part of their lands.

There has been increased interest on the part of experiment station researchers in doing collaborative work with ATIP which includes farmer group testing of technologies, particularly crop varieties. Suggestions from the farmer groups have lead to modifications in some technologies, mostly equipment.

Given the harsh environment in which arable agriculture takes place in Botswana, it is hard to assess what contribution farmer groups have made to sustainability of agriculture, particularly in the short run. The farmer groups have opened up a new communications channel among farmers, extensionists and researchers which is proving beneficial to the agricultural research effort. The long run impact may depend on developing organizational structures within the extension and research establishments that will assure the continuation of farmer involvement in the process of research ad extension.

Traditionally increases in productivity have been the major criteria used by research and extension in determining if a technology is an improvement. Farmers appear to have more interest in stability of production than in straight production increase, a fact which may now be more appreciated within the research establishment. The sustainability of new technologies, particularly ones based on equipment which is only beginning to be locally manufactured (and which may be highly subsidized by the ALDEP programme), is still an open question. Where improved varieties are identified there may be problems of obtaining sufficient seed for wide scale introduction, thus limiting the technology at least initially. Equity has been promoted by the self-selection process and by the development of technologies which are specifically applicable to limited resource farmers, particularly those who do not own their own draught. In part the questions of equitability and sustainability must be addressed on a higher level than the groups because they are a part of agricultural research and extension structures and are affected by policy decisions at the national level. Because the groups are part of the structure they have potential for influencing the broader policy

questions particularly those pertaining to new technologies and support systems.