

APPENDIX 3

SOCIO-ECONOMIC COMPONENT OF THE USAID MID-TERM
EVALUATION OF THE ZAMBIA AGRICULTURAL RESEARCH AND EXTENSION
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I. INTRODUCTION

This report represents the social impact component of USAID's mid-term project evaluation of the ZAMARE-sponsored Adaptive Research Planning Team's (ARPT) involvement in Farming Systems Research (FSR) in Central Province, (CP) Zambia. The terms of reference (Annex A) for this component were developed by the evaluation team (Sutherland and Warren) in collaboration with USAID/Lusaka. The principal documents consulted are listed in Annex E. Two field trips were made by the team to Central Province; in December 1984 and in January 1985. All of the ZAMARE team members based in Kabwe were interviewed, as were a variety of provincial and district level agricultural officers and a number of cooperating small-scale producers (SSPs). Members of various C.R.Ts. at Mt. Makulu were also interviewed during December and January (see Annex B). The evaluation Team was received in a very cooperative manner by all individuals concerned with the evaluation.

Considerable effort and achievement has already been recorded by the CP/ARPT. As one of the first ARPTs to be organized in Zambia, its experience is of considerable value to the newer ARPTs. The evaluation team found a very healthy attitude of self-appraisal and self-criticism in many individuals interviewed. There is commitment to the project by both GRZ and the ZAMARE team and a strong desire to strengthen and improve the efforts of ARPT. The recommendations presented in this report - many provided by interviewees - are given in the same positive perspective as they were given to us, to make current efforts even better. We feel that while local conditions vary across Zambia, many of the constraints identified and recommendations made in this report will be useful to the

national system of ARPTs as they grapple with the complex activities designed to improve agricultural productivity by the small-scale producers (SSPS).

II. THE ZAMARE ARPT

ZAMARE provides technical expertise and capital and operational funds for the CP/ARPT. The team consists of a Farming Systems Agronomist, a Farming Systems Economist (both of whom arrived in Zambia in August 1982), and a Research-Extension Liaison Officer (RELO), who arrived in Zambia in October 1982. The agronomist and economist have formal Zambian counterparts. The RELO whose position is established in the Extension Branch works most closely with the Provincial Extension Training Officer (ETO). In addition to carrying out farming systems research and research - extension liaison in the province, the ZAMARE ARPT component provides resources for in-service and overseas training for Zambian counterparts and trial assistants. The training component is not covered in this part of the evaluation.

FSR survey work was begun by a team under the leadership of CIMMYT in 1978 (See CIMMYT, 1978). The first on-farm trials were established in 1981-82 season by Zambian ARPT staff in the Serenje District of Central Province. The ZAMARE team arrived in August 1982. Their initial activities included survey work in Mkushi District and on-farm trials in both Serenje and Mkushi Districts during the 1982-83 cropping season. Since then the Central Province ARPT program has expanded to incorporate the three largest traditional recommendation domains (TRD's) in the province. What follows is a summary of the team's work, point to strengths

and weaknesses in the socio-economic aspects of work to date, and making suggestions for operation improvements.

III. THE SOCIO-ECONOMIC IMPACT OF THE ZAMARE ARPT

A. Diagnostic Surveys and On-Farm Research

In 1978 CIMMYT's East African Economics Program demonstrated low-cost farm survey techniques in the Serenje District of Central Province. The following year CIMMYT 'zoned' the entire province into eight recommendation domains (RD's); one 'commercial' one 'emergent'; and six 'traditional' (See CIMMYT, 1979). The six traditional recommendation domains (TRDs) - with an estimated 46,000 farm families were the primary target group identified in the social analysis section of the ZAMARE Project Paper (USAID, 1980). This section emphasized that 'women are central to agricultural production in Zambia' (p.38) and that 'women are over-represented among the poorest stratum of traditional farmers' (p.39), concluding that, with its focus on multiple target groups, ARPT 'should take care not to exclude female headed households' (ibid). The Project Paper also recommended that ARPT 'move beyond the existing CIMMYT methodology by including sex of household head as one criteria in discerning recommendation domains' (ibid).

One objective in this section of the evaluation is to establish the reasons why CP/ARPT has been unable to consider gender as a factor in its program of diagnostic surveys, on-farm trials and research extension liaison, and to make recommendations for the situation to be rectified. A further, related, objective is to assess the extent to which the ARPT program has been targeted to reach the larger numbers of poorer

'traditional' farmers than the smaller numbers of relatively richer 'emergent' farmers.

In order to address these objectives it is necessary to consider the ARPT program of diagnostic survey and on-farm research in the three traditional domains where it is operating: TRD2, TRD3, and TRD5 (See Annex C).

Each TRD will be covered separately before general comments are made regarding the collaborative aspects of on-farm research.

1. Traditional Recommendation Domain 2

TRD2 lies in the northern high rainfall area incorporating most of Serenje District. Its estimated population of 13,000 'traditional' farmers makes it the largest domain, and the first to be exposed to farm surveys and on-farm trials. A formal survey was completed by CIMMYT in 1978, (prior to the zoning of the province), and on-farm research began in the 1981-82 season which addressed farmers' problems identified and prioritised during the formal survey. This was continued after the ZAMARE component of CP ARPT arrived in August 1982 (See USAID, 1983). No more socio-economic survey work has been conducted in this domain since 1978, although farm level agronomic data was collected in the 1983-84 season. As the initial survey work carried out by CIMMYT was based on a sample drawn from the farm register, it is highly likely that both female headed households and poorer households were under represented. Survey data was not disaggregated by gender as the sex of household head was not required on the CIMMYT questionnaire and labour data was not collected and analysed by gender or age. However, detailed labour and other household data was being collected in TRD2 by the Mpika IRDP which the CP/ARPT economists

could have made use of, and which incoming economists must use in the economic analysis of trials.

The selection of farmer cooperators in TRD2 over the four seasons of on-farm trials has shown a bias towards relatively more wealthy household heads who are predominately male. Two (10%) out of the 20 farmer cooperators listed by the TA are female, and both are larger farmers (one with 21 HA. and one with 4 HA). While zoning reported farms in TRD2 in the range of .8 to 2 HA., and cultivated area in one formal survey averages 2.2 HA., nine (45%) of the farmer cooperators had 3 or more HAs., and only three (15%) less than 2 HAs. Partly due to an attempt to integrate with the T and V system there was also a 'politico-economic' bias; three (15%) held party positions, one (5%) was a tractor operator, three (15%) were ox owners, and three (15%) others hired either oxen or tractors. This bias towards male and more wealthy farmers is of concern given the nature of the on-farm trials which address cash and labour constraints which are most acute in poorer and female-headed households.

2. Traditional Recommendation Domain 3.

Diagnostic survey work in TRD3 (Mkushi District) began in August 1982 with an informal survey. This domain, with an estimated 8,000 small farmers, is the third largest in the province. According to the zoning reports, sorghum is often dominant over maize as a staple and 1-2 HA is the average area cultivated with hand hoe as the dominant method of tillage (see CIMMYT, 1979). Later survey work did not confirm this. In the informal survey of 1982 (covering 24 farmers in 3 wards), maize was found to be the dominant starch staple in all households, 92% of the sample surveyed had access to oxen or tractor power, and the average cultivated

area as 2.6 HA. Gender of household was not indicated in this survey, but the average household size of 8.7 suggests that large monogamous or polygamous households were selected. An extension bias towards more progressive farmers with better than average resource endowments is a likely explanation for some of the discrepancy between the zoning done in 1979 and the survey work conducted in 1982.

While labour and cash were the main constraints considered in designing the 82-83 trial program in TRD3, few data were collected on labour in the informal survey. However, a detailed labour data study using a modified version of the Mpika IRDP format was initiated in the same season and continued into the 83-84 season. This promised much useful data but suffered several major drawbacks. Firstly, although the study was conducted over two seasons covering 26 households (9 in 82-83 and 17 in 83-84), only one household (5%) was female-headed. Secondly, different households were sampled in each season so that consistency across seasons and reliability checks couldn't be made. Thirdly, the richness of the data has not, so far, been analysed in a way that allows any modification or conclusive endorsement of the on-farm trial program. Fourthly, the survey did not start until December, 1982, and so missed important operations in the first season. Fifthly, in the second season, the ZAMARE economist reported that the data was dubious as the enumerator was not doing a thorough job. Finally, much valuable data on off-farm activities was excluded, thereby weakening the systems aspect of the study. Despite the under-representation of female-headed households in the labour survey, the average size of households was small (6) as was the average cultivated area (1.7 HA). In comparison to the informal and formal survey

sample, the labour survey data should therefore be more relevant in regard to the labour constraints experienced by smaller farmers in TDR3. The labour data has been used in the economic analysis of trials in the domain. It should be borne in mind that the main objective of collecting labour data is to explore further hypotheses being worked on in the trial program. Therefore this data should be of high quality, and used extensively and sensitively both in the economic analysis of trials and in the pre-screening of technical solutions. The analysis of the labour data is being continued by the outgoing ARPT economist at Illinois, where there is access to a computer. The analysed data should be made available to CP/ARPT for planning on-farm research, analysing trial results, and in the extension of recommendations in the forthcoming cropping season. However, we caution that such economic analysis should never substitute for increased farmer participation in the evaluation of trials and the pre-screening of technical options.

Similar data analysis constraints apply to the formal survey of TRD3 which was not carried until July 1984, following the seasons of trials. As yet, the data collected have only been broken into frequencies; cross-tabulations and correlations to test hypotheses developed in the informal survey are the next step in analysis in order to improve on-farm research in TRD3. Frequencies presented in the annual report suggest that the sample for the formal survey, like that of the informal survey, over-represented more wealthy male-household heads. For example, the average cultivated area of 3.3 HA was larger than the 1-2 HA reported during zoning and most were either oxen owners (44%) or able to hire oxen or tractors (42%). All reported maize as the main staple crop.

Eighty-eight percent were male-headed households, more than the 70% estimated for the population as a whole (See Annex E), but it was encouraging that gender of household head was included as a factor in the survey. The smaller size of households (6.5), compared with 8.7 in the informal survey, was also encouraging given the importance of labour constraints in the system. However, the fact that the average number of household working members was larger, suggests that different kinds of households were selected or that young children were not all recorded).

In short, the collection of socio-economic data in TRD3 has involved considerable resources and effort but the benefits are not yet fully apparent. Thus while the informal survey and prognosis identified 12 major production constraints, this list has not yet been increased or refined as a result of the labour survey and formal survey in TRD3.

After constraints were identified during the informal survey, on-farm trials for TRD3 were designed and implemented in the 1982-83 season. The ZAMARE agronomist noted the following prioritisation of agronomic problems; maize is most important crop with problems of late planting, poor soil fertility and crop establishment. Sorghum is secondary to maize and problems need further exploration. From the socio-economic perspective constraints were very similar to those identified in 1978 for TRD2; labour and cash shortages at critical periods. But socio-economic constraints were not prioritised in relation to agronomic ones. The 12 types of constraint were matched against 59 possible technical solutions. Of these 59, 14 have been tried in trial programs, some over three seasons.

The selection of farmer cooperators to host on-farm trials showed a bias similar to that in the surveys. Only one (7%) of 15 cooperators was

a female, and she was married. More than half (60%) owned oxen and only one (7%) relied on hand hoe cultivation. The relatively small size of most cooperator's farms suggested that they were not using their draft power to the fullest extent, perhaps due to cash shortages (for fertilizer and labour hire) or labour shortages (for planting and weeding), perhaps to alternative income sources, or perhaps to more intensive than average management. Five (33%) of the cooperators held positions of leadership responsibility in the local community which might affect their farming activity. Lack of more basic socio-economic data on the cooperators precludes firmer conclusions (see recommendation B.7).

3. Traditional Recommendation Domain 5

TRDS, located primarily in Kabwe Rural District, has the second largest target group in the province with an estimated 11,000 'traditional' farmers who grow maize as their major staple and cash crop. Tillage is mainly by oxen or tractor ploughing and hybrid seed and fertilizer are widely used. Diagnostic surveys for this target group were undertaken as part of the CIMMYT "in-country" training program involving ARPTs from all provinces. The informal survey was completed in March 1983 and the formal survey three months later in June.

The surveys covered 2 agricultural camps within a single ward. Local extension workers (EWs) identified farmer informants during the informal survey, and acted as enumerators and helped with tabulation of data during the formal survey. Sampling for the formal survey was done by the ARPT rural sociologist together with the CP/ARPT economist. Purposive sampling ensured that the farm size and access to draft power were within the expected range (Av 2.7 HA), and just under half in the sample not owning

oxen). Female-headed households (about 20%) were selected for interview but unfortunately gender of HH head was not on the questionnaire and data were not broken down by gender. Analysis of survey results produced a set of production constraints similar to those identified in TRDs 2 and 3. Apart from infrastructural constraints, (credit, labour payments, untimely arrival of inputs, etc.) labour shortage during land preparation, planting, and weeding was identified as the primary production constraint. This constraint resulted in a series of compromises leading to poor management of cash crops, especially maize and sunflower. Constraints were prioritised during the training workshop when a trial program was outlined. No checks were made to ensure the prioritized constraints identified in the survey area were applicable to the domain as a whole.

The trial program in TRD 5 related to technologies which would help the smaller farmers by increasing the efficiency of labour in weeding maize and applying fertilizer, and by moving their demand for labour and draft power out of the peak period to permit growing of later planted crops such as short-season maize and soybeans and sunflower. In the light of these objectives it is regrettable that similar biases towards better endowed male headed households took place in the selection farmer cooperators. 13 (93%) of the 14 cooperators were male, 4 (27%) own tractors, 8 (53%) own oxen, while only 3 (20%) hire oxen or tractors. The average cultivated area of 9.5 HA, is nearly four times greater than the 2.7 reported in the formal survey.

B. Collaboration with SSPS and Extension in Research Trials

CP/ARPT has built up and sustained a large and impressive program of on-farm research trials spread over three domains. All of these trials

fall into the category of 'research managed - research implemented' (RM/RI) and the farmers have not been closely involved with the design or running of the trials. This, unfortunately, has resulted in a low level of dialogue between the farmers and the ARPT officers and minimal collaboration. In some cases the complexity of experimental design has precluded such collaboration. However, there was nothing in the basic problems being experimented which precluded more farmer involvement. Moreover, in many cases trials have been sufficiently simple to enable the kind of collaboration between farmer and researcher which FSR is designed to promote.

Language has been a major obstacle, and ZAMARE staff may have benefitted considerably from a more intensive introductory course in Chibemba with a short follow up course. In addition, the size of the on-farm trial program greatly reduces the researcher-farmer contact, and level of places heavy dependence on the trial assistant (TA). This aspect suggests the need to intensify current attention being paid to training, especially sensitising TAs to the importance of farmer feedback. As TA training is currently under national review, and CP/ARPT have recently conducted a TA training program which emphasised both technical and practical skills, there is need to consolidate further by training TAs how to more fully involve SSPs and local EWs in the on-farm research process.

The selection and design of on-farm research trials has followed diagnostic survey work in all domains largely according to the CIMMYT sequence for on-farm research (the exception being a late formal survey in TRD3). Yet in spite of some efforts SSPs and EWs have not been closely

involved in the identification of research priorities and the design of trials for farmers' fields. There are logistical problems, but closer involvement of SSPs should be a primary objective, especially as the on-farm research becomes less exploratory, and more verification-oriented in the three domains. At present farmers are only involved at meetings used to recruit volunteers and in field days. The discussion of existing research priorities should also be attempted at meetings with farmers, which can be organized through local EWs. Similar meetings could be used to discuss the design of on-farm trials. Farmer field days can also be further developed and monitored, with cooperating farmers explaining the nature of the trials on their fields, rather than agronomists or TAs taking the leading role. Now the task of organising field days has been handed to TAs the language problem has eased. Yet now the task of recording farmer feedback should be discussed in greater detail with TAs who should keep a detailed record of farmer comments made during field days. In particular, TAs should be trained to record all comments, and be cautioned against selecting those which reinforce their own, or the agronomist's, ideas about which are the best treatments.

The extension service has been involved with on farm trials and the ARPT trial assistants are agricultural assistants seconded from the extension service. This arrangement is intended to allow for a rotation of EWs through ARPT to help inject a FSR perspective into extension. The heavy reliance on capable and motivated TAs who have been trained over 2 or more seasons means that a biannual rotation would probably adversely influence the scale and quality of on-farm research. A proportion of extension workers are clearly not suitable for training as trial assistants

while others might require close supervision. For these reasons a rotation of 3-4 years is favoured. A one year period for handing over to a successor who would work simultaneously as a local field EW in that year would provide continuity when experienced TA's decide to go back into regular extension work or change jobs.

At the same time, further steps could be made to involve field EW's more in the on-farm research program. Involvement in survey work, farmer selection, and field days are current practices which familiarise EWs with the on-farm research in their local area. Involvement of field EWs in TA training programs, would be one way to increase extension involvement in the monitoring of trials. Another way would be more job sharing. TAs could assist field EWs with their work strictly on a voluntary basis during the slack season (tasks such as farm registration, advice on post-harvest practises, etc), and request help from field EWs during the planting and monitoring of ARPT trials the following season. At the same time, TAs should not forget their primary responsibility to ARPT, and would not be able to give much assistance to EWs if they had dry season trials in their areas.

Farmer selection for cooperation in trials is an important part of collaborative on-farm research. This is particularly so when great value is placed on farmer response in the evaluation process, and FSR is viewed as an 'iterative process' (Tripp, 1984), rather than as applying conventional scientific methods in an on-farm situation. CP/ARPT employs a strategy of farmer selection which is also common to other ARPTs. Meetings are held at which farmers are asked to host trials. Farmers who fall outside of the target group may be rejected, but this does not always

happen as the reliability and receptiveness of more progressive farmers is seen as a valuable attribute. The main criterion of selection is therefore willingness to host trials, and representativeness of the target group is secondary. The danger of this approach, as the above findings suggest, is the risk of selecting farmers who are not very representative of the target group. If this happens the social impact of the program is reduced because target group farmers are not well integrated into the on-farm research program.

C. Research-Extension Liaison

The historically weak linkage between agricultural research and extension in Zambia has been strengthened, at the provincial level, through the new positions of 'Research-Extension Liaison Officer' (RELO). Central Province is the first to have an RELO (who started work in October 1982). The value of a professional officer linking research with extension, in general terms, is to facilitate better two way communication between these two branches of the Dept. of Agriculture, with the aim of more closely integrating their activities and also avoiding duplication of effort. In relation to small scale farming activities, this involves instilling the FSR component of research into extension, so that the on-farm research can be effectively transformed into technical recommendations which local extension workers can communicate effectively to farmers. In practice this involves short and long-term strategies for training and re-orienting extension workers.

Activities relating to research-extension liaison have been at three levels: (1) the provincial level, incorporating block-level staff in the districts through the extension administrative hierarchy; (2) the

recommendation domain-level, incorporating camp-level staff operating in ARPT's target areas for on-farm research (See Annex C); and (3) the National level, involving training institutions and specialist researchers at Mount Makulu.

1. Liaison through the provincial hierarchy

The thrust of the RELO's program so far has been at the first level, working with the provincial extension hierarchy, and concentrating on the upper end of this hierarchy. The RELO began his work with a 6-month familiarisation program during the 1982-83 season, visiting provincial and national agricultural training institutes and district officers, assisting with survey work and on-farm trials, and helping to organise field days to explain to extension personnel and farmers the on-farm research program. Provincial training work began in May 1983 with the production of a monthly newsletter which was distributed to Camp EWs. In October 1983, a series of one-day training meetings were held at the district level throughout the province. These were intended to explain to field EWs the work of ARPT and to show them how to set up a demonstration which showed the benefits of using new (F1) hybrid maize seed over saved (F2) hybrid seed. This training exercise was followed by a three-day workshop in April 1984 which focussed on teaching district and block level staff crop husbandry recommendations. The workshop had a broad focus, covering soil classification, animal draft power, farming systems research/extension, and work planning.

The Provincial Training Program continued later in 1984, when following on from the April workshop district level extension staff, under direction from the provincial extension training officer (ETO), organised

their own training workshop to provide in-service training for field EWs. Materials presented at these workshops were based on the earlier workshop for block supervisors and DAOs containing a mix of specialist and farming systems material. They were not closely monitored and so far only one report on district level workshops has been submitted. This program of training is scheduled to continue into 1985, with provincial level officers training block supervisors and district level staff who, in turn, train field EWs. The proposal is to provide more of a farming systems focus by implementing the handbook 'Agricultural Extension for Small Scale Farming Families', and by giving training on animal husbandry recommendations. The newsletter will continue, re-enforcing the content of the training programs, and hopefully re-enforcing the farming systems perspective at the camp level.

2. Liaison in traditional recommendation domains

At the recommendation domain level, organised field days in target areas have been the primary mode of research-extension liaison, and in this the RELO has worked in cooperation with other ARPT staff. After the first season, when the audience was combined, separate field days have been held for farmers on the one hand and extension and research officers on the other. The reason was that during the first season it was felt that farmers were intimidated by the present of senior officials. This season, field days for farmers have been organised by the TAs in conjunction with the local field EWs. Delegation of responsibility is encouraging, but as yet the outcome of these farmer meetings have not been closely monitored, and the RELO has requested assistance with developing a uniform monitoring system. To date ARPT field days have

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functioned effectively as public relations and education exercises, but priority has not been placed on obtaining feedback from farmers or extension and research officers visiting the trials. Thus the impact of farmers and extension staff on CP/ARPT trial programs through field days has been minimal, while in target areas the ARPT public relations impact on local farmers and extension staff has been quite considerable.

Farmer surveys and on-farm research has also involved field EWs within RDs 2,3, and 5. This involvement has been perhaps the most constructive in introducing an FSR perspective to EWs at the field level. However, as it has involved only field EWs working in target areas in each domain, the majority working elsewhere still need to be reached through more formal training programs and by strengthening the FSR perspective in the monthly newsletter.

Another kind of research-extension liaison in TRDS is the demonstration used during the on-farm testing stage of FSR. Demonstrations began in the 83-84 season with a comparison of F1 and F2 hybrid maize. These served a double function; being both large-scale research plots and demonstrations for small farmers. Unfortunately, follow-up proved difficult and feedback was poor so that the research and demonstration effects were not conclusive. This season (84-85) the RELO has assisted in repeating demonstrations of the 'improved' Lima at the province's farm training centres and at Kabwe Research Station. This is a long-term 'improved Lima' demonstration/research test, which looks at the benefits of intensive management (liming, crop rotation, hand planting, fertilisation, and the application of dieldrin) for maize. The RELO's involvement serves, potentially, to link the soil productivity research

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team at Mount Makulu more closely with ARPT and extension in Central Province. However, the demonstration is more cropping systems than farming systems in orientation, and did not arise explicitly out of priorities identified during diagnostic survey and conclusively tested in on-farm trials in the province. This season, Lima plots (.25 HA) of rainfed wheat have been added to the demonstration program. Like the previous demonstrations, these do not arise from diagnosis and on-farm research in the province.

After three years of on-farm experimentation in TRD2, on-farm testing was planned for the 84-85 season to demonstrate the value of early weeding in conjunction with a single application of mixed basal and top dressing fertilisers. As testing in the target area is the final step before the release of recommendations across the domain, great emphasis needs to be placed on delivering the message to farmers this season, and monitoring adoption in subsequent seasons. Moreover, as these management recommendations are primarily labour-saving devices, the RELO should take care to demonstrate them on farms experiencing labour shortages, particularly female-headed households and households with few children.

3. Liaison at the national level

In addition to activities at the levels of the provincial extension hierarchy and recommendation domains, the RELO has worked at the national level. In June 1984, the RELO organised an 'Effective Teaching and Training Workshop' along with the visiting 'INTERPAKS' team from the University of Illinois. This aimed at improving communication skills in national level and identifying insect pests in maize. Also, dieldrin treatments have been superimposed on on-farm trials and demonstrations in

order to assess its effectiveness for insect control in maize. The above activities reflect a direction somewhat adrift from the main focus of ARPT in the province, and concern for national level problems has the danger of weakening the impact of the RELO's program relating to local EWs and SSPs at the provincial level.

D. Communications of Farmers' Problems to CSRT's and Local Institutions and Projects

1. Background

Inadequate communication between ARPTs and CSRTs was recognised as a potential problem almost since the time that ARPTs started to function in 1981. The re-organisation of the research branch included with it the mandate for ARPTs, as the spokesmen of the small farmers, in the longer term, to determine about two-thirds of the content of CSRT research programs (Kean and Chibasa/GRZ, 1981). The logic was that small farmers produced at least this proportion of the national food supply and therefore should receive a proportionate amount of national research resources.

This much quoted mandate has been the cause of some misunderstanding, as it is not clear exactly how this could take place. Perhaps it could be more appropriately said that through close cooperation between CRTs and ARPT staff, the research branch should work towards ensuring that a large proportion of CRT research relates to appropriate small farmer problems.

The statement was made at a time when the bulk of agricultural research was oriented to technology suited primarily to commercial farmers and high levels of management. Moreover, many of the CRT programs were long standing breeding and varietal selection programs under the direction of experienced expatriates who had spent a long time in Zambia. These

breeders sometimes lacked a farming systems perspective, and in some instances were skeptical about the value of breeding for the low management and late planting conditions which prevail in most of Zambia's small-scale farming systems; the attitude being to change the small farmer rather than adjust breeding priorities. It was partly due to pressure from the CIMMYT demonstration in 1978, that the maize team intensified work on shorter season maize varieties, and to the arrival of the ZAMARE maize breeder that the maize section began to look more closely at higher yielding open-pollinated varieties as an alternation to hybrids for subsistence farmers. Other specialists, largely in response to government pressure in the later 1970s, were involved in putting out crop recommendations for small farmers based on research station trials, and promoting storage technologies which had not been tested under farmers' conditions, and compared with farmers' practices under experimental conditions.

The reactions of new ARPT staff (from all provinces) to these earlier attempts to assist the small farmer were sometimes critical and this attitude did not assist in developing a good working relationship with CSRTs. Moreover, the financial support given to ARPT created some jealousy among other CSRT sections which were grounded due to lack of operations funds. Things were not helped by an attitude, described as 'arrogant' by CRT staff, of some new graduates from UNZA who formed the Zambian component of ARPT, and of some incoming expatriate staff. Both ARPT staff and CRTs sometimes saw FSR as a panacea to the small farmer's problems offering a new kind of technology, rather than as the initial missing link between the technical expert and the small farmer. Such misconceptions are

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regrettable, but common during times of innovation when expectations vary, and established researchers may feel threatened. It has taken time for researchers from CSRTs and ARPTs to realise the complementary nature of their work.

Various steps have been taken by the national ARPT co-ordinator to improve ARPT-CSRT linkages (See Annex F). Agronomists from ARPT were encouraged to liaise with CSRT specialists in the planning of their trial programs. In 1983, "pre-research committee meetings" were instituted to bring ARPT agronomists and CSRT specialists together to discuss research findings, and ways in which CSRTs could work more closely with ARPTs. Provincial teams were encouraged to invite CSRTs to visit their trial programs. ARPTs have been given a format for reporting farmers problems to CSRTs and CSRTs have been provided with a format for presenting crop profiles on new varieties for ARPTs. More recently a formal program of visits by CSRTs to ARPT trial programs has been arranged.

CP/ARPT has an advantage over most other ARPTs to further improve ARPT-CSRT linkages in at least three ways:

1. It is physically closer to Mount Makulu and so communications are relatively easier.
2. It is part of the ZAMARE project which is explicitly designed to more closely integrate the work of farming systems with commodity research; the ZAMARE CSRT agronomists and breeders have an explicit mandate to assist small farmers and are keen to learn about small farmers' problems (USAID, 1980); and
3. The team has an RELO who can use his position to ensure better feedback of farmers' problems to CSRT's and receive guidance from

experienced CSRT experts at Mount Makulu on the formulation of crop recommendations.

In spite of these advantages the record of contact and cooperation has room for improvement.

2. Crop Breeders

Crop breeders are probably the scientists who can most assist SSPs.

In order to develop relevant programs they need to have full information about small farmers' preferences for particular crops, preferred varietal characteristics, production problems (under low management), taste and cooking preferences, etc. CP/ARPT has had contact with breeders in the maize, grain-legume, sorghum and millets, wheat and soybean programs. They have also had contact with oilseed breeders through the ZAMARE sunflower agronomist.

- a. MAIZE: Contact with the maize program began well, and has been sustained but not without some clashes of priorities. The ARPT agronomist felt unable to continue to test maize varieties, especially after those tested were not released, while a released variety was not given for testing. Perhaps over-concerned with public relations at the farmer level, this attitude has not helped to improve cooperation with maize breeding program. The maize CRT has also been criticised by the ARPT for not always ensuring varieties were tested on farmers fields before being put forward for release. However, the ZAMARE breeder feels that they take a lot of trouble to select the best varieties to give ARPT for testing. Part of the problem arises from the large number of hybrid lines being tested, some of which have very similar parent stock, and a line closely

affiliated with, but not identical to, the one being tested by ARPT performs better in CRT trials and so is selected for release. The situation should improve considerably when the maize CRTs completes the crop profiles for ARPT's information (See Annex F). Yet the rapidly changing situation in the breeding program will necessitate good communication and a tolerant attitude on both sides. Farmers' production problems and preferences for maize have been discussed and the maize CRT has explicitly asked for information on varietal characteristics favoured by the small farmer in the domains. This has been provided and there has been agreement on the kinds of problems requiring attention. As maize is the main cash and staple crop in the province this dialogue clearly needs to be strengthened further. The ZAMARE breeder feels there is a need for more quantified prioritisation of farmers' problems with maize. The ZAMARE linkage provides a good opportunity for this dialogue to grow, but contact should always be through the appropriate GRZ channels and non-ZAMARE maize breeders and agronomists are equally important to the success of the program. A further point is that the maize section is extremely busy, and often time restricts the level of contact. The ZAMARE breeder feels that most constructive contact has been during his visits to field days in CP, and when ARPT agronomists have called into his office to discuss trial designs on maize.

- b. Grain-Legumes: Contact with the grain-legume team has been limited (including an improved bean variety in an inter-cropping trial). Geographical distance is an obstacle (as the breeders are mostly in Chipata), and in one instance CP/ARPT agronomists were not supplied

- with bean varieties requested for testing. More efforts should be made to feed upwards farmers' problems and preferences for beans, and even to request what kinds of information the breeders require, in order to encourage better co-operation from the breeders.
- c. Sorghum and millets: Varietal testing of sorghum has now gone into a second season and linkage here is strong with a good working relationship with breeders. The sorghum team still requires more information on farmers' preferences and the valued characteristics of the local varieties in the province. Like the ZAMARE maize breeder, the sorghum breeders value the opportunity to visit ARPT trials and appreciate being called in promptly to help with the identification of problems in trials and farmers field. Also, they see cooperation is most constructive when an ARPT agronomist calls in to discuss trial priorities and trial designs for sorghum and millets.
- d. Wheat: Contact with the wheat team began this season when in response to a request for the wheat CRT, CP/ARPT expressed an interest in trying out rainfed wheat. It is not clear why such an ambitious demonstration program has gone ahead in an area where no farmers have grown wheat before, and the justification from a farming systems perspective is not clear (planting of wheat competes with weeding and fertilizer application in maize and seems most likely to be adopted by ox-cultivators who can use mechanised planting and weeding). Nevertheless, the spirit of cooperation is a healthy sign.
- e. Soybeans: Work with soybeans began this season in response to the introduction of a LINTCO soybean package. The FAO soybean expert

might have been more closely involved in the trial design, as he has a wealth of experience to draw on, and should be invited to visit the trials before harvest. The ZAMARE soybean breeder has visited the CP trials.

- f. **Oilseeds:** Cooperation with the oilseeds team began with on-farm trials for sunflower last season, which have been expanded this season. The arrival of the ZAMARE sunflower agronomist with a farming systems training in 1984 has done a lot to develop a strong working relationship which has resulted in a collaborative on-farm trials this season. Attention should be paid to ensure that this is not seen simply as good ZAMARE co-operation and that the sunflower breeders are also more closely involved. A very effective system of information exchange and discussion of project outlines and trial results has been developed between the ZAMARE agronomists; this could be adopted more widely by other ARPT agronomists when co-operating with agronomists in other CSRTs. This level of cooperation demonstrates the value and potential of the ZAMARE project in improving the linkage between FSR and CSRT work in Zambia.

3. Soil Scientists

Soil and pest problems identified during survey work rank high in the biological problems which SSPs face in CP. Soil acidity and poor structure (sandy soils and 'hard pan') limit production particularly in the higher rainfall areas. These have been reported in surveys and annual reports and the head of soil productivity was involved in prioritising farmer problems in TDR5, and invited to participate in the extension worker training program.

A low level of cooperation between CP/ARPT and the soils advisory officer at Mount Makulu has led to some bad feelings, both in relation to trial content, and the release of crop recommendations through the monthly newsletter. The RELO needs to get together with the soils advisory officer before releasing recommendations, especially those relating to fertilizer. It is encouraging that the soils advisory officer is visiting the CP/ARPT trials this season and that the team is also looking forward to monitoring his involvement with small farmers in the Serenje District.

4. Plant Protection

There has been contact between CP/APRT and the plant protection section, both in relation to nematodes and insect pests in maize. The RELO has been the prime mover in this, sending soil samples for nematode analysis and referring the consultant entomologists from Illinois to inspect the collection of insects and slides for identification purposes. The plant protection head is expecting that the findings of the entomologist consultants will have general use in Zambia, and looks forward to feedback.

5. Local Institutions and Projects

A range of institutional problems were encountered during survey work. Late delivery of inputs, shortage and non-availability of inputs, late payment for crops, shortage of credit and late arrival of credit, poor transport infrastructure in some areas, limited contact with extension workers, and inappropriate extension advice were all identified as production constraints. These problems were encountered in varying degrees in all target groups. It seems that few steps have been taken to inform the local co-operative unions and credit institutions of the situation

(although they are probably aware of it anyway). The inclusion of representatives of these organizations in the pre-research committee meetings, while increasing the size of the committee, might help to open a dialogue which could prove very useful in the longer term.

There has been some liaison with the EEC maize improvement project based in Kabwe and are operating in parts of TDRS; mainly exchange of reports and assistance received for the purchase of soil analysis kits. A change of personnel, together with the inclusion of a social scientist evaluation officer and an extension expert on the EEC team, provides the opportunity for increasing the level of cooperation. Close attention should be paid to exploring the possibility for co-operating in measuring the impact of ARPT work in TDRS, and in training EWs at the camp level in this domain. In view of the fact that Mpika IRDP are moving into Mkushi district, closer links should be developed with them, to consolidate the cooperation begun during the labour data survey. Finally, as the liaison with related institutions is one of the ARPT economist's responsibilities, the incoming ZAMARE economist should ensure that he or she improves on the performance of the outgoing one in this respect.

IV. RECOMMENDATIONS

A. Survey and Diagnosis

1. Review the 1978 zoning of the province using the latest farmer categories, and with specific attention to testing the representativeness of target areas for on-farm research;
2. Make more use of existing data in the reviewing of research priorities and the design of on-farm trials, and make a CP/ARPT

library containing all references in the ARPT bibliography on rural studies;

3. In future survey work pay more attention to off-farm activities and subsistence crops, especially those involving women;
4. In all data collection ensure 1 in 3 households in the sample is female headed;
5. In recruiting a new social scientist for the team ensure that he or she has more of a farming systems orientation, a more anthropological perspective and a sensitivity to the importance of the role of women, and the ability to work as a member of a team;
6. Involve the ARPT sociology section more in survey work, particularly in sampling for surveys, framing of questions and fuller incorporation of indigenous knowledge into data collection and problem definition;
7. In collecting data ensure the sample is within the range of resource endowments of the target group and not above average;
8. Give more attention to economic analysis in the pre-screening of technical options and, the evaluation of on-farm trials. The sociology section should be invited to comment on the suitability of trials and treatments;
9. Follow the suggestion of the national coordinator, and prepare, as part of a provincial handbook, annual information on crop sales, inputs purchases and loans based on figures for CPCMUNAMBoard and giving averages/farmer; and
10. Prepare for use by CSRTs using on agronomic summary sheet format;

B. Collaboration in On-Farm Research

1. Develop a more systematic and rigorous method of selecting farmer cooperators, paying special attention to gender and to the labour and cash resources of the farmer; we recommend that a minimum of one in three farmer cooperators be female heads of households, and that wives of farmers are also more involved in trial evaluation. As far as possible, farmers with larger than average cultivated areas, cash resources and family labour should be excluded;
2. Train trial assistants to collect and record farmer reactions in a systematic way which avoids technical bias in their own training. If necessary seek assistance with this;
3. As trials become more farmer implemented, farmers should be made even more aware of their role in the trials, and also be made to feel they are community representatives;
4. Where possible reduce the complexity of on-farm trials, and also the number, so that more attention can be made to recording farmer responses and to observations during the growing season, and less reliance is placed on making predictions and drawing conclusions on the basis of statistical results;
5. In relation to the above, consider using a 'farmer panel' in the review of trial results and the design of the program for the next season;
6. Consider using farmers fields as 'control plots' and collect more agronomic data from the fields of farmer cooperators;

7. Keep a full record of the socio-economic characteristics of farmer cooperators, recording changes over time; and
8. Make the selection and design of on-farm trials less the prime responsibility of the agronomists, and more of a team responsibility.

C. Research-Extension Liaison

1. Intensify training of EWs at the field level to differentiate between different categories of farmers (in relation to resource endowment) and to deliver advice on crops and livestock relevant to the different categories. This involves using the handbook 'Agricultural Extension for Small Scale Farming Families', testing the handbook for its suitability for training different levels of extension workers. There is a need for closer monitoring of district level training programs for field EWs, followed up through camp visits. This work is best carried out on a pilot basis due to its innovative nature;
2. Continue writing, collecting, and editing materials for the newsletter, but more specifically, with a farming systems perspective in mind. This implies even greater involvement of the CP/ARPT agronomists in preparing materials, and also other ARPT agronomists and social scientists.
3. Materials prepared for the newsletter and presented during training programs could be incorporated into the EW training manual for use at the district level and to provide guidance to RELO's in other provinces.

4. Give added attention to the organization of farmer field days, within the framework of T and V, to improve interaction between farmers, and EWs and researchers in the assessment of on-farm trials, and demonstrations. This means using contract farmers to assist with farmers field days, demonstrations and monitoring adoption.
5. Liaise with research and extension in such a way as to ensure that the demonstration program follows on from the verification stages of on-farm research trials, or at least problems identified during diagnostic surveys and verified through observations and feedback from field EWs. Care should be taken to ensure that EWs do not confuse demonstrations with on-farm experiments.
6. Assist other ARPT staff in liaising with institutions and projects offering infrastructural support to ensure that successful on-farm testing of new recommendations is matched by any necessary changes in input supply and marketing arrangements.
7. Continue to ensure that new recommendations are widely distributed through the monthly newsletter and continue to check if this reaches field EWs. This also involves continuation of the close liaison with other authorities responsible for formulating crop recommendations.
8. Continue to work through training programs, and through the monthly newsletter, to improve the quality of reporting by field EWs of farmers' production problems and continue to develop mechanisms to ensure that these are passed on to other ARPT staff and appropriate CSRT staff at Mount Makulu and elsewhere.

9. Consult with the ARPT Rural Sociology Section to look at areas of work deserving specialist consideration. These include: (i) Ways of involving women in general, and female-headed households in particular, in the assessment of on-farm trials and demonstrations; (ii) Heightening the awareness of field EWs to the necessity of more effectively involving women in the extension process; (iii) Devising and testing methodologies for measuring adoption of new recommendations; (iv) Making use of local indigenous knowledge and terminology both in the reporting of farmers' problems and in the delivery of new recommendations; and (v) Training EWs how to group farmers into homogenous categories, and how to define farm households.
10. Ensure that the RELO's activities are more closely integrated with those of other members of the team, particularly during on-farm testing and demonstration work;
11. RELO to participate fully in the review of RDs in order to co-ordinate an in-service training program which will ensure that local EWs deliver the appropriate message for each domain; and
12. Renew efforts to secure a full Zambian counterpart.

D. Links with CSRTs

1. Improve the reporting format in Annual Reports so that ARPT findings and suggestions relating to CSRT work are easily accessible and vice versa. List contents of annual reports, indicating sections relevant to individual CSRTs. Send heads of CSRT sections relevant extracts from these reports for comments.

2. Involve CSRTs more in the design of trials and the analysis of results by sending trial results wherever possible before the ARPT-CSRT pre-research committee meetings, and by discussing project outlines at least a month before a trial is due to be planted.
3. Pay special attention to communicating with plant breeders the kinds of characteristics valued and problems faced by farmers in the different domains of the province. Request CSRTs to specify, preferably in writing, the kind of data most valuable to them, and efforts should be made to standardize the measurements of problems.
4. Follow procedures outlined in Annex F, including involvement of CSRT specialists in exploratory surveys, preparation of agronomic data sheets based on survey data, and presentation of problems and trial proposals at pre-research committee meetings.
5. Continue the good progress made in informal interaction with CSRT scientists, even in the face of personality differences which inevitably arise.

E. General

1. Continue developing strong links with other local institutions (e.g., the Provincial Planning Unit) and projects to avoid duplication of effort and co-ordinate infrastructural development and change along with technical change at the farm level; assure that ARPT is represented on the Provincial Agricultural Planning Committee.

2. Re-think and expand the role of the social scientists to include more work on technology transfer mechanisms and monitoring of farmer response and better farmer collaboration in the FSR process.
3. Improve the team dynamics through a training program, and by revising terms of reference which spell out clearly areas where a team effort and input is especially important. National and provincial coordinators should emphasize the need to develop a team situation which allows for more coordination of efforts between ARPT, CSRTs, TAs, EWs, and SSPs; this would reduce the necessity to be directive in management style.
4. To ensure improved understanding of ARPT activities at the district level, where logistics permit follow the approach taken by Serenje District Council which made the ARPT Trial Assistant a full-time members of the Council Agricultural Development Committee; where logistics do not permit have TAs send monthly reports to DAOs so the Committee can be kept current regarding ARPT activities.
5. Since the Newsletter is clearly regarded as highly useful and the only regular communication device down to the camp level, it should be considered for implementation by other ARPTs which lack such a device; more efforts should be made to include news/notes and views from all provincial agricultural officers, to add more FSR materials, and to solicit more material from the district, Block and Camp levels; more support must be provided through ZAMARE to institutionalize the Newsletter production

- in Kabwe; the PETO should be trained as a co-editor to later assume the editorship role.
6. Given the large volume of socio-economic and agronomic data collected by the ARPT and the critical need for rapid tabulation and analyses of data, pressure should be increased for the installation of microcomputers at Kabwe RRS. Zambian counterparts and support staff especially should be provided with training in their uses. This would assure that field results could be provided in time for inclusion in the DADs' annual reports, Newsletters could be produced far more easily and quickly, and the reporting process would be speeded up generally
 7. CP/ARPT staff, like provincial coordinators and ARPT staff elsewhere must be fully knowledgeable about FSR; standardized approaches to ARPT must be understood and followed; staff should have the ability to collaborate across disciplines and cultures, to interact fully with EWs and SSPs, be strongly 'people oriented' by willing to extend knowledge and skills to counterparts in order to institutionalize the ARPT approach in Zambian colleagues; and staff should be willing to learn skills from SSPs as well as work to teach them improved skills.
 8. Although ARPT is established within the Research Branch and has its primary responsibility to improving agricultural research as an integral part of the Research Branch, it was felt by some interviewees from the Extension Branch that the collaborative approach between research and extension would be enhanced by

changing the name ARPT to ARET (Adaptive Research and Extension Team).

9. Where appropriate in specific systems, consider more trials involving minimal purchased inputs and using local varieties and traditional crops.
10. Assure that Zambian counterparts have appropriate housing and rationalize use of ARPT vehicles so counterparts have appropriate access to them; develop training possibilities so counterparts can learn to drive vehicles; develop maintenance training for TAs and EWs provided with Honda motorbikes. Provide more adequate supply of spare parts for motorbikes.
11. Assume that the Central Ministry includes the PAO in decisions taken to hire and terminate expatriate ARPT members operating under the jurisdiction of the PAO.
12. The reason for establishing ARPT was to focus on the technological problems of traditional and small-scale commercial procedures and thus it is expected that these 2 categories form the target groups for ARPT. The ZAMARE Project Papers also identifies these as the ARPT target groups. As the vincial ARPT is expected to identify the different farming systems in a province, the Provincial ARPT committee must decide which of the systems ARPT will work in given its resource constraints.
13. Where appropriate in specific systems, work to expand CP/ARPTs program to include agricultural mechanization, animal husbandry, forage and agro-forestry efforts, and youth and home economics extension.
14. Provide soil ample analysis facilities at Kabwe RRS.

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V. CONCLUSION

The CP/ARPT was the first Adaptive Research Planning Team in Zambia to become fully operationalized. It has experienced the full range of new project start-up constraints. Despite these, considerable progress has been achieved in less than 3 years. Many issues have been thoughtfully discussed and presented for consideration, not only by the Central Ministry but by CIMMYT/Nairobi itself (see e.g., Hudgens, R.E., 1984). Some of these issues have equal impact on all ARPTs and include the following: (1) the fact that TRDs cut across agroecological zones and political divisions, with MAWD personnel expected to operate within political divisions; (2) the fact that TRDs are dynamic systems sometimes undergoing dramatic change - e.g., rapid adoption of sunflower as a cash crop - requiring rapid rural appraisal techniques to keep on top of such changes; and (3) the fact that over time the ARPT reaches the outer limit of the current FSR methodologies - requiring additional guidance when the farmer managed/farmer implemented stage is completed and the on-farm test stage begins, the sequence to monitor adoption of the new technology under 'real world' conditions when close supervision and free inputs are no longer provided.

It is clear that there is a growing understanding of the principles and philosophy upon which FSR and ARPTs are based. Members of both ARPTs and CSRTs are beginning to develop the avenues for improved collaboration. Sensitivity by MAWD personnel down to the camp level has improved regarding the important role of the SSP in the ARPT process. One small-scale cooperating farmer in Serenje even designed his own research trial

intercropping maize and sunflower in rows - and determined that the mix was not one he would recommend.

The impact has been substantial in terms of contact - through the Newsletter; by training courses at national, provincial, district and camp levels; by demonstrations at FTCs and the Kabwe Regional Research Station; by district field days for both EWs and SSPs. The pay-off in terms of an improved and energized research-extension system capable of operating in a two-way dialogue with SSPs, and the potential high adoption and diffusion rates of improved cropping methodologies and practices by SSPs should become evident within another year or two. Hopefully the recommendations provided in this evaluation study will assist the ARPTs to achieve these important objectives.

VI. ABBREVIATIONS

ARPT	Adaptive Research Planning Team
CIMMYT	International Maize and Wheat Improvement Centre
CP	Central Province
CRT	Commodity Research Team
CSRT	Commodity Specialist Research Team
DAO	District Agricultural Officer
ETO	Extension Training Officer
EW	Extension Worker
FSR	Farming Systems Research
FTC	Farmer Training Centre
HH	Household
IRDP	Integrated Rural Development Program

NRDC	Natural Resources Development College
PAO	Provincial Agricultural Officer
RD	Recommendation Domain
RELO	Research-Extension Liaison Officer
RM/RI	Research Manager/Research Implemented
SMS	Subject Matter Specialist
SSP	Small-Scale Producer
TA	Trial Assistant
TRD	Traditional Recommendation Domain
T and V	Train and Visit System of Extension
UNZA	University of Zambia
ZAMARE	Zambia Agricultural Research and Extension Project

VII. ANNEXES

- A. Scope of Work
- B. Individuals Interviewed
- C. Recommendation Domains for Traditional Farmers in Central Province
- D. Female Headed Households
- E. Bibliography
- F. ARPT National Coordinator's program for CRT-ARPT linkage.

ANNEX A. SCOPE OF WORK

7th December, 1984

SCOPE OF WORK

EVALUATION OF SOCIO-ECONOMIC ELEMENT
OF ZAMARE PROJECT'S FSR (ARPT) COMPONENT

By Alistair Sutherland and Mike Warren

I. INTRODUCTION - ZAMARE PROJECT

The Zambia Agricultural Research and Extension Project (ZAMARE), funded by USAID as a five-year grant to GRZ, is designed to assist MAWD "in strengthening its agricultural research capacity and to increase the effectiveness of the extension service in transferring relevant new agricultural technology to the farmers of Zambia, with special emphasis on small producers and the cereal grains Commodity Research Teams (CRTs) and the Central Province Adaptive Research Planning Team (ARPT) based in Kabwe.

The ARPT at Kabwe plays an important linkage role in the ZAMARE Project. The provincially-based ARPTs follow CIMMYT's Farming Systems Research (FSR) methodology based on four adaptive research stages, (1) the diagnosis of farming systems, (2) the design of improved system elements, (3) on-station and on-farm testing of these elements, and (4) the extension of these elements to the small-scale producers (SSPs). The ARPT acts in a primary liaison role to facilitate linkages and communications between the CRTs, extension personnel, and the SSPs. ARPTs work with SSPs to jointly identify needs and constraints of the SSP as a client group. ARPTs then translate these findings into research

priorities, some of which can be handled by CRTs, some by the ARPT itself. Adaptive testing of new technologies is conducted and successful innovations are packaged with extension staff for transmission to the SSPs.

II. EVALUATION OF THE SOCI-ECONOMIC IMPACT OF THE ARPT COMPONENT OF ZAMARE

USAID has requested that an evaluation of the socio-economic impact of the Central Province ARPT (CP/ARPT) be completed for use by the team contracted to conduct the ZAMARE mid-project evaluation. The terms of reference include the following:

1. To determine the extent to which CP/ARPT, in conjunction with SSPs and extension personnel has conducted diagnostic research to establish recommendation domains with different resource mixes, to prioritize these target groups as beneficiaries of ARPT resources, and identify and prioritize SSP production constraints;
2. To determine mechanisms developed through ARPT to refer priority constraints for action research by appropriate CRTs resulting in the design of improved agricultural technologies relevant to SSPs;
3. To determine the extent to which ARPT has conducted on-station and on-farm trials of improved technologies in a collaborative mode with SSPs and extension staff;
4. To determine the appropriateness and effectiveness of ARPT strategies for disseminating improved technologies through the extension system to SSPs in different recommendation domains (target groups)
5. To determine the actual beneficiaries of ARPT to date.

The ZAMARE Project Paper stresses that ARPT "should take care not to exclude female-headed households" and should move beyond CIMMYT methodologies to include the gender of the head of household to help discern recommendation domains. A key question to address in this evaluation is the appropriateness of the recommendation domains which have been stratified according to area cultivated and type of production technology utilized (hoe, oxen, or tractor).

The effectiveness of ARPT in facilitating a collaborative and participatory approach to problem identification with SSPs, to prioritizing research activities with extension staff is a key area for evaluation. A CIMMYT study of Central Province prior to the organization of its ARPT identified 8 recommendation domains (6 traditional, 1 emergent and 1 commercial). An important evaluation question will center on the criteria used by ARPT to prioritize these target groups to assure that ARPT resources would research the largest beneficiary group with the greatest possibility for a rapid spread (adoption-diffusion) effect of appropriate improved technologies.

III. APPROACH TO EVALUATION

The socio-economic impact of CP/ARPT will be evaluated through several mechanisms as follows:

1. A review of relevant studies and reports produced by CP/ARPT and collaborative groups such as CRTs and extension staff;
2. A review of survey and other data collected by ARPT appropriate to each of the 4 stages in the FSR methodology;

3. Interviews with ARPT members and with members of collaborating groups, i.e., a sample of SSPs, CRTs, extension staff, provincial and district agricultural staff, (e.g., PAO, DAOs), and Rural Informational Services Staff.

IV. TIME LINE FOR EVALUATION

The evaluation will be conducted by Sutherland and Warren. Since both officers have other work commitments, the different evaluation activities will be conducted at different times as follows. Report writing will be completed January 29 - February 3, 1985.

ACTIVITY	TIME PERIOD	SITE
III.1	Dec. 18-22	Kabwe
III.2	Jan. 2-3	Kabwe
III.3	Jan. 21-26	Central Prov.

V. ASSUMPTIONS

1. Clearance has been given by the Director of Planning, the ZATPID Team Coordinator, and USAID for Warren to participate.
2. Clearance is given for provision of transportation by the Kabwe team for field surveys, and evaluation report preparation by the ZAMARE/ZATPID Project Support Unit.

VI. ANNEX - CLIENT FOCUSED EVALUATION INPUTS**A. SSPs**

1. Examine the diagnostic survey work;
2. Examine the on-farm research programme
 - a. By geographical location;
 - b. By relative size of target group;
 - c. By gender;
 - d. By resource base.

B. EXTENSION BRANCH

1. Involvement in on-farm research;
2. Information sharing with ARPT;
3. Progress with preparation and dissemination of recommendations to SSPs.

C. CRTs

1. Research priorities submitted by ARPT;
 - a. Suggestions to crop breeders;
 - b. Suggestions to Soil Productivity Research Team;
 - c. Suggestions to Plant Protection Section regarding chemical and biological control of pests and weeds;
 - d. Suggestions for farm machinery and tillage.

ANNEX B. INDIVIDUALS INTERVIEWED

* Indicates interviewed by Warren

** Indicates interviewed by Sutherland

*** Indicates interviewed jointly by Warren and Sutherland

- 19 Dec - Al Harms*** - ARPT Economist - Kabwe
 Mary Chulu*** - Prov. Asst. Ext. Tr. Officer Kabwe
- 20 Ron Dedert*** - RELO - Kabwe
- 22 J.M. Sinkonde*** - Farm Manager, Keembe Farm
 Institute, Keembe
 Simushi Nomai* - Commodity Demonstration -
 Muswishi
 A. Katelele*** - SSP - Muswishi
 H. Mwanza* - Block Supervisor - Muswishi
 K. Zulu* - Agric. Assistant - Muswishi
 M. Bwalya** - Trial Assistant - Muswishi
 Bob Hudgens*** - ARPT Agronomist - Kabwe
23. J.K.B. Nshindano* - Trial Assistant - Serenje
 J. Tembo* - District Agriculture Officer - Serenje
 Evans Mphande * - RETO - Serenje
 K.G. Maka* - DES - Serenje
 J. Chisha* - DPD - Serenje
 K.C. Chime* - District Governor - Serenje
 C.I. Imbula* - Commercial Secretary - Serenje
 G. Chitenta* SSP - Serenje

Munshya* - SSP - Serenje

Jessie Fise* - SSP - Serenje

A. Simwanza** - Trial Assistant, Nkole Agric.

Camp Mkushi

Harold Simuzia** - Labour Enumerator, Nkole Agri.

Camp Mkushi

-----** - Agricultural Assistant, Nkole

Agric. Camp, Mkushi

W. Falanga** - SSP, Nkole Agric. Camp, Mkushi

L. Malata** - SSP, Nkole Agric. Camp, Mkushi

24. Aida Musonda** - SSP, Nkole Agric. Camp, Mkushi

Aaron Njovu** - SSP, Nkole Agric. Camp, Mkushi

Joe Chilomba* - District Agricultural Officer,

Mkushi

P. Mutale* - Officer In Charge (Incoming), Mkushi

FTC

M. Mwambwa* - Officer In Charge (Outgoing),

Mkushi FTC

E.K. Musonda* - Farm Manager, Mkushi FTC

I. Chileshe* - Project Coordinator, Mkushi FTC

25. Lingston Singogo* - Provincial Agricultural

Officer, Kabwe

Evans Mphande* - Prov. Crop Husbandry Officer,

Kabwe

Grace Mwangala* - Prov. Planning Officer, Kabwe

D.S. MANDA* - Prov. Planning Officer, Kabwe

Jan 85 - Mt. Makulu

Dr. P. Gibson** - ZAMARE, Maize Breeder, Mt.

Makulu

Dr. V. Eylands** - ZAMARE, Sunflower Agronomist,

Mt. Makulu

Dr. B. Patel** - Chief Agricultural Research

Officer, and Head of Plant Protection

Mr. K. McPhilips** - Soils Advisory Officer

Dr. D. Roose** - Plant Protection (Legumes)

Dr. Little** - Head ZAMCAN Wheat Program

Dr. B. Vermer** - Head of Sorghum and Millets

Mr. M. Chis:** - Sorghum Breeder

Ms. B. Habowa** - Sunflower Breeder

Mr. J. Munyinda** - Soil Scientists

ANNEX C. FEMALE HEADED HOUSEHOLDS

FEMALE HEADED HOUSEHOLDS BY DISTRICT, 1980, CENSUS

Proportion of FHH ^{1/}		Adjusted as proportion of SSPs
Kabwe Rural and Mumbwa (TRD5)	22%	29%
Mkushi District (TRD3 mainly)	21%	25%
Serenje District (TRD2 mainly)	30%	30%

* Adjusted figure based on assumption that there are twice as many female headed households in the 'traditional' farmer category as in the 'emergent' category. As there are very few emergent farmers in Serenje District no adjustment has been made for TRD2.

^{1/} Source, Sophilos - Rothschild (1984)

FEMALE HEADED HOUSEHOLDS BY DISTRICT, 1969, CENSUS 1/

Kabwe Rural 21%

Mumbwa 27%

Mkushi 24%

Serenje 47%*

Source: 1969 Census, Final Report

*This very high figure of 47% contrasts with the 30% recorded 11 years later in 1980. The difference may be due to a difference in definition of a FHH, and/or to an increase in the popularity of virilocal (wife going to live in husband's village) marriages due to possibly increased oxenization and cash cropping in the district.

ANNEX D. BIBLIOGRAPHY

1. CIMMYT 1979 "Zoning in Central Province: Demonstrations
 (for MAWD) of an interdisciplinary approach to planning adaptive
 agricultural research programs", Report Number 4.,
 Nairobi
2. CIMMYT, 1978 "Demonstrations of an interdisciplinary
 (for MAWD) approach to planning adaptive agricultural research
 programs: Part of Serenje District Central Province
 Zambia" Report No. 3., Nairobi.
3. CIMMYT, 1983 "System Scenario for TRD5, Central Province, Zambia"
 (Report for In-Country Training Program), Nairobi
4. FAO 1981 "Background to Agricultural Development in Central
 Province, Zambia" Field Document AG: dp/zam/77/004,
 Lusaka
5. GRZ, MAWD NO. "Report of an Informal Survey of Farmers in
 (CP/ARPT) DATE Traditional Recommendation Domain 3 of the
 1982? Mkushi District. Central Province, Kabwe RRS.
6. GRZ, MAWD NO "Development of the Farming System in
 (CP/ARPT) DATE Western Part of Mkushi District. Result
 1983? and Prognosis from the Informal Survey", Kabwe RRS.
7. GRZ, MAWD No. "Prognosis on an Informal Survey of
 (CP/ARPT) DATE Farmers in TRD3 of the Mkushi District,
 1983? Central Province" Kabwe RRS.

8. GRZ, MAWD 1983 "Final Report on the Formal Survey in
(CP/ARPT) Traditional Recommendation Domain 5 (Kabwe Rural
District, Central Province Zambia), Kabwe RRS
9. GRZ, MAWD 1873 "Adaptive Research Planning Team Central
(CP/ARPT) Province, Provincial Annual Report, 1982-1983" Kabwe
RRS.
10. GRZ, MAWD NO "Summary of the Major Findings from the
DATE Labour Survey" Kabwe RRS
1984?
11. GRZ, MAWD 1984 "Provincial ARPT Annual Report, July 1983 to June
1984 Kabwe RRS.
12. HARMS, A.G. "Are Small Scale farmers getting a
No Date fair share of fertilizer?" Kabwe RRS
1983?
13. HUDGENS, R.E. "Subregional issues in the implementation
1984 of farming systems research and extension methodology
- a case study in Zambia" (Paper presented at Kansas
State University. FSR conference, Kabwe
14. KEAN S.A. & "Institutionalising Farming Systems
CHIBASA W.M. Research In Zambia," MAWD, Lusaka.
1984
15. SUTHERLAND, A. J. "Extension Workers, Small-Scale Farmers and
1984 Agricultural Research: A case Study in Kabwe Rural,
Central Province" (Draft) Mt. Makulu

16. SAFILIOS- "The policy implications of the roles of
ROTHSCHILD, C. women in agriculture in Zambia (Preliminary
1984 Draft), Lusaka
17. TRIPP, R. 1984 "Anthropology and on-farm Research" (Paper presented
at the ARPT-CIMMYT Regional Workshop on the role of
rural sociology in FSR), Lusaka.
18. USAID, 1980 Project Paper for "Zambia Agricultural Development,
Research and Extension" Unclassified, Lusaka
19. USAID, 1983 "Evaluation of Agricultural Development: Research
and Extension Project (611-0201) Zambia", Lusaka.
20. All CP/ARPT quarterly and annual reports

ANNEX E. ARPT NATIONAL COORDINATORS PROGRAM FOR CRT-ARPT LINKAGE

1. INTERACTION BETWEEN ARPT AND THE COMMODITY AND SPECIALIST RESEARCH TEAMS

An important preoccupation during the early stages of institutionalising farming systems research within the Research Branch has been to avoid appearing as a threat to the scientists with the CSRTs. This has been necessary firstly, to avoid any animosity developing on the part of CSRT scientists which could inhibit the development of good working relationships between ARPT and the CSRTs which is essential if the new structure of the Research Branch is to work effectively.

Secondly, with considerable attention, as well as support in terms of manpower and finance being given to ARPT, both from the government and from outside agencies, there has been a danger that technical component research would be overlooked. This is due in part to the tendency to see farming systems research as pancea. However, it has become very obvious to those with ARPT that it is not, and that whilst it does have several unique and important features it must be seen as an integral part of the Research Branch complementing the work of the CSRTs. For, when no technical component research has been undertaken, as is most obvious in the case of farm machinery and tillage research, then ARPT is not able to test any possible technological situations. However, efforts are being made to ensure that when technology is from analagous situations in other countries that it can be tested in Zambia.

There is a two-way flow of information between ARPT and CSRTs, with ARPT providing information on farmers' problems requiring technical

component research, which will form 60% of the CSRT work programme, and also providing feedback on the performance of such research when conducted under farmers conditions. The CSRTs, in turn, provide information on possible technological solutions available for on-farm experimentation.

In order to achieve this two-way flow of information several mechanisms have been established:

a. Involvement by CSRT scientists in the exploratory survey

In order to benefit from specialist knowledge on particular crops or specialist issues, scientists from relevant CSRTs are invited to participate in the last few days of the exploratory survey. Such participation helps to guide the questionnaire development for the verification survey by clarifying factors related to identified technical problems and also enables ARPT to obtain a better understanding of those areas where technological solutions may already exist and could be tested with confidence in on-farm experiments.

b. Pre-Research Committee Meetings

Prior to the annual Research Committee Meetings, held to review the previous season's result and to discuss the forthcoming season's programme, a series of meetings are now held between scientists from each CSRT and from ARPT. These Pre-Research Committee Meetings are small meetings in which ARPT scientists from all provinces are able to present the problems that have arisen in the different domains either during the surveys or trials undertake, and then present proposals for both technical component and on-farm experimentation. CSRT scientists are able to learn of these problems and contribute to the formulation of the research programme. Following the approval of ARPT's proposed research programme by the main

Research Committee Meeting the CSRT scientists are again asked to comment on the project outlines in which the details of each trial are specified.

c. Agronomic data sheets

In order that CSRT scientists can make use of agronomic data collected by ARPT, data sheets are prepared after each survey has been completed. These sheets simply present quantified data, without interpretation, on the agronomic practices and problems found on farmers' fields in different domains, e.g. percentage of maize plantings affected by streak virus, percentage of farmers using retained or purchased seed, etc. These data do not entail conducting new surveys but only require printing data which might never otherwise have been seen. Such data provide a much needed quantified data base for the CSRTs.

d. Crop research strategies

It is proposed that when sufficient numbers of farming systems have been surveyed, that a crop research strategy will be drawn up using the quantified data collected from across the country by ARPT, together with CSRT knowledge of what research is feasible over a given time period

2. ADAPTIVE RESEARCH PLANNING TEAM

FORMAT FOR USE WHEN PRESENTING IDENTIFIED PROBLEMS TO COMMODITY AND SPECIALIST RESEARCH TEAMS IN RESEARCH COMMITTEE MEETINGS

1. Commodity specialist team to be involved.
2. Province (s).
3. Location of farming system (s)
4. Crop.
5. Technical description of the problem.
6. Description of the problem in terms of the system.

7. Benefits of successful research; Number of farmers who could benefit, importance of the crop to these farmers, market potential, increased output anticipated if solution was successful.
8. Research programme required-short and long term.
9. Key constraints within which a solution would have to work

EXAMPLE

1. Farm machinery and tillage research team.
2. Lusaka Province (also probably southern and parts of Central)
3. Ox-based farming systems with (900mm rainfall.)
4. Maize
5. Late planting, which reduce yield potential, increases weed problems, and limits the returns to inputs such as fertilizer and weeding. A high proportion of the planting (commonly more than 50%) is done after 15th December
6. The system is limited by the speed of the planting operation, and the need to minimize risks. The risk of complete failure due to lack of moisture at critical stages in the growth cycle (emergence, pollination) is reduced by planting over a number of weeks, and only planting when moisture conditions are good. This is likely to occur on only a few days before mid-December. The draft power (manpower equipment) cannot cover sufficient ground before the potential yield starts declining rapidly.
7. A reduction in this problem would significantly affect a lot of farmers. If 20% of the area currently planted after 15th December was planted before 15th December, an increase in output of 10% be expected. The greatest beneficiaries would be the ox-hiring members

of the community, who currently have to wait until the ox-owners have finished their fields. If potential for high yield exists in the emerged crop, farmers will be more willing to invest in inputs such as fertilizer weeding.

8. Research must establish more rapid ways to prepare and plant fields in order that a higher proportion of the crop can be planted early. It must also establish ways to provide a better environment for the planted seed to increase the rate of emergency, and to extend the number of days on which planting can be done.

Short term research should concentrate on testing planters (or other methods) for plant establishment under different moisture conditions, and on different soils. Successful methods should be tested in farmers hands.

Other approaches might be to look at winter ploughing or ploughing with the first rains to allow the planting operation to occur earlier; and investigation of reduced tillage techniques, etc. Other specialists such as plant breeders, may simultaneously approach the problem by different means.

9. The research programme tackles an operation which is constraining the system; however, at the same time there is severe cash constraint and very high returns would be needed for a new piece of equipment to be purchased. A low-cost planter would be much more likely to be adopted. Secondly, it is worth noting that the idea of winter ploughing has been pushed by extension for a long time without a great deal of uptake. Even if it is shown to be a solution

technically, it seems unlikely that it will be taken up unless some other change occurs which make it appear more favorable to farmers.

3. CROP PROFILES FOR A. R. P. T.

INTRODUCTION

Farming systems research involves identifying constraints, both agronomic and socio-economic, in a given farming system. Ways are then sought to overcome these constraints and exploit the potentials identified. This often involves matching a particular crop or variety to the existing farming system. In some cases varieties with appropriate characteristics will already be in existence, but where a breeding programme needs to be undertaken, the farming systems perspective can give a fine focus to the criteria for breeding.

In order that a general agronomist can assess the potential for a crop in a system, he must have an accurate idea of the environmental and management requirements of the crop. We are therefore asking C.R.T. co-ordinators to draw up 'crop profile's for the major small-farmer crops in Zambia.

For a given crop, it may be easier to make one profile to the crop showing the genetic potential of the crop (e.g. germplasm known with tolerance to pH 4.2) and separate profiles for varieties currently available in Zambia. Alternatively, potential and existing varieties could be combined in profile.

Emphasis should be given to points that are likely to be of most importance in the small-scale farming sector. Where genetic potential could be relatively easily realized in the breeding programme, this should be indicated.

Comparisons with other crops (eg sorghum with maize) may be the best way to illustrate the relative merits of a crop.

PROFILE FORMAT

1. Name Common name, genetic name, and any known Zambian names.
2. Soils a) pH The pH range for optimum growth should be indicated, and an indication given of the way in which yield decline at pH levels below this. Often the yield potential at sub-optimal pH is very important for farmers who can afford to apply lime.
- b) Texture. Indicate preference for clay or sandy soils, etc.
- c) Structure. How prone is crop to drought, waterlogging, compacted soil etc.?
- d) Depth. Does it require a deep soil, or can it perform well on relatively shallow ones?
- e) Nutrients. Response to macro-nutrients give some idea of actual response rather than an economically or biologically optimal level
- f) Any other important requirements of the soil environment.
3. Temperature a) Maximum and minimum air temperatures. If the sensitivity varies with growth stage, indicate this. Give optimum temperatures.
- b) Sensitivity to soil temperatures at different stages.

- c) Any other aspect of temperature directly or indirectly affecting the crop.
4. Rainfall
- a) Duration of moisture required
 - b) Mean monthly requirement, and most sensitive stages.
5. Altitude
- Limitations
6. Daylength
- sensitivity
7. Botany
- a) What is the range of plant forms? Stress particularly those features of agronomic importance (e.g. weed suppression, need for support).
 - b) Nodulation - What conditions are conducive to natural nodulation? (Where appropriate).
 - c) Any other botanical features considered to be important.
8. Management
- a) Planting date. This should be related to rainfall, or other environmental features which determine it.
 - b) Seed bed preparation: how critical is this operation?
 - c) Depth of planting?
 - d) Plant population and plant response to changing population would be of more use than a recommendation.
 - e) Time and method of fertilizer applications
 - f) Days to harvest
 - g) Ability to intercrop
 - h) Crop weed competition and critical weeding periods.

- i) Pest and disease problems, potential for resistance.
Relate attack to environmental factors.
- j) Storage problems
- k) Any other important management aspects (e.g. irrigation for vegetables).

4. PROJECT OUTLINE FORMAT FOR ADAPTIVE RESEARCH TRIALS

INTRODUCTION

The standard format which is supposed to be followed when drawing up project outlines for trials has been found somewhat inappropriate for on-farm trials concerned with problems identified through farming systems research methodology. We need a greater emphasis on the systems context in which the problem occurs, and to provide information on the hypothesis proposed as to how the problem can realistically be reduced, and the criteria necessary for disproving the hypothesis. The traditional format designed to serve as instructions for the agronomist carrying out the trials; as it is necessary to produce a separate set of instructions for the Trials Assistants, it is felt that for an on-farm adaptive trial, the project outline should specify the overall management level, rather than the full detail.

To make this outline more comprehensive, it is also proposed that some of the headings, such as 'initiated by', 'authorised by' and 'to commence on' could easily be omitted without any great loss.

Proposed Format:

1. Master Number
2. Title
3. Location Number of farms, recommendation domain, (district) province

4. **Agricultural System:** Salient agro-ecological and socio-economic features of the system which are important for an understanding of the trial (Reference to survey reports)
5. **Hypothesis.** The key constraint, and how the proposed technology will relieve it
6. **Treatment**
7. **Design** (Including the phase of trialing)
8. **Criteria for evaluation:** The hypothesis may state that the benefits of treatments will come indirectly through increased time available for another crop, rotational benefit, nutritional benefit, etc.
 - (a) These criteria must be stated, and
 - (b) further data which needs to be collected to evaluate the treatments should be outlined
9. **Literature** (on technology)
10. **Duration:** This should include what the duration will depend on.
11. **Management and Implementation:** An overview of the management to be followed, highlighting the most important points. Emphasis on which management decisions are made by research and which by the farmer
12. **Staff involved**