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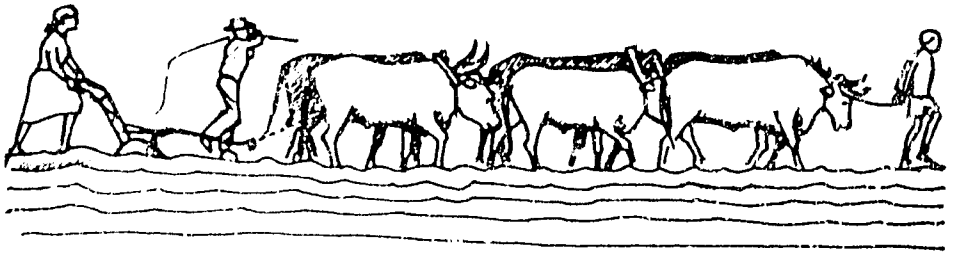
AGRICULTURAL TECHNOLOGY IMPROVEMENT PROJECT (ATIP)

AGRICULTURAL EXTENSION IN THE CENTRAL REGION AD PERFORMANCE AND RESEARCH - EXTENSION LINKAGES

NUMBER: ATIP WP - 14

BY

DOYLE BAKER



Agricultural Technology Improvement Project
Department of Agricultural Research
Ministry of Agriculture
P / Bag 0033
Gaborone
Botswana

Telephone 352381 Ext. 260
A GOB / MIAC / USAID Project

AGRICULTURAL TECHNOLOGY IMPROVEMENT PROJECT

(ATIP)

WORKING PAPER

AGRICULTURAL EXTENSION IN THE CENTRAL REGION AD PERFORMANCE AND RESEARCH-EXTENSION LINKAGES

NUMBER: ATIP WP-14

BY

DOYLE BAKER

DEPARTMENT OF AGRIC. RESEARCH
MINISTRY OF AGRICULTURE
BOTSWANA

MID-AMERICA INTERNATIONAL
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(MIAC)

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P/BAG 0033	P. O. BOX 10	P.O. BOX 10275
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ATIP WORKING PAPERS CONSIST OF METHODOLOGICAL AND EMPIRICAL MATERIAL WHICH HAS BEEN REVIEWED INTERNALLY BY ATIP BUT DOES NOT NECESSARILY REFLECT THE VIEWS OF THE DEPARTMENT OF AGRICULTURAL RESEARCH, MINISTRY OF AGRICULTURE, BOTSWANA

PREFACE

ATIP working papers consist of methodological and empirical material which has been reviewed internally by ATIP. Working papers are prepared and circulated to make ATIP research findings easily available to GOB personnel and researchers interested in Botswana farming system. The viewpoints expressed do not necessarily reflect the views of the Department of Agricultural Research, USAID or Kansas State University.

This working paper presents a diagnosis of agricultural extension in the Central Agricultural Region and a discussion of improved research-extension linkages. The extension service has perhaps been having a less than desired impact on the pace of arable farming development in Botswana. Few recommendations promoted by the Department of Agricultural Field Services have been adopted by a majority of farmers, particularly in the Central Region. While there has admittedly been modest progress in developing relevant recommendations for limited resource farmers, lack of farmer adoption also may be due to the ways ADs communicate messages and demonstrate innovations. Therefore, technology development research needs to be complemented with research on extension methods. An assessment of extension service performance and research-extension linkages is particularly timely in light the dramatic fall in arable crops production during the recent drought.

The diagnosis presented in the second section of the paper is based on a review of several past and recent national studies, as well as primary data collected in 1983 in the Central Region. Partial findings from the 1983 survey were initially presented in ATIP Research Report Number One. The discussion of research-extension linkages in the third section of the paper builds on observations presented in two ATIP Miscellaneous papers. The section "Advantages of Improved Linkages" draws on ATIP MP 83-5 by D. Baker and D. Norman. The section "Issues Constraining Improved Linkages," draws on on ATIP MP 84-5 by D. Baker and J.A. Hobbs. Relevant sections from those papers have been revised and included in this paper since neither of the previous papers has been circulated in Botswana.

Additional information on extension area characteristics and extension agent activities in the Central Region can be found in ATIP PR M84-2 and PR M84-3. Selected tables from those progress reports are included as an appendix.

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AGRICULTURAL EXTENSION IN THE CENTRAL REGION:

AD PERFORMANCE AND RESEARCH-EXTENSION LINKAGES

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1. INTRODUCTION

Agricultural Demonstrators (ADs) are the link between farmers and the Ministry of Agriculture. All messages about modified production practices and assistance programmes are channeled through ADs. The Department of Agricultural Field Services uses the ADs' annual reports to determine extension service priorities. Therefore, any institutional changes which improve the effectiveness of ADs in communicating messages, demonstrating innovations, or providing feedback to the Ministry should contribute to arable farming development.

The objectives of this paper are to: (a) diagnose extension problems and (b) identify opportunities to improve the performance of the extension service. The focus is on the Central Agricultural Region. However, there is substantial evidence that several of the problems identified in the Central Region are found throughout Botswana. It is, therefore, expected that the diagnosis and recommendations may be relevant to other agricultural regions. Special attention is given to research-extension linkages since this currently is one of the most important issues facing the Ministry of Agriculture.

The paper begins with a brief historical perspective on extension in Botswana. This is followed by summary results from a 1983 survey of agricultural demonstrators in the Central Region. The diagnosis of extension service performance ends with a review of four recent national extension studies.

The remainder of the paper turns to the specific issue of research-extension linkages. Many potential advantages of improved linkages to both extension workers and on-farm researchers are identified. Unfortunately, there are several obstacles to improved linkages. Some of the most crucial obstacles are then discussed.

Recommendations to improve the performance of ADs and to establish closer research-extension linkages are presented in the final section.

2. DIAGNOSIS OF EXTENSION PERFORMANCE

2.1 HISTORICAL PERSPECTIVE

The primary mandate of the extension service through the 1950s was to provide advice on farming methods. There was no mandate to act in a regulatory capacity or to offer services to farmers. The main activity of extension workers was to carry out demonstrations on farmers' fields. The relative emphasis on providing advice versus services has changed completely.

In 1962, the Pupil Farmer Scheme was established as the primary mode of agricultural extension. In this approach, each AD concentrated on improving the practices of about 25 farmers. In order to qualify for the scheme, a farmer had to own a plough and draught oxen, and needed destumped land. As their farming methods improved, pupil farmers were promoted through "progressive" and "improved" stages, until they became a "master farmer." In the end, master farmers autumn ploughed, row planted in early spring using appropriate spacing, used quick-maturing varieties, did regular weeding, applied fertiliser as needed, followed a defined crop rotation, had fenced lands, and used contour bunds (as needed) [ESM, 1965].

During the early 1970s, three major consultancies were commissioned to examine the Pupil Farmer Scheme and the organization of extension activities [Willett, 1981]. Each of the consultancies proposed abandonment of the Pupil Farmer Scheme. The consultants argued that, even though the pupil farmers did become more productive, the recommended technologies rarely spread to other farmers. Most other farmers lacked the necessary resources [Lever, 1970; Willett, 1981] and ADs often were too busy with their pupils to spend time with other farmers. Lever [1970] reported that ADs spent approximately 90 percent of their time with the pupil farmers.

The consultants identified several major problems in the administration and management of the extension service. For example, agricultural extension activities were being carried out by several sections of the Ministry of Agriculture, leading to overlap and confusion. In addition, field staff were inadequately supervised, poorly housed, lacked necessary extension equipment, and were short of suitable transport.

Following the consultant's advice, the extension approach and the organization of extension activities were both changed in the mid-1970s to their current status. In 1973, a principle of pursuing both group and individual extension was adopted. In 1976, the Pupil Farmer Scheme was ended. ADs now are required to work with groups of farmers whenever possible. Different approaches are used for communicating extension messages, including demonstrations, speaking at village meetings and participating in village groups.

The administration of the Ministry of Agriculture, including the extension service, was reorganized during 1974 and 1975. A regional administrative structure was created for the extension. To improve field staff management, several institutional changes were introduced, including:

(a).Farmer record cards
(b).Monthly management meetings involving all the ADs for each extension district
(c).Monthly and annual plans to be filled-in by the ADs
(d).A daily activities planning and record system

One of the key issues now facing the Ministry is whether the reorganization of the extension service and the adoption of a group extension approach has accomplished the envisioned aims.

2.2 EXTENSION IN THE CENTRAL REGION

Information on extension area characteristics, extension activities and problems facing ADs in the Central Region was obtained through a regional survey in 1983. The survey had two objectives. The first was to determine the extent to which farming systems differ across the Central Region, necessitating specialized research and extension priorities for different areas. The second was to find out what ADs do, what they believe to be important, and what problems constrain their effectiveness.

The survey instrument was a questionnaire filled out by the ADs. The questionnaire was distributed at monthly management meetings in March 1983. ADs returned the questionnaires through the mail. After a questionnaire was returned, each AD was interviewed in order to eliminate mistakes. Eventually, questionnaires were received from 52 of 54 ADs then stationed in the Central Region.

Of the 52 respondents, approximately ten came from each of the five

extension districts in the Central Region. (Since 1983, a sixth district, Letlhakane, has been added to the Region.) All but four ADs were male, with no district having more than one female AD. On average, the ADs had completed their formal education ten years prior to the survey but each had attended an in-service training course within the previous two years. In terms of formal education, about 30 percent had attended the equivalent of high school, approximately 40 percent stopped with the equivalent of a junior high school degree, and about 30 percent had less than a junior high school degree. All ADs also had technical agricultural certificates, mostly from the BAC.

2.2.1 Extension Area Characteristics

An overview of extension area characteristics is presented in Table 1. On average, extension areas encompassed two or more villages and more than 400 farming families. Lands areas were on average between six and twenty-four kilometres from the villages where ADs were stationed. Sorghum, maize and cowpeas were the most important crops in every district. Millet was relatively more important in the northern districts.

Average field size was 15 "acres," around six hectares. Estimates of field size were somewhat lower for Mahalapye West and Palapye districts, but not significantly so. A greater proportion of fields were wire fenced in Mahalapye East and Bobonong Districts. Approximately three-fourths of households owned cattle, with slightly greater proportions of households owning cattle in Serowe and Mahalapye West.

Donkey traction was used by 25 percent of households, higher than the national average. Donkey traction was particularly important in Mahalapye East and Bobonong. Tractors or tractors in conjunction with animal traction were used by 36 percent of the households. Nevertheless, there was a small number of tractors per extension area.

ADs were asked to estimate the number of farmers in their extension area who used progressive cropping practices. In all districts, the percentage of farmers using certified, improved seed was much higher than any other progressive practice. Use of other progressive practices was minimal. For example, an average of less than seven percent of households did more than one weeding, less than five percent used row planting, and even fewer households applied fertiliser, did winter or spring ploughing, used a metal harrow, used fallow in rotation, or had cut and stored fodder.

Each year, the DAFS annual plan identifies the main general and arable production problems, and resource constraints in each agricultural region. In the ATIP survey, ADs were asked to rank the relative importance the problems and resource constraints for their extension area. With reference to general problems, "lack of resources by particular groups of farmers" was ranked either first or second in each district and was the top ranked problem overall. Otherwise, there was substantial diversity in the rankings across the districts. For example, "income distribution" was not seen as an important problem in Serowe, Palapye and Mahalapye West but was in Mahalapye East and Bobonong. In most cases, the rankings of problems were quite similar in Bobonong and Mahalapye East, as were those in Mahalapye West and Serowe Districts.

Rankings of arable problems were quite similar across all districts. "Reliance on traditional cultivation methods," "livestock damage" and "water shortage at lands areas" were ranked first, second or third in every district. "Soil fertility" and "lack of draught power" were consistently

TABLE 1: EXTENSION AREA CHARACTERISTICS BY DISTRICT: 1983

		MAHALAPYE WEST	MAHALAPYE EAST	PALAPYE	SEROWE	BOBONONG	ALL
Size of Extension Areas:	Villages	1.1	2.6	3	3.3	2.5	2.5
	Farming families	353	283	640/a	523	368	432
	Nearest lands (kms)	6	4	5	7	7	6
	Farthest lands	16	23	23	32	28	24
Most Important Crops:	First/b	Sorghum	Sorghum	Sorghum	Sorghum	Sorghum	Sorghum
	Second	Maize	Maize	Maize	Maize	Maize	Maize
	Third	Cowpeas	Cowpeas	Cowpeas	Cowpeas	Cowpeas	Cowpeas
	Fourth	Jugo bean	Jugo bean	Jugo bean	Millet	Millet	Millet
	Fifth	Melon	Millet	Millet	Melon	Sunflower	Jugo bean
	Sixth	W/melon	W/melon	Melon	W/melon	Jugo bean	Melon
	Seventh	Millet	Mung	W/melon	Tepary	W/melon	W/melon
Fields:	Size ("acres")	12	16	12	17	18	15
	Households with:(%)						
	Wire fencing	22	54	14	17	48	30
	Bush fencing	44	27	30	23	41	32
	No fencing	34	19	56	60	19	38
Households Owning Cattle (%)		81	70	73	86	73	77
Primary Traction (% hh):	Donkeys	16	36	11	10	60	25
	Cattle	47	35	47	49	12	39
	Tractors	13	7	12	23	10	13
	Tractors & animals	24	22	30	18	18	23
Households Hiring Traction (%)		34	33	24	25	26	29

a. Based on 9 of 10 ADs. The other AD could not estimate the number of farming families.
b. Rankings derived from inverse weighting of subjective appraisals by ADs.

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ranked as middle priority problems. "Difficult roads", "communication", "loss of grain in store," and "lack of markets" were seen as less important problems for farmers in the Central Region.

In the rankings of resource constraints, "lack of animals or equipment to plough" was ranked as the top resource constraint in Bobonong District, while ADs in Mahalapye East and Palapye ranked a "lack of money to hire traction" as the top resource constraint. Taking these together, access to traction emerged as the top problem, followed by "no drinking water at lands" and "no fencing."

In total, more than 50 characteristics were recorded for each extension area. The survey revealed important differences in extension areas when compared on an individual basis. For example, row planting was dominant in one extension area, but in no other extension area. Similarly, there were differences in the amount of wire fencing, the distance to the lands, and the percent of households owning cattle. The reasons for village differences are not clear, but such differences have been commonly noted in Africa [Eicher and Baker, 1982]. In general, factors which are know to affect village trends include: ethnic composition, soil and cattle resources, institutional support, infrastructural development, and past village leadership.

When extension area characteristics were analysed by district, few significant differences were identified. The most important difference was the importance of donkey traction in the Bobonong and Mahalapye East Districts, versus the importance of cattle and tractor traction in the other three districts. The reason for a lack of systematic differences by agricultural district is that districts are administrative units which bear no relationship to village characteristics, agroclimatic conditions or type-of-farming zones. Consequently, variability among areas within districts was greater than differences across districts. To a certain extent, the result also stems from a general homogeneity of farming patterns in the Central Region.

2.2.2 Extension Activities

ADs provided advice and services to farmers, acting as field agents for several government programmes. Advice was provided through direct contacts and at village kgotla meetings. Kgotla meeting were the primary forum for contacting farmers. On average, kgotla meetings were addressed ten times during the cropping season, more frequently in Mahalapye East and Serowe Districts than elsewhere. The emphasis of AD messages at kgotla meetings was on government programmes, particularly ALDEP, rather than promotion of improved technologies. Group formation and drift fencing projects were priority topics in every district.

According to the ADs own estimates, only one-fifth of the farming families were contacted even once a season. Only one in fifteen farmers was contacted once per week, and these farmers often were the same ones week after week. When ADs were asked what distinguished the farmers contacted regularly, 85 percent of the responses related to attitudes, productivity, and resources that would be associated with the best, most progressive farmers. This raises the issues as to whether abandonment of the Pupil Farmer Scheme has increased the amount of extension advice being received by poorer, less progressive farmers.

When providing advice to farmers, ADs stressed the same recommended practices throughout the Region, almost in the exact same order of

importance. Row planting was the main recommendation in each district, followed by early ploughing, crop rotation and early weeding.

In addition to providing advice, ADs were responsible for demonstration plots and for supplementing supplies of equipment, seed, and fertiliser. During the 1982-83 season, few demonstrations were attempted and very few were successfully implemented. The number of demonstrations ranged from just over one per area in Bobonong District to three per area in Serowe District, averaging two per area across the Region. Eighty-seven percent of the demonstrations dealt with row planting and/or fertilisation (including manuring).

Summary results on equipment supplies are presented in Table 2. The main types of equipment provided were planters, cultivators, harrows, burdizzos and dehorning irons. Although most ADs had at least a few of these to loan to farmers, few farmers made use of AD planters, cultivators or harrows.

TABLE 2: AD SUPPLY AND USE OF EQUIPMENT, 1983

	NUMBER AVAILABLE	NUMBER OF FARMERS USING	
		TOTAL	PER PIECE
PLANTERS	1.7 (1.5) /a	6.0 (9.1)	3.5
CULTIVATORS	0.9 (1.4)	3.1 (8.2)	3.4
HARROWS	0.8 (0.9)	5.0 (7.9)	6.2
BURDIZZOS	0.4 (0.6)	67.3 (196.1)	156.5
DEHORNING IRONS	0.8 (1.7)	55.0 (192.8)	70.5

a. Standard deviations in parentheses.

Just over sixty percent of the ADs reported sales of sorghum and maize seed. Nearly all the ADs reported they could have sold more seed had it been available. Forty-two percent provided fertiliser but the number of farmers receiving fertiliser was quite small (3.6 farmers per area where any fertiliser was provided). The remaining major activity of ADs was helping with ALDEP applications.

An analysis of the correlations among farmer contact activities showed there were positive and significant (above 0.9 confidence level) correlations of 0.35 to 0.40 between times addressing a kgotla, families met individually during a season, and the number of demonstrations. There was also a positive (0.34) and significant correlation between the number of record cards kept and the number of families met during a season. Each of the above contact activities were negatively related to the number of visits to the lands area per week (but not significantly so). It would appear that certain ADs are more active and this is reflected in all their farmer contact activities, except for visits to the lands areas. Visits to the lands areas may be a substitute for other types of farmer contact activities.

2.2.3 Institutional Support

Monthly management meetings are the main format for giving instructions to ADs and helping them with problems they encounter. Eighty-eight percent of ADs said they had reported problems to a monthly management meeting during the six months preceding the survey. Eighty-two percent said they felt monthly management meetings were useful. The main value of the meetings was seen as the opportunity to interact and get ideas. Among the eighteen percent who were dissatisfied, the primary concern was that complaints and problems were never solved.

In addition to the monthly management meetings, 60 percent of the ADs had requested special assistance at some time in the two years preceding the survey. The proportion of ADs requesting assistance ranged from a low of 30 percent in Mahalapye East to 75 percent in Bobonong. On average, just over four requests were made during that two year period by those ADs who made any requests. (The median number of requests was lower since a few ADs had made more than 20 requests.)

The most frequently contacted person was the District Agricultural Officer (DAO). The DAO and the regional Crop Production Officer were the main individuals providing information directly to ADs. Less than half the ADs requesting help felt they received timely and effective help. Twenty-five percent reported they received no help and 25 percent said they received help, but it arrived to late to be of use.

There was a clear consensus among ADs that closer ties are needed between researchers, extension agents and farmers. For example, 90 percent said there should be more village research and 81 percent agreed when asked if researchers and ADs should try to learn from farmers. Only 31 percent felt they knew what was going on in Sebele research.

TABLE 3: AD ASSESSMENTS OF THE MOST VALUABLE CROPS; 1983

RANK	CROP	MOST FREQUENTLY CITED REASONS
1	SORGHUM	Harvested in large quantities High demand Multiple uses Stable yield
2	COWPEAS	High demand High prices Matures early Can harvest leaves in bad years
3	MAIZE	Good prices High demand relative to supply Can sell green or dry
4	MELONS	Easy management Ripens early Multiple uses
5	JUGO BEANS	Low labour relative to price High demand

2.2.4 Perceptions and Priorities

ADs were asked about the value of different crops and practices, farmers attitudes towards change, and constraints on their effectiveness. Table 3 presents a summary of responses on the most valuable crops. Nearly all ADs said that sorghum was the most valuable crop because it is harvested in large quantities, and has multiple uses and a relatively stable yield. Multiple uses also was mentioned as an attractive feature of cowpeas (harvesting leaves in bad years) and melons. High demand and/or prices was mentioned for five of six of the most valuable crops. ADs said early maturity (availability of product) was a valuable feature of cowpeas, maize and melons.

Table 4 summarizes ADs' views on changes farmers could make to increase productivity, why each change would increase productivity, and why farmers do not make the change. Row planting was by far the highest ranked change, followed by fertiliser use, fencing, winter or spring ploughing and early planting.

In general, the reasons ADs cited for productivity increases were obvious and somewhat superficial. It was not clear from the responses whether the ADs had a good understanding of the advantages and disadvantages of different production practices. Lack of a proven benefit, or other technical questions, were only cited as major problems for fertiliser use, better weed control and early planting. Otherwise, the ADs tended to cite resource constraints and lack of knowledge as the main reasons farmers do not make changes.

The emphasis on resource constraints was also found in relation to a question on farmers' attitudes towards change. ADs' ranked highest the statement "most farmers want to change and know of changes but lack resources." "Lack of knowledge" of changes received the second ranking and "lack of interest" in changing received the lowest ranking.

When asked to evaluate the circumstances constraining their effectiveness, nearly half of the ADs said the conditions of their service, including housing and lack of transport, was the major constraint on their effectiveness. Another 21 percent of ADs cited farmers' lack of resources as the main constraint on their effectiveness. Only 13 percent of the ADs cited the dominance of traditional practices and only 11 percent mentioned farmer attitude problems.

2.3 RECENT NATIONAL EXTENSION ASSESSMENTS

Since the 1983 regional survey was completed, four studies at the national level have been carried out on factors affecting extension service performance. Major findings from those studies are now summarized.

The circumstances of male versus female ADs were reviewed by Bettles [1984] and mentioned by Fortmann [1985]. Both argued that there was a bias against female ADs in training. Two gender related problems were cited, pregnancy and difficulty in bicycling around the lands, but neither was seen as a reasonable excuse for bias against female ADs. Fortmann pointed out that females were less likely to suffer from alcoholism and Bettles recommended that transport problem could be addressed through the government loan scheme for motorcycles.

TABLE 4: MOST PROMISING CHANGES FARMERS COULD MAKE TO INCREASE PRODUCTIVITY; 1983

RANK/a	PROMISING CHANGE	WHY CHANGE WOULD INCREASE PRODUCTIVITY/b	WHY FARMERS DO NOT USE/b
1	Row plant	Proper plant spacing Helps weeding Better seed depth Less seed used	Lack implements Too much work
2	Fertiliser	Increase soil fertility Improve soil structure Conserve soil moisture	Lack funds Lack knowledge Fear more weeds
3	Fencing	Reduce livestock damage	Lack funds Lack cooperation
4	Winter or spring plough	Improve soil moisture	Lack draught Not ready at lands Lack labour
5	Early plant	Leaves long time to mature Use first rains Reduces pest attacks	Erratic rains Lack draught
6	Certified seed	Quick maturing Better germination	Lack funds
7	Better weed control	Reduce weed competition Moisture conservation	Lack labour No perceived benefit
8	Crop rotation	Increase soil fertility Reduce diseases and pests Promotes different crops	Lack knowledge Lack seeds
9	Dams in lands	Water for draught animals	Lack funds
10	Destump	Less damage to ploughs Use planters and cultivators	Lack funds Lack labour

a. Ranking based on the number of times a change was cited. Each AD was allowed to cite three promising changes.

b. Most frequently received reasons are cited. Among cited reasons, no strict ranking is implied. Two "attitude" reasons were cited frequently -- farmers lazy and no interest -- but have not been included since they do not relate to particular changes.

Ramolemana and Hobbs [1985] studied the relative importance of factors influencing extension efficiency and prospects for crop production improvements. Forty-two factors were ranked. The most important factors (in order) were found to be:

(a).Improved housing for ADs
(b).A system for performance evaluation and promotion procedures
(c).Ensured seed supplies
(d).Access to motorized transport
(e).Increased opportunities for in-service training
(f).Increasing the proportion of practical training in extension methods at BAC
(g).Organizing specific courses at BAC on identifying farmers' problems

The relative rankings of different factors showed a perceptional gap between researchers and ADs. Researchers tended to emphasize factors influencing the substance of the message being delivered, while ADs stressed their own conditions of service and training.

Fortmann [1985] reviewed factors affecting the effectiveness of the extension services, with a focus on the number and continuity of personnel, recruitment, training, and field support. She concluded that further changes were required in the structure and administration of the extension services. Her recommendations paralleled those made more than a decade earlier, before the reorganization of the extension service in 1974 and 1975.

Trent, Styles and Ramolemana [1986] evaluated the competence of ADs in 102 subjects, grouped into 13 selected subject areas. Questionnaires were distributed to all ADs and extension district officers. The results showed that the lowest perceived competencies were for farm management, inquiry methods, farm mechanisation and administration. The highest areas of competency were for MOA schemes, arable crop production, and group work. There were few differences in rank order competencies by sex, age or length of time on the job.

3. RESEARCH AND EXTENSION LINKAGES

Promotion of close research-extension linkages is one of the core themes of the farming systems approach. Unfortunately, recognition of a need for close linkages does not provide answers as to how linkages can be established in particular circumstances. This section tries to establish a Botswana case for closer linkages through reference to the activities and mandates of Botswana researchers and extension workers. This is followed by a review of several issues which will need to be addressed if closer research-extension linkages are to be forged in Botswana.

3.1 ADVANTAGES OF IMPROVED LINKAGES

This section discusses four sets of advantages from improved research-extension linkages:

(a).Contributions of ADs to on-farm researchers
(b).Contributions of on-farm researchers to ADs
(c).Contributions of on-farm researchers to extension subject matter specialists
(d).Contributions of on-farm researchers to farmer assistance programmes

3.1.1 Contributions of ADs to On-Farm Research

The primary objective of on-farm research by the Department of Agricultural Research (DAR) is location specific evaluation and adaptation of technologies. Since there can be substantial diversity in farming systems and farmer circumstances, it generally is necessary to carry out on-farm research in several villages. However, DAR does not have the personnel to conduct trials in a sufficient range of villages to adequately screen technological alternatives. Therefore, ADs can make a major contribution by helping farmers conduct farmer managed and implemented (FMFI) trials (with support by on-farm research teams). In addition, ADs are in daily contact with farmers and should be able to provide valuable insights to farming system (FS) teams, to assist in diagnosing problems, and designing and screening technologies. From a pragmatic perspective, ADs are likely to be more enthusiastic about recommendations if they are involved in developing and screening the recommendations.

ADs already have made substantial contributions to on-farm research in Botswana. In each of the major on-farm research projects, DAFS personnel have helped implement on-farm trials. ADs also have provided valuable descriptive and diagnostic information to the FS teams.

3.1.2 Contributions of On-Farm Research to ADs

Most on-farm researchers recognize there are benefits from close linkages with extension personnel, but the converse is not always true. At a workshop held to explain the purpose of FS work to Botswana extension officers, the fear often was expressed that FS work is another soon-to-be-abandoned approach which merely creates extra work for ADs [Hobbs, 1984]. Consequently, if FS teams and ADs are to develop close relationships, it is important to convince extension officers and ADs that the FS approach can help them better accomplish their objectives.

FS work can contribute to ADs in two key ways. The primary linkage between FS work and ADs is the information on-farm research teams can provide ADs. Second, understanding of the farming systems approach can help ADs be better extension agents as they work on their own.

3.1.2.1 Information Flows from FS Teams to ADs

ADs have a number of obligations which take up most of their time. In order to fulfill their obligations, ADs need information about farming practices, farmers' resources, problems faced by farmers, and the relevance of alternative solutions to low productivity and other farmer problems. Of all AD activities, five perhaps are most important. Each has its own information requirements. The activities and their information requirements are as follows:

(a). **Reporting obligations of ADs.** Each AD prepares a monthly situation report and contributes information for the three month and annual plans of DAFS. The information ADs provide to DAFS officers involves facts about farming systems and a diagnosis of problems. The DAFS annual plan is not very useful if information coming from the ADs is not accurate. Unfortunately, this currently is the case and a priority of DAFS is to improve the quality of information being provided by ADs [DAFS, 1984].

(b). **Demonstrations of improved technologies.** The first step in preparing a demonstration is deciding which recommendation(s) to demonstrate. This requires information on which practices are likely to work well in each extension area, and which practices might be of interest to farmers. Also, to be useful, a demonstration must show benefits relative to current practices. This means there is a need for information on current practices in order to set the control practices for each demonstration plot. Information is also needed on which variables are likely to influence demonstration results so an AD can record and evaluate reasons why a demonstration did or did not work.

(c). **Advice to farmers.** Advice might be presented individually, through group events, or at a village meeting. Each time an AD presents advice, he or she must have information on what are priority topics to address at that time, and how can advice be presented so it is of interest to farmers.

(d). **Processing ALDEP, Drought Relief, and ARAP applications.** ADs often must help farmers fill out applications for the various farmer assistance programmes, and also must make sure farmers meet the qualifications for the various programmes. Consequently, ADs need information about farmers' circumstances to help fill applications or verify compliance with regulations.

(e). **Monthly Management Meetings.** In order to take advantage of the monthly management meetings, ADs need information on the major problems faced by farmers in their extension area. It is also important to be able to report accurately on the status of on-going projects and group activities.

Taken together, the above activities make substantial demands on an AD's ability to generate sufficient information. Without accurate information about farming systems and farmer circumstances, ADs cannot fulfill their obligations. There are several ways that on-farm research teams might be able to help. Some examples are presented in Table 5. The table shows the potential flow of information from FS teams to ADs. AD duties and the respective information requirements are listed to the left. Letters corresponding to particular information requirements are indicated under the on-farm research activities which should contribute that information.

3.1.2.2 Tenets of the FS Approach

While the information generated by on-farm research teams can directly benefit ADs, ADs might benefit to even a greater extent by adopting elements of the farming systems approach when doing their own work. The following tenets of the farming systems approach should help ADs be more effective extension agents:

(a). The problems faced by farmers are not just technical. AD advice that does not take into account the economic, social and institutional environment of farmers will generally not be followed.

(b). Low adoption rates by farmers stem from many causes. ADs need to rethink any tendency to blame farmers' attitudes for resistance, and their pattern of primarily working with the most serious and progressive farmers.

TABLE 5: INFORMATION LINKAGES BETWEEN ON-FARM RESEARCH TEAMS AND ADs

AD DUTIES	INFORMATION REQUIREMENTS	INFORMATION AVAILABLE FROM FS FIELD TEAMS BY ACTIVITY				
		DESCRIPTION	DIAGNOSIS	DESIGN	TESTING	DISSEMINATION
Reporting obligations	A. Accurate profile of farming systems B. Assessment of problems and potential solutions	A	A,B	B	A,B	A,B
Demonstrations	C. Which to do D. Where to set controls E. How to record and evaluate results	C,D	C,D,E	C,E	C,D,E	C,D,E
Advising farmers	F. Priority topics G. How to present	F,G	F,G	F	F,G	F,G
Assistance programmes applications	H. Filling in forms I. Evaluating priorities	H	H,I	I	I	I
Monthly management meeting	K. Major problems L. Status of projects and group activities	L	K,L	K	K	K,L

(c).A technology is the combination of implements, inputs and management practices used for producing a crop. This viewpoint should help ADs concentrate on how existing and potential inputs might be used, rather than formulating advice in simple terms such as broadcasting versus row planting.

(d).Technologies do not always work, their performance depends on the technical environment. Consequently, advice to farmers should stress appropriate options -- taking into account factors such as soils and rainfall patterns -- rather than complete packages.

(e).Farmers are different; they have different objectives and resource endowments. Attempts to treat all farmers the same means that few recommendations will actually be suited to most of the farmers.

(f).A key failure with past efforts to promote changes in farming practices is that too much was demanded of farmers. Most farmers have a limited capacity to make changes. This view suggests that extension activities must try to build on existing practices and not demand too much of farmers.

(g).It is important to respect farmers and the knowledge they have about farming. Obviously, not all farmers are good farmers, nor do all farmers have a good attitude toward farming. But farmers have a better understanding of the trade-offs they face in selecting particular practices than researchers do, and in many cases better even than ADs. ADs need to respect farmers' assessments of technologies rather than treating extension as a top-down transfer of knowledge.

3.1.3 Contributions to Subject Matter Specialists

Subject matter specialists are expected to play a key role in Botswana. In principle, subject matter specialists set priorities for extension programmes in each agricultural region. Subject matter specialists also are expected to be the main link between researchers and ADs. When ADs face problems they cannot handle, the regional subject matter specialist often is contacted for a solution. Another task of subject matter specialists is to provide in-service training of ADs.

A recent review of DAFS in-service training showed that many specialists have insufficient expertise to function well in their specialist roles. Several specialists expressed concern about their lack of preparation and felt they did not have sufficient contact with researchers. Subject matter specialists have done little in-service training of ADs.

A major constraint keeping subject matter specialists from being more effective is that most are general agricultural graduates. They generally have little training in farming systems diagnosis, nor are they in a position to evaluate potential contributions of alternative technologies to target categories of farmers. Diagnostic skills can be learned through experience but many subject matter specialists, both at headquarters and in regional offices, are relatively recent graduates.

On-farm researchers can work with subject matter specialists to help increase their competence. Three areas of communication should be valuable:

(a).Farming systems researchers can liaise with subject matter specialists to see that extension messages are continually updated to reflect

findings from on-farm research. Clearly, when subject matter specialists develop sufficient expertise, a two way communication about potentially relevant technologies would benefit both on-farm research teams and subject matter specialists.

(b). Training in on-farm research methods and farming systems philosophy should help specialists be more effective problem-solvers, instead of tending to concentrate on the programmes with which they are most familiar, regardless of a programme's contribution.

(c). To date, most on-farm researchers in Botswana have had more disciplinary training than the current subject matter specialists. On-farm researchers, therefore, should be able to serve as subject matter specialists to the specialists.

One of the best ways on-farm researchers can help extension specialists, and ADs as well, is to participate in in-service training courses. On-farm researchers have in fact been participating in the ALDEP in-service training for ADs, and recently have participated in a extension specialist training programme designed by the Research Extension Coordination Unit.

The FS teams also should benefit from any time spent aiding regional subject matter specialists since subject matter specialists have tremendous influence over demonstrations run by ADs. If regional specialists support the on-farm research teams, the task of translating research results into extension recommendations should be greatly reduced.

3.1.4 Contributions to Farmer Assistance Programmes

ALDEP and ARAP are the most important agricultural development programmes in Botswana for limited-resource farmers. On-farm research should be able to help farmers be more productive with the resources they have but many farmers lack the resources to substantially increase production. Lack of farmer resources in turn constrains the options on-farm researchers can consider.

On-farm research can play two vital roles with respect to farmer assistance programmes. First, research findings can be used when setting priorities and designing specific programmes. For example, IFPP (and, to a lesser extent, EFSAIP) played an instrumental role in providing information used to design the ALDEP programme. Second, on-farm research teams can help monitor the impact of the various programmes. This, in fact, happened last year when the FS teams collaborated on an evaluation of the ARAP and Drought Relief programmes.

3.2 ISSUES CONSTRAINING IMPROVED LINKAGES

This section reviews seven issues which will need to be addressed if improved research-extension linkages are to be developed in Botswana.

3.2.1 Lack of New Recommendations

Agricultural research was started in Botswana nearly 50 years ago. Despite a long and active research programme, research findings have been limited. Thus, recommendations have not changed much over the last 30 years or so. Crop production recommendations, for example, have long included early and deep ploughing, row planting, and cultivating to control weeds. Similarly,

a recommendation to apply phosphorous fertiliser at about 20 kg P/ha every three or four years was first made in the early 1960s.

Because of the lack of progress in generating new recommendations, ADs have been communicating incorrect or partially correct messages for a long time. As a result, neither farmers nor ADs are likely to be receptive to research recommendations.

3.2.2 Preponderance of Expatriate Staff

Because Botswana has shortage of trained agricultural researchers, most of the senior agricultural researchers in Botswana have thus far been expatriates. A 1980 study showed, for example, that only 25 percent of DAR senior positions were held by Batswana [Litschauer, 1980]. Dominance of research by expatriates can have unfortunate effects on the research process and research-extension linkages. Four typical problems are as follows:

(a). Expatriate officers initially are not as familiar with the major agricultural problems as are local officers but often have major say over research priorities and the determination of research recommendations.

(b). Since many expatriates stay relatively short periods of time, they often leave before their investigations have reached a fruitful stage. As a result, research and the formulation of recommendations can lack continuity.

(c). Even after several years, expatriates rarely are familiar with the language and customs of Batswana, and cannot as easily become acquainted with farmers as can ADs and Batswana researchers.

(d). When expatriate researchers are funded by donor agencies, they usually are given mandates that are relatively difficult to amend or modify. Accordingly, unanticipated conditions that arise between project design and completion often cannot be studied, no matter how important they may appear to be.

3.2.3 Extension Approach

It is not clear how much progress can be made on research-extension linkages as long a the current community extension approach continues to be used by DAFS. Although a change away from the Pupil Farmer Scheme may have been needed, the loss of response from progressive farmers has had a psychological effect on ADs. Many lost enthusiasm for their work, and some never gained it back. Moreover, the current approach is inconsistent with the farming systems tenet that recommendations should be tailored to particular farming systems and farmer circumstances. Unless ADs are encouraged, or instructed, to refine the way they present recommendations, it is unlikely they will be interested in the contributions on-farm research teams have to make.

3.2.4 Lack of Training of ADs

Most extension personnel in Botswana are not adequately prepared for their jobs. Certificate holders, ADs and Agricultural Supervisors (ASs), have minimal academic training -- three years of secondary schooling or less -- and their professional training is short and superficial. Even specialist

officers in the regions and at headquarters are seldom specialists by either training or experience when they start work.

Certificate instruction at the Botswana Agricultural College (BAC) was improved during the late 1970s and early 1980s with assistance provided by a USAID project. Nevertheless, ADs still indicate they have little familiarity with many aspects of agriculture and have little knowledge of practical extension methods. One unfortunate trend is that many staff members from BAC do not attend research field days, research review conferences or research seminars. It is questionable whether FS work can directly benefit future ADs and indirectly benefit farmers if BAC teachers do not collect and teach new ideas about agricultural science, farming practices, and extension methods.

3.2.5 Lack of Personal and Professional Support

The morale of many ADs is low. As stated above, most ADs blame this on lack of support for their field activities. Inadequate housing, poor or no extension equipment, insufficient transport, little supervision, and poor opportunities for advancement are but a few of the complaints commonly heard from ADs and field officers.

Some complaints arise because funds are lacking to run the extension service, but some, if true, might come from lack of awareness on the part of administrative personnel in DAFS. Top administrators rarely go to extension areas or even to agricultural district offices, especially those far away and off better roads. Meetings between headquarters staff and regional staff and between regional staff and district personnel are too infrequent to develop a good esprit de corps. There is little administrative input into field workers' annual plans of work, and there is little effort made to check that work plans are followed.

Until steps can be taken to improve the working and living conditions of extension agents, there will be a morale problem and inefficiency. While successful on-farm research may generate enthusiasm among ADs for their work, on-farm researchers should have minimal expectations for the contributions of ADs to technology development and monitoring for the foreseeable future. Even efforts to stimulate discussion among ADs over farmers' problems and potential solutions may be seen as one more burden rather than an acknowledgement of AD expertise.

3.2.6 Burden of Non-Extension Activities

Most on-farm researchers believe that the major responsibility of ADs should be to extend advice to farmers. Unfortunately, there is a tendency for many individuals and organizations inside of and outside of government to look on ADs as a handy source of labour ready to undertake a great variety of activities. These activities may help farmers and may actually be good programmes, but non-extension activities reduce the ADs' time for extension, and their interest in research-extension linkages.

3.2.7 Isolation of Researchers from ADs

DAR is located at Sebele, with most senior researchers housed there. DAFS is headquartered in Gaborone. DAFS regional and district staff are dispersed throughout the country. ADs are located in rural areas far from district and regional offices. Accordingly it is difficult for researchers

to meet extension administrators, and even more difficult for researchers to meet ADs and farmers. Lack of contact has two major effects: researchers may not study the right problems, and solutions developed by researchers may not be transferred to the farmers.

Recently, several steps have been taken to help increase two-way communication among levels of staff in DAFS, on the one hand, and between researchers and extension workers on the other. These have included:

(a). Establishment of a Research Extension Coordinating Unit in the Crop Production Division of DAFS.
(b). Placement of greater responsibility on specialist officers in headquarters and in the regions for liaison between research and extension.
(c). Establishment of several on-farm research teams

Several steps taken by the various FS teams have made substantial contributions toward improved research-extension linkages. But FS personnel represent a minority of DAR researchers. The continued isolation of many DAR researchers from ADs and from farmers does not suggest there is sufficiently high priority placed on improved research and extension linkages.

4. CONCLUSIONS AND RECOMMENDATIONS

There continue to be major extension problems in the Central Region, and throughout Botswana, which go beyond the extension message. The administrative changes introduced during the 1970s have helped but the lack of a coherent extension approach is a major constraint. The on-going problems hold important implications for the prospect of linking on-farm research and extension, as is the Ministry's stated goal. This concluding section presents several recommendations as to how extension performance might be improved and better research-extension linkages developed.

First, most ADs give the same advice and use the same demonstrations, regardless of extension area circumstances. Extension priorities should be established for each extension area, based on area characteristics. The key characteristics would appear to be: type of traction used, distance to nearest lands, amount of wire fencing, and percent of farmers using early ploughing and row planting. These variables tend to distinguish progressive farming areas from those which are less progressive.

Second, most ADs work primarily with progressive farmers, but do so less effectively than they did under the Pupil Farmer Scheme. An extension approach should be adopted which is in between the Pupil Farmer Scheme and the "community at large" approach. Following the farming systems approach, recommendations should be developed for a few clearly identified recommendation domains (RDs). Then extension workers could work with representatives ("pupils") from each domain. In this way, improvement could be initiated and monitored for a range of farming households, but ADs could be allowed to concentrate on a limited number of households.

To move toward an RD or target farmer approach, FS teams, Sebele researchers, DAFS officers, and the Division of Planning and Statistics will need to agree on an RD framework which reflects: (a) farmer circumstances, (b) existing and potential production technologies, and (c) national objectives for the agricultural sector.

Third, there will have to be more extensive interaction and

collaboration between on-farm researchers and ADs despite the distinct mandates of DAR and DAFS. With the Botswana history of questionable recommendations, on-farm researchers will have to be directly involved in extension activities in order to build credibility for recommendations. On the other side, ADs need be active in the technology development process in order to develop enthusiasm for recommendations.

Fourth, most ADs are fully occupied with ALDEP, Drought Relief and ARAP. When ADs are given a proven set of practices to promote, other chores will have to be taken from them so that they can do their extension job. Of course, the question remains as to who else will perform the various services now performed by the ADs. If ADs cannot be released from service activities, one option might be to set up one or two mobile extension teams in each district to implement demonstrations and hold periodic extension "clinics." An advantage of such teams is that research-extension linkages should be more easily established than would be possible between on-farm researchers and the many ADs in each district.

Fifth, to the extent possible, steps should be taken to improve the working and living conditions of ADs. Until conditions of service are improved, the Ministry should have minimal expectations for the contributions of ADs to technology development, extension or programme monitoring.

Sixth, few ADs are adequately prepared for their job. In particular, ADs receive essentially no training which prepares them to deal with human and institutional problems. To address this problem, the emphasis given to technical training at BAC should be reduced relative to training in farm management analysis (or farming systems diagnosis).

Seventh, perhaps the best hope for developing a better trained cadre of extension workers is a good in-service training programme, building on the current in-service training sponsored by ALDEP. To develop an improved in-service training programme, all levels of staff should undergo training so that more senior officers will be able to train newer or lower level of staff. Following the example of EFSAIP and ATIP, on-farm research teams should participate the in-service training courses in order to show ADs how to put in demonstrations with proper control plots, and how to keep records for evaluating demonstration results. FS teams should also participate regularly in monthly management meetings in order to communicate research results and participate in an on-going process of updating ADs' knowledge and skills.

Eighth, the overlap between the ADs and on-farm research teams in providing information about local farming systems should be minimized. To do so, the RELO should work together with the on-farm research teams and DAFS officers in order to design an improved annual report form. If an adequate form could be developed, on-farm researchers could refer to ADs' annual reports to identify farming systems trends and priority problems in particular localities. The concept of integrated diagnosis of farming systems trends should be extended to include the Division of Planning and Statistics as well.

Ninth, it is unlikely that a substantial number of ADs will be willing to participate in collaborative activities with researchers until the benefits of doing so are clearly demonstrated. Therefore, two or three of the most active ADs in each district could be selected to cooperate with FS teams in testing and demonstrating technologies, to set an example for other ADs.

Tenth, ADs probably would be more effective and more enthusiastic about their work, if the importance of their role was more widely acknowledged. Therefore, more attention should be given to the tenets and methods of the farming systems approach -- which is based on a bottom-up development philosophy. At both BAC and in in-service training, the FS approach should be communicated to ADs.

Eleventh, it is particularly important for on-farm researchers to establish close relations with ALDEP officers at the regional level. On-farm researchers, ALDEP officers, subject matter specialists and DAFS administrative officers are all assigned overlapping responsibilities for identifying and disseminating extension recommendations. Coordination among these individuals at the regional level could be one of the most important steps toward establishing effective research-extension linkages, regardless of formal ties at departmental headquarters or ties between DAFS officers and experiment station researchers.

APPENDIX:

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TABLE A.1: DRAUGHT POWER CLASSIFICATION OF EXTENSION AREAS

	MAH. WEST	MAH. EAST	PALAPYE	SEROWE	BOBON.	ALL
	(Number of Extension Areas)					
Donkey EAs	2	3	0	[illegible]	6	11
Cattle EAs	6	2	5	6	1	20
Tractor EAs	3	1	2	5	0	11
Mixed traction EAs	0	4	3	1	2	10

a. Donkey and cattle extension areas are those where more than 50% of farmers used donkeys and cattle, respectively. Tractor areas are those where more than 50% of farmers used tractors as a primary traction, or tractors in conjunction with some type of animal traction. Mixed traction areas are those where no one type of draught power was used by more than 50% of farmers.

TABLE A.2: USE OF PROGRESSIVE PRACTICES BY DISTRICT

	MAH. WEST	MAH. EAST	PALAPYE	SEROWE	BOBON.
	(Number of Farmers Per EA/a)				
Used improved seed	158	96	60	134	81
Have done more than one weeding	33	28	7	26	25
Used fallow in rotation	12	3	1	1	18
Used a metal harrow	25	8	18	5	14
Planted in rows	39	12	9	7	12
Stored fodder	1	1	1	1	5
Winter or spring ploughing	4	2	1	1	3
Applied fertiliser	4	2	3	2	3

a. Numbers are based only on those farmers with whom the ADs have contact and, therefore, are likely to be an underestimate. Figures for different practices should represent the relative prevalence of progressive practices.

TABLE A.3: FARMER CONTACTS BY DISTRICT

	MAH. WEST	MAH. EAST	PALAPYE	SEROWE	BOBON.	ALL
Families Contacted:						
Once per season	135	138	114	177	97	124
Three times per season	51	87	50	53	68	72
Once per week	35	31	33	37	87	43
Times Addressed Kgotla During Season	8	10	7	16	6	10
Record Cards Filled-In	168	157	104	82	30	113

TABLE A.4: ISSUES STRESSED AT KGOTLA MEETINGS

	MAHALAPYE WEST	MAHALAPYE EAST	PALAPYE	SEROWE	BOBONONG	ALL
First/a	ALDEP/NDB Loans	ALDEP/NDB Loans	ALDEP/NDB Loans	ALDEP/NDB Loans	ALDEP/NDB Loans	ALDEP/NDB Loans
Second	Group Formation	Drift Fence	Parasite Control	Group Formation	Parasite Control	Group Formation
Third	Drift Fence	Early Plough	Drift Fence	Livestock Husbandry	Group Formation	Drift Fence
Fourth	Agricultural Show	Group Formation	Group Formation	Drift Fence	Vegetable Growing	Parasite Control

a. Rankings are based on frequency of responses. Each AD was asked to cite upto three topics.

TABLE A.5: ISSUES STRESSED IN FARMER DISCUSSIONS

	MAHALAPYE WEST	MAHALAPYE EAST	PALAPYE	SEROWE	BOBONONG	ALL
First/a	Early Plough	ALDEP/NDB Loans	Early Plough	ALDEP/NDB Loans	ALDEP/NDB Loans	ALDEP/NDB Loans
Second	ALDEP/NDB Loans	Early Plough	ALDEP/NDB Loans	Group Formation	Parasite Control	Early Plough
Third	Row Plant	Modern Farming	Fence Field	Parasite Control	Early Weeding	Early Weeding
Fourth	Livestock Husbandry	Certified Seed	Destump Field	Early Plough	Contour Plough	Parasite Control

a. Rankings are based on frequency of responses. Each AD was asked to cite upto three topics.

TABLE A.6: RECOMMENDATIONS STRESSED

	MAHALAPYE WEST	MAHALAPYE EAST	PALAPYE	SEROWE	BOBONONG	ALL
First/a	Row Plant	Row Plant	Row Plant	Row Plant	Row Plant	Row Plant
Second	Early Plough	Early Plough	Early Plough	Early Plough	Crop Rotation	Early Plough
Third	Crop Rotation	Crop Rotation	Crop Rotation	Crop Rotation	Early Plough	Crop Rotation
Fourth	Early Weeding	Early Weeding	Early Weeding	Early Weeding	Early Weeding	Early Weeding

a. Rankings are based on frequency of responses. Each AD was asked to cite upto three recommendations.

TABLE A.7: AD DEMONSTRATIONS

AREA	NUMBER OF DEMONSTRATIONS
Mahalapye West	1.6
Mahalapye East	3.1
Palapye	2.0
Serowe	2.0
Bobonong	1.1
All Districts	2.0

MOST FREQUENT DEMONSTRATIONS:

RANK	DEMONSTRATION	PCT. OF DEMONSTRATIONS/a
1	Row Planting	40
2	Chemical Fertiliser	35
3	Kraal Manure	12
4	Crop Rotation	7
	Other	6

Source: 1983 Agricultural Demonstrator Survey.

a. More than one item was demonstrated in some demonstrations. In these cases, each practice demonstrated was counted as a separate demonstration.

TABLE A.8: SUPPLY OF SEED AND FERTILISER

	MAH. WEST	MAH. EAST	PALAPYE	SEROWE	BOBON.	ALL
Sorghum Seed:						
Percent selling	80	80	80	23	50	61
Kgs sold per seller	930	1080	500	1570	1760	940
Maize Seed:						
Percent selling	71	70	80	38	50	63
Kgs sold per seller	700	580	320	480	1690	700
Fertiliser:						
Percent providing	36	30	63	46	60	42
No. farmers supplied:						
All EAs	0.8	1.6	2.1	1.3	1.3	1.4
EAs where any supplied	2.3	5.3	4.2	2.8	4.0	3.6

TABLE A.9: REQUESTS FOR ASSISTANCE: 1981-82 and 1982-83 SEASONS

	MAH. WEST	MAH. EAST	PALAPYE	SEROWE	BOBON.	ALL
Pct Requesting Assistance	64	30	60	69	75	60
Number of Requests:						
Average for all ADs	1.8	0.7	4.1/a	4.8	1.8	2.7
Per AD requesting	2.6	3	6.6/a	5.7	1.1	4.1

a. One AD made 20 requests. Averages for remaining ADs in district were 1.6 for all and 3.3 for those requesting assistance.

TABLE A.10: CONSTRAINTS ON AD EFFECTIVENESS

	MAH. WEST	MAH. EAST	PALAPYE	SEROWE	BOBON.	ALL
	(Percent of All Responses/a)					
Conditions of service	53	46	41	55	16	45
Farmers' limited resources	16	19	21	16	39	21
Dominance of traditional husbandry practices	12	14	14	4	29	13
Farmer attitudes	18	11	7	12	3	11
Other responses	1	10	17	13	13	10

a. ADs were allowed to give up to three responses.

TABLE A.11: TOP PRIORITIES FOR RESEARCH

RANK	RESEARCH PRIORITY	PCT RESPONSES
1	Crop improvement	21
2	Local adaptation research	15
3	Crop husbandry practices	15
4	Pest control	11
5	Seed multiplication	10
6	Improved implements	8
7	Fertilisers	8
	Other	21

TABLE A.12: VALUE OF VILLAGE RESEARCH

RANK	REASON	PCT RESPONSES
1	Gain a better understanding of farmers' problems	36
2	Demonstration value	34
3	Assess responses using farmers' resources	22
	Other	8

TABLE A.13: MOST USEFUL FARMERS TRAINING COURSES

RANK	COURSE	PCT RESPONSES
1	Crop Husbandry	25
2	Group Management	21
3	Animal Husbandry	21
4	Farm Machinery	8
5	Home Economics	7
6	Fire Control	4
	Other	14

TABLE A.14: RANKING OF GENERAL DEVELOPMENT PROBLEMS

	MAH. WEST	MAH. EAST	PALAPYE	SEROWE	BOBON.	ALL
Lack of resources by particular groups of farmers	1	2	2	1	2	1
Illiteracy	3	2	8	5	3	2
Poor village leadership	2	8	7	3	7	3
Lack of interest in working together	4	6	3	6	1	4
Too much dependence on cattle	5	7	5	2	5	5
Lack of direction and motivation of youth	6	4	1	4	8	6
Inequitable cattle ownership	8	5	9	7	6	7
Income distribution	7	3	10	9	4	8

TABLE A.15: RANKING OF ARABLE PRODUCTION PROBLEMS

	MAH. WEST	MAH. EAST	PALAPYE	SEROWE	BOBON.	ALL
Low yields due to traditional cultivation methods	2	2	1	1	3	1
Livestock damage	1	1	3	2	2	2
Water shortage at lands	3	3	2	3	1	3
Low soil fertility due to lack of crop rotation	4	4	4	4	5	4
Lack of draught power	5	6	5	7	6	5
Soil erosion	6	7	7	6	4	6
Lack of markets	7	5	6	5	7	7
Loss of grain in store	8	8	8	9	8	8

TABLE A.16: RANKING OF RESOURCE CONSTRAINTS

	MAH. WEST	MAH. EAST	PALAPYE	SEROWE	BOBON.	ALL
No water for drinking at the lands	2	4	2	1	2	1
No fencing to keep cattle out of field	1	2	4	2	3	2
No money to hire traction	3	1	1	3	5	3
No labour to destump field so have too many stumps	5	5	5	4	4	4
No labour to plough	6	7	3	5	6	5
No animals or equipment to plough	4	3	8	6	1	6
No labour to weed properly	8	8	6	8	7	7
No money to buy seed or seed not available	7	6	7	7	8	8

REFERENCES

Baker, D. 1983 Agricultural Demonstrator Survey: Tables and Summary Findings. Part One: Extension Area Characteristics in the Central Agricultural Region. ATIP PR M84-2. Gaborone: ATIP, 1984.

Baker, D. 1983 Agricultural Demonstrator Survey: Tables and Summary Findings. Part Two: AD Activities and Constraints on Effectiveness in the Central Agricultural Region. ATIP PR M84-3. Gaborone: ATIP, 1984.

Baker, D., and J.A. Hobbs. "Farming Systems Research and Extension in Botswana: Current Programmes and Issues Facing the Ministry of Agriculture." Paper presented at the KSU Farming Systems Research Symposium on Farming Systems Research and Extension: Implementation and Monitoring, 7-10 October 1984, Manhattan, Kansas, USA. ATIP MP 84-5. Gaborone: ATIP, 1984.

Baker, D., and D. Norman. "Relevance of the Farming Systems Approach to Agricultural Demonstrators." Paper presented at ALDEP In-Service Training Course, Mahalapye RTC, August, 1983. ATIP MP 83-5. Gaborone: ATIP, 1983.

Bettles, F. Ten Years After: A Look at Female Agricultural Demonstrators in the Department of Agricultural Field Services. Gaborone: MOA, 1984.

Department of Agricultural Field Services (DAFS). Department of Agricultural Field Services Annual Plan 1982-83. Gaborone: MOA, 1984.

Economic Survey Mission (ESM). The Development of the Bechuanaland Economy: Report of the Ministry of Overseas Development Economic Survey Mission. Gaborone: Government Printer, 1965.

Eicher, C., and D. Baker. Research on Agricultural Development in Sub-Saharan Africa: A Critical Appraisal. International Development Paper 1. East Lansing: Michigan State University, 1982.

Fortmann, L. "Factors Affecting Agricultural and Other Rural Extension Services in Botswana," Agricultural Administration 18: 13-23, 1985.

Hobbs, A. (ed.) Report on Farming Systems Workshop, Denman Rural Training Centre, 28th - 29th June, 1983. ATIP Working Paper 2. Gaborone: ATIP, 1983.

Ramolemana, G., and A. Hobbs. Relative Importance of Factors that Influence Extension Efficiency and Crop Production Improvement. ATIP Working Paper 1. Gaborone: ATIP, 1985

Lever, B. Agricultural Extension in Botswana. Development Study No. 7. Reading: University of Reading, 1970.

Litschauer, J. Five Year Training Plan 1980-1985. Gaborone: MOA, 1980.

Trent, C., D. Styles, and G. Ramolemana. An Assessment of Subject Matter Competencies of Agricultural Demonstrators in Botswana. ATIP Working Paper Number 6. Gaborone: ATIP, 1986.

Willett, A. Agricultural Group Development in Botswana (3 volumes). Gaborone: MOA, 1981.