TRIALS AND ERRORS: USING FARMING SYSTEMS RESEARCH TO REACH FARMERS WHO ARE OFTEN NEGLECTED

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INTRODUCTION

In many African countries extension programs for women focus on home economics. Often the clientele for these programs are rural women who are engaged in agricultural production activities as well as in domestic and reproductive activities. Because of the emphasis on home economics, and particularly on a narrow definition of home economics as cooking and sewing, these women farmers do not receive the training on crops, livestock, and farm management that will help them gain a livelihood and assure the food security for their families. The notion of scientific agriculture for men and scientific home economics for women is part of a model used in the United States and other developed societies that has been transferred to developing countries (Mead 1973; Gladwin and Staudt 1983; Gladwin, Staudt, and McMillan 1984). An assumption of the model is that women are considered as helpmates on the farm, or as farmer's wives who may be interested in poultry raising and small vegetable gardens for household consumption, but who are not farmers in their own right.

This paper examines programs for women in Malawi that until recently put women in the "neglected" farmer category because of the emphasis on home economics rather than on agriculture. It examines how a Farming Systems Research (FSR) approach that utilized farmer-managed demonstrations and trials assisted in including women farmers in agricultural programs. In addition, the paper attempts to distinguish between problems that affect smallholders in general and problems that are gender specific.

Malawi is a country where the government is committed to increasing the agricultural production of farmers in the smallholder sector (NRDP 1977). It is also an area where women are heavily involved in smallholder farming, doing 50-70% of the farm operations (Clark 1975; Spring, Smith and Kayuni 1983). Recent studies show that women are increasingly moving into full-time farming as men become part-time farmers because of off-farm wage activities (Kydd 1982; Spring, Smith and Kayuni 1983; Spring 1984). Up until recently, Malawi's Ministry of Agriculture (MOA) had the idea that women's extension programs should focus on home economics almost exclusively. Table 1 shows that training courses in 1981-82 for rural women at day and residential centers consisted of from 75% to 84% home economics subjects, while courses for rural men consisted of from 88% to 93% agricultural subjects. The extension staff who offered these courses and did other extension work was composed of approximately 1800 men and 150 women. The male extensionists received about 75% of their two year training in agriculture, while the women received 78% of their 6 month or one year training in home economics. Most of the agricultural training for women extensionists focused on poultry raising and vegetable production. In 1981 the MOA changed the designation of the home economics section to women's programs with the hope of increasing agricultural services to rural women (Spring 1983).[1]

It was during this change that the Women in Agricultural Development Project (WIADP) funded by the Office of Women in Development, USAID operated in Malawi

(Spring 1985). The Project was conducted from 1981 to 1983 and aimed at documenting women's and men's involvement in smallholder agriculture. Using a FSR approach, it ascertained problems facing women farmers as client groups, assisted the Women's Programs Section of the MOA to reorient its direction from home economics to agriculture, and worked with farmers, extension agents, and research personnel to develop workable communication patterns and solutions to problems.

In terms of FSR projects the WIADP assisted in sondeos and intercropping trials that were conducted by the Farming Systems Analysis Section of another USAID funded project on Agriculture Research and conducted sondeos and trials on its own (Hansen 1981; Hansen and Ndengu 1983). This paper focuses on soybean demonstrations carried out during 1981-82 and trials conducted in 1982-83 in the Lilongwe Rural Development Project (LRDP).

The LRDP, one of the first development projects in Malawi, was begun in 1968 under World Bank funding. The LRDP is one of five projects in the Lilongwe Agricultural Development Divison (LADD), itself one of eight contiguous agricultural divisions in the country (NRDP 1977). People in the LRDP constitute a mix of farmers. There are farmers at subsistence level; those who obtain varying amounts of income from agriculture; and those who seek wage labor in nearby Lilongwe, the capital city, or who work on agricultural estates in other parts of the country. People primarily monocrop maize, groundnuts, tobacco, beans, and sweet potatoes under rainfed conditions with the average landholding being 4 acres per household (Kinsey 1973; Lele 1975). A 1981 sample survey showed that 20% of the households were headed by women (NSO 1982) with 39% of these female heads being married to men who were away from the family farm (Spring 1984).

SOYBEANS: A NEW COMMODITY FOR SMALLHOLDERS

For many years, soybeans were grown commercially in the estate sector for the bean and as a green manure. However, production of the crop in the smallholder sector was negligible. In 1981, the Food and Nutrition and Women's Programs Sections of the MOA chose to introduce the crop via female extensionists to women in home economics classes. Their aim was to increase fats and proteins in the Malawian diet. Sixty female extensionsts who attended a National Refresher Training Course were taught recipes for soybean milk, porridge, coffee, snacks, relish, scones and other baked goods (Spring 1981). Several months later, the WIADP came across a woman extension agent who had introduced the soybean recipes to her home economics class of sixty four women. However, since she had not received agronomic information, she was unable to teach the women how to grow the crop properly. She was planning to give the women a handful of seed to plant.

The WIADP wondered if the errors of excluding the technical information about growing the soy crop, of giving women only a small amount of seed, and of thinking that women were doing light gardening instead of field work could be remedied.[2] The WIADP posed some questions for study: Were women interested in learning correct husbandry practices? Could they participate in agronomic demonstrations and trials? Were they just helpers or domestic workers rather than farmers in their own right?

The WIADP asked the extension agent to call the women who had attended the class for a meeting where soybean husbandry practices would be demonstrated.

Fifty six of the sixty four women attended. In order to ascertain what the women knew about growing beans in general and soybean in particular, they were questioned about their cultural practices relating to these crops. Their involvement in other staple and cash crops, livestock enterprises, and their experience with credit and inputs were queried along with their household labor patterns. It was found that the women were farmers who grew unimproved maize, groundnuts, pumpkins, sweet potatoes, beans and indigenous vegetables. Half of them cultivated hybrid maize; some planted cowpeas, groundbeans, sorghum, sugar cane, exotic vegetables, and tobacco. The cropping patterns coincided with the patterns delineated by Hansen during his sondeo. The women worked alone (if unmarried or if husbands had migrated for work) or with their husbands either sharing crop operations or being responsible for specific operations.

The women were given demonstrations and information as to how to cultivate soybean by the WIADP and male extension staff. This included information on plant spacing, use of fertilizer and inoculant, weeding, signs of readiness for harvest, and storage. Some aspects of the demonstrations utilized a hands-on approach; for example, bamboo stalks for measuring spacing between rows, ridges, seeds and planting depth were prepared by the women.[3] The seed was inoculated with rhizobium and the farmers went home with seed, low nitrogen fertilizer, measuring sticks and instructions. The soybean rhizobium inoculum that is prepared at the research station in Malawi is only viable for 2 to 3 days and it was anticipated that the rains would start that week; but when the rains were delayed, the farmers had to be called back two weeks later to reinoculate the seed. Thirty nine farmers returned for the reinoculation; the others had already planted the seed in dry soil.

Six to eight weeks later, a sample of 23 of the 59 demonstration farmers were visited in their fields and observations on the growth of the plots were made with the assistance of the extension staff. The farmers selected were questioned as to when they planted, their husbandry practices and other aspects of their farming system.

In half of the married households, the wife supplied nearly all the labor on the soybean plots; husbands helped with the plots on the remainder even though they had not attended the instruction sessions. Unmarried women (only 9% of this sample) did all their own work. When questioned as to proper soybean husbandry practices, 75% of the famers in the sample knew the correct spacing, half knew which fertilizers were appropriate, all farmers understood the correct number of weedings and 75% knew which animal manures to use if no commercial low nitrogen fertilizer were available. Less than half grasped the function of the rhizobium inoculum although two-thirds understood how to prepare it by the slurry method (see below). Farmers laid out the demonstrations in a variety of ways and spacing and plant populations varied.[4]

Yields were taken in April 1982 using two plots from each demonstration. Table 2 shows the average yield for a sub-sample of 11 farmers and can be grouped into three yield categories of high (2,530 to 2,900 kg/ha.), medium (1,160 to 1,400 kg/ha.) and low (320 to 660 kg/ha.). The reasons for the yield differences are most likely due to variation of plant spacing, inoculation and soil fertility.

After harvesting the demonstrations, the WIADP interviewed farmers in another project who had been growing soybeans for some years in order to obtain a

greater perspective on farmers' knowledge and cultural practices. Both men and women were growing the crop and their experiences allowed some comparisons. It was found that the men became interested in growing soybeans as a result of taking agricultural training courses or because of their work experiences. The women learned through home economics courses or from relatives. None of the farmers knew of the recommended rhizobium inoculant or that fertilizers should be low in nitrogen; they said these topics were not discussed in the training courses. The farmers received their seed at a training course. The seed usually was not inoculated and yields were low. The men received two to five times as much seed as the women. Most of the women consumed the crop in the first year and did not save any for seed. Some of the men had seed for subsequent plantings. In farm operations on the crop, wives helped 80% of the male farmers, and husbands helped 50% of the female farmers in growing the crop; however, women always threshed and cleaned the seed. No conscious rotation pattern was known although most grew maize alternately with soybean. Farmers were interested in the crop mainly as a food for home consumption primarily for the porridge, milk, fried snacks and flour to make baked goods. People did not like the cooked beans because they require long cooking and do not mash well. Two farmers used soybeans for feeding dairy cows or chickens. Some of the men were attempting to grow the crop for sale, but experienced marketing problems because the government market was not available in the area and farmers did not consider the price favorable.

RESULTS FROM THE FIRST CYCLE OF SOYBEAN DEMONSTRATIONS

Based on observations, interviews and discussions with the extension staff and with the farmers, a number of problems were discerned. The first difficulty noted was that many farmers and extension agents were having trouble understanding research station recommendations (especially the use of low nitrogen fertilizer with inoculated seed) for cultivating soybean. The extension circular was too technical and was based on trials carried out on soils that may have had the rhizobium already established. Second, the proper type of rhizobium bacteria is not indigenous to the soil. Thus, there is a need for sufficient quantities to be prepared and to be timely for planting. Distribution problems so that smallholder farmers as well as estates could receive the inoculum had to be solved. In particular, the LRDP and the LADD lack refrigeration in their development units and the transportation of viable inoculum was a problem. A third problem was the small size of the soybean plants. This was related to lower than optimum soil fertility as well as the need for inoculant. The fourth problem was an error in planning and targeting farmer populations. Women farmers needed to be taught husbandry practices and technical information concerned with production. Women extension staff needed to receive adequate training to teach women how to cultivate a new crop. Male extension staff had to be willing to teach groups of women in their areas either as a supplement to the classes of the female extension staff or in their own agricultural classes and village meetings. Fifth, inoculated seed and the amount distributed to class participants, especially to women, was too little.

The WIADP took the following actions. A simplified version of the recommendations for growing soybeans was produced with an English and vernacular (Chichewa) version distributed to extension workers of both sexes as well as to the demonstration farmers. In addition, a syllabus for teaching a course on the crop to farmers was written. The topics covered included history, uses, recipes, botany and general agronomy. Finally, female agents received in-

struction in soybean agronomy and recipe preparation from the WIADP and the faculty of the agricultural college.

SOYBEANS TRIALS TESTING METHODS OF INOCULATION IN 1982-83

Considering the problems of distributing viable inoculum and being able to plant the seed within several days after inoculation, improved methods of maintaining viable inoculum were needed. Although this problem has been solved elsewhere using other technologies, the WIADP was constrained to use the existing research station methods since the method was working in the estate sector. One possibility then was a granular method where the inoculum was mixed with moist sand so as to prolong its viability before distributing it to farmers.

Three trials were designed to test different methods of inoculation. They were: no inoculation; the standard 5% sucrose slurry method of coating the seed; and the granular method of rhizobium inoculation. Three objectives for the trials in 1982-83 were specified by the WIADP and the LRDP project staff. The first was to compare the growth of soybeans as affected by the different treatments. The second was to help popularize soybeans in the smallholder sector. The third was to provide an example of how to organize women farmers with extension staff in order to field test ideas derived from agricultural research stations and to solve problems identified by working with farmers.

In December 1982, twenty women farmers participated in planting trials at four demonstration centers as well as in planting trials in their own fields under the instruction of the WIADP agronomist (Smith 1983) and local male extension staff. A short questionnaire was asked of each farmer regarding her experience with soybean, other crops and inputs. To begin the trials, farmers were taught how to form the desired spacing, inoculate the seed in the granular method, and plant the seed. Each farmer received the necessary materials in order to plant her own trial the following day. The local extension staff were requested to draw a diagram of each trial so as to be able to locate each of the three treatments. Because the trials were to be completely farmer managed, it was decided to have the same order of treatments for each trial: 1) no inoculum 2) inoculum with sand, and 3) inoculum with seed. Standard randomization techniques were not used due to the chance of confusing the farmers.

RESULTS FROM THE SOYBEAN TRIALS

About 6 weeks after planting, each soybean plot was evaluated for nodulation at the time of flowering. At this time it became evident that the first objective of the trials would not be successful, that is, the two methods of rhizobium inoculation could not be compared. None of the treatments in the trials had successful nodulation, even though it was the period of maximum nodulation for the soybean lifecycle. The reason for the lack of nodulation is not positively known. One likely cause was the lack of viable rhizobium bacteria within the inoculum packets, probably due to a failure of the refrigeration room at the research station where the packets of inoculum are stored after being produced.

In spite of the lack of recorded nodulation, it was decided to harvest some of the trials to see if treatment differences were noticeable. The average yield for all plots was 640 kg/ha with a standard deviation of 170 kg/ha. The low

yields achieved in 1982-83 are probably explained by the lack of nodulation in all three treatments and are similar to the yields achieved by demonstration farmers whose seed did not have viable inoculum the previous year. In summary, the experiment was not successful at distinguishing differences in nodulation and yield among the three treatments, and therefore, failed to solve the major growing problem that farmers and extension staff experienced. The failure was due to a general lack of nodulation, which was probably the result of defective inoculant. The failure of the experiental aspects were probably the fault of the researchers, not of the farmers and the extension staff.

The second objective of helping to promote soybeans was successful since the trials of all cooperating farmers did mature a crop, the only soybeans being grown in LRDP that year. The third objective of demonstrating how to organize women farmers with extension and research staff to field test new ideas also was successful. Not only did the extension staff assist in organizing women farmers for agricultural research and extension activities, but a more accurate method of instructing farmers in agricultural technologies was devised. Most farmers were able to repeat the differences between the three inoculation methods. The women were instructed in a laboratory approach, in which each person was forced to actively participate in planting the demonstration prior to her own trial.

FURTHER ACTIONS AND CONCLUSIONS

Many of the questions posed concerning women's involvement in agricultural services have been answered by the demonstrations and trials reported on here. The staff of the LADD and the LRDP learned that women were interested in agricultural subjects if given the opportunity. The staff realized that women could participate in extension demonstrations and research trials. They saw that women were farmers who needed agricultural information, in addition to information about recipes. The staff realized that interest in agricultural topics could be generated by home economics subjects, but because there were few female extension agents, there needed to be other ways to provide agronomic information to women. The larger and better trained male extension staff were able to work with women farmers and to provide regular extension services to them. Both the development project management and its field workers could reach a variety of client groups and they could make adjustments in their programs. The staff also realized it was possible for extension workers to be retrained in terms of subject matter and in methods of dealing with clients. As a result of this new way of thinking, some actions were taken. Thirty percent of the places in the LADD's agricultural courses for farmers were reserved for women. The next refresher course for women agents included information on soybean agronomy, as well as on the preparation of soybeans, and in fact, the agricultural content of the refresher courses for women agents was increased. In addition, it became possible for women agents to attend some of the refresher courses held for men, essentially integrating the two groups for the first time. After the trials, the WIADP prepared an extension circular entitled "Reaching Female Farmers Through Male Extension Workers" that was printed by the MOA (1983) and distributed to all extension staff in the country. The circular legitimated the male staff's work with women farmers in terms of farmer visits, demonstrations, clubs, and credit programs and offered techniques that the male staff could use to work with women. The WIADP helped design new reporting formats for the LADD's extension workers and project management that measured extension contacts to both women and men; previously the forms did not differentiate sex of farmer. All these changes may be pointed

to as part of the effect that the WIADP and the demonstrations and trials had on the LADD and the LRDP.

What about the errors that occured? There were several categories of error: technical, structural, and situational. The technical kinds of errors can occur during any farming systems research project. First, the farmers might not truly understand the planting instructions and layout, as was the case in the demonstrations the first year. Other family members not present during the instruction sessions might do some or all of the work. This was found to be the case in other trials in Malawi in which husbands were selected as trial farmers, but where, in fact, the wives did much of the work. Second, the primary technical error in the second year was with the technology. The inoculant was defective and this resulted in the major problem for smallholders not being solved during that planting season. Research now has to consider the problem again. Third, once technical errors occur, farmers might be hesitant to participate in subsequent farmer-managed trials or to follow extension recommendations.

Another group of errors were structural. First, because of certain assumptions and inappropriate models already in place, errors in targeting the appropriate groups of farmers were made. Men and women were given differential training. Women were not targeted as farmers or as trial participants, but rather were targeted for their domestic roles only. Hence, they had reduced access to new technologies and their farming problems were not known. Second, soybeans were popularized through a course in cooking and nutrition and a demand factor was created, but the production end was not set up. Little or no seed was available, inoculant and the proper fertilizers were difficult or impossible to obtain; the commercial aspects of smallholder production were not fully addressed. These aspects also affected men. Farmers were intrigued with the new crop, but the technical support was lacking. Extension had difficulty understanding research recommendations, and researchers did not know the problems experienced by the farmers and extension workers. Researchers were committed to particular methods of planting and of inoculant preparation and administration that were problematic for smallholders.

The final type of error concerned the mistake made by some Malawians and some expatriate technical assistants of thinking that the WIADP was only interested in soybean production or that the WIADP staff thought that soybeans were a priority crop for research. In fact, the soybean demonstrations and trials were only a small part of the WIADP's activities and were chosen because of the MOA refresher courses (Spring 1985). The WIADP was attempting to show that some problems were gender specific and some were not; the soybean demonstrations and trials provided a vehicle for this attempt. The topic was interesting to the WIADP, because of the problem between training in home economics and agriculture for women. Soybeans had been selected by the Women's Programs and Food and Nutrition sections of the MOA to improve diet, but the production aspects in terms of the smallholder had not been considered. (Fortunately, the confusion was resolved when the WIADP prepared better information about its work and disseminated this to people in research and extension.)

Finally, it is important to point out the successes and changes that occured as a result of the events described here. First, as noted above, it was shown that women were agriculturalists and interested in new technologies. Second, a precedent for extension and research interacting with each other and with

farmers was set up, and technical information was rewritten with the farmer in mind. Third, the method of instructing farmers in planting trials by doing demonstrations first, and by being corrected as they went along, was noted as alleviating the major sources of farmer errors. In sum, the purpose of farming systems research is to correct errors and to improve farmer productivity, income and quality of life. But FSR only works if the errors can be admitted openly and if the appropriate corrections can be made.

FOOTNOTES

1. Male and female extension workers are now being trained at the new Natural Resources Colleges. The curriculum for the female workers is being changed to include more training in agriculture. However, the curriculum at day and residential training centers for rural women has not yet been revised.

2. The WIADP was located at the major agricultural research station in the country where soybean trials were conducted annually, where inoculant for soybean was made, and where the technical circular on soybean had been written.

3. The recommendations that had been prepared by the agricultural research station were used; planting on ridges was followed because it was the government recommendation.

4. For plots without luxurious top growth, the canopy did not reach full ground cover and the ridge spacing was too far apart. Insects were a minor problem among the plots with good growth because termite damage occured after pod formation. But where the plants were widely spaced, farmers experienced pest problems.

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TABLE 1 BREAKDOWN OF CLASSROOM TIME FOR MALE AND FEMALE FARMERS TAKING AGRICULTURAL AND HOME ECONOMICS COURSES AT DAY TRAINING CENTERS, RESIDENTIAL TRAINING CENTERS AND FARM INSTITUTES (percentages)*

SUBJECT MATTER	Day Training Centers		Residential Training Centers		Farm Institute	
	Male (Agri)	Female (Home Ec)	Male (Agri)	Female (Home Ec)	Male (Agri)	Female (Home Ec)
CROPS	48	19	44	16	33	8
LIVESTOCK	13	6	20	6	50	8
FARM MANAGEMENT	27	0	22	0	10	0
TOTAL AGRICULTURE	88	25	86	22	93	16
HEALTH & NUTRITION	12	45	66	49	3	52
CLOTHING	0	30	0	23	0	27
LEADERSHIP	0	0	8	5	4	5
TOTAL NON-AGRICULTURE	12	75	74	78	7	84

* Source: "Syllabus for Farmer Training Centres of the Department of Agricultural Development," Ministry of Agriculture, n.d.

TABLE 2 YIELD CHARACTERISTICS FROM ON-FARM SOYABEAN DEMONSTRATIONS IN EPA 2 OF LILONGWE RDP IN 1981-81.

Yield Class	Farmer's Name	Soyabean Yield	Plant Population	In-Row Plant Spacing	Innoculated Twice
		-Kg/ha-	-Plants/M -	-cm-row/plant-	
High	Chembe	2,900	30	7	Yes
High	Unit Centre	2,530	26	9	Yes
Med.	Bau	1,400	32	6	Yes
Med.	Benesi	1,210	28	7	Yes
Med.	Kazola	1,200	14	16	Yes
Med.	Baitoni	1,160	27	8	Yes
Low	Davisoni	660	20	9	No
Low	Chinoko	590	9	24	No
Low	Kabwalo	460	18	11	No
Low	Chauya	400	18	10	No
Low	Kabvala	320	11	18	No