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Abstract

To address the issue of farmers not knowing or adopting improved crop production practices, the Institute of Agriculture at the University of Iringa(formerly Tumaini University)in Iringa, Tanzania, developed the Companion Village Project (CVP). Working primarily with pastors at local churches, the CVP has 47 demonstration plots highlighting improved production practices and serving as a backdrop for multiple educational presentations throughout the growing season. Local farmers managed the CVP plots. Local farmers were able to see the results and discuss the improved practices with the pastors and other local leaders as well as with Institute staff. To estimate the impact of the CVP, yields were measured on the plots and surveys were taken of participating and non-participating farmers .Crop yields were greater with the recommended improved production practices compared to conventional practices. The visibility of the improved practices and greater yields has resulted in adoption of the improved practices by more farmers in the region

Keywords

Tanzania, agriculture, extension, training and visit, farmer field schools, demonstration plots

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The Companion Village Project: An Extension Education Tool for Improving Crop Production

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Abstract

To address the issue of farmers not knowing or adopting improved crop production practices, the Institute of Agriculture at the University of Iringa (formerly Tumaini University) in Iringa, Tanzania, developed the Companion Village Project (CVP). Working primarily with pastors at local churches, the CVP has 47 demonstration plots highlighting improved production practices and serving as a backdrop for multiple educational presentations for farmers throughout the growing season. Local farmers managed the CVP plots. Local farmers were able to see the results and discuss the improved practices with the pastors and other local leaders as well as with Institute staff. To estimate the impact of the CVP, yields were measured on the plots and surveys were taken of participating and non-participating farmers. Crop yields were greater with the recommended improved production practices compared to conventional practices. The visibility of the improved practices and greater yields has resulted in adoption of the improved practices by more farmers in the region.

Keywords: Tanzania, agriculture, extension, training and visit, farmer field schools, demonstration plots

Introduction and Theoretical Framework

Agricultural extension in Tanzania has been almost entirely provided by the public sector represented by the government through the Ministry of Agriculture and Cooperatives. For years extension programs were implemented by the Ministry's staff from the national level down to the field level (Rutatora & Mattee, 2001). The ministry has been offering conventional extension services, trying to reach a large number of the clients all over the country. However, ministry-based extension has been unable to reach a majority of farmers for economic, socio-psychological, and technical reasons (Food and Agriculture Organization [FAO], 1998).

In 1986, the Tanzanian extension service underwent reforms, and the training and visit (T&V) approach was launched as part of the National Agricultural and Extension Rehabilitation Program funded by the World Bank (Douglah & Sicilima, 1997). The T&V system of extension was considered as an innovative approach in extension organization and management and as having resulted in the streamlining of the government system to make more efficient use of staff resources (Rutatora & Mattee, 2001). The T&V system was found to have a positive impact on farmers' yields especially when there was adequate contact with local extension agents in a participatory manner (Dejene, 1989; Feder, Slade, & Sundaram, 1986; Hussain, Byerlee, Heisey, 1994; Phillips-Howard, 1994). However, the approach also has been criticised as a top-down approach leaving little possibility for participation and initiative both for farmers and village extension workers (FAO, 1998).

In 1996 another reform was initiated in Tanzania with the National Agricultural Extension Program (NAEP) which modified the T&V approach by adopting a more participatory approach. Observations revealed that even with the modified T&V system, the approach continued to assume that knowledge flowed from the source down and lacked communication, participatory problem solving skills, and participatory experiential approaches (Rutatora & Mattee, 2001).

Over the years and with declining resources, reforms have been undertaken by the government intended to limit its role to the core functions of governance and allow more involvement of the private sector in offering public services such as extension education (Rutatora & Mattee, 2001). The Agricultural and Livestock Policy of 1997 in Tanzania stressed the need to promote private sector participation for collaborative efforts, that extension service delivery would no longer be a monopoly of the government, and the private sector would be allowed to own and manage extension services. The need to substitute traditional extension systems with participatory, pluralistic knowledge systems was also recommended by the InterAcademy Council (2004).

In light of these policy changes, the Institute of Agriculture at the University of Iringa (formerly Tumaini University) started the Companion Village Project (CVP) in the Iringa region of Tanzania in 2008. The goal of the CVP was to improve farmers' knowledge and adoption of improved production practices through demonstration, education, and engagement at a local level. To achieve this goal, the CVP aimed to bridge the gap between agricultural researchers and farmers. The program followed the advice of Gemo, Eicher, and Teclemariam (2005) and developed a particular extension model to meet the needs of local farmers and communities in the Iringa region. In addition to using the general model of T&V, the project also utilized principles from Sasakawa Global 2000, and Farmer's Field Schools (FFS).

The T&V approach includes "(a) professionalism, or building of a professional extension service, (b) single line of command, (c) concentration of effort, (d) time-bound work or operating in a regular and timely fashion, (e) field and farmer orientation, (f) regular and continuous training, and (g) linkages with research" (Benor & Baxtor, 1984, p. 39-40). Similar to the Sasakawa Global 2000 projects (Borlaug, 1989), the CVP includes improving productivity in staple food crops, effective use of local extension staff, creating immediate and significant benefits to farmers by using well-managed and large demonstration plots, and supplying the seed and fertilizer needed to run these demonstration plots. The CVP also follows the findings in northern Tanzania on the need for many demonstration plots across the area to account for differences in the biophysical conditions as well as the socioeconomic and environmental conditions of the farmers and focusing on farmer education for influencing technology adoption (Nkonya, Schroeder, & Norman, 1997). The CVP is also similar to Subair's (2002) description of the on-farm adaptive research philosophy and follows Subair's admonition that "farmers will adopt a new technology only if they perceive that it is in their economic interest to do so, and if needed support services are adequate" (p. 90). Farmer's Field Schools have been credited with improving agricultural production elsewhere in the world (Anandajayasekeram, Davis, & Workneh, 2007; Davis, 2008; FAO, 2001).

Farmer's Field Schools, originally associated with promoting integrated pest management, work at the grassroots level to advance the principle of stakeholder participation in program decision-making and eventually giving full responsibility to stakeholders for program development (FAO, 2001). FFS are "a method to educate farmers in an informal setting within their own environment" (Anandajayasekeram et al., 2007, p. 83). The defining characteristics of FFS include discovery learning, farmer experimentation, and group action. The approach is an interactive and practical method of training, and empowers farmers to be their own technical experts on major aspects of localized farming systems (Davis, Nkonya, Ayalew, & Kato, 2009). The FFS elements of discovery learning and group action are especially evident in CVP.

Purpose and Objectives

The purpose of this paper was to describe how the CVP operates and to assess the impact of this participatory demonstration method of extension education. The specific objectives of the impact assessment were to measure the adoption rates of the improved practices demonstrated on CVP plots and to quantify the resulting impact on crop yields.

Background and Operational Framework

The CVP was started in 2008 and was the primary tool of the Institute to address crop production and food security in the Iringa region. The primary approach of the CVP was to establish a series of demonstration plots and educational offerings in the villages of the Southern Highlands of Tanzania. The educational offerings of the "extension network " included issues such as improved crop production practices and the related issues of grain storage, marketing, processing to add value to the crops, etc. The CVP leveraged the role churches and pastors hold as community leaders and their resulting authority and credibility to extend knowledge and recommendations from university research to village farmers adopting principles of T&V, Sasakawa Global 2000, and FFS approaches as previously discussed.

Similar to FFS, the CVP demonstration plot is the primary learning resource where farmers meet for field work and educational meetings and discussions. Training lasts the entire cropping season when researchers from the Institute visit farmers and lead classes and discussions four to six times a year. Demonstration plots of the size of 0.4 hectare (one acre) are established in the villages. The demonstration plots consist of half maize and half edible beans because maize and beans are the main staple crops of the region (URT, 2006, 2012).

The CVP model involved religious organizations as part of the extension delivery model. Churches and, in a few locations, schools in the Iringa region provided land for the demonstration plot, supervised and managed the plot, and organized educational meetings in exchange for funding of the CVP operating expenses provided by churches of the Evangelical Lutheran Church of America (ELCA). Church leaders and members received the maize and beans from the demonstration plot after the final measurements were recorded during harvest. Churches were chosen to be part of the extension model because (a) the integrity of pastors implied credibility of project, (b) regular traffic to and from the church increased the visibility of the demonstration plots, and (c) they increased trust in the data collection. Having churches playing a role in community development is not a new phenomenon in Tanzania. Historically, Christian missions have played an instrumental role in introducing new crops, medicines and technologies in Tanzania (Koizumi, 2007).

The demonstration plots were intended to inform and educate the entire village despite being associated with a particular church or school. In addition to the open invitation for all villagers, specific village officials and local extension officers were invited to (and often did attend) the regular meetings throughout the year.

Farmers were involved in choosing the demonstration location at each village. Each demonstration plot was 0.4 ha (one acre) and was divided equally between beans and maize.

The CVP recommended these farming practices: (a) minimum tillage and residue management practices, (b) high quality seed, (c) optimum cultural practices, (d) improved soil fertility, (e) pest management, and (f) crop rotation. All of these practices were applied together on each demonstration plot. There were no sub-plots showing the effect of the practices separately. These practices were chosen based on university research and experience that showed which practices would improve yields quickly. Minimum tillage and residue management were practiced by retention of stubble. The next crop was sown through the remaining stubble and weed residue. Farmers were instructed to leave the crop residues on the soil instead of the conventional practice of burning the residue.

High-quality seed was promoted because the crop yield and quality parameters are all dependent on the genetics of the seed. There was a wide range of genetics grown among the villages for all crops. While local genetic seed was considered, the usual CVP recommendation was to introduce new genetics that had high production potential for the Iringa region, but these had not been tested in most of the villages. Most farmers were using open-pollinated maize varieties that were harvested from their own fields the previous year. While these varieties can be very well adapted for the village, they may lack the yield potential that a maize hybrid might provide.

The cultural practices being demonstrated included growing the crops separately from each other, planting seeds in

rows to facilitate work in the field during the growing season, and planting seeds at a proper depth and spacing to maximize germination and early vegetative growth potential. Maize was planted in rows 60 cm apart, and 20 cm from plant to plant within a row. Beans were planted in rows 30 cm apart, 10 cm apart within a row.

Soil fertility was managed and enhanced through the use of fertilizer, manure, and compost. Soil samples were collected and analyzed prior to the first growing season to help develop fertilizer recommendations. Weeds were controlled by regular hand weeding starting two or three months before seeds are sown and continuing to harvest. Insects and diseases were monitored and control products applied if warranted. The maize and bean areas within the plot were rotated each year to show the benefit of the legume nitrogen (N) credit from the beans for the following maize and to reduce pest pressure by breaking the life cycles of the pests.

Plot yields were compared with the performance of the farmers fields near the plots, planted on the same date, and whose owners did not use the CVP recommended practices. Yields on both the demonstration plots and the nearby farmers' fields were measured on three 10 meter lines randomly located in each plot or field. These yield results were evaluated at the post-harvest meeting.

As part of the CVP program, the Institute of Agriculture conducted six educational sessions during the first year of the program in each village to educate the farmers through knowledge sharing as well as through hands-on participatory demonstration of promoted practices. A Researcher from the Institute of Agriculture led the instruction and discussion with all those who attended the meetings. The meetings were typically announced a week ahead of time so that the word could spread in the village for those interested in attending. In subsequent years, the first two meetings, which specifically addressed plot location and preparation, were omitted and four field days were held.

The first meeting was held in March (before the initial growing season) and included an introduction to the CVP program and an overview of the farming practices to be used. Soil samples were collected and sent for analysis to determine soil fertility status and fertilizer management recommendations. At the second meeting in August, the plot area was measured and marked and instructions given on minimum tillage and residue management. At the third meeting in November, the maize seed and planting-time fertilizer were delivered to the site. Instruction was given on how to plant the maize at the proper spacing between rows and within rows and how to apply the fertilizer. The seeds and fertilizer delivered by CVP to the sites were used in the demonstration only. Farmers were advised where they could purchase the seeds and fertilizers for their own farms. The fourth meeting in January included the delivery of bean seeds, fertilizer for the beans, and side-dress nitrogen fertilizer for the maize. Instruction was given on making the second application of fertilizer to the maize and how to plant the bean seeds and fertilize them. At the fifth meeting in April or May, instructions were given on how to get ready for harvest and how to determine and record yields. The sixth meeting in June or July involved evaluating the harvest and instruction on storage techniques.

During each of the six meetings, researchers and participants engaged in a joint discussion of the decisions that needed to be made to adopt the recommended practices. A common issue affecting cropping decisions was cash and credit constraints faced by many farmers. Institute personnel discussed what could be done to

accommodate these constraints. For example, while fertilizer can be a good investment, if farmers cannot afford to purchase commercial fertilizer the project encourages them to use alternative methods such as (a) adding compost through utilizing minimum tillage and residue management, (b) using manure whenever possible, and (c) mixing-and-matching compost and manure with fertilizer. Likewise, purchasing hybrid maize or new bean seed is usually a sound agronomic practice; however, if funds were limited, the discussion included how to obtain less expensive but still improved seed.

A secondary goal of the project was to encourage attendance of women at these meetings as women conduct the majority of the field work for the crops on their own small land holdings. To assist in extending the presented information to women, and others that could not attend meetings, most presentations were supplemented with handouts printed in Swahili that could be taken home.

Each village was required to maintain thorough notes of each meeting's presentations and copies of handouts. The villages were given a box file or notebook where they kept copies of the handouts. The box file was left in the village and was accessible to all village members. It also provided a place to record the varieties/hybrids used, the type and amount of fertilizer applied, any pest control products used, and specific events associated with field preparation, planting dates, and harvest dates. In addition, each village was instructed on keeping rainfall data for the entire growing season.

Methods

Data used for the impact assessment study were collected through a survey of meeting attendees in April and May, 2013. These village meetings were part of the extension education program of the Institute of Agriculture and were open to all people even if they had not been involved in the CVP demonstration plots. The survey data were collected using structured questionnaires that were developed and administered by research assistants involved in the program. All meeting attendees, CVP participants and non-participants, were asked to complete a survey on demographic characteristics, agronomic practices, and maize and bean yields. The questions for agronomic practices were specific for maize and beans only the two crops involved in the program. Eight villages that joined the program in 2008 and 2009 were selected for the study because these participants had more experience with the demonstration plots (see Table 1).

Table 1

Villages Participating in the Survey and the Length of Time with CVP

Village	Year joined the program
Ihemi	2008
Ilambilole	2008
Ipogoro	2008
Nduli	2008
Itungi	2008
Kilolo	2008
Lulanzi	2009
Mlafu	2009

Findings /Results

Of the 190 farmers who completed the surveys, 51% were female; 49%, male (see Table 2). Fifty-eight percent of the respondents were between 30-49 years old. Almost 75% of the respondents were married. Over 50% were involved in farming only; 25% also had a small business selling perishable commodities.

Table 2

Characteristics of Respondents

Variable	Category	Frequency	Percentage
Gender	Male	93	48.9
	Female	97	51.1
Age	Below 20	3	1.6
	20-29	23	12.1
	30-39	47	24.8
	40-49	63	33.2
	50-59	26	13.7
	60-69	21	11.1
	70 and above	7	3.7
Marital status	Single	24	12.8
	Married	137	73.3
	Divorced	5	2.7
	Widow	21	11.2
Economic activities	Small business/selling perishable crops	45	24.7
	Employed	9	4.9
	Temporary unskilled laborers	18	9.9
	Farming only	94	51.6
	Others	16	8.8

Seventeen percent of the attendees reported cultivating 0.4 ha (1 ac) or less (see Table 3). Sixty percent farmed 0.8-1.6 ha. Twenty-four percent cultivated 2.0 or more ha. Besides growing maize and beans, many also grew potatoes, tomatoes, and other vegetables.

Based on their answers in the survey, the farmers were divided into two groups. Farmers who had adopted at least one agronomic practice (e.g. planting in rows, systematic spacing of seeds, using commercial fertilizer, using hybrid maize, etc.) taught by the CVP were grouped as adopters. Farmers who did not use any the practices recommended by CVP were grouped as non-adopters. The adopters were further divided into two groups: those who adopted one to three practices (Group 1) and those who adopted four to six practices (Group 2). The non-adopters were asked whether they had attended other farming training and then divided into two groups: those who had attended or were attending or had attended training administered by other NGOs or government agencies (Group 3) and those who had never attended any other farming training (Group 4). The non-

adopters were split into these two groups because participation in other training may have improved their farming methods and yields compared to those who had not attended any training. Twenty-three percent of the respondents had adopted four to six CVP practices and 15% had adopted one to three CVP practices (see Table 4). Thirty-four percent were non–adopters who had attended other training meetings; 28% were non-adopters who had not attended any training

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Table 3

Area Cultivated and Crops Grown by Respondents

Variable	Category	Frequency	Percentage
Area cultivated in maize and beans	Less than 0.4 ha	4	2.2
	0.4 ha	27	14.5
	0.8 ha	32	17.2
	1.2 ha	41	22
	1.6 ha	38	20.4
	2.0 ha	23	12.4
	2.4 ha	7	3.8
	More than 2.4 ha	14	7.5
Crops cultivated (other than maize and beans)	Potatoes	56	38.6
	Sorghum	6	4.1
	Cowpeas	23	15.9
	Tomatoes	50	34.5
	Vegetables	86	59.3
	Others	27	18.6

Table 4

Adopters and Non-Adopters

Group	Frequency	Percentage
Group 1: Adopters (4-6 CVP practices)	43	22.6
Group 2: Adopter (1-3 CVP practices)	28	14.7
Group 3: Non-adopters, attended/attending other trainings	65	34.2
Group 4: Non-adopters, never attended any other training	54	28.4

Adopters were asked to indicate the year they joined the CVP program. To determine whether those who had been engaged in the CVP program for longer periods of time adopted more practices than those who had participated for shorter periods of time, a chi-square test was run. The chi-square was estimated to be 27.45 ($df = 20$, $p = 0.12$). This nonsignificant relationship showed there was no association between the number of practices

a farmer adopted and the year he or she started attending the CVP meetings.

Of the adopters, 59% were male and 41% were female. Thirty-four percent of the adopters had been attending the CVP demonstration meetings for five years, 21% for four years, 24% for three years, 10% for two years, and 9% for one year. In total, 98% of the adopters had been attending CVP meetings sometime during the period of the CVP program. Two adopters did not answer the question on how long they had been attending CVP meetings. Sixty-two percent of adopters said they had been regularly attending the CVP demonstration meetings. Of the non-adopters, 57% were female and 43% were male. The survey was structured so that non-adopters were not asked whether they had attended CVP meetings. Other differences between adopters and non-adopters included 80% of the adopters were married compared to 69% of the non-adopters, 57% of the adopters listed their economic activity as only farming compared to 48% of the non-adopters, and 89% of the adopters farmed 0.8 or more ha compared to 80% of non-adopters (see Table 5).

Table 5

Differences between Adopters and Non-Adopters

		Adopters[a]	Non-adopters[b]
Variable	Category	%	%
Marital status	Single	4.2	18.1
	Married	80.3	69
	Divorced	1.4	3.4
	Widow	14.1	9.5
Economic activities	Business/selling perishable crops	19.1	28.1
	Employed	2.9	6.1
	Temporary unskilled labourers	5.9	12.3
	Farming only	57.4	48.2
	Others	14.7	5.3
Area cultivated	Less than 0.8 ha	11.3	20.0
	0.8 and More	88.7	80.0

Note. Percentages are for each category within each variable: marital status, economic activities, and area cultivated. [a]Groups 1 & 2. [b]Groups 3 & 4.

Adoption of Improved Practices

Adopters were asked to indicate which of the CVP recommended practices they had adopted. The practices listed most often were leaving crop residues and reducing seed spacing as recommended by CVP (both 80%). The practice adopted the least was commercial fertilizer usage, which was stated by 46% of the survey respondents (see Table 6). Minimum tillage and plant spacing were most likely implemented the most because these practices do not require additional resources or expenditures by the landholder. In contrast, fertilizer usage requires resources, and this is a limitation for small scale farmers.

Table 6

Adoption of CVP Recommended Practices

	Adopters[a]
Agronomic practices	%
Leaving crop residues	79.7
Reducing spacing in planting	79.7
Improved seeds	69.6
Minimum tillage	62.3
Pest and diseases control as instructed by CVP	55.1
Applying fertilizers according to soil analysis	46.4

Note. [a]Groups 1 and 2, n =71.

When the respondents were asked what obstacles prevented adoption, 96% said because "inputs were expensive" (see Table 7). This was also revealed by adopters when asked to mention obstacles that prevented them from adopting all the recommendations. Another obstacle mentioned by 28% was agricultural marketing problems (e.g., unreliable market and low prices offered by buyers).

Table 7

Obstacles to Adoption indicated by Farmers

	Adopters[a]
Obstacles that prevent adoptions of all practices	%
Inputs were expensive	95.5
Lack of market	28.4
Poor availability of inputs	6.0
The practices were difficult	1.5
I am waiting to see success from others	1.5

Note. [a]Groups 1 and 2, n =71.

Yield Impact

To determine the impact of adoption of the CVP recommended practices on maize and bean yields, the self-reported yields were compared into two ways: before and after adoption within the adopters group, and between the adopters and non-adopters groups. Because there were no baseline data of the participants of the program in terms of the yield before adoption, the 2013 survey asked the farmers to estimate the maize and bean yields before they adopted the recommended practices and then the yields they currently are harvesting after adopting the practices. Non-adopters were asked to estimate the yields they currently are harvesting.

Maize yields.

Among the adopters, the average maize yield before adoption was 1.0 t/ha (*SD* = 0.7) and 3.3 t/ha (*SD* = 1.6) after adoption of one or more recommended practices. A paired sample *t*-test indicated there was a significant difference between the maize yields before adoption of CVP recommended practices and after adoption of the practices ($t = 13.2$, $df = 64$, $p < 0.001$).

Maize yields were also compared among the "adopters' groups" and the two groups of non-adopters: Group 3 and Group 4 (see Table 8). An ANOVA test showed that average maize yields among the four groups were significantly different overall ($F(3, 177) = 27.88$, $p < 0.001$) The post-hoc comparison using Tukey's lsd indicated that the average yields for Group 3 (non-adopters who attended other training) and Group 4 (non-adopters who had not received any other training previously) did not differ significantly from each other but both differed significantly from the average yield of Group 1 and Group 2, the "adopters." The average yield for adopters of four to six of the recommended practices by the program was slightly higher but not significantly different from those who adopted one to three practices. The average yields of the adopters were higher than the average regional maize yield of 1.5 t/ha in both 2009 and 2010, the latest years available (Ministry of Agriculture, Food Security and Cooperatives [MAFSC], 2012), but the average yields of the non-adopters were similar to the regional averages.

Table 8

Comparison of Maize Yields of Adopters versus Non-Adopters (t/ha)

	N[a]	*M*[b]	*SD*
Group 1: Adopters (4-6 CVP practices)	41	3.28	1.68
Group 2: Adopters (1-3 CVP practices)	26	3.16	1.38
Group 3: Non-adopters, attended/attending other trainings	62	1.81	1.06
Group 4: Non-adopters, never attended any other training	52	1.30	0.77

Note. [a]Some respondents did not report maize yield information. [b]The average yields of groups 1 and 2 are not statistically different but both are significantly higher than the average yields of groups 3 and 4. The average yield of group 3 is statistically different from the average yield of group 4. $p < 0.005$.

Bean yields.

Among the adopters, the average yield before any changes was 0.3 t/ha (*SD* = 1.4) and 0.60 t/ha (*SD* = 2.3) after CVP practices had been adopted. A paired sample *t*-test indicated there was a statistically significant difference in bean yields from before adoption of CVP practices compared to yields after adoption ($t = 7.1$, $df = 20$, $p < 0.001$).

Bean yields among the four respondent groups also differ significantly ($F(3, 71) = 4.60$, $p = 0.005$) (see Table 9). The post-hoc comparison using Tukey's lsd indicated that the average yields for Group 3 (non-adopters who attended other trainings) and Group 4 (non-adopters who had not received any other training previously) did not differ significantly from each other but the average yields of both differ significantly from the average yield of

Group 1 (adopters, who used four to six practices) which was the same result as with the maize yields. Although the average yield of Group 2 (adopters of one to three practices) was higher than of the non-adopters and slightly lower than the yield of Group 1, it was not statistically different from any of the other groups. Because the average bean yields of both adopters and non-adopters were below the average regional bean yields of 1.1 t/ha in 2009 and 0.9 t/ha in 2010 (MAFSC, 2012), the farming conditions (e.g., soil and climate) may not be as conducive to producing beans in these villages as it is elsewhere in the Iringa region. However, the yield advantage of adopting four to six CVP practices was still present in these villages compared to those who did not adopt any of these practices.

Table 9

Comparison of bean yields of adopters versus non-adopters (t/ha)

	N^a	M^b	*SD*
Group 1: Adopters (4-6 CVP practices)	15	0.62	0.26
Group 2: Adopters (1-3 CVP practices)	6	0.56	0.13
Group 3: Non-adopters, attended/attending other trainings	25	0.37	0.28
Group 4: Non-adopters, never attended any other training	29	0.35	0.26

Note. [a]Some respondents did not report bean yield information and not all maize growers grew beans. [b]The average yields of groups 1 and 2 are not statistically different. The average yield of group 1 is statistically greater than the average yields of groups 3 and 4. The average yields of groups 2, 3, and 4 are not statistically different. $p < 0.005$.

In summary, the 2013 survey indicated that Groups 1 and 2, the "adopters," had greater average maize yields after they adopted the CVP techniques and in comparison to Groups 3 and 4 (non-adopters). The survey also showed that Group 1 had greater average bean yields than Groups 3 and 4. Since the average bean yields of Group 2 (adopters of one to three practices) did not differ significantly from the other groups, the program was more effective for those who adopted four to six practices that those who adopted one to two practices.

Conclusions and Recommendations

The demonstrated success in improving crop yields through adoption of the CVP recommended practices was seen in the yield differences found in the 2013 survey. Thus, the CVP with its adaptation of T&V, SASKAWA Global 2000, and FFS approaches to local conditions proved to be an effective extension education tool for improving crop production. These dramatic increases in adoption of improved practices and the resulting yield increases show the ability of the farmers to adopt and improve their yields once they had been shown, instructed, and witnessed the impact of those practices. This conclusion mirrors the findings of Owolade and Kayode (2012) for snail farmers regarding information-seeking behavior and adoption of practices to increase production.

The CVP began with the goal to be a three-year education and demonstration program for villages in the Iringa region of Tanzania. This has been accomplished with the support of the administration of the

University of Iringa and financial funding from companion congregations from the St. Paul (Minnesota) Area Synod of the ELCA. Most projects had been extended to a fourth or even fifth year, which were completed in 2012 and 2013. There continues to be a need for education related to agricultural production and subsequent issues related to production such as grain storage, credit, marketing and value-added processing of the crops. As a result of the positive relationships that had been developed through visits to village churches and schools that had participated in the CVP, there was now the potential to establish an educational infrastructure for delivery of education on an expanded array of topics related to agricultural production and the food system separate from the system of demonstration plots. The next phase of the CVP will include the transition to an extension network that will allow the staff to continue providing educational information on agricultural production and the food system to farmers and others in the communities where relationships had been developed.

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