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Full Length Research Paper

Improved agricultural technologies, prelude to higher yields of maize: A case study of two farmer based organizations in Ghana

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Maize production in Ghana is characterized by very low technological input which translates to lower yields. Informal training organized at the instance of the Millennium Development Authority for Farmer Based Organizations and facilitated by the Crops Research Institute impacted positively on yield. This study examined the extent to which two FBOs in the Akwapim South Municipality of the Eastern Region adopted improved agricultural practices prior to and after the training. Significantly high (58%) of farmers were in the old age bracket (>45) years. Farmers had considerable experience with 56% having engaged in the farming business for over twenty years. As low as 8.5% of farmers used improved maize varieties and practiced row planting. Only 13% applied fertilizers however, all farmers sowed seed on time and treated seed against soil pests before sowing. None of the farmers was aware that 9 kg seed maize was required for one acre of field. Average yield of maize increased significantly (10.9 bags/acre) when farmers adopted good agricultural practices taught them using a "starter pack" inputs supplied to them after the training compared with (1.5 bags/acre) realized prior to the training.

Key words: Adoption, farmer based organizations, good agricultural practices, improved maize varieties, *Zea mays*.

INTRODUCTION

Ghana is an agrarian country where agricultural production drives the national economy. The country has sufficient arable land complemented by a virile human resource base. Agriculture contributes over 35% Gross Domestic Product (GDP). More than half of the entire labour force is employed in the agricultural sector (CIA, 2009). However, Ghana hasn't achieved self-sufficiency in cereal production (EIU, 2007).

To revamp the agricultural sector, the government of Ghana signed an agreement with the American government in 2006 known as the Ghana Compact. Under the agreement, the US government granted its Ghanaian counterpart $547 m for national reconstruction out of which an amount of $208.8 m representing 38.2% was allocated for agricultural transformation within a five-year period. The project aimed at reducing rural poverty by raising farmer incomes through private sector-led agribusiness development. The programme therefore focused on increasing the production and productivity of high value cash and food staple crops and on enhancing the competitiveness of Ghana export base in horticultural and other traditional crops. The programme was administered by the Millennium Development Authority (MiDA). MiDA therefore organized series of training

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for Farmer Based Organizations (FBOs) in three intervention zones comprising 30 districts made up of five in the northern region (Northern Agricultural Zone), nine in the central Afram Basin region (Afram Basin Zone) and 16 in the southern horticultural belt (Southern Horticultural Belt Zone). In these intervention zones, poverty rates are generally above 40% (MiDA, 2007).

As part of the Ghana compact, an intensive informal training was organized for FBOs which lasted for twelve weeks. During the training, farmers were sensitized to regard farming as a business, adopt improved agricultural technologies and divorce the area expanding method of increasing food production and marry the yield increasing method of achieving the same objective, as means of reducing rural poverty. At the end of the training, the farmers whose area of specialization was maize production, were supplied with free inputs known as "starter pack" to cultivate one acre of maize comprising; 9 kg of seed maize, 2 bags of NPK 15:15:15, 1 bag of Sulphate of ammonia fertilizer, a pair of Wellington boots and thirty Ghana cedis (Gh¢ 30.00) for land preparation.

Maize, *Zea mays* L. is an important staple cereal in Ghana. Several improved maize varieties of different maturity cycles have been developed and released by the Crops Research Institute of Ghana to meet the needs of growers (Badu-Apraku et al., 1992; Sallah et al., 1997; Twumasi-Afriyie et al., 1997). However, the productivity of maize is generally, below 2 t/ha (PPMED, 1998). Therefore, the study examined the demographic characteristics of the respondents, the extent to which respondents adopted improved agricultural technologies before and after the training of FBOs and yield of maize using the technologies learnt during the training and the "starter pack" inputs.

METHODOLOGY

The study was conducted in two communities in the Akwapim South Municipality in the Eastern region of Ghana prior to their training in commercial development for Farmer Based Organizations and good agricultural practices. The training was organized by MiDA and facilitated by the Council for Scientific and Industrial Research-Crops Research Institute. The communities were; Okanta and Duayeden where Cooperative Crops and Woodlog Farming and Marketing Society (CCWFMS) and Onuado Cooperative Farmers and Marketing Society (OCFMS) were located respectively. Respondents from the two farmer associations were selected through simple random sampling technique facilitated by the Municipal Directorate of the Ministry of Food and Agriculture (MoFA).

Agriculture extension agents had over the years introduced farmers to a total of nine improved technologies namely; recommended seed rate of 9 kg/acre, improved maize varieties available, seed treatment before sowing, timely sowing of seed, row planting, recommended spacing of 80 x 40 cm, fertilizer application, diseases and pests management and timely harvesting to support sustainable food production. Before training, the farmers' level of operation, technologies and farming practices they have already adopted were investigated. Such background information was essential to tailor the training to satisfy the needs of the farmers.

The total sample size was all the 106 farmers in the two FBOs distributed as follows; CCWFMS had a membership of 58 comprising thirty-one males and twenty-seven females while the 48 members of OCFMS was made up of thirty-eight males and ten females. Data was collected by the use of one on one interview with respondents using a research instrument, questionnaire. Both open and closed ended questionnaires were designed, pre-tested, revised and administered to the population in the two communities. To make sure reliable responses were given by respondents, questions asked before were later asked again to test the veracity of responses. To gain the confidence of respondents to open up to the interviewer, the purpose of the study was well explained to them. It was revealed from the interview that yield of maize prior to the training was as low as 1.5 bags/acre (Data not presented).

Data was collected on the demographic characteristics of the population, the agricultural technologies adopted and yield of maize after the training programme, using the "starter pack" facility. Frequencies, percentages and means were used to analyze data on the demographic characteristics of respondents while GenStat regression was used to analyze the unbalanced design of the yield data.

RESULTS AND DISCUSSION

Demographic characteristics of respondents

Majority of the respondents (66%) were males whilst approximately (34%) were females (Table 1). Thus, females constituted approximately half of the male population in maize farming in the two communities. This situation agrees with the observation of Fanadzo et al. (2010) that majority of maize farmers in South Africa were males. It must however be pointed out that, the role of women in agriculture in recent times has been significant (FAO, 1998).

Significantly high proportion, 58% of the maize farmers were above 45 years (Table 1). This situation is bleak for the agricultural industry in the Municipality, which was comparable to the Asian countries where farming has been left for the aged (Martinsen, 2007). The introduction of agricultural inputs subsidy and establishment of ready markets for agricultural produce as obtains for the cocoa industry in Ghana, might attract the youth to the agricultural sector of the economy.

Most of the respondents (67.0%) interviewed had gone through basic education (Middle School Leaving Certificate and Junior High School Certificate) and a meagre 3% had had tertiary education (Table 1). Extremely low level of education has been reported to affect the level of technology adoption and skills acquisition among farmers (Oyekale and Idjesa, 2009).

Majority of the respondents (approximately 56%) had been in the farming business for over 20 years (Table 1). Maize farmers in the Municipality could therefore, be said to be experienced. However, people with very low educational background who are old in addition rarely try innovations. Having been in the business for long would give the farmers a false sense of satisfaction which could impact negatively on technology adoption.

Approximately 45% of the respondents had an average

Table 1. Demographic characteristics of respondents.

Demographic characteristics	CCWFMS		OCFMS		Total
	Frequency	Percent	Frequency	Percent	
Gender					
M	31	53.4	38	79.2	66.3
F	27	46.6	10	20.8	33.7
Total	58	100	48	100	100
Age (Years)					
< 30	1	1.7	1	2.1	1.9
30-45	23	39.7	19	39.6	39.7
46-60	29	50.0	28	58.3	54.1
> 60	5	8.6	0	0	4.3
Total	58	100	48	100	100
Educational level					
None	18	31.0	6	12.5	21.8
MSLC	26	44.8	32	66.6	55.7
JHS	6	10.4	6	12.5	11.5
SHS	7	12.1	2	4.2	8.1
Tertiary	1	1.7	2	4.2	2.9
Total	58	100	48	100	100
Farming experience (Years)					
< 9	3	5.2	3	6.3	5.7
9-20	26	44.8	15	31.2	38.0
21-32	20	34.5	24	50.0	42.2
33-44	8	13.8	6	12.5	13.2
> 44	1	1.7	0	0	0.9
Total	58	100	48	100	100
Household size					
< 4	4	6.9	8	16.7	11.8
4-6	29	50.0	19	39.6	44.8
7-9	18	31.0	15	31.2	31.1
10-12	4	6.9	5	10.4	8.6
>12	3	5.2	1	2.1	3.7
Total	58	100	48	100	100

household size of five. This result was similar to the situation in South Africa where farmers had household size of 5 people (Fanadzo et al., 2010). With such a large farm household size, farmers are likely to have enough labour for their farming activities and this could also affect the level of technology adoption (Doss, 1999).

Extent of adoption of technologies prior to training

Maize farmers had been introduced to various technologies by the extension wing of MoFA prior to the training by MiDA. However, all the respondents were unaware that 9 kg seed maize was required for one acre of field, did not use recommended spacing of 80 x 40 cm and did not manage diseases and pests in maize production apart from seed treatment prior to planting (Table 2). Failure to use the recommended spacing could impact negatively on yield since yield is a function of plant population (Akbar et al., 2010; Wiersma, 2002). All respondents sowed maize seed after treatment and sowed on time as well. However as low as 8.5% used improved seed varieties. Some farmers continued to use local maize varieties because of the perception that local maize tastes better and has longer shelf life. Use of local varieties resulted in abysmally low productivity prior to the training. Only 13.2% of the farmers applied fertilizers (Table 2).

Table 2. Improved technologies adopted by the two FBOs before receiving training.

Technology before	Awareness before training		Application training		Percent adoption
	Yes	No	Yes	No	
Recommended seed rate 9 kg/acre	0	106	0	106	0
Improved varieties available	46	60	9	97	8.5
Seed treatment before sowing	106	0	106	0	100
Timely sowing of seed	106	0	106	0	100
Row planting	46	60	9	97	8.5
Recommended spacing (80 × 40 cm)	0	106	0	106	0
Fertilizer application	59	47	14	92	13.2
Diseases and pests management	0	106	0	106	0
Timely harvesting	46	60	7	99	6.6

Table 3. Improved technologies adopted by the two FBOs after receiving training.

Technology	Awareness before training		Adoption after training		Percent adoption
	Yes	No	Yes	No	
Recommended seed rate (9 kg/acre)	0	106	106	0	100
Improved varieties available	46	60	106	0	100
Seed treatment before sowing	106	0	106	0	100
Timely sowing of seed	106	0	106	0	100
Row planting	46	60	106	0	100
Recommended spacing (80x40) cm	0	106	106	0	100
Fertilizer application	59	47	106	0	100
Diseases and pests management	0	106	106	0	100
Timely harvesting	46	60	106	0	100

Table 4. Yield of maize using "starter pack" inputs after training of farmers.

FBO	Average yield (bags/acre)	Standard deviation	Standard error mean
OCFMS	10.5	1.4	0.2
CCWFMS	11.3	1.1	0.2

In Ghana, food crop production is characterized by no or very limited fertilizer application (Ennin and Dapaah, 2008). Farmers do not use fertilizers because they cannot afford them. Non application of fertilizers however, impacts negatively on yield.

Extent of adoption of technologies after training

After the MiDA training, respondents adopted all the nine technologies taught them using the "starter pack" facility (Table 3). This was as a result of the knowledge and skills of the facilitators as well as the desire of farmers to learn and improve their standards of living. Farmers realized the benefits they stood to gain from the training and made the best of it.

Yield of maize using "starter pack" inputs

The mean yields of (10.5 and 11.3) bags /acre obtained by the two FBOs, OCFMS and CCWFMS respectively were not significantly different ($P > 0.05$) (Table 4). Thus, the FBOs realized a weighted mean of 10.9 bags/acre. This was a significant improvement over their performance of (1.5 bags/acre) prior to the MiDA training. The adoption of technologies impacted positively on farmers' yields

Shortcomings of the MiDA sponsorship

The most significant shortcoming was delay in the distribution of funds. Most (68%) of the respondents were

Table 5. Shortcomings of the MiDA sponsorship for maize production for the two FBOs.

Problems	Frequency	Percent
Delay in the distribution of inputs	9	8.5
Delay in the distribution of funds	72	67.9
Inadequate amount of funds	14	13.2
Inappropriate length of time for training	11	10.4
Total	106	100

dissatisfied with this issue. As at the time of harvest of maize using the starter pack facility, the thirty Ghana cedis (Gh¢30.00) meant for land preparation had not been received by farmers. Farmers therefore lost hope that the loans they had requested for under the MiDA initiative, after the preparation of business plans were not going to be realized. Delay in the distribution of inputs, inadequate amount of funds and inappropriate length of time for training were not major problems as less than 15% of respondents had issues with those factors (Table 5).

Conclusion

Maize production in Ghana is characterized by very low technological input. Yields are therefore very low, averaging 1.5 t/ha. This position impacts negatively on peasant farmers standards of living. Adoption of hybrid maize is associated with poverty reduction. It is therefore important to find mechanisms of extending high yielding maize varieties to districts with high poverty rates.

An important factor that influences adoption of agricultural technologies is capital. Money is always needed to purchase inputs such as improved seed maize varieties, fertilizers and recommended pesticides for post harvest management of produce. The extension of soft loans to farmers could catalyze the achievement of self-sufficiency in cereal production.

Finally, universal primary education should be upheld so that the economy could benefit from improved farm management skills acquired by literate farmers. Strict adherence to the above could boost the maize production industry of the country.

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