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ASSESSMENT OF GOOD AGRONOMIC PRACTICES (GAP) IN MAIZE PRODUCTION AMONG SELECTED COMMUNITY BASED ADVISORS (CBAS) IN SABONGARI LOCAL GOVERNMENT AREA, KADUNA STATE, NIGERIA

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ABSTRACT

The study examined the effects of Good Agronomic Practices (GAP) in maize production among Community Based Advisors (CBAs) in Sabongari Local Government Area, Kaduna state. Multistage sampling technique was employed to select 42 maize CBAs for the study. Data were collected from the respondents with the aid of field data questionnaire and were analysed using descriptive statistics. The result shows that mean age was 38 years. Most (61.9%) of the respondents were married and 52.3% of the CBAs had National Certificate of Education (NCE) as their highest educational qualification. Mean average maize output of the respondents from the demos (50 x 50 m) was 8.0 (100kg bag) and more than half (59.5%) of the CBAs participated in the mother demonstrations for commercial reasons. About 23.2% of the CBAs and 20.3% of the farmers ranked fertilizer application method of burying and correct spacing and sowing of maize seeds as 1st and 2nd respectively. The production data components assessed were cobs weight and yields of maize mother demonstrations technologies of AGRA/NAERLS plots along the farmers baby demonstrations was observed to have significantly outperformed the farmers baby plots by 44% and 27.3% per best two rows in an average cobs weight and grain yield. High costs of labour (54%) were the most important constraints associated with the maize production technologies by the CBAs. The CBAs the major technologies promoted were knowledge of GAP; spacing/sowing of seeds and fertilizer application methods which resulted in the AGRA mother Demo plots production of the heaviest average cobs weight more than the farmers' baby demos plots. The project should encourage more women participation and policy focus on measures for the provision of simple mechanized tools and labour savings devices to address the high labour costs.

Keywords: Agronomic practices; maize production; CBAs

INTRODUCTION

Subsistence agriculture practiced by majority of the smallholder farmers coupled with high extension - farmers ratio have resulted in high yield gaps among maize farmers

(NAERLS, 2018). Other factors, according to International Food Policy Research Institute (IFPRI, 2015) were use of low-yielding local varieties, with only 5% of farmers using improved varieties as against 25% in East Africa and 60 % in Asia (AGRA, 2017). Akinola, Issa, and Sanni (2011) opined that low private sector participation coupled with low Agricultural Extension Agents to Farm Family ratio (about 1:10,000) resulted to poor extension outreach. Similarly, Adam, Okeh, Uguru and Jamilu (2017) observed that access by farmers to modern agricultural inputs such as improved seeds, fertilizers and crop protection chemicals, machinery, irrigation and knowledge are critical to any successful crop production, farm productivity and profitability of which maize inclusive.

Thus, the uses of fertilizers and improved seeds have been very low among rural farmers in Nigeria (Abubakar, 2011). Similarly, according to World Bank (2013), only 10 tractors were available per 100 hectares of farmland in Nigeria as compared to 241 tractors per hectare in Indonesia. Also, International Fertilizer Development Centre IFDC (2016) affirmed that the average usage of fertilizer in Nigeria was 18kg/hectare compared to Africa 48kg/ha and world average standard usage of 100kg/hectare. Agricultural productivity, particularly maize could be increased through; improved agronomic practices such as timely planting, proper spacing, timely weeding, timely and correct use of fertilizer and agro-chemicals, timely harvest, reduced post-harvest losses (Bucheyeki *et al*., 2011) and adoption of new technologies.

Abubakar (2011) further reported that in Nigeria, both Governmental and Non-Governmental Organizations (NGOs) have made several efforts to bring about changes in agricultural production system of smallholder farmers. Notable are the National Agricultural Extension and Research Liaison Services and Sassakawa - Africa Association/SG 2000 Nigeria, aimed at smallholders' productivity, food security and market production. Agricultural advisory (extension) service is broadly defined as a structure that facilitates the access of farmers, their organizations and other market actors to knowledge, information and technologies (Abdullahi, 2012). Extension service delivery in Nigeria involves various teaching methods which include a practical demonstration, which is the best way to teach, in all extension teaching situations. This is because it used to teach various agricultural techniques and technologies, showcase new or improved crops. They also serve as a venue to research and test new methods alongside traditional ones (Ibikunle, Omidiji, and Menkir, 2009).

The Alliance for Green Revolution in Africa (AGRA) had collaborated with National Agricultural Extension and Research Liaison Services (NAERLS) and several partners to resolve the challenges of low numbers of poorly trained extension workers by building the capacity of selected numbers of public and private agricultural extension agents who would in turn train Community Based Advisors (CBAs). These CBA's in turn provide knowledge of GAP to maize, rice and soybeans farmers. Proper conduct of all cultural operations that can enhance grain yield and health of both the farmer and everyone constitute GAP. Improved seeds and proper fertilization are the two main technologies promoted through mother demonstration of good agronomic practices for higher productivity of maize by AGRA/NAERLS project. The project has the goal of catalysing and sustains an inclusive agricultural transformation in Nigeria, increase incomes and improve food security by developing a private sector-led extension approach, increase crop productivity of maize, rice and soybean through increased adoption and access to yield enhancing inputs.

The adoption of improved agronomic practices such as use of recommended quantities of fertilizers, agricultural seed technology and high yielding varieties could lead to significant

increase in agricultural productivity, thus stimulate advancement from low productivity (World Bank, 2016; Segun, Baba, Ndanitsa, 2019).

Different types of extension approaches are being practiced in various parts of the world. Each approach reflects a particular set of objectives, aims, clients and sociocultural setting. The AGRA/NAERLS CBA extension approaches which involve mother/baby demonstrations could increase crop productivity of maize, rice and soybean through increased adoption and access to yield enhancing inputs for smallholder farmers in Kaduna State. Similarly, Auta, Arokoyo and Akpoko (2012) opined that adopting good agricultural practice innovations would help farming communities enhanced their incomes and improve living standards. The results provided empirical evidence that agricultural technology adoption can contribute to improved productivity and raising income of farm households.

Maize is one of the cereal crops grown and consumed across all agro ecological zones of Nigeria. It currently accounts for approximately 20% of domestic food production in west and central Africa. Despite the high yield potential of maize, its production is faced with numerous constraints (Babatunde *et al.*, 2008; Maijama'a, 2010) have shown that maize average yield is still low compared to its potential yield. Hence, dissemination of proven technologies targeted at the beneficiaries was to bridge the gap in knowledge and bring about positive changes in attitude and skills of the end users. There have been studies on agricultural innovations and adoption of maize technologies, but very few, if any, of such studies provided an empirical basis for in-depth inferences on CBAs approach to adoption. Major objective of the study was to assess the effects of maize production Good Agronomic Practices among CBAs in Sabongari Local Government Area, Kaduna state. While the specific objectives were to, identify the socio-economic characteristics of the respondents; ascertain the extent of CBAs access to maize production technologies; determine CBAs perception on maize technology adoption of farmers in the study area and identify the constraints affecting the adoption of maize production management practices in the study area.

MATERIALS AND METHODS

The Study Area

The study was conducted in Sobangari Local Government Area of Kaduna State, Nigeria. The area is located within northern guinea savannah agro-ecological region of Nigeria; the area lies between latitudes 11°10 to 11°17´ North of the equator and between longitudes 7°17 to7°23 East of the Greenwich meridian, at an altitude of 240 m above sea level. The temperature of the area ranges between 24 - 48^{0}C, mean annual rainfall of the area is1100 mm, the two distinct seasons of rainy and dry seasons range from (May-October) rainy season and dry season (November-April). The inhabitants of the area are predominantly traders' and subsistence farmers producing crops such as maize, sorghum, soybeans, groundnut, cowpea and rice. They also rear animals such as cattle, sheep, goat and chicken (Kaduna State Diary, 2015).

Sampling Technique

Sample selection was by multi-stage random sampling. The first stage involves a purposive selection of Sabongari LGA from Maigana ADP zone out of the 9 LGAs based on

the predominance of number of CBAs. In the second stage, six wards were randomly selected out of eleven wards in the area. In the third stage, 6 CBAs were chosen using simple random sampling from the list of the maize CBAs. A total of 42 Community Based Advisors (CBAs) served as sample for the study. Similarly, corresponding number of 42 farmers baby demonstrations which are supervised by the CBAs were also targeted and selected as sample for the study.

Data Collection Instrument

The instruments used for data collection for the study comprised of two sets of questionnaires. The first set titled 'CBAs field data measurements' for gathering primary data for the study, which covered socio-economic characteristics of the CBAs and maize production demonstrations of Good Agronomic Practices and field constraints. The second set of the instrument was farmer's data questionnaire for collecting information on farmers' baby demonstrations comprises of assessment on maize technology adoption of farmers.

Data Analysis

Descriptive statistics such as means, frequencies, percentages and ranking were used for the analysis of the data.

The mother/baby protocols

The AGRA/NAERLS protocols for the mother/baby demonstrations specifies that the CBAs established maize demonstrations plot on 50 x 50 m (2,500 m^2) and followed all the good agronomic practices as specified:

Land preparation: land was prepared, relevant herbicides were applied at the rate of 1 Litre/ 0.25hectare (for mother Demo) and Harrowed at 10-14 days after pre-planted and general systemic herbicide was applied in June 2019.

Seed treatment: The Maize seeds was dressed with recommended seed dressing chemical before it was sowed at a rate of 4kg of seeds to one sachet (10g) of the chemical (Apron Star 50DS).

Sowing: To boost maize yield, the ideal selected soil for maize was a deep, medium textured well-drained, fertile soil with high water holding capacity with PH range of 5.5-8.0. Seed rate was 20-25kg/ha and the spacing was 75 x 25 cm, thinned to 1 plant per hole or per stand at 2 weeks after planted (WAS).

Weed control: Pre-emergence herbicide was applied two days after sowed at rate of 1 litre per Mother Demo. Second weeding was done at 5 weeks after sowed.

First fertilizer application: Two (2) bags of NPK 20:10:10 10 was applied at 14 days after planted and half (½) bag of urea was equally applied 4 weeks after the first fertilizer application to the Mother Demo.

The baby demo on the other hand is the establishment by the farmers' demonstration plot on their farms on 5 x 5 m (25 m^2) and replication of all technologies learned from the CBAs mother demos along their farm practices.

RESULTS AND DISCUSSION

Socio-economic Characteristics of the CBAs

Results in Table 1 present the distribution of the respondents based on their socio-economic characteristics. The result shows that majority (78.6%) of the respondents were males and females constituted only 21.4%. This is an indication that males dominated maize crop CBAs in the study area. This may not be unconnected with the fact that most arable crops production requires a lot of energy of which most women do not have and cannot cope with the rigorous activities involved.

Table 1: Distribution of CBÁs socio-economic characteristics (n=42)

Variable	Frequency	Percentage	Mean
Sex			
Male	33	78.6	
Female	09	21.4	
Marital Status			
Married	26	61.9	
Single	9	21.4	
Divorced	4	9.6	
Widowed	3	7.1	
Age (years)			
18-25	11	26.1	
26-33	9	21.1	
34-41	17	40.5	38
42 and above	6	14.3	
Highest Educational Qualifications			
SSCE	4	9.5	
Diploma	7	16.7	
NCE	22	52.3	
BSc/HND	8	19	
Postgraduate	1	2.4	
Average Maize Output (per 100Kg bag)			
1-5	6	14.3	
6-10	28	66.7	8.0
11 and above	8	19.0	
Reasons for enterprise			
Subsistence	25	59.5	
Commercial	16	40.5	
Major Occupation			
Traders	12	28.6	
Farming	20	47.6	
Agro dealer	02	4.8	
House wife	03	7.1	
Others	05	11.9	
Number of years in maize farming			
1-5	06	14.3	
6-10	30	71.4	8.0
11 and above	06	14.3	
Membership of Associations			
Members	32	23.8	
Non members	10	76.2	

Source: field survey; 2019

Similarly, most (61.9%) of the CBAs were married while 21.1% were not married. This implies that CBAs that conducted mother demos on maize production practices in the study area were predominantly married individuals. Table 1 further revealed that 40.5% of the CBAs were within the age range of 34-41 years with mean age of 38 years. The results depicts that the CBAs were within their active and productive age group. This implies that greater proportions of the CBAs were capable of facilitating and undertaken training activities. This result is in agreement with findings of Baba, Umar and Adam (2010); Muhammad et al. 2019 that farmers' leaders at their youthful ages are more prolific and could easily participate in any intervention programme aimed at increasing their level of productivity.

Furthermore, more than half (52.3%) of the CBAs had National Certificate of education (NCE), followed by 19.0%, 16.7%, and 2.4% of the CBAs with Diploma, Degree / HND and Post Graduate certificates respectively. The implication of this finding is that education is generally considered as an important variable that could enhance CBAs understanding and acceptance of new idea and practices targeted at increasing their productivity. This finding agrees with Garba (2006); Abubakar (2011) who reported that formal education is generally considered as an essential variable that could enhance adoption of new technologies and practices. Reasons for engagement in the enterprise revealed that 59.5% of the participated in the mother demonstrations for commercial agricultural purpose while only 40.5% of them participated in the conduct of the demonstrations for subsistence agricultural purpose. This implies that a greater proportion of the CBAs could have the entrepreneurial tendencies to invest in business and agricultural products marketing. Farming experience (Table 1), further revealed that a greater proportion (71.4%) of the CBAs had 6-10 years of maize farming experience, about 14.3% of them had 11years and above of experience with mean farming experience of 8 years. This finding implies that most of the CBAs had been into farming for a relatively long period of time and hence maize production is not new in the study area. Majority (76.2%) of the CBAs did not belong to functional associations, while only 23.8% of them were members of cooperatives. Membership of an association could encourage the members to make decisions that balance the need for technology adoption of their members.

Access to Maize Production Technologies

Findings in Table 2 on perceived level of maize production practices and ratings of the qualities of the technologies demonstrated by the CBAs indicate that fertilizer application method of burying (23.2%) was ranked 1st. This was closely followed by spacing and sowing of maize seeds with 20.3% was ranked 2nd. The findings further showed that improved maize seeds (19.6%), fertilizer quality (18.8%) and quality of herbicides (18.1%), were ranked 3rd, 4th and 5th respectively. This might not be unconnected with the capacity developments on knowledge of agronomic practices which exposed them to various improved technologies. Thus, the findings affirmed Bucheyeki *et al.* (2011) who asserted that agricultural productivity can be increased through improved agronomic practices such as timely planting, proper spacing, timely and correct use of fertilizer and agro-chemicals. The result is also in line with the recommendations of Dahiru (2018) who opined burying (sowing) of fertilizer and spacing at 25cm x 25cm between plants, 75 cm x 75 cm between rows with one seed per hole at sowing were the major maize technologies that could enhance yield.

Table 2: Perceived CBAs ratings on level of maize production technologies practices and attributes (n=42)

Variables	Frequency	Percentage	Ranking
Improved maize seeds	27	19.6	3rd
Quality of herbicides	25	18.1	5th
Quality of fertilizers	26	18.8	4th
Spacing/sowing of seeds	28	20.3	2nd
Fertilizer application methods	32	23.2	1st
Total	138*	100.00	

Source: field survey; 2019. *Multiple responses

CBAs perception on maize technology adoption

The results in Table 3 showed perceived benefits derived by the CBAs of maize production Good Agricultural Practices (GAP) in the study area. Majority (11.1%) of the respondents indicated improved capacity development and knowledge of GAP acquired from the trainings was ranked first as the major benefits they derived. Access to improved maize seeds and quality fertilizers ranked 2nd and 3rd respectively. This result demonstrated that the best bet agricultural practices applied to maize had the highest effects on beneficiary's perception.

Table 3: Perceived benefits derived by the CBAs of maize production good agricultural practices (GAP) (n=42)

Benefits derived	Frequency	Percentage	Rank
General awareness about the GAP**	29	9.2	3rd
Access to improved maize seeds	30	9.5	2nd
Access to quality herbicides	20	6.3	8th
Access to quality fertilizers	30	9.5	2nd
Access to credit	10	3.2	13
Increased crop yield	22	6.9	7th
Improved capacity development and knowledge of GAP	35	11.1	1st
Access to markets and good price	14	4.4	11
Improve access to ICT tools and technical skills***	24	7.6	6th
Self-empowerment	19	5.9	9th
Increased income	28	8.8	4th
Access to weather information	13	4.1	12th
Access to improve post-harvest management skills	16	5.0	10th
Linkages to Agricultural Extension Agents (AEAs)	27	8.5	5th
Total	317*	100.00	

Source: field survey; 2019 *Multiple responses **Good Agricultural Practices ***

Maize Production Yield Performance

Result in Table 4 indicated that AGRA mother Demo plots produced the heaviest average cobs weight of 1.3 kg (44%) more than the farmers' baby demos plots that produced 0.9 kg cobs weight. The table further indicates that the grain yield performance of mother

demonstrated varieties and grain yielded was higher in AGRA mother demos technology plot than the farmers baby plot, and mother plots of maize gave the highest yield of 28 kg (27.3%) per best two rows and the farmers baby plots was 22kg per 2 best rows equivalent 2800 kg/ha and 2200 kg/ha respectively. Dahiru (2018) in his study introduction of Sassakawa Technology on Irrigated Maize (*Zea mays* L.) production in KurmiMayolope, reported similar results in which Sassakawa technology experimental plots produced the heaviest cobs weight of 1.2 kg (80%) more than the farmer's plots that produced 0.7 kg cobs weight.

Table 4: Average comparative percentage performance of AGRA mother demos plot and selected farmers baby plot of maize in terms of cobs weight and grain yield (kg) during 2019 wet season (n=42)

Treatments	Cobs weight (kg)	Grain yield from at least the best 2 rows in (kg)
AGRA mother Demo plots	1.3	28
Farmers baby demo plots	0.9	22
Percentage performance of AGRA* mother plot to farmers baby demos	44%	27.3%

Source: field survey; 2019* Alliance for Green Revolution in Africa

Constraints Affecting Maize Production Activities

Findings in Table 5 indicated high costs of labour was the most important problem associated with the maize production technologies by the CBAs, constitutes 54%. Garba (2006) in his study on adoption of SG, 2000 maize production technology in Bauchi State reported inaccessibility to farm inputs as the major constraints to adoption of technologies by farmers. Similarly, Ali, Adam and Abdullahi (2018) in their study found lack of finance/fund as the major constraints of adoption of millet production management practices. The disagreement with these findings may not be unconnected with the fact that the CBAs received the inputs (seeds, agrochemicals and fertilizers) from the project with no cost. Other problems cited were low market price of the maize and unfavourable demo sites.

Table 5: Distribution of respondents according to constraints faced (n=42)

Constraints	Frequency	Percentage
Outbreak of pests and diseases	2	4.8
Low market price/Lack of good prices	9	21.4
High costs of labour	23	46.0
Unfavourable demo sites	6	14.3
Timing of inputs supply	2	4.8

Source: field survey; 2019

CONCLUSION

The community-based advisors in the study area were dominated by males and relatively had good educational qualifications. The CBAs have applied the good agronomic practices of maize production in their mother demonstration, improved capacity development and knowledge of GAP coupled with spacing/sowing of seeds and Fertilizer application methods was the major technologies learned. Meanwhile, the AGRA mother Demo plots

produced the heaviest average cobs weight more than the farmers' baby demos plots. The CBAs were constrained by high costs of labour and low market prices.

The project should encourage more women participation and policy focus on measures for the provision of simple mechanized tools and labour savings devices to address the high labour costs.

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