

ICT Support for Popularization of Sunflower Intercropping with Arable Crops: A Case Study of Nigerian and Batswana

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Abstract: Sunflower is an alien crop to the tropical and subtropical Africa, especially Nigeria and Botswana. The crop has potential for enhancing farmers' economic condition if integrated into the existing traditional farming system. Popularization of sunflower intercropping with arable crop production in Nigeria and Botswana using ICT support system was then conceived in this project with a view to collecting and assessing information on production method, processing and marketing with the aim of increasing farm income among the small holder farmers. An E-agriculture model of establishing Young Animators Club to play the role of extension workers was adopted and a total of 200 smallholder farmers (with at least 1 ha of farmland) were randomly selected alongside the 10 young animators in junior secondary schools and four extension workers purposively selected for the project from the two countries. With the backdrop of inadequate and very low extension farm-family ratio, high illiteracy level prevailing among the small holder farmers and zero access to ICT which have resulted to very low productivity and poverty, ICT structural capacities were built for selected schools. An articulated Sunflower Farmers' Association (SFA) was formed in two separate agro-ecological regions of Nigeria and Botswana while accompanying Young Animator Club was formed to collate, disseminate information from the selected extension workers to the SFA. The project revealed a high enthusiasm on the part of the selected students and farmers resulting to 98% participation by the participants in all the agro-ecologies of the two countries. Awareness of sunflower intercrop with arable crops increased significantly among farmers while the use internet to assess information on production practices was also improved. Impact assessment of the use of ICT to support sunflower popularization revealed a significant increase in farmers' income due to their involvement in the project. Although, the adoption experiences varied at different locations in the two countries, the emerging use of hand phone seems to be most effective in information gathering and dissemination among the participatory members of the project. The use of ICT proved to be very effective in popularizing a crop within an intercropping regime.

Key words: Popularization, sunflower, intercropping, ICT, animators club, Botswana, Nigeria

INTRODUCTION

Over the years agricultural extension services in Africa have either collapsed or failed to operate altogether. Where they operate, they have not effectively and efficiently addressed the problems of small-scale farmers. As a result, there has been a shift in the extension process and focus is now on how to facilitate and disseminate information, knowledge, communication and advocacy services and provide broader services to

improve rural livelihoods. Agricultural, rural development and rural extension continue to be in a phase of transition in this part of the world. The role of extension and support systems in this background is undergoing profound changes while no unified alternative framework has emerged (Eicher, 2007).

The growing demand for agricultural commodities including higher quality products offers opportunities for improving the livelihoods of the rural communities (Stienen *et al.*, 2007). The role of Information and

Communication Technologies (ICTs) to enhance food security is increasingly being recognized and was officially endorsed at the World Summit on the Information Society (WSIS) 2003-2005. Information and communication technology includes any communication device or application encompassing cellular phones, computer and internet hardware and software, satellite and geographical information systems as well as various services associated with them such as video conferencing.

Information and Communication Technology (ICT) is an umbrella term that includes computer hardware and software, digital broadcast and telecommunications technologies as well as digital information repositories online or offline (Selwyn, 2002) and includes contemporary social networking aspects, read/write interfaces on the web besides file sharing systems online. It represents a broad and continually evolving range of elements that further includes the Television (TV), radio, mobile phones and the policies and laws that govern the widespread use of these media and devices. The term is often used here in its plural sense (ICTs) to mean a range of technologies instead of a single technology.

An appropriate blend of ICTs could be used to free time for extension workers and cut down the number of change agents required and the associated costs. Thereby freeing resources to implement activities that directly impact on production, productivity and marketing agricultural produce by small-scale farmers in rural areas. One initiative employing ICTs to offer extension services and training to small holder farmers who are involved in planting and popularizing the production of sunflower in intercrop with arable crop is the Young Animator Club in Nigeria and Botswana. These small holder farmers in Nigeria and Botswana could utilize their small farms more efficiently and effectively by adopting improved agricultural practices, high value crops (like sunflower) and technologies such as appropriate interspacing in intercropping crop mixture to for effective land use. These would earn them more money through increased productivity and improve their livelihoods. Information on these new and improved technologies could be accessed through the use of ICTs. This essay will discuss how ICTs has been used to counter information poverty and unwillingness of farmers to popularize and grow sunflower by some group of small holder farmers in Nigeria and Botswana in order to improve crops production, increasing income and alleviating poverty. Sunflower is an alien crop to the tropical and subtropical Africa, especially Nigeria and Botswana but has potential for enhancing farmers' economic condition if integrated into the existing traditional farming system. The

production of edible oil has been mainly from oil palm and soybean which remain inadequate for the ever growing teeming population (FAO, 2003). The increase in the population of developing countries is by far greater than the increase in food and oil production, hence the evidence of malnutrition among the populace and most especially children of the developing countries. Sunflower which is the third most important oil crop after soybean and oil palm (Rehm and Espig, 1991) has not been adequately exploited for its commercial edible oil potential in Nigeria and Botswana. Considering its tolerance to drought and great variety of soil (CAADP, 2008), it could be suitable for planting in most areas of Nigeria and Botswana.

Given the wide range of climates, types of soil and cultural variability that exist around the globe, there are substantially different constraints, to productivity from countries or locations to another. Francis indicated that there are so many constraints of soil and climatological factors, human cultural and interaction among these factors make it difficult to establish the precise physical or climatological constraints for a given area without on the ground experience or survey. According to Francis, the participation of farmers and students in this process can be crucial. There may be economic, political or social reasons why productivity is limited in a given situation and this reason may not be apparent to a researcher or extension specialist who is familiar only to crop and soil. Information poverty makes farm entrepreneurs isolated, uncertain and risk prone. If received information is complete, accurate, relevant, timely and appropriately presented, it results in cost reduction and increased income. First of all, increasing the efficiency, productivity and sustainability of small scale farms is an area where ICT can make a significant contribution.

Key improvements stem from information about pests and disease control, early warning systems, quality control, agro-meteorological services, agro-technology transfer and what is being done around the world (McNamara, 2009).

MATERIALS AND METHODS

Study setting: The study was conducted in two Southwestern states Nigeria which are Ogun and Ekiti states and two districts (Southwest and Kgatlang) of Botswana. Ogun state is an important state where the principal partner of the project is located (Crawford University, Igbesa) while Ekiti state is the site of the Faculty of Agriculture of the Crawford University where the Sunflower Extension Centre is located. Ogun state which is an agrarian state with extensive industrial

encroachment has a population of about 2,338,570 (NPC, 1991) and occupies a land area of 16,762 km². The coordinates of the state is 7°0'N" 3°35'E/7°N" 3.583°E with transitional savanna vegetation. It experiences approximately 8 months (March to October) of bimodal rainfall and 5 months (November to March) of dry season each year with slightly irregularity in the rainfall distribution annually. On the other hand, Ekiti state is an inland state with a total land area of 9,251 km² and a population of 1,628,762 (NPC, 1991). The state falls within 7°30'N" 4°30'E/7.5°N" 4.5°E and the vegetation is rainforest with some patches of Guinea Savanna. It experiences approximately 8 months (March to October) of bimodal rainfall and 4 months (November to February) of dry season each year with slightly irregularity in the rainfall distribution yearly.

Botswana is predominantly flat, tending toward gently rolling tableland. Botswana is dominated by the Kalahari desert which covers up to 70% of its land surface. It covers about 600,370 km² (231,804 m²) and lies between latitudes 17 and 27°S and longitudes 20 and 30°E. According to the 2011 Census, Botswana has a population of about 2,208,228 people (NPC, 1991).

Sampling process: Multi-stage sampling procedure was used to select respondents for the study. Ekiti state was purposively selected in the rainforest zone while Ogun state was also purposively selected in the derived Savannah zone. At each location, one junior secondary school was also purposefully selected. A total of 50 farmers were also purposefully selected at each of the locations while the 10 students used for the Animator club were selected based on some criteria: First must be in junior secondary school; secondly, must have farmers' parentage and must be a boy or girl of between 13-20 years of age, involve in farming activities and were subjected to written examination where the best 10 students were picked.

In each of the secondary schools, an ICT building was constructed to house all the ICT gadgets (computer, home theater, internet modem, radio, printer while each of the pupils were equipped with a TECNO multifunctional) hand phone. In all 200 farmers (50 from each location), 40 young animators (10 from each location), 12 teachers (3 from each location) and 8 extension workers (2 from each location) were involved in the two countries making a total of 260 participants for the study within a time frame of 12 months.

Measurement of variables: Selected socio-economic characteristics of farmers like age, years of formal education, household size, farm size in hectare and

distance of farm to home/farmstead were measured by their absolute values. Furthermore, farmers and students were asked to supply information on their knowledge on ICT. Farmers were also asked to supply information on their knowledge of sunflower and utilization and also crop combination planted if they were not practicing monocropping. Responses to these questions were summarized and analyzed. Data were summarized using frequency, percentage and standard deviation and t-test was used to compare the selected socio-economic characteristics of farmers across the two agro ecological zones of the study areas.

RESULTS AND DISCUSSION

Figure 1 showed the age distribution of the respondents in the four agro ecological zones of the study areas. The data revealed that the mean age of the respondents was 41.5 in Ogun, 51.3, in Ekiti, 59.14 in Mogobane and 53.0 in Oodma. The t-test analysis established that there is significant difference between the ages of respondents in all the locations. The result also indicated that there were more male farmers at the Nigeria locations contrary to the result obtained from Botswana where more females were involved.

While the result in Table 1 showed that all the farmers belong to one social or religious association or the other, the level of association among respondents in Botswana was very low compared to those of Nigeria. In Nigeria, the farmers were more involved in religious and community development associations while farmers in Botswana had very low levels of participation in association except in religious where they showed little appearance. There was more enthusiasm to belong to the Sunflower Farmers Association (SFA) because of the common interest which they seemed to pursue. Hence, the SFA formed became a strong avenue to push for new innovation, especially in the usage of the ICT provided in the

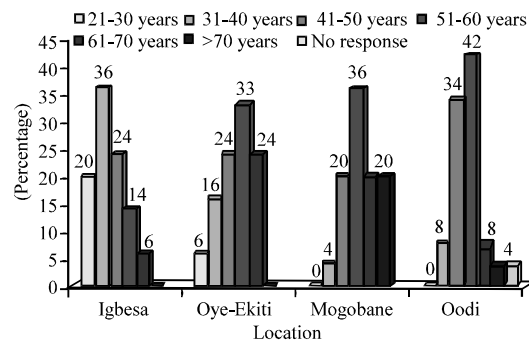


Fig. 1: Age distribution of farmers in the four agroecology of the study area

Table 1: Distribution of respondents by association membership in the four agroecology zones

Group/association	Nigeria				Botswana			
	Igbesa		Oye Ekiti		Mogobane		Oodima	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Religious	28	56.0	44	88	11	22	30	58.0
Village council	21	42.0	-	-	-	-	-	-
Cooperative society	12	12.0	38	76	7	14	10	4.0
Comm. Dev. Ass.	32	64.0	26	52	2	4	10	4.0
Social organization	14	28.0	26	52	1	2	18	6.0
Political group	12	24.0	22	44	-	-	-	-
Farmers' Ass	18	36.0	35	70	1	-	18	6.0

Table 2: Distribution of respondents by period of years they heard about sunflower

Years	Igbesa		Oye-Ekiti		Mogobane		Oodima	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
<10	6	12.0	5	10.0	8	16.0	3	6.0
10-20	9	18.0	3	6.0	2	4.0	4	8.0
>20	1	2.0	7	14.0	2	4.0	13	26.0
No response	34	68.0	35	70.0	38	76.0	30	60.0

locations. The association became local community of practice where the farmers, the animators and the extension officers exchange information, ideas and resources related to the use of Information and Communication Technologies (ICT) for sunflower popularization.

The farming system in the location revealed that significant variation. In Igbesa, majority (70%) of the respondents practiced mixed cropping in which both annual and perennial crops were put into cultivation while few (20%) practiced mixed farming thus engaged in little livestock production. In Oye Ekiti, 52% of the respondents engaged in mixed cropping while 36% practiced mixed farming and very few (2%) practiced mono cropping. These result reaffirmed the complexity in which farming enterprise used to be as the farmers are not sure which of the crop will be of the greatest advantage at any particular time. In Oodima, majority (82%) of the respondents were involved in mixed farming, 14% practiced mixed cropping while only 2% engaged in mono cropping. Results indicated that mixed farming was more prominent amongst the respondents in Oodi. Similar trend was also observed in Mogobane where the respondents (85%) were engaged in mixed farming and 10% in mixed cropping. Contrary to the results in Nigeria, the rearing of livestock seems to be the predominant occupation of the respondents, however the are involved in postural farming and they need to produce food for home consumption contrary to the nomadic farmers.

Their knowledge of sunflower revealed by this study in Table 2 showed that farmers in Botswana have been growing the crop in very low level for the consumption of their domestic chicken, it is completely alien to Nigeria respondents. In Igbesa, 26 and 18% of the respondents

indicated they heard about the sunflower crop through fellow farmers and their parents, respectively. Also, 14% heard about the crop through extension agents while 12% heard through publications. At Oye Ekiti, 30% of respondents heard about sunflower from their parents, 26% heard from their fellow farmers while 20% each heard through extension agents and mass media. Very few (6%) had through publications. The results revealed that sunflower is alien to the respondents as none of them have seen the crop as a field crop.

In Mogobane, 46% of the respondents became aware about sunflower through fellow farmers. While very few (6 and 4%) got to know about the crop from extension agents and other friends (who are not farmers). Similarly, very few (2%) indicated parent as knowledge source about sunflower. None of the respondents got to know about the crop through mass media, market or publication. In Oodima, 32 and 10% of the respondents heard about sunflower from co-farmers and extension agents while 6% each had about it through mass media and market arena, respectively. Results showed that fellow farmers were most prominent source through which respondents knew about sunflower. The result further confirm that Botswana had more knowledge of sunflower as field crop than Nigeria and popularizing it among the farmers may be worthwhile.

On Information Communication Technology (ICT) usage, Bisaso (2008) reported ICT has been introduced for the educational system of Botswana since, 1999 and this research further showed that students in Botswana are well knowledgeable in the use of computers and the accessories while the use of internet is not strange to the pupils also hand phone is a common thing owned by the students. This might be due to the fact that the



Fig. 2: The ICT resource center housing the accessories for the Animators' Club in Nigeria

educational activities in Botswana were computerised since 1999 to keep track of a rapidly expanding education sector and were in line with administrative reforms aimed at improving public sector efficiency. However, the reverse is the case in Nigeria while only hand phone is generally used through commercial activities, the ICT and the accessories were innovation into most of the Nigeria junior secondary schools. This might be that national policies do not clearly and adequately address the use and application of ICTs in rural communities. Hence the provision of ICT centres (Fig. 2) in those locations in Nigeria enables the pupils to have access to ICT technology. While Nigerian government is making some progress in addressing the issue of ICTs and development, existing ICT policies/drafts do not adequately cater for the needs of the small-scale farmers. Some of the ongoing efforts which this project has made to bring about policy change include organizing farmers in groups or associations, forming Young Animators Club among pupils to fulfill the role of information dissemination among farmers and ensuring participation of these groups in sunflower popularization. There is the need to ensure that the needs of the small holder farmers are catered for and that adequate resources (human and financial) are allocated in the implementation of ICT for sunflower popularization. Despite the high potential of ICTs in improving small-holder agriculture in sunflower popularization, the low usage patterns and adoption may be due to the fact that ICT initiatives are scattered. Consequently, there is high cost of ICT infrastructure and skills acquisition, poor and expensive connectivity, language barriers and/or inappropriate credit facilities and systems. Further, there is weak institutions and inadequate collaboration and awareness of existing ICT

facilities and resources, a poor information sharing culture and low awareness of the role of ICTs in sunflower popularization.

CONCLUSION

The effect of the ICT project on popularization of sunflower has effectively enables the sunflower project to organization the farmers into associations using the Young Animators Club (YAC) as impetus for information dissemination. Construction and equipping ICT resource centres at the chosen locations has increased the level literacy on ICT usage by the rural communities. The establishment of sunflower community interactive forum among researchers, extension worker, YAC teachers and farmers is serving as a machinery to encourage the younger ones to be engaged in agriculture contrary to the earlier notion that farming is now exclusive of the older people. It is also creating greater awareness in the cultivation of sunflower for poverty alleviation as more farmers are showing interest to be part of the initial cultivator of sunflower as field crop. There is also greater awareness on the usage of ICT for sunflower sensitization no matter the distance in Africa.

REFERENCES

- Bisaso, R., 2008. Information technology for managing education in Botswana and Uganda: Use of computerised information systems in Uganda and Botswana. id21 Development Research Reporting Service. <http://www.eldis.org/assets/Docs/50343.html>.

- CAADP, 2008. Pillar 3: Food supply and hunger, Comprehensive Africa Agricultural Development Programme (CAADP) <http://www.nepad-caadp.net/pillar-3.php> (Accessed 5 February 2010)
- Eicher, C., 2007. Agricultural extension in Africa and Asia. Literature review prepared for the World AgInfo project, Cornell University, Ithaca.
- FAO, 2003. The State of Food Security in the World. Food and Agricultural Organization, Rome, Italy.
- McNamara, K., 2009. Mobile Application in Agriculture and Development-Framing the Topic and Learning from Experiences. American University, Washington DC.
- NPC, 1991. Nigerian population commission. Census Report. Abuja, Nigeria.
- Rehm, S. and G. Espig, 1991. Cultivated Plots of the Tropics and Sub-Tropics. CTA Eugen Ulmer GmbH & Co., Germany. pp: 552.
- Selwyn, N., 2002. Defining the 'Digital Divide': Developing a theoretical understanding of inequalities in the information age. School of Social Sciences Occasional Paper, 49. School of Social Sciences, Cardiff University, Cardiff. ISBN 1-872-330-967.
- Stienen, J., W. Bruinsma and F. Neuman, 2007. How ICTs can make a difference in agricultural livelihoods. International Institute for Communication and Development, AN, The Hague, the Netherlands.