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Full Length Research Paper

A study on the assessment of the use of sunflower crop among smallholder farmers in sub-Saharan Africa: Evidence from Nigeria and Botswana

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Sunflower is a crop with high oil and economic values which portends its great potential for enhancing agricultural productivity and poverty alleviation among smallholder farmers. These notwithstanding, optimum benefit of the sunflower value chain have not been adequately harnessed. Conceived with the backdrop of lack of awareness about the commercial, nutritional and medicinal potentials of sunflower among the rural farm families, the study assessed the utilisation of sunflower among smallholder farmers in two southwestern states (Ogun and Ekiti) of Nigeria, and two districts (southeast and Kgatleng) of Botswana in sub-Saharan Africa. A total of two hundred smallholder farmers were randomly chosen from four purposively selected farming communities in southwestern Nigeria and Botswana districts. Results showed that 49 and 84% of the respondents were aware about the sunflower crop in Nigeria and Botswana, respectively, while only 10 and 25% cultivated the crop, respectively. The results further showed that all those (25%) who cultivated the crop in Botswana utilised it as animal feed only, while their Nigerian counterpart utilised it for variety of purposes. While 6 and 7% utilised it as animal feed and manure/fertiliser production, respectively, in Nigeria, 2, 5 and 8%, respectively, used it for cake/snack production, and traditional and ornamental purposes. Yet, another 6% cultivated the sunflower crop for seed oil extraction. The study concluded that, although, higher proportion of smallholder farmers from Botswana knew about and cultivated the sunflower crop, yet, their Nigeria counterpart utilised the crop more. The need for continuous popularization of the production and utilisation of sunflower crop among smallholder farmers was therefore recommended in both Bostwana and Nigeria.

Key words: Sunflower utilisation, smallholder farmers, value chain.

INTRODUCTION

Smallholder farmers are vital for agriculture and rural economy of every developing nation especially in the sub-Saharan Africa and other parts of Africa continent where they largely rely on rain-fed agriculture. The

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smallholder farmers are generally marginal and sub-marginal farm households that own or/and cultivate less than 2.0 ha of land and are characterized by a narrow spectrum of education, mass illiteracy with high level of poverty and poor standard of living (Adedoyin et al., 1996; Ekong, 2003). They usually produce crops in mixed intercropping, which often result in persistent and continuous poor yield in agricultural production leading to poor financial return thereby exacerbating their poverty condition (Amujoyegbe et al., 2011).

The sunflower, *Helianthus annuus* L., is one of major crops of global importance native to the United States. Archeological evidence suggests that Native Americans began cultivating and improving the sunflower as early as 2300 B.C. (Rindels, 1996). Although, alien to the tropical and subtropical Africa, it could be suitable for planting in most areas of Nigeria and Botswana, considering its tolerance to drought and great variety of soil (CAADP, 2008; Amujoyegbe et al., 2012).

The sunflower crop has a lot of potentials and has been utilised for a wide variety of purposes from time immemorial. For instance, 'native Americans in the U.S. have been using wild sunflower for food and medicine for at least 8,000 years, the seeds were usually roasted and ground into a fine meal for baking or used to thicken soups and stews. "Seed-balls", similar to peanut butter, made from sunflower butter made a convenient carry-along food for traveling. Roasted sunflower hulls were steeped in boiling water to make a coffee-like beverage. Dye was extracted from hulls and petals. Face paint was made from dried petals and pollen. Oil, extracted from the ground seeds by boiling, provided many tribes with cooking oil and hair treatment. Medicinal uses included everything from wart removal to snake bite treatment to sunstroke treatment' (Rindels, 1996). Also, by adding sunflower to an existing crop rotation, pest problems such as corn borer or soybean cyst nematode can be reduced (Myers, 2002). A field of sunflowers in bloom is a striking sight, and many farmers remark about the pleasure they, and people passing by, get from seeing the flowers (Myers, 2002).

According to Johnson et al. (2009) cited in McClure et al. (2013), there are basically two types of sunflower hybrids: the oilseed type that is grown for vegetable oil and the confection or non-oilseed type. The oilseed type has a higher oil composition in the seeds than the non-oilseed type. Oilseed types produce smaller black seeds and the oil is primarily used for human consumption. The oilseed types are also marketed as a sole ingredient for birdseed or in birdseed blends. The non-oilseed type produces the large, striped seeds that are used for human food snacks in the shell or as kernels, in baking ingredients, and in birdseed mixes (Johnson et al., 2009). Currently, production of edible oil in sub Saharan Africa has been largely from oil palm and soybean, which remain inadequate for the ever growing teeming population (FAO, 2003). Sunflower, which is the fourth leading oil consumed (7.8%) behind (oil) palm (31.8%),soybean (30%) and rapeseed (14%) (ASA, 2008) has not been adequately exploited for its commercial edible oil potential in most African countries, especially Nigeria and Botswana. Even in South Africa, for instance, where approximately 95% of all sunflower seed produced is processed for sunflower oil production, the dilemma of the sunflower market is that not enough sunflower seed is produced locally for the oil industry. With the total demand for sunflower seed, resulting from the total demand of sunflower oil, increased to over 1 million tonnes, South Africa has become a huge importer of sunflower crude oil in the last decade (FPMC, 2003).

Enhancing the value chain can improve the livelihood of smallholder farmers, ensure competitiveness in the global market, and ultimately contribute to economic growth. However, imperfections along the chain continue to widen the disparity between farm gate and retail prices, leaving poor farmers with the least value (IFPRI, 2008). Despite the promising potentials of the sunflower which portends great potential for enhancing agricultural productivity and poverty alleviation among smallholder farmers, optimum benefit of the sunflower value chain have not been adequately harnessed. Conceived with the backdrop of lack of awareness about the commercial, nutritional and medicinal potentials of sunflower among the rural farm families, the study assessed the utilisation of sunflower among smallholder farmers in two southwestern states (Ogun and Ekiti) of Nigeria, and two districts (southeast and Kgatleng) of Botswana in sub-Saharan Africa. Specifically, socioeconomic characteris-tics of smallholder farmers were described, and their awareness about and utilisation of the sunflower crop were assessed.

METHODOLOGY

The study was conducted in two Southwestern states (Ogun and Ekiti) of Nigeria and two districts (Southwest and Kgatleng) 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, 2006) and occupies a land area of 16, 762 km^2. The coordinates of the state is 7°00'N 3°35'E/ 7°N 3.583°E with transitional savanna vegetation. It experiences approximately eight months (March – October) of bimodal rainfall and five months (November – 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 km^2 and a population of 1,628,762 (NPC, 2006). 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 eight months (March – October) of bimodal rainfall and four months (November – February) of dry season each year with slightly irregularity in the rainfall distribution yearly.

Botswana, where the second institution (Botswana College of Agriculture) is located 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 km^2 (231,804 sq mi) and lies between latitudes 17° and 27°S, and longitudes 20° and 30°E. According to 2011 population Census, Botswana has a population of about 2,024,787 people (BPC, 2012)

Two farming communities were purposively selected from each of the countries because of their proximity to the participating institutions. These communities were Adie-Owe Igbesa in Ogun State and Oye-Ekiti, Ekiti State of Nigeria; and Oodi in Kgatleng District and Mogobane in South-East District of Botswana. Fifty farmers were also purposefully selected at each of the locations making a total of 200 participants for the study within a time frame of twelve months. Structured interview schedule, which was developed by the researchers using literature and professional experience, was used for data collection. Reliability test of the instruments was determined using a pre-test technique. With correlation coefficient (r = 0.71) obtained from the analysis, the research instrument was adjudged reliable since the correlation value of 0.7 and above are considered as satisfactory or good for a test-retest reliability (Statistics.com, 2014). The data collected were processed using SPSS version 14. Descriptive statistics such as percentages, means, line graph and charts were used to analyze the data.

RESULTS AND DISCUSSION

Socio-economic characteristics of the respondents

Results in Table 1 showed that 82% of the respondents from Nigeria were male, while 18% were female. Conversely, 56% were female in Botswana, while 44% were male. The results indicated that more female were engaged in smallholder farming in Botswana compared to Nigeria, where more male were involved. Majority (72.0%) of the respondents from both countries were aged between 31 and 60 years old. Mean age of respondent from Nigeria was 46.4 years, with standard deviation of 12.45 while mean age of respondents from Botswana was 56.13 with standard deviation of 10.85. The results thus indicated that respondents from Botswana were relatively older than their Nigerian counterparts. Similarly, majority (83% Nigerian and 86% Botswana) were married, while few others were either single or separated from their spouses. Majority (89% Nigerian and 95% Botswana) were Christians while very few were of the Islamic faith.

Results in Table 1 further showed that in Nigeria, 89% of the respondents could read and write, while 52% of the respondents from Botswana could read and write. Also, while 9% of the Nigerian could neither read nor write, 38% Botswana could neither read nor write. The results indicated that respondents from Nigeria had higher literacy level than their Botswana counterpart. These results have implications for educational techniques and approaches to adopt in continuous popularization of sunflower crop in both countries, in order not side line the unlettered ones amongst the smallholder farmers.

Similarly, in Nigeria, 72, 58 and 53% of the respondents belonged to religious association, community development association and farmers' association, respectively. While half (50%) of the respondents belonged to cooperative societies, 41 and 30% belonged to social organization and political group, respectively. Conversely, while 40% of the respondents from Botswana belonged to religious association, very few (less than 10%) were members of other associations. The results indicated that level of association membership was higher amongst Nigerian smallholder farmers compared to their Botswana counterpart.

Results in Table 2 showed that majority of the respondents (75.0% Nigerian and 87.0% Botswana) had farm size below 20 acres, while few cultivated above 20 acres in both countries. Mean farm size was 14.45 acres in Nigeria and 13.1 acres in Botswana. In addition, 59% of respondents from Nigeria acquired their farm land through inheritance, while 26% cultivated rented land area. Conversely, in Botswana, 56% of the respondents acquired their farm land through gift. The results indicated that respondents from both countries own sizeable portion of cultivable land area, from which they might dedicate some portion to sunflower crop, if they are convinced about its economic importance and become interested in its cultivation.

Furthermore, results in Table 2 showed that 61 and 28% of the respondents from Nigeria engaged in mixed cropping and mixed farming, respectively, while 11% engaged in mono cropping. In Botswana, however, 55% engaged in mixed farming, while 40 and 5%, respectively, engaged in mixed cropping and mono cropping. The results indicated that respondents from both countries already engaged in 'multi-farming' system, and therefore the integration of sunflower cultivation into the existing system could significantly enhance smallholder farmers' productivity.

Results in Table 3 showed that 49% of the respondents from Nigerian indicated they know about sunflower crop, while 84% of their Botswana counterpart knew about the crop. Results further showed that 24 and 26% of the respondents indicated parent and co-farmer as their source of awareness about sunflower in Nigeria, while 49 and 39% of their Botswana indicated these same sources, respectively. 17 and 8% indicated extension agent as source of awareness in Nigeria and Botswana, respectively, while very few (7% and below) indicated other sources friends, mass media and market. These results implied that parents and co-famers were most prominent ways through which respondents knew about the sunflower crop. The results underscored the need for popularization of sunflower amongst smallholder famers through use of mass media, radio, for example, which will gain wider coverage and audience.

Sunflower cultivation and utilization

Results in Figure 1 showed that, despite the proportion of respondents that knew about the sunflower crop as earlier discussed, only 10 and 25% of the respondents cultivated the crop from Nigeria and Botswana, respectively.

Table 1. Respondents' socio-economic characteristics.

Variable	Nigeria (n = 100)		Botswana (n = 100)	
	Frequency	Percentage	Frequency	Percentage
Sex				
Male	82	82.0	44	44.0
Female	18	18.0	56	56.0
Age (Years)				
Below 30	13	13.0	0	0.0
31 – 60	72	72.0	72	72.0
Above 60	15	15.0	28	28.0
Mean	46.40		56.13	
Standard deviation	12.45		10.85	
Marital status				
Single	13	13.0	7	7.0
Married	83	83.0	86	86.0
Divorced/widowed/Separated	4	4.0	7	7.0
Religion				
Islam	8	8.0	5	5.0
Christianity	92	92.0	95	95.0
Literacy level				
Can read and write	89	89.0	52	52.0
Can read but can't write/Can write but can't read	2	2.0	10	10.0
Can neither read nor write	9	9.0	38	38.0
Association membership				
Religious association	72	72.0	40	40.0
Village council	48	48.0	0	0.0
Cooperative society	50	50.0	9	9.0
Community development				
Association	58	58.0	3	3.0
Social organization	41	41.0	4	4.0
Political group	30	30.0	0	0.0
Farmers' association	53	53.0	9	9.0
Farming experience (Years)				
Below 20	31	31.0	12	12.0
21 – 40	23	23.0	19	19.0
41 – 60	4	4.0	2	2.0
Above 60	0	0.0	2	2.0
No response	42	42.0	65	65.0
Mean	21.19		27.07	

Source: Computed from field survey, 2013.

This indicated that low cultivation of sunflower amongst smallholder farmers in both countries. Results in Figure 2 showed that all those (25%) who cultivated the crop in Botswana utilised it as animal feed only, while their Nigerian counterpart utilised it for a variety of purposes. While 6 and 7% utilized it as animal feed and manure/fertiliser production, respectively, in Nigeria, 2, 5 and 8%, respectively, used it for cake/snack production, and traditional and ornamental purposes. Yet, another 6% cultivated the sunflower crop for seed oil extraction. The results indicated that the potentials for enhancing agricultural productivity and reducing poverty amongst

Table 2. Respondents' farm size, land acquisition and type of farming.

Variable	Nigeria (n = 100)		Botswana (n = 100)	
	Frequency	Percentage	Frequency	Percentage
Farm size (Acres)				
Below 20	75	75.0	87	87.0
21 – 40	6	6.0	13	13.0
41 – 60	4	4.0	0	0.0
Above 60	1	1.0	0	0.0
No response	14	14.0	-	-
Mean	**14.45**		**13.1**	
Land acquisition type				
Inheritance	59	59.0	39	39.0
Rent/lease	26	26.0	3	3.0
Outright purchase	9	9.0	2	2.0
Gift	8	8.0	56	56.0
Type of farming				
Mono cropping	11	11.0	5	5.0
Mixed cropping	61	61.0	40	40.0
Mixed farming	28	28.0	55	55.0

Source: Computed from field survey, 2013.

Table 3. Awareness about the sunflower crop.

Variable	Nigeria (n = 100)		Botswana (n = 100)	
	Frequency	Percentage	Frequency	Percentage
Do you know about the crop?				
Yes	49	49.0	84	84.0
No	51	51.0	16	16.0
Source of awareness*				
Parent	24	24.0	49	49.0
Co-farmer	26	26.0	39	39.0
Friends	7	7.0	5	5.0
Extension agent	17	17.0	8	8.0
Mass media	7	7.0	3	3.0
Market	1	1.0	3	3.0

*Multiple responses applicable, Source: Computed from field survey, 2013.

smallholder farmers through sunflower utilisation have not been well harnessed in both countries.

CONCLUSION AND RECOMMENDATION

The study concluded that higher proportion of smallholder farmers from Botswana were aware about and cultivated the sunflower crop. However, their Nigeria counterpart utilised the crop more. Notwithstanding, optimum benefit that could be derived from utilisation of sunflower have not been adequately harnessed in both countries. The need for continuous popularization of the production and utilisation of sunflower crop among smallholder farmers was therefore recommended in both Bostwana and Nigeria.

Conflict of Interest

The authors have not declared any conflict of interest.

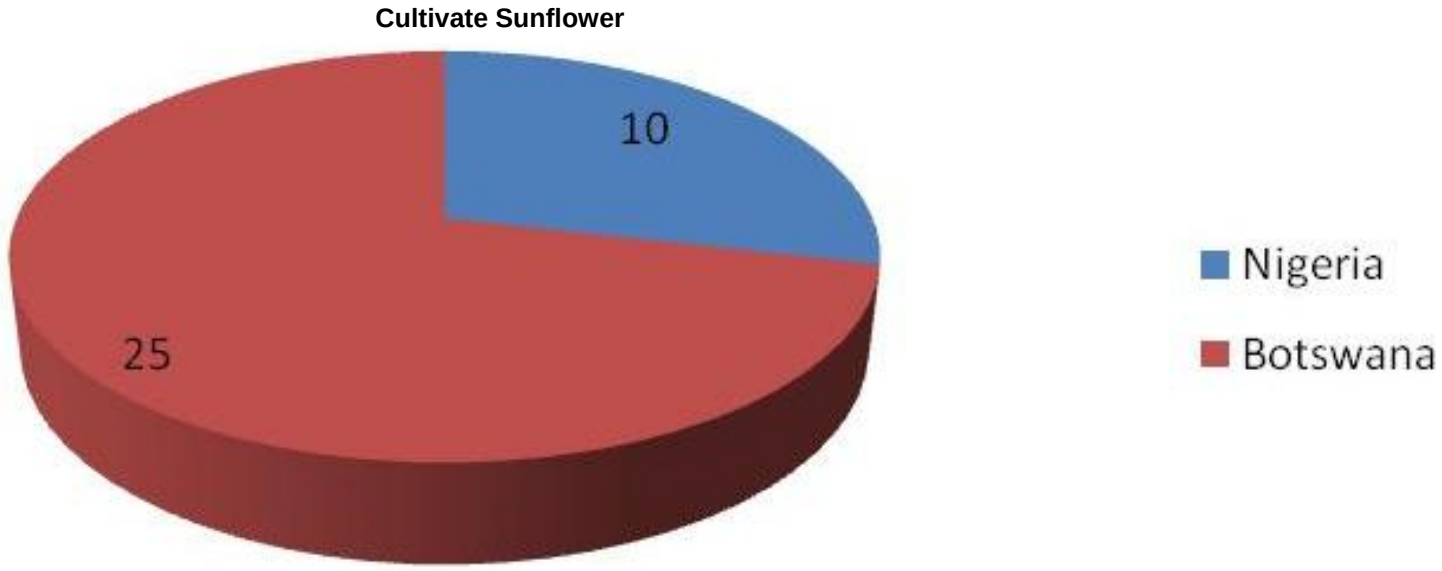

Figure 1. Percentage distribution of respondents that cultivated sunflower crop. Source: Computed from field survey, 2013.

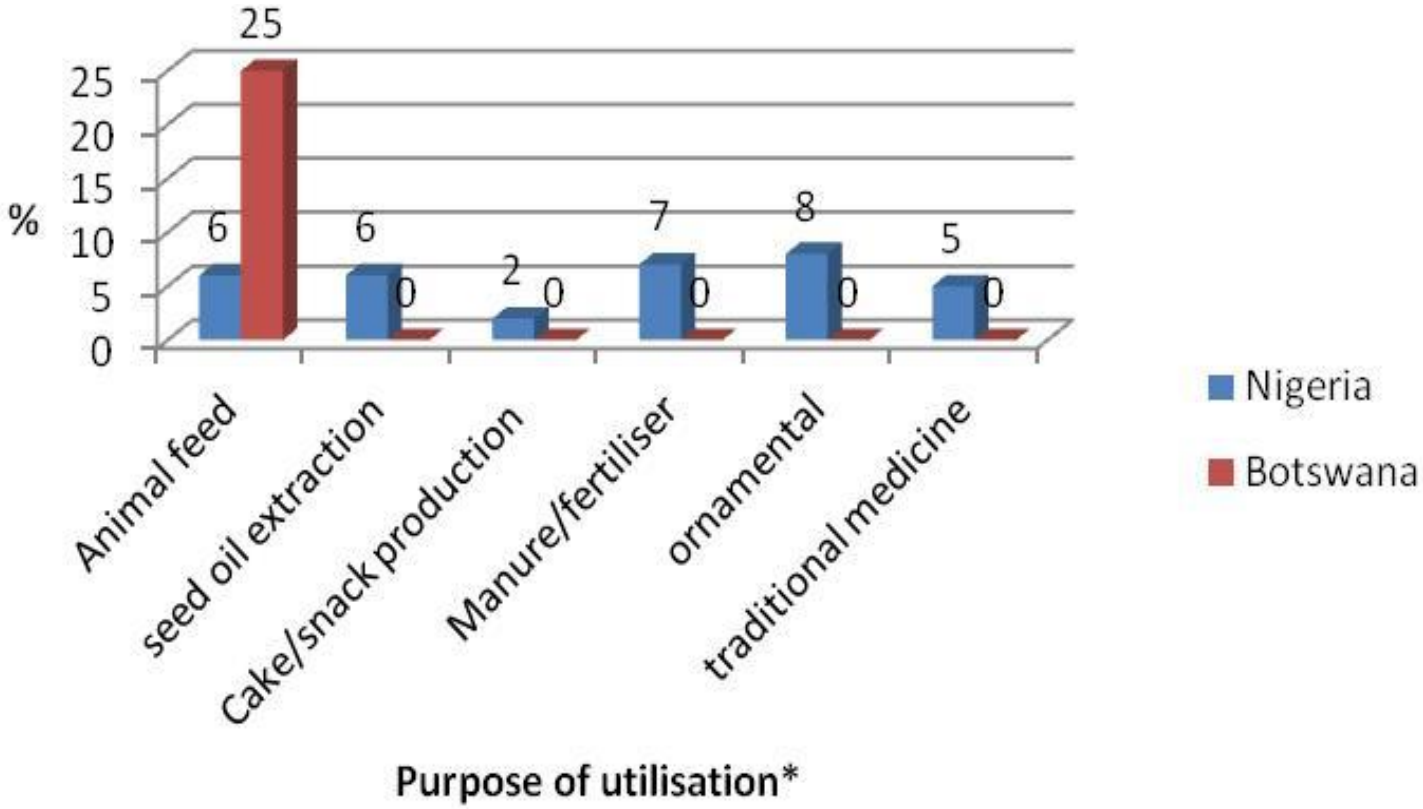

Figure 2. Percentage distribution of respondents that utilised sunflower crop. *Multiple responses applicable. Source: Computed from field survey, 2013.

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