Sesame Production Characteristics and Challenges in Western Kenya

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Abstract

Sesame is one of the most important oilseed crops in the tropical and subtropical regions of the world. Despite its importance, sesame yield potential in Kenya is very low. The objective of this study was to identify constraints limiting sesame production in Western Kenya. A survey was undertaken in Busia, Bungoma and Siaya Counties of Western Kenya involving a representative sample of 153 sesame farmers. To identify the sampling units, a three-phase stratified sampling was used to select the three counties out of the 10 counties in western Kenya, followed by selection of smaller sampling units from the selected counties. Subsequently, snowball sampling was used to identify the 153 respondent sesame farmers in the selected sampling units. The sampled farmers were then interviewed using a structured questionnaire. The data obtained was analysed using Statistical Package for Social Scientists (SPSS) version 20. The findings showed that majority of sesame farmers were aged above 41years at 66%. Among the respondents, 39% were male while 61% were female. Adult females at 56% mainly provided sesame farming labour. On land tenure, 62% of the respondents inherited land from their parents. The largest proportion (67%) of the respondents obtained seed from the grain markets whereas a majority of the respondents (80%) planted sesame as a mono-crop, in rows (69%) and did not use any fertilizer (81%) in producing their crop. Farmers did not grow any improved sesame cultivars with three popular genotypes being grown that included Local white, Sudan cultivar (advanced) and Local Brown. Pests and diseases were a minor problem in sesame production in the study area. About 70% of the farmers planted sesame for both subsistence and commercial purposes. The majority of the farmers reported yields that ranged between 200 – 400 kg/ha which is still low as compared to yields realized in other regions. There is therefore need to train farmers in this region on the adoption of sesame improved agronomic practices and value addition. Moreover, there is need for all the stakeholders to develop proactive interventions aimed at improving sesame production for food security and increased earnings.

Keywords: Sesame, baseline survey, farmers, food security

INTRODUCTION

Kenya's population is on the rise and this calls for measures aimed at improved and sustainable management of agricultural production. Among the millennium development goals and Kenya's vision 2030, it seeks to end food insecurity and to increase income among the general population. In order to realize these goals, technological research and outreach interventions are required to increase food security, value addition and sustainable development. In particular, applied research should aim at solutions to increase crop productivity and quality of food available to the general population. In this regard, sesame (*Sesamum indicum* L.) is one of the most important ancient oil seed crops of great potential to bridge the gap of food insecurity and for income (Ashri 1998).

Sesame is an important crop for edible oil, food and animal feed. Sesame seeds are an important source of oil (44 - 58%), protein 19-30% (Ssekabembe 2007) and carbohydrates 13.5% (Yoshida 1994). The seeds also have multiple uses in food industry as ingredients, decorative elements and highly nutritious constituents of confections in bread, cakes, pastry and as halva (Elleuch, Bedigian, and Zitoun 2011). Sesame is also an important element in crop rotation and intercropping for improved soils fertility and potential for suppression of the parasitic weed, striga (Hess and Dodo 2004). As has been highlighted, sesame has many uses including local consumption, industrial use and for export, hence playing an important role in income generation and subsistence for commercial and small scale farmers (Sabiel et al. 2015).

The crop is grown in the tropics and sub-tropical regions of Asia and Africa in marginal areas (Bedigian, D. and Harlan 1986; Ashri 1998; Bedigian 2010). In Kenya, sesame is produced by small scale farmers in the marginal agro-ecological zones of Western and Coastal areas (Ayiecho and Nyabundi 1997). According to FAO the total area under sesame cultivation in Kenya has marginally increased in the last 10 years from 24,628 ha in 2006 to 26,556 hectares in 2016 (FAO, 2018).

Despite sesame production potential, the yields in Kenya are still very low. According to Ayiecho, Ong'Injo, and Ayiecho 2009, the average seed yields among Kenyan farmers are 400 kg/ha as compared to the potential research yield of 2230 kg/ha. The sesame low yields could be due to poor genotypes including unimproved land races that exhibit non-synchronous maturity (Zerihun 2012). Other causes for low yields in sesame are biotic and abiotic constraints (Zerihun 2012). In addition, lack of knowledge on improved agronomic practices including fertilizer application is considered to constraint sesame production (Akintoye and Oyeleke 2014), besides; the utilization of sesame genotypes that are planted in Kenya has not been reported. Further to this, genetic and environmental factors affect the oil, protein and fatty acids compositions of sesame (Carlsson et al. 2009; Langham et al. 2010). This notwithstanding, scanty information is available on sesame diversity, agronomy and the influence of biotic and abiotic factors on sesame productivity and nutritional value in Western Kenya. The existence of genetic variation is a pre-requisite for genetic improvement, adaptation and evolution (Okogbenin et al. 2007; Dixon et al. 2008). Thus, there is need to identify the existence of genetic diversity of genotypes and breeding material for possible utilization in the improvement of sesame production. Further to this, improved agronomic practices and environmental factors limiting sesame production in western Kenya need to be documented. Optimum fertilizer application that is in tandem with the smallholder economic status is also of significance in order to enhance sesame yields, nutritive value and to alleviate poverty, food insecurity and improve human nutrition. This study therefore sought to characterize sesame farming; investigate constraints facing sesame production, the genotypes planted and how socio demo-graphic factors affect sesame production and consumption in Western Kenya.

MATERIALS AND METHODS

Study Area

This study was carried out in three counties of Busia, Siaya and Bungoma. These are the major sesame producing areas in Western Kenya. Busia County is located in the lower midland marginal sugar zone (Jaetzold, 1982). Bungoma County is on the southern slopes of Mt Elgon bordering Uganda to the Northwest, and Busia County to the west and south west. Siaya County is in the Nyanza region and borders the counties of Busia to the north. The three western counties' main economic activities being agriculture with the main subsistence crops being maize, beans, finger millet, sweet potatoes, bananas, Irish potatoes and assorted vegetables. Cash crops produced from the counties include sugar cane, cotton, palm oil, coffee, sunflower, rice and tobacco. A majority of the farmers in the region are small scale and lack the financial capability to access the agricultural inputs for maximum yield potential.

Research design and sampling

A descriptive survey was conducted in Busia, Bungoma and Siaya Counties of Western Kenya. A three-phase stratified sampling was used to select a sample representing sesame farmers in Western Kenya. This is a non-probability sampling where a large sample of units are selected and from them a relatively smaller sub-sample is selected to collect information on the main character under study (Fattorini, Marcheselli, and Pisani 2006). The first phase involved selecting the three target counties (Busia, Bungoma and Siaya), out of 10 counties in western Kenya. The second phase involved the selection of three sub-counties from each of the three counties. These sub-counties were Teso South, Teso North and Matayos in Busia, Bumula, Sirisia and Kanduyi in Bungoma, and Gem, Bondo and Rarieda in Siaya. The last phase involved identification of sesame farmers in the various wards (a smaller administrative unit of the sub-county) within the sub-counties. In all the phases, selection was based on annual sesame production trends using the information provided by the county crops extension officers in conjunction with the sub-County agricultural officers and extension officers in the respective wards.

Snowball sampling was used to identify respondent sesame farmers in the selected locality (Wards). All the known sesame farmers were used in the survey making a total 153 farmers. These were farmers currently involved in sesame production.

Data collection and analysis

A structured questionnaire administered by the researchers was used to collect data. Data collected included; socio-demographic characteristics of sesame farmers, sesame farmers' seed sources, sesame agronomic practices, sesame seed yields, pests, diseases and post-harvest handling of sesame. The data was then cleaned, edited and coded to ensure consistency, uniformity and accuracy. Processing and analysis of data was done using the Statistical Package for Social Scientists (SPSS) software version 20 (IBM Corp. 2011). Descriptive statistics such as percentages, minimum, maximum and frequencies were used for analysis of socio-demographic characteristics.

RESULTS AND DISCUSSIONS

Socio-demographics, labour source and land ownership characteristics of the respondents

The findings revealed that 38.6% of the sampled farmers were aged 41-50 years with only 8.5% being below 30 years (Table 1). In the Counties of Bungoma and Siaya, there were no sesame farmers who were above 61 years of age. Overall, the involvement of young people in sesame production was low (8.5%) (Table 1). This is true of most farming activities in Africa where young people have recently been moving to cities to study and in search of employment besides having low interest in farming activities. The low numbers of people below 30 years being involved in sesame cultivation could also be attributed to the land tenure system in Africa. The young people may not be accessible to land since they may not have inherited land from their parents nor have money to purchase or lease their own land.

Among the respondents, females were the majority at 60.8% of those involved in sesame production and processing. Siaya County had the highest percentage of sesame female farmers (66.7%) (Table 1). In Africa, women labour in agriculture is estimated to be in the range of 60 – 80% (Palacios-Lopez, Christiaensen, and Kilic 2015) thus agreeing with the findings of this study.

Majority of the respondents (43.1%) had received education up to primary/elementary level (Table 1). A few of the respondents (16.3%) had only acquired tertiary level education of education (Table1). Busia County had the highest proportion of farmers with education up to secondary school (45.1%) (Table 1). The study also revealed that only 17.6% of the respondents had received the right information or knowledge about sesame production. Aina 2004 observed that poor access to information and training has remained a challenge to most farmers in developing countries. Ajayi, Banmeke, and Solomon 2011 reiterated that even when farmers are exposed to information, cursory observation has revealed that most disseminated information are usually given without needs assessment and identification and this has implications for capacity building. In both Bungoma and Siaya Counties, 3.9% of the farmers had received training on sesame production unlike Busia County where 45.1% of the farmers had received training (Table 1). The limited knowledge on crop production may be the factor behind the low sesame yields in the region. Most small-scale farmers such as sesame farmers of western Kenya usually receive information on crop agronomy through extension agents. Success in the adoption of most of the practices passed from extension to farmers were if the extension staff to farmer ratio was low and therefore, the extension staff were able to follow up the practices taught (Ali-Olubandwa et al. 2010). For Western Kenya region the estimated ratio of extension to farmer was considered high at, 1:400 in 2010 (Ali-Olubandwa et al. 2010). Besides these extension workers are not facilitated to enable them to reach as many farmers as possible (Ali-Olubandwa et al. 2010).

Training is thus the best way to pass this information to the farmers since most of the farmers' education level across western Kenya is at primary and below. Therefore, identifying the information needs of sesame farming households could help in solving farming households' problems and would ensure that those involved in extension services design and disseminate appropriate information to them through training. This will build competency, improve yield, profit, and improve living standards and sustainable production among sesame farming households. The problem of lack of technical and extension support services could imply that sesame farmers lack information on the appropriate practices aimed at improving production of the crop.

The findings of this study revealed that the major source of labour was women (55.6%) with the men only accounting for 37.3% (Table 1). This coupled with the earlier finding that most sesame farmers are women points out the biasness in gender involvement in sesame production. These findings are in agreement with a report by (Dalipagic and Elepu 2014) on the sesame value chain analysis in northern Uganda who noted that while the production of crops is done by both genders, most operations are normally carried out by women, while men market the crop and subsequently dictate on how revenues are spent.

Land used for sesame farming in the study region was mainly inherited (62.1%) (Table 1) which in most cases was owned by males yet they were not mainly involved in sesame farming. This limits sesame production since the men would fail to allocate or allocate smaller portions of their land for sesame farming.

Table 1: Socio-demographics, labour source and land ownership characteristics of sesame farmers from the three western Kenya Counties of Busia, Bungoma and Siaya

Variable	Characteristic	Percent (%) distribution of respondents according to their socio-demographic characteristics			
		Busia	Bungoma	Siaya	[a]Mean
Age	< 30 years	2.0	7.8	15.7	8.5
	31 - 40 years	19.6	31.4	25.5	25.5
	41 - 50 years	41.2	52.9	21.6	38.6
	51 - 60 years	25.5	7.8	37.3	23.5
	> 61 years	11.8	0	0	3.9
Gender	Male	37.3	47.1	33.3	39.2
	Female	62.7	52.9	66.7	60.8
Education Level	None	9.8	5.9	9.8	8.5
	Primary	33.3	37.3	58.8	43.1
	Secondary	45.1	29.4	21.6	32.0
	Tertiary	11.8	27.5	9.8	16.3
Information on sesame production	Informed	45.1	3.9	3.9	17.6
	Not informed	59.9	96.1	96.1	82.4
Land ownership	Own	33.3	41.2	27.5	34.0
	Inherited	62.7	54.9	68.6	62.1
	Hired	3.9	3.9	3.9	3.9
Labour source	Men	33.3	37.3	41.2	37.3
	Women	58.8	56.9	51.0	55.6
	Children	3.9	3.9	2.0	3.3
	Entire family	2.0	0	2.0	1.3
	Hired	2.0	2.0	3.9	2.6

[a]Mean value of each of the variable from the three Counties sampled

Common sesame genotypes grown by farmers in western Kenya

There were two local sesame accessions and one improved cultivar grown in the three Counties. Local white and local brown genotypes were identified by their seed coat colours. Local white was the most common genotype grown by farmers (89.5%) across the study region followed by Sudan at 7.2% and Local brown at 3.3% (Table 2). It was also observed that Local white was readily available and utilized by many consumers in the region. Sudan type is an improved cultivar that was introduced by Adventist Relief Agency (ADRA) a non-governmental organization under a project aimed at producing organic sesame. The Sudan type cultivar was exclusively found in Busia County whereas the Local brown was mainly found in Siaya County (Table 2). The preference for the white seeded sesame genotypes could be attributed to the premium prices in the market. Generally, white seeded sesame genotypes fetch higher prices in the market as compared to the dark coloured sesame genotypes (Pandey, Das, and Dasgupta 2013). White sesame seeds could also be preferable due to their high quality and high oil content than pigmented cultivars as reported in other regions of the world (Hassan 2012). Studies from Eastern India indicated that white seeded sesame is sold at a price at least 30% higher than that of brown seeded or black seeded cultivars because of consumer's preference and greater culinary utility (Chakraborty, Maiti, and Chatterjee 1984).

Table 2: Common sesame genotypes grown by farmers and their seed sources in the three western Kenya Counties of Busia, Bungoma and Siaya

Genotype and seed source	Description	Percent (%) distribution of farmers planting the sesame genotype and their seed sources			
		Busia	Bungoma	Siaya	[a]Mean
Genotype	Local White	76.5	100	92.2	89.5
	Local Brown	2.0	0	7.8	3.3
	Sudan	21.6	0	0	7.2
Seed source	Grain market	64.7	70.6	64.7	66.7
	Farmer own saved	35.3	21.6	17.6	24.8
	Commercial seed merchants	0	5.9	2.0	2.6
	Friends	0	2.0	5.9	2.6
	Others	0	0	9.8	3.3

[a]*Mean value of each of the genotype and seed source from the three Counties sampled*

Results on sesame seed sources indicated that majority of farmers purchased seed either from the grain market or saved their own grain to use as seed stocks (Table 2). Overall, the largest proportion (66.7%) of the respondents bought their planting material from markets while 24.8% of the respondents saved part of their produce for planting in the next season (Table 2). This observation agrees with that of (Were et al. 2006) who observed that the reason for low sesame yields is lack of improved cultivars for use by the farmers in East Africa since most farmers purchased traditional sesame landraces from the local markets. A very small proportion of farmers obtained their seed from commercial seed merchants (Table 2). These finding also agrees with a number of research work elsewhere. For instance, in Ethiopia it has been shown that farmers have no access to improved sesame cultivars and access to quality seed of available cultivars appears to be very limited (van der Mheen-Sluijer and Cecchi 2011). A study in Kenya, Tanzania and Uganda recently also revealed that 60-80% of smallholder farmers depended on own saved seed or seed obtained through informal systems such as exchanges between farmers, community sharing systems and local markets (Vernooy 2016). In another study, McGuire and Sperling (2016) indicated that 90.2% of farmers from six African countries (Kenya included) accessed their seed from informal systems with 50.9% of them deriving their seed from the grain markets.

Agronomic practices

The study revealed that farmers utilised three methods of land tillage (ox-plough, hand and tractors) in the surveyed Counties. The use of ox-plough method was the most commonly utilised method at 54.9% followed by hand cultivation at 35.9% whereas a small proportion (2.6%) of farmers mentioned that they used tractors to cultivate their land (Table 3). Hand cultivation was common in small land sizes and in steep areas where the use of oxen was not feasible. Conventional tillage involves the mechanical soil manipulation of an entire field, by ploughing (inverting the soil) followed by one or more harrowing (Karuma et al. 2014). The findings of this study is in line with those reported elsewhere in Kenya where most common conventional tillage practiced involves the use of hand hoes, ox-drawn mould board ploughs, tractor-drawn and disc ploughs (Gachene and Kimaru 2003). Due to fragmented farms, the level of mechanization in most African land holding systems is generally not feasible. Fragmented land holdings also tend to limit scale dependent agricultural technologies such as mechanization and integrated pest management (Mwangi and Kariuki 2015). Small land holdings limit the availability of land needed to be dedicated to a new technology.

Table 3: Characteristics of sesame agronomic practices by farmers from the three western Kenya Counties of Busia, Bungoma and Siaya

Practice	Description	Percent (%) distribution of farmers using the agronomic practice			
		Busia	Bungoma	Siaya	[a]Mean
Tillage	Ox-plough	58.8	51.0	54.9	54.9
	Hand	37.3	47.1	23.5	35.9
	Tractor	3.9	2.0	2.0	2.6
	Others	0	0	19.6	6.5
Cropping system	Mono-cropping	98.0	72.5	70.6	80.4
	Inter-cropping	2.0	27.5	29.4	19.6
Method of planting	Row	76.5	62.7	43.1	60.8
	Broadcasting	23.5	37.3	56.9	39.2
Planting time	Long rains	29.4	47.1	64.7	47.1
	Short rains	39.2	52.1	17.6	36.6
	long and short rains	31.4	0	17.6	16.3
Fertilizer use	Fertiliser use	9.8	31.4	15.7	19.0
	No fertiliser	90.2	68.6	84.3	81.0

[a]*Mean value of each of the agronomic practice from the three Counties sampled*

Among the respondents in the three Counties, 80.4% planted sesame as a mono-crop while 19.6% practised intercropping (Table 3). Busia County had 98% of the farmers planting sesame as a sole crop, Bungoma at 72.5% and 70.6% in Siaya. For the farmers who practised intercropping, small land sizes were mentioned as the main reason why farmers practised intercropping. Beans, sorghum and groundnuts were mentioned as the crops that were commonly intercropped with sesame.

The survey sought information on the time at which the farmers planted sesame. This study also revealed that sesame was planted at different times of the year in the region. The crop was planted during the long rains (March - July), during the short rains (August - October) or during both long and short rains season (Table 3).

On whether the respondents used or did not use fertilizer when planting sesame, the study revealed that a majority of the respondents (81%) did not use any fertilizer at all when growing sesame (Table 3). The reasons attributed for not using fertilizer varied with some farmers citing that their soils were fertile and that they obtained satisfactory yields without the use of any fertilisers. The farmers who used fertilisers claimed that fertiliser application improved sesame yields. Among the fertilisers that were being utilised were di-ammonium phosphate that was applied during planting and calcium ammonium nitrate applied as top-dress when the plants were about one month old. In spite the belief by farmers that sesame can perform well without application of fertilisers, studies have shown that the crop responds well with the applications of organic or inorganic fertilizers (Olowe and Busari 2000; Haruna and Abimiku 2012; Okpara, Muoneke, and Ojikpong 2007). Application of Nitrogen and phosphorus has been reported to affect all the growth and yield attributes of sesame especially seed (Olowe and Busari 2000). Seed oil content is also significantly influenced by nitrogen and phosphorus application (Olowe and Busari 2000). Failure by some farmers to apply any form of fertilisers could be attributed to lack of information on the benefits of fertilisers by framers.

Among the planting methods adopted by farmers in the region, a majority of the farmers practiced row planting at 60.8%, whereas 39.2 % of the respondents broadcasted their crop (Table 3). Row planting was practised more by farmers in Busia (76.5%) and Bungoma (62.7%) Counties whereas in Siaya only 43.1% of the farmers planted sesame in rows (Table 3). The respondents mentioned that row planting eased other farm activities such as weeding and harvesting as compared to when the crop was broadcasted. The inter-row spacing used by farmers varied among the farmers ranging from 15 to 45 cm with seed being sown thinly along the furrows. The farmers who preferred broadcasting over row planting mentioned that it was cheaper to plant sesame by broadcasting as it required less labour and that they lacked equipment to use in row planting. Sowing by broadcasting leads to non-uniform plant stands thus influencing yields negatively. Since there is no standard recommended spacing for sesame in Western Kenya, future efforts need to be put in establishing an optimum plant density for optimum sesame yields.

Biotic factors affecting sesame production

Broad-leaved weeds were mentioned as the most predominant weeds in the region with a prominence of 34.6% and 30.1% respectively (Table 4). However, the frequency of different weed groups varied in the three counties (Table 4). Weeds compete for resources with the main crop thus affecting its performance. In particular sesame are reported to be sensitive to weed competition during their early growth stages (Terefe et al. 2012).

Table 4: Common weeds in sesame fields in the three western Kenya Counties of Busia, Bungoma and Siaya

Weed group	**Percent (%) distribution of weed groups**			
	Busia	**Bungoma**	**Siaya**	**[a]Mean**
Broad-leafed	7.8	33.3	62.7	34.6
Grass	9.8	58.8	21.6	30.1
Striga	19.6	7.8	9.8	12.4
Grass and striga	41.2	0	5.9	15.7
Broad-leafed and grass	21.6	0	0	7.2

[a]*Average value of each of the weed type from the three Counties sampled*

The presence of diseases affecting sesame was reported by 16.3% of the farmers. However, the farmers who reported the presence of diseases in their crops were unable to identify the disease and said that they did not apply any management measures to these diseases. Sesame is affected by several diseases the major ones being Fusarium wilt (*Fusarium oxysporum* spp. Sesame), leaf spot (*Alternaria sesame*), bacterial leaf spot (*Pseudomonas syringae* pv *sesami*) and bacterial blight (*Xanthomonas campestris* pv. sesame). Previously in western Kenya white leaf spot (*Cercospora sesame*) and angular leaf spot (*Cercospora sesamicola*) were reported to be the most severe foliar diseases in sesame (Nyanapah, Ayiecho, and Nyabundi 1995). There was no mention of pests affecting sesame in the study region although within East Africa, certain pests have been identified to be limiting sesame production. In Uganda sesame webworm (*Antigastra catalaunalis*) and sesame gall midge (*Asphondylia sesami*) (Okidi 2002; Ssekabembe *et al.,* 2006) were reported to be the major pests of sesame whereas in Ethiopia, sesame webworm was also a major pest of sesame (Zerihun 2012).

Sesame seed yields and post-harvest handling

The survey revealed that 59.4% of farmers in western Kenya obtained seed yields below 400 kg/ha with the rest (10.6%) obtaining seed yields above 600 kg/ha (Fig.1). Sesame yields in the region were very low as compared to the potential research yields of 2230 kg/ha. These findings agrees with earlier reports by Ayiecho, Ong'Injo, and Ayiecho 2009, who reported that sesame seed yields among Kenyan farmers averaged 400 kg/ha. The low yields could be attributed to poor crop management, lack of motivation amongst farmers due to the low market prices and unimproved sesame cultivars as observed during the survey. Other factors that could be attributed to the low sesame yields in Western Kenya could be due to low yielding sesame cultivars, saline soils, poor drainage, weeds, diseases and insect pests as observed in Uganda (Ssekabembe e*t al.*, 2001).

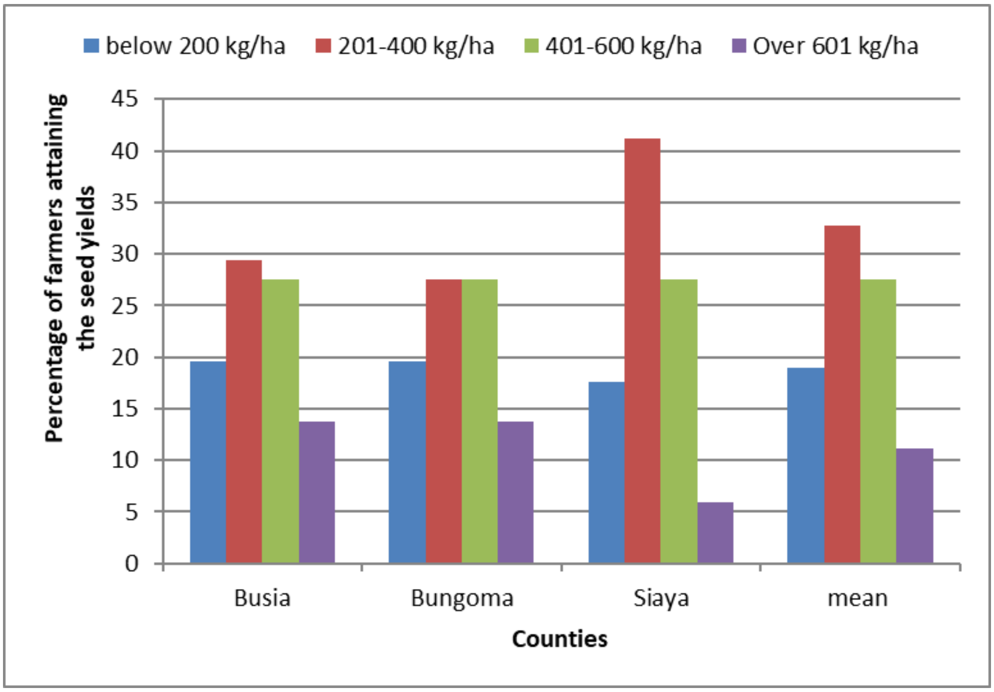

Figure 1: Sesame seed yields (Kg/ha) across the three counties of Western Kenya. The mean represents the mean seed yields from the three Counties of Busia, Bungoma and Siaya. Mean represents the mean value of each of the yield ranges from the three Counties of Busia, Bungoma and Siaya

Sesame post-harvest handling

Sesame farmers in the study region harvested their crop when the stem changed colour to brown and when the lower capsules begin to dry. The stems were manually cut at the base of the stem and hanged to dry on traditional driers that are either shaded or exposed to the sun. After drying, the pods are threshed by beating using sticks and the seed obtained either sold immediately or stored. Among the respondents, 75.8% stored the threshed and dried sesame seed in gunny bags just like other grains while the rest of the produce was sold after threshing (Figure 2). The need for money for family use was the reason behind immediate sell of the produce. For those farmers who stored their produce, 53.6% of the respondents reported that they faced storage challenges while 46.4% reported no challenges (Figure 2). Some of the storage challenge faced by farmers included lack of storage space and damage of seeds by rodents.

Sesame farmers in western Kenya are subsistence hence have limited income thus any of the produce that they do not utilise would be readily sold regardless of the prevailing market prices. Besides storage challenges faced by farmers make the farmers to dispose their produce immediately it is harvested.

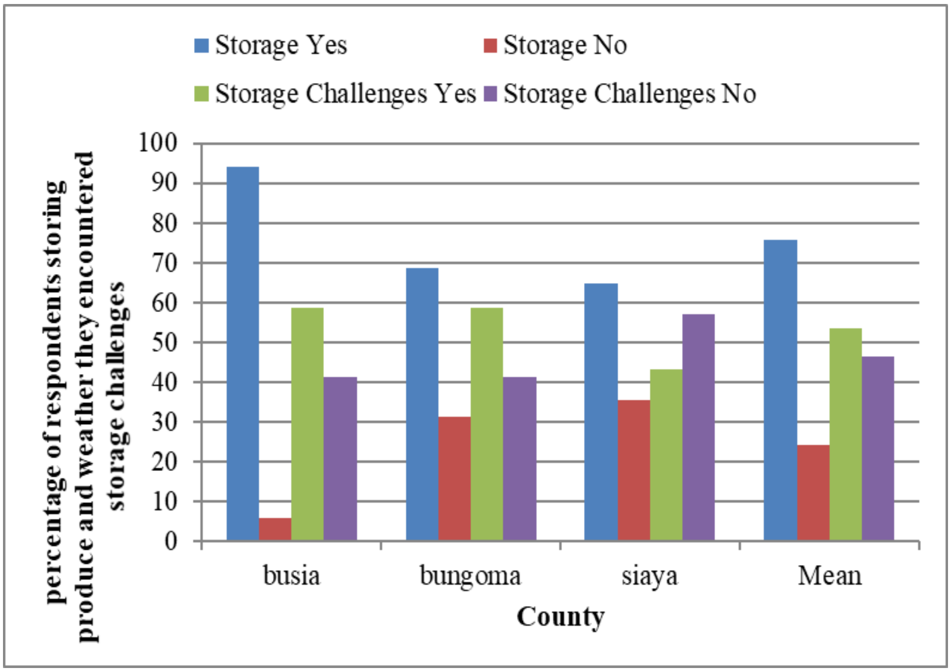

Figure 2: Sesame storage and storage challenges faced by farmers across the three Counties of Western Kenya. The mean represents the observations from the three Counties of Busia, Bungoma and Siaya.

Sesame consumption

This study revealed that a majority of the respondents (71.2%) produced sesame for both commercial and subsistence purposes (Table 5). Among the farmers who produced sesame for subsistence purposes, 79.1% of them preferred sesame to animal protein while 20.9% preferred animal proteins. Some of the reasons that could be attributed to the preference of sesame to animal proteins was due to the affordability of sesame and also the wide perception that sesame is rich nutritionally and also that they also have some health benefits. It is therefore envisaged that market demand for sesame would likely increase because of the increasing knowledge on the dietary health benefits of sesame (Were et al. 2006).

On the preferred frequency of sesame consumption, the study revealed that if sesame supply was unlimited, the respondents would prefer to consume sesame daily at 30.7%, once per week 24.8%, twice per week 22.3% and more than twice per week at 22.2% (Table 5).

Among the respondents, none reported that they had allergy from consuming sesame contrary to the findings of (Asghar, Majeed, and Akhtar 2014) who reported that during the last five decades, there has been evidence of increased sesame allergy especially with people from developing countries. The reported form of sesame allergenicity was the systemic anaphylaxis which is often expressed as hypersensitivity to sesame proteins and the second one was the delayed contact allergic dermatitis expressed as sensitivity to lignin-like

Table 5: Sesame cultivation purposes, consumption preference and the preferred frequency of consumption in western Kenya counties of Busia, Bungoma and Siaya

Sesame cultivation and consumption	Characteristic	Percentage (%) of respondents			
		Busia	Bungoma	Siaya	[a]Mean
Purpose of cultivation	Commercial	5.9	5.9	2.0	4.6
	Subsistence	19.6	23.5	29.4	24.2
	Both	74.5	70.6	68.6	71.2
Sesame preference as a protein source	Sesame	66.7	92.2	79.1	79.1
	Animal Protein	33.3	7.8	20.9	20.9
Preferred frequency of sesame consumption	Daily	27.5	25.3	39.2	30.7
	Once a week	35.3	11.8	27.5	24.8
	Twice a week	21.6	27.5	17.6	22.3
	More than twice a week	15.7	35.3	15.7	22.2

[a]Mean value of each of the purposes of cultivation and consumption preferences in the three Counties sampled

CONCLUSION

Sesame production in the study areas was carried out by small scale farmers for both home consumption whereas the surplus was sold at local markets. The yields realized were low as compared to the research potential yields. As a result, sesame has not been attached much value hence sesame farmers in the region allocated small portions of their lands to the crop and production left mainly to women and children. Additionally, small land sizes, lack of improved cultivars and low use of inputs in the region play a significant role in contributing to low sesame yields per unit area as compared to other sesame growing countries.

Limited genetic diversity is available among the sesame genotypes grown in western Kenya. The limited genotype diversity limits farmers on the availability of a variety of sesame cultivars that they can choose from and utilize.

Since sesame has been accorded least attention in the region, there has been limited provision of extension services on sesame production to farmers. In order to improve sesame production and utilization in this region, there is need to train farmers on sesame production particularly on good agronomic practices, cultivation of improved sesame genotypes, value addition and strengthening post-harvest handling. Moreover, there is need to develop proactive interventions aimed at improving sesame production for food security and betterment of livelihoods.

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