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Impact of Sesame Value Chain on Food Security of Smallholder Farmers in Magwi County, South Sudan

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Abstract: The purpose of this study were to identify how sesame contributed to food and nutrition security of smallholder farmers' households in Magwi County, South Sudan. A total of 409 households in the study areas in Magwi County were interviewed using structured household questionnaires. The results of this study showed that sesame crop harvested in 2024 was used in three ways, for market sales, reserved as food for consumption and as seeds for planting in 2025 respectively. Sesame seeds were sold to obtain cash income which were used to meet household's expenditures on food and drinks and non-food expenditures. The findings indicate that sesame is one of the most important crops which was used by households for direct consumption in 2025, the recycled seeds were to be used for planting in 2025 and expected to contribute to improved food security in 2025/2026. Approximately, about 40% of households have poor food consumption score (FCS), 32% have borderline, while 28 % have acceptable FCS. In this context there is the need for government, NGOs and development partners to support and strengthen the sesame value chain including production as well as value addition to enhance their positive impact on the food and nutrition security of smallholder's farmers.

Keywords: *Sesame, Value Chain, Food and Nutrition Security, Smallholderfarmer.*

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I. INTRODUCTION

South Sudan produces a large variety of agricultural commodities for local consumption including cereals, pulses, legumes, oil seeds, roots/tubers Coffee, tea, sugar and tobacco are also produced but on a small scale. Nonetheless, the majority of farmers cultivate small areas, average of one to three Feddans of land (0.4 to 1.2 hectares) (JICA, 2015). South Sudan total net national dependency (reliance on imports) of cereals is 49.8 percent, followed by livestock at 29.7 percent. Legumes, vegetable and oilseed dependency is 16.5 percent of the net national dependency with remaining four percent belonging to various other food sources such as fruits (World Bank, 2019). South Sudan IPC (2020) contended that low crop production was one of the important factors that contributed to food insecurity, with the 2019 cropping season production meeting 63% of the 2020 national cereal needs (comparatively, 2018 cereal production met 57% of the 2019 national cereal needs).

According to The Social Science in Humanitarian Action Platform-SSHP (2024), between 2019 and 2023 more than half of people in South Sudan (54%) were food insecure, as defined under the Integrated Food Security Phase Classification (IPC) three or higher. Phase 3 classification of this standardised scale for measuring food insecurity means the population are in crisis mode and are barely able to meet their minimum food needs The causes of food insecurity includes extensive flooding, conflict and, low agricultural productivity that resulted from crop pests and diseases and the erratic weather patterns in South Sudan. Similarly, FEWS Net (2024) maintained that the key drivers of food insecurity in South Sudan among others include armed conflict and intercommunal violence in several hotspot areas in the country, the high burden of over 720,000 refugees and returnees from Sudan people and the overall poor performance of the March-to-May 2024 first rainy season in terms of spatial and temporal distribution. Other contributing factors to food insecurity include the deepening macroeconomic crisis which is driving high import inflation, volatility and deterioration in the exchange rate, rising costs of

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living, and disruption to economic activity. The low market supplies and high and rising food and non-food prices including fuel are eroding the purchasing capacity of many market-dependent poor households, and limiting their financial access to food.

The South Sudan IPC (2020) reported that according to the IPC Acute Malnutrition (AMN) scale, in January-April 2020, Budi, Kapoeta North (Eastern Equatoria state) were classified as Critical (GAM 15.0-29.9%). While Ikotos, Kapoeta South, Magwi, Torit, (Eastern Equatoria), were classified as Serious (GAM 10-14.9%). The major factors contributing to acute malnutrition in South Sudan include very poor quality and diversity of food (Minimum Acceptable Diet: 5%, Minimum dietary diversity: 17%) and an unexpectedly high prevalence of diseases (above 50%) attributed to flooding that has worsened the spread of malaria and unsafe drinking water. Acute Malnutrition (Phase 3 and above) also contributed to acute malnutrition in some counties. Outbreaks of measles in some counties, such as Budi and Aweil South, also had an impact on the nutrition situation in these counties

II. MATERIALS AND METHODS

➢ *Study Area and Selection of the Surveyed Sites*

The study was carried out in Owinykibul locality in Magwi Payam and in Pajok Payam of Magwi County, Eastern Equatoria State, South Sudan. Magwi County fall in Longitudes: 31.715° E and 32.887° E, and Latitudes: 3.3.497° N and 4.395°N. Its altitude ranges from 514-2,223m above sea level. The County borders Republic of Uganda in the Southwest. The County covers an area of 5,202 km with a population of about 296,326 persons as at 2020 (National Bureau of Statistics, NBS 2015). Magwi Payam has a population of 72,823 (36,604 males and 36,219 females), while Pajok Payam has 37,300 persons (18,748 males and 37,300 females). The zone has a bi-modal rainfall pattern with two reliable seasons and average annual precipitation of 1100-1600 millimetres (mm); although the seasonal averages range 600-900 mm each season (FEWS NET, 2018).

➢ *Sampling Procedure and Sample Size*

The study used random sampling to select samples from the population in the study areas. The specified samples of household heads were selected randomly, using probability proportionate to size, i.e. 203 for Pajok Payam and 204 for Magwi Payam. The required sample size determined using Yamane's (1967) formulae, at 95% Confidence Level with +/- 7% level of precision to represent the population. n=N/1+N(e2). Where **n**= is the sample size N=Population in the selected Payam e=level of precision (0.07).

➢ *Data Collection*

The data collection was conducted in Pajok Payam and in Owinykibul locality in Magwi Payam Magwi between 22 January to 31 January 2025. The enumerators used KOBO Collect to obtain primary data from 409 households; 223 households in Pajok Payam and 186 in Magwi Payam. Structured household questionnaires were used for face to face interviews with households' representatives. In addition, quantitative surveys were conducted with traders/distributors, processors, consumers and end-users (restaurants). On the other hand, qualitative surveys were conducted with the Director for Agriculture and Forestry, Principal Magwi College of Agri-Business and Management, local community members and a farmers' cooperative society.

Summer (2020) maintained that productivity of sesame in South Sudan remains low and fragmented, due to a combination of lack of production inputs, lack of access to extension services, minimal policy intervention, and low yields. Other constraints of the sesame value chain include inadequate land preparation, inadequate storage and processing facilities, no proper national policy regarding sesame, and lack of adequate national standards.

Therefore, this study strives to assess the contribution of sesame value chains to food and nutrition security of smallholder farmers in the study areas in Magwi County. The specific objectives of this study are to: i. describe the socioeconomic characteristics of the respondents in the study areas, ii. determine how sesame value chain, contribute to food and nutrition security of smallholder farmers' households in the study areas, iii. review the prevailing constraints and challenges to sesame production and value addition, iv. Make suggestions to overcome constraints and challenges in production and value addition to sesame crop.

➢ *Data Analysis*

Data from the household interviews was analysed using SPSS and MS Excel. The cleaned quantitative data were subjected to descriptive analysis. Simple descriptive statistical techniques like frequency distribution, percentages and mean were administered for quantitative data analysis using computer software tools. The latest version of SPSS was used be used for the data analysis. Value chain analysis approach was also used to analyse survey data. Value chain analysis is a process that involved, data collection and research, value chain mapping, analysis of opportunities and constraints, and recommendations for future actions.

III. RESULTS AND DISCUSSION

➢ *Socio- Economic Characteristics of the Respondents*

As shown in Table 1, a total of 409 households were interviewed in Magwi County; 186 in Owinykibul locality of Magwi Payam and 223 in Pajok Payam.186 (45.5%). About 34.2% of households were in the 25-34 years' category, 29.4% were 35-44 years old, while 20.7% were in the 45-54 years' age bracket. On the other hand, 8.3% and 5.9% of households were of ages 55-64 years and 18-24 years respectively and 1.4% were 65 years and above.

The majority (82%) of household heads were married (88% males;73% females), whereas 6% were separated and never married/single respectively. On the other hand, 4% of household heads were divorced and 3% were widowed.

About 13.4% of household heads never attended an education programme, 25.9% of household heads completed secondary education, while 19.1% did not complete. Only about 2.9% of household heads had some college or

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university education and similarly, 2.4% of household heads had vocational (Diploma), while 1.7% had vocational (certificate).

Approximately 53.3% of respondents had household sizes of 4-6 adults (18 years and above), 32.0% mentioned 1-3 members, while 12% had 7-9 members. Only 1.5% and 1.2% of households had 10-12 and more than 13 adults respectively. The mean number of adults (18 years and above) in the household was 4.6 persons. Nationally, the average household size was found to be 7.3 members with most households having between 6 and 9 members (WFP, FAO and UNICEF, 2025). The low mean of 4.6 adult members in the households in the study area could have implication in their access to adequate family labor for agricultural and other livelihood activities.

Table 1 Socio-Economic Characteristics of the Respondents

Characteristics	**Total (*n* = 490)**	
Sex	Freq	Percent
Male	241	58.9%
Female	168	41.1%
Age (years)		
18-24 years	24	5.9%
25-34 years	140	34.2%
35-44 years	120	29.4%
45-54 years	85	20.7%
55-64 years	34	8.3%
65 years and above	6	1.4%
Marital status		
Married	334	82%
Widowed	11	3%
Divorced	15	4%
Separated	25	6%
Never married/single	24	6%
Education		
Never attended an education programme	55	13.4%
Some primary education (no completion)	68	16.6%
Primary completed	73	17.8%
Some secondary (no completion)	78	19.1%
Secondary completed	106	25.9%
Vocational (Certificate)	7	1.7%
Vocational (Diploma)	10	2.4%
Some College or University (no completion)	12	2.9%
Family size		
1-3	131	32.0%
4-6	218	53.3%
7-9	49	12.0%
10-12	6	1.5%
More than 13	5	1.2%

Source: Field survey, 2025

➢ *Contribution of Sesame Value Chain to Food and Nutrition Security of Smallholder Farmers' Households*

- *Quantity of Sesame Sold and Income Earned*

Aproximately,14.7% of households earned SSP 500,000- less than 750,000, 11.0% obtained SSP 750,000 - less than 1,000,000, while 10.5% reported incomes of SSP 1,000,000-less than 1,250,000 4from the sales of sesame seeds in the past 10 months. The mean income realized by households from the sales of sesame during the 10 months' period was about SSP 1,111,100 SSP. Rapsomanikis (2015) stated that the four broad sources of income for small holder farmers include: crop and livestock production; off-farm agricultural labour; labour in the non-farm sector; and transfers and remittances.

- *Household Expenditure on Food*

The four main items on which household expended most of their incomes were medical bills (84%), food and drinks (80.2%), clothing and foot wear (76.8%) and educational expenses/school fees (65.7%). Other minor items of expenditures included, home repairs (32.1%), buy airtime top-ups (24.9%), furnishing, household equipment (10.6%), investment in non-farm income generating ventures (e.g. buying a sewing machine, building brick kiln, etc) and making large purchase (such as, car, bicycle, motorcycle) at 6.7% respectively.

The average per capita monthly expenditure in South Sudan was 29,188 SSP at the time of data collection, including an average of SSP 21,265 SSP (72.8%) on food expenditure and SSP 8,054 (27.6%) on non-food expenditure

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(WFP, FAO and UNICEF, 2025). A household's ability to purchase food in the marketplace is a critical determinant of food access, which in turn depends on the household's ability to generate income (Woller *et al.,* (2011). For a developing country like Nigeria, the household's expenditure pattern is skewed towards food i.e., food is higher than the non-food items. households' expenditure pattern in 2019. At the national level in Nigeria, 56.65% (60.2% in 2009/10) of total household expenditure in 2019 was spent on food with the balance of about 43.35% (39.8 % in 2009/10) spent on non-food items. Household expenditure on non-food items were directed mostly at transport, health, education and services rent and fuel and light, accounting for a combined 79.40% of non-food expenditure (Omotoso AB et al., 2022)

The findings of the study showed in the study area in Magwi County that food and drinks was the second most important item of household expenditure and the allocation of 80.2% of household income to buy food for consumption across the study areas to a large extent contributed to their house hold food security.

Table 2 Household expenditures in the past 12 months

Household expenditure	Frequency	%
Food and drinks	325	80.2%
Clothing and food wear	311	76.8%
Medical bills	340	84.0%
Transport (minibus, Bodaboda& special hire)	90	22.2%
Investment in farming business (e.g. purchase oxen, ox-plough, treadle foot pump, hand tools)	72	17.8%
Investment in non-farm income generating ventures (e.g. buying a sewing machine, building brick kiln, etc)	27	6.7%
Home repairs	130	32.1%
Educational expenses, school fees	266	65.7%
Make a large purchase (such as, car, bicycle, motorcycle,)	27	6.7%
Buy airtime top-ups	101	24.9%
Furnishing, household equipment,	43	10.6%
Contributions to social occasions (e.g. weeding, church, burials,)	29	7.2%
Other	3	0.7%

Source: Field Survey, 2025

- *Food Availability and Access at Household Level (2014 Sesame Harvest Reserved for Consumption in 2025)*

The majority (72.6%) of respondents commented that they reserved under 200 kilograms of sesame from their 2024 harvest for their household consumption in 2025. Whereas, 8.6% and 2.4% of households indicated that they put aside 200-less than 400 kg and 400-less than 600 kg of sesame for consumption respectively. The findings of the study showed that the mean quantity of sesame harvested in 2024 and put aside for consumption by a household was 236.6 kilograms. This quantity of sesame will be used by households for consumption in 2025 and thus will be expected to contribute to their food security.

Table 3 Quantity of Sesame Put Aside for Household Consumption in 2025

Quantity of the sesame (in Kg) harvested in 2024 (between October 2024 and November 2024) was put aside for household consumption in 2025	Frequency	Percentage
0 Kgs	30	7.3%
Under 200 kg	297	72.6%
200-less than 400 kg	35	8.6%
400-less than 600 kg	10	2.4%
600-less than 800 kg	2	0.5%
800-less than 1,000 kg	2	0.5%
1,000-less than 1,200 kg	6	1.5%
1,200 -less than 1,400 kg	5	1.2%
1,400 -less than 1,600 kg	3	0.7%
1,600 kg and above	19	4.6%
Total	409	100.0%

Source: Field Survey, 2025

- *Quantity of sesame (in Kg) Harvested in 2024 (Between October 2024 and November 2024) and Reserved as Seeds for Planting in 2025*

The majority (83.0%) of households reserved from the 2024 harvest under 200 kilograms as recycled seeds for 2025 cultivation season, while 3.4% put aside 200-less than 400 kg. The mean quantity of the harvested sesame that was reserved as seeds for planting in 2025 was 119.8 kg.

This quantity of home saved sesame seeds is expected to be used as inputs in lieu of market purchases for planting in 2025. The recycled seeds will be planted by households facilitate improved access to production inputs and this is expected to engender increased production and productivity of sesame crop. At a higher seeding rate of 4kg/Feddan, the reserved sesame seeds of 119.8 kg could be used to plant 30 Feddans with sesame. Considering the estimated average

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sesame yield of 300 kg/ha or 126 kg/Feddan for South Sudan, the total production could amount to 3,780 kgs assuming favorable agro-climatic conditions for vegetative growth and production. The expected increased production of sesame will most likely translate into improved food availability and access for smallholder farmers and hence contribute to their household food security.

Table 4 Quantity of Sesame Reserved as Seeds for Planting in 2025

Quantity of the sesame (in Kg) harvested in 2024 (between October 2024 and November 2024) and reserved as seeds for planting in 2025?	**Frequency**	**%**
0 Kgs	27	6.6%
Under 200 kg	341	83.%
200-less than 400 kg	14	3.4%
400-less than 600 kg	7	1.7%
600-less than 800 kg	1	0.2%
800-less than 1,000 kg	1	0.2%
1,200 -less than 1,400 kg	2	0.5%
1,400 -less than 1,600 kg	2	0.5%
1,600 kg and above	14	3.4%
Total	409	100.0%

Source: Field Survey, 2025

- *Contribution of Cultivated Crops to Household Food Security in the 12 Months (January 2024-January 2025)*

Households were asked to indicate their perception of the contribution of assorted crops they cultivated in the past 12 months (January 2024-January 2025) to their food security. The nine (9) crops that were cultivated by households were sesame, beans and cowpeas, sorghum, maize and cassava, sweet potatoes, soybeans and pigeon peas.

As illustrated in the Table below, the four crops with very high contributions to household food sources were sesame (48.5%), beans (48.0%), Pigeon peas (29.1%:) and sorghum (12.9%), The findings of the study show that sesame was the prime contributor to household food availability and access and hence food security.

Table 5 Contribution of Sesame and Other Crops to Household Food Security

Crop	**Very high Contribution**
Sesame	48.5%
Beans	48.0%
Cowpeas	9.1%
Sorghum	12.9%
Soybeans	9.1%
Maize	4.6%
Cassava	3.4%
Sweet potatoes	10.6%
Pigeon peas	29.1%

Source: Field Survey, 2025

- *Household Food Consumption*

Individual quantitative surveys were conducted with nine households in the study areas in Magwi County. When asked which of the sesame products they usually consume in their households, 100.0% of respondents said local sesame paste/butter, 77.8% mentioned local sesame oil, while 66.7%% of respondents cited local Halwa simsim/ confectionery, sweeten cake and sesame seeds (after processing) respectively. Meanwhile, 55.6% of respondents reported that they consume Tahania (imported) and 44.4% said they usually consume imported packed sesame oil and local roast packed sesame seeds respectively.

Sesame has exceptional source of high-quality oils; it is stable and free from undesirable fat and flavour components. Its oil possesses natural antioxidants which is important for vital organs of the body such as the heart and liver and also prevents aging (Oyedepo E.O. and. Evbuomwan G.O.,2024). In Ethiopia, farmers consume limited quantity of sesame, thus directly contributes to the food security at the household level. Consumers in both local and national markets purchase oilseeds for consumption both processed and unprocessed ones. Local consumers are the end users of both sesame seed and edible sesame oil (SID-Consult-Support Integrated Development, 2020). Whereas, in Uganda, sesame is largely locally consumed in variety of ways, including sesame ground into paste, made into stew and consumed with other foods such as the popular smoked meat (CASA, 2020). In Somalia, DAI (2019; cited in SCALA, 2024), stated that only 25 percent of sesame seed produced in Somalia is exported, while the rest is consumed internally as seed or edible oil.

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Table 6 Consumption of Sesame Products by Households (HHs)

Sesame products	HH1	HH2	HH 3	HH4	HH5	HH6	HH7	HHk8	HH9	Total	
										n	%
Local sesame oil	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	7	77.8%
Imported packed sesame oil	1	1	No	1	No	No	No	1	No	4	44.4%
Local sesame paste/butter	1	1	1	1	1	1	1	1	1	9	100.0%
Imported packed sesame paste	1	0	0	0	0	0	0	0	0	1	11.1%
Tahania (imported)	1	1	1	1	0	0	0		1	5	55.6%
Local Halwa simsim	1	1	1	0	0	1	0	1	1	6	66.7%
Local roast packed sesame seeds	1	0	1	0	0	0	0	1	1	4	44.4%
Sesame seeds (after processing)	1	1	1	1	0	0	0	1	1	6	66.7%

Source: Field Survey, 2025

There was moderate mean household consumption of the following food items within the last 7 days: vegetables (4.62 day), oil and fats (4.0 days) and main staples (3.69 days). On the other hand, there was low mean consumption of sugar (2.98 days), pulses/beans (2.27 days), fruits (2.41 days). Whereas, there was very low mean household consumption of meat/fish (1.50 days) and milk and dairy products (0.94 days) respectively within the last 7 days.

WFP, FAO and UNICEF (2025), pointed out that the average number of days in a week households consume various food groups at the national level were as follows: staples foods (e.g. maize, sorghum, cassava, rice, millet, etc (4.2 days); vegetables, e.g. spinach, onion, tomatoes, carrots, peppers, lettuce, okra, etc- (2.9 days); milk and other dairy products, e.g. yoghurt, cheese (1.5days); while fish, fruit, meat, and eggs were generally consumed. infrequently.

Table 7 Frequency of Consumption of Food Items from Nine Food Groups

Food Consumption (number of times in the last 7 days your household members eaten the below foods	Mean	Median	Mode	Standard deviation
a. Main staples (Cereals; tubers; plantains etc.)	3.69	3.00	7.00	2.43
b. Pulses/beans, peas, lentils, groundnuts and cashew nuts	2.47	2.00	3.00	1.41
c. Vegetables and leaves (e.g. tomatoes)	4.62	5.00	7.00	2.25
d. Fruits (oranges, papaya, etc.)	2.41	2.00	2.00	1.69
e. Meat/fish (beef, goat, chicken, ducks, eggs and fish kidney)	1.50	1.00	1.00	1.66
f. Milk and dairy products (fresh milk, yogurt cheese and other dairy)	0.94	0.00	0.00	1.55
g. Sugar, sugar products, honey	2.98	3.00	3.00	1.92
h. Oil and fats (oil, butter, ghee)	4.04	4.00	7.00	2.42

Source: Source: Field Survey, 2025

- *Food Consumption Score*

The Food Consumption Score (FCS) is one of the measures of food security at the household level. It is meant to reflect the quality and quantity of food accesses at the household level. The FCS is a frequency weighted diet diversity score calculated using the frequency of consumption of nine (9) food groups consumed by a household during the 7 days before the survey. The nine food groups are a) main staple (cereals), b) pulses and legumes, c) vegetables, d) fruits) meat/fish, f) milk and milk products, g) sugar, h) oil and fats (WFP, 2009).

The Table below shows the Food Consumption Score (FCS) for the assessed households in the study areas in Magwi County, Eastern Equatoria State and the results indicate that about 40% of households have poor FCS Poor (<=21), 32% have borderline FCS 2 (>21 & <=35).and 28 % has acceptable FCS (>35). In Eastern Equatoria State, in 2024 (June 27, 2024 - Sep 11, 2024), 32% of households had poor food consumption and an additional 42% had borderline food consumption, while 26% had acceptable food consumption score (WFP, FAO and UNICEF, 2025).

Similarly, in August 2020, about 72% of households in South Sudan were confronted with inadequate food consumption (31% had borderline food consumption and 41% had poor food consumption). On the other hand, 28% of households had acceptable FCS. The high proportion of households with inadequate food consumption is reflective of insufficient dietary and nutrient intake. The inadequate food consumption is likely the consequence of diminished livelihoods and incomes, coupled with high prices of food items which reduces household level access to staples (WFP, FAO and UNICEF, 2021)

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Table 8 Household Food Consumption Score (FCS)

Food Consumption	Male Headed Household		Female Headed Household			Total
	Frequency	%	Frequency	%	Frequency	%
Poor(<=21)	96	23.5%	67	16.38%	163	40.0%
Borderline(>21 & <=35)	75	18.3%	57	13.94%	132	32.0%
Acceptable(>35)	70	17.1%	44	10.76%	114	28.0%
Total	241	58.9%	168	41.08%	409	100.0%

Source: Field Survey, 2025

- *Main Sources of Food for Households in the Study Areas in Magwi County*

The three main ways household in the study areas in Magwi County obtained their food in the past 30 days were from own crops production (94.6%), own livestock production (74.9%) and wild foods (45.5%). Other important sources of food for households were from hunting wild animals (30.5%) and market/shop purchase (20.9%) and exchange labor for food (14.0%). Meanwhile, market/shop purchase contribute to about 20.9% of food sources for households in the study area.

For South Sudan, about 60% of households obtained cereals, grains, roots, and tubers through market purchases, 23% of households obtained these items through own production and 8% of households obtained these items through humanitarian food assistance (WFP, FAO and UNICEF, 2025).

Approximately 94.6% households in the study areas in Magwi County compared to 8% for South Sudan sourced their food from own production. On the other hand, 20.9% of household in Magwi County unlike 60% of households in the country obtained their food through market purchases.

Table 9 Main Sources of Food for Households

Main ways the household obtained food in the past 30 days	Frequency	%
Own production (crops)	385	94.60%
Own production (livestock)	305	74.90%
Hunting (wild animals)	124	30.50%
Wild foods (plants, vegetable, fruits)	185	45.50%
Borrowing/taken on credit	30	7.40%
Market/shop purchase	85	20.90%
Food assistance/aid	24	5.90%
Exchange labor for food	57	14.00%
Exchange items for food	17	4.20%
Gifts, kinship support	34	8.40%
Fishing	25	6.10%
% of Total	407	

Source: Field Survey, 2025

➢ *Prevailing Constraints and Challenges in Sesame Production and Value Addition.*

- *Production*

Based on their importance and as reported by women farmers, the eight main events that seriously affected sesame farming in the past two years included the following: lack of ox-plough (60.2%), pests and crop diseases (59.6%), limited access to land (54.2%), poor soil fertility (51.2%), lack of access to ox-ploughing services (49.4%), shortage of labor (47.0%) and lack of/ or poor road infrastructure (39.8%), and variable rain/drought/dry spells (35.5%).

Other events of importance that affected sesame farming were heavy weed infestation (30.7%), erratic rainfall (38.6%), lack of access to high quality sesame seeds (34.9%), lack of knowledge on good agricultural practices (34.3%), excessive rains/flooding and shortage of storage facilities at 31.3% each, the high cost of improved sesame seeds (29.5%)%), land for farming too far away and the absence of extension service/technical support at 28.9% each. More females in comparison to males faced challenges of limited access to land, lack of access to ox-ploughing services and the lack of own ox-plough. WFP, FAO and UNICEF (2021) reported that the major challenges to agricultural production across South Sudan in 2020 included shortage of seeds (45.5 %), floods (41%), shortage of rain (37 percent) and shortage of agricultural tools (36 %) and heavy weed infestation a 27 % (WFP, FAO and UNICEF, 2021). Similarly, the main production problems included

According to WFP, FAO and UNICEF (2025) the main production problems in South Sudan in 2020 included plant diseases (65%), heavy weed infestation (37%), shortage of agricultural tools (34%), high cost of seeds (34%) and plant pests (33%), shortage of seeds in the market (22%), uncontrolled grazing of animals (18%), floods/too much rains (14%:) and the lack of tractors and other machinery for hire (11%). Similarly, WFP, FAO and UNICEF (2021) reported that the major challenges to agricultural production across South Sudan in 2020 included shortage of seeds (45.5 %), floods (41%), shortage of rain (37 percent) and shortage of agricultural tools (36 %) and heavy weed infestation at 27 %.

Likewise, in Hadejia LGA of Jigawa State, Nigeria sesame production are affected by the poor agricultural

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extension (90%), theft (91.7%), lack of capital (83.3%), pests/diseases (76.7%), poor marketing (73.3%), inadequate land (63.3%), drought (60%), lack/insufficient fertilisers (56.7%), poor storage facilities (53.3%) and lack of formal education (40%). (Yakubu, 2020). Similarly, the challenges faced by Smallholder Farmers in sub-Saharan Africa include: climate change (high temperatures, droughts, bush fires, floods, soil salinity, and shifts in the onset and end of the rainy season); limited and/or inadequate access to capital assets for sustainable and adequate food production (natural, physical, financial, and human) and; poor road network (Alie Kamara et al. (2019).

Table 10 Constraints and Challenges in Sesame Production

Events that seriously affected sesame farming	Male		Female		Total	
	Frequency	%	Frequency	%	Frequency	%
Limited access to land	100	41.5%	90	54.2%	190	46.7%
Lack of access to ox-ploughing services	107	44.4%	82	49.4%	189	46.4%
Lack of own ox-plough	130	53.9%	100	60.2%	230	56.5%
Shortage of labor	123	51.0%	78	47.0%	201	49.4%
Poor soil fertility	96	39.8%	85	51.2%	181	44.5%
Erratic rainfall	98	40.7%	64	38.6%	162	39.8%
Pests/crop diseases	147	61.0%	99	59.6%	246	60.4%
Excessive rains/ flooding	99	41.1%	52	31.3%	151	37.1%
Variable rain/drought/dry spells	110	45.6%	59	35.5%	169	41.5%
Lack of access to high quality sesame seeds	103	42.7%	58	34.9%	161	39.6%
Absence of extension service/technical support	88	36.5%	48	28.9%	136	33.4%
Lack of knowledge on good agricultural practices	97	40.2%	57	34.3%	154	37.8%
Shortage of storage facilities	94	39.0%	52	31.3%	146	35.9%
Death or loss of draught animals/oxen	54	22.4%	36	21.7%	90	22.1%
Increased prices of on-farm inputs (sesame seeds, hand tools, etc.	84	34.9%	37	22.3%	121	29.7%
Human disease epidemic	76	31.5%	47	28.3%	123	30.2%
Heavy weed infestation	112	46.5%	51	30.7%	163	40.0%
Violent conflict in the community	47	19.5%	34	20.5%	81	19.9%
Land for farming too far away	97	40.2%	48	28.9%	145	35.6%
Conflict over access to land for cultivation	52	21.6%	42	25.3%	94	23.1%
Land being take away by foreigners	50	20.7%	34	20.5%	84	20.6%
Lack of/ or poor road infrastructure	125	51.9%	66	39.8%	191	46.9%
High cost of improved sesame seeds	93	38.6%	49	29.5%	142	34.9%
Damage to growing sesame crop from strong wind	91	37.8%	43	25.9%	134	32.9%
Inadequate access to credit/loans	77	32.0%	35	21.1%	112	27.5%
Pilfering/theft	76	31.5%	32	19.3%	108	26.5%
Limited own capital	59	24.5%	23	13.9%	82	20.1%
None	22	9.1%	7	4.2%	29	7.1%
Don’t know	4	1.7%	4	2.4%	8	2.0%

Source: Field Survey, 2025

- *Challenges in Value Addition to Sesame*

The main constraints to local processing of sesame seeds encountered households in the study areas in Magwi County were the lack of access to simple processing equipment (65.3%), limited access to semi-industrial processing machines (59.9%) and poor knowledge on postharvest handling and value addition (57.5%), the lack of postharvest handling equipment such solar driers (37.7%) and lack of tarpaulins for drying sesame seeds (25.1%). In Mozambique, USAID (2016) there is poor post-harvest practices among smallholder farmers resulting in excess of humidity. In addition, smallholders do not clean and sort the sesame due to poor post-harvesting handling practices such as farm-level threshing against the ground, which introduces extraneous material. On the other hand, in Senegal and Mali, local processing of sesame seeds into oil is rudimentary and limited (Dossa et al., 2017). Similarly, in Northern Uganda, sesame farmers have poor knowledge on postharvest handling and value addition and also lack postharvest handling equipment such solar driers, tarpaulins for drying, gunny bags, and even traditional granaries for their produce (Dalipagic and Elepu, 2014).

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Table 11 Constraints to Value Addition and Processing of Sesame Seeds

Constraints to processing of sesame seeds	Male		Female		Total	
	Frequency	%	Frequency	%	Frequency	%
Limited access to semi-industrial processing machines (sesame oil/paste processing machine)	146	61.1%	100	59.9%	246	60.6%
Lack of simple processing equipment for home processing (manual sesame paste makers)	163	68.2%	109	65.3%	272	67.0%
Poor knowledge on postharvest handling and value addition	123	51.5%	96	57.5%	219	53.9%
Lack of postharvest handling equipment such solar driers,	82	34.3%	63	37.7%	145	35.7%
Lack of tarpaulins for drying,	48	20.1%	42	25.1%	90	22.2%
Not applicable	54	13.3%	27	6.7%	81	20.0%

Source: Field Survey, 2025

➢ *Suggestion to Overcome Constraints and Challenges in Production and Value Addition to Sesame*

The findings of the study clearly indicated that smallholder farmers in the study areas in Magwi County faced numerous constraints in the production and value addition to sesame crop and therefore affect their food security. The following suggested strategies and policy measures aim to remove the constraints and challenges that limit smallholder production of sesame crop and value addition to raw sesame that impact on their food availability and acess and overall food security.

- *Production*

✓ Agro- dealers and/or village stockists to be supported with seed money to procure and avail agro-inputs (seeds, tools, fertilisers, pesticides, bagging materials, etc) within easy reach of smallholder farmers across the study areas.
✓ Establish/strengthened sesame growers Village Savings Association that will enable smallholders to save and take low interest loans which they can invest in sesame production and value addition**.**
✓ Strengthen and support Micro-Finance Institutions (MFIs) to allow smallholder farmers and farmers groups or cooperatives to access credit without collateral (group solidarity) for inputs procurement, production and value addition to sesame.
✓ Facilitate the establishment of ox-traction groups among the youth, train them on how to plough and provide them with revolving fund for accessing bullocks and ox-ploughs and other related inputs for the horizontal expansion of land under sesame and thereby ensure food security and marketable surplus for income generation.
✓ Promote and support farmers' cooperatives for collective procurement of inputs such as certified sesame seeds, hand tools and implements, bagging/packaging materials and agro-chemicals for members.
✓ Facilitation of improved access to finance, extension/advisory and related services through the strengthened cooperatives
✓ The government to support the delivery of extension services to farmers using variety of methods including radio, ICT, lead farmer's, farmer field schools, method and result demonstrations, exposure visits and field days in order to reach many farmers in Magwi County. This will facilitate the adoption of the innovative crop husbandry practices among Smallholder farmers.
✓ Increased public investment in infrastructures including in roads (trunk roads, rural/feeder roads), off-farm storage, water supply, irrigation, etc).

- *Value Addition to Sesame*

✓ Training of farmers on improved post-harvest handling and management methods of sesame seeds and
✓ Provide smallholders and cooperatives with grants to acquire postharvest handling equipment and materials such solar driers, tarpaulins/plastic sheets for improved quality of sesame seed for the market.
✓ Capacity building of smallholders and cooperatives in value addition and local processing of sesame seeds into paste/butter and edible oil and other sesame products
✓ Support smallholder and cooperatives with revolving funds to procure semi-industrial oil seeds processors

IV. CONCLUSION

This study set out to determine the contribution of sesame value to food and nutrition security among smallholder households across the study areas in Magwi County. The mean income realized by households from the sales of sesame during the 10 months' period was about SSP 1,111,100 SSP. The findings of this study indicated that the incomes from the sales of sesame were used by households for expenditures on medical bills (84%), food and drinks (80.2%), clothing and foot wear (76.8%) and educational expenses/school fees (65.7%) among others. Food and drinks was the second most important item of household expenditure and the allocation of 80.2% of household income to buy food to a large extent contributed to their house hold food security. On the other hand, the mean quantity of sesame harvested in 2024 and put aside for consumption by a household was 236.6 kilograms and this will directly contribute to their food security in 2025. Whereas, the mean quantity that was reserved as seeds for planting in 2025 was 119.8 kg. The recycled seeds will be planted by households facilitate improved access to production inputs and this is expected to engender increased production and productivity of sesame crop and thus will contribute to food availability and acess at the household levels.

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The findings of the study showed that sesame was the prime contributor to household food availability and access and hence their food security. This was followed by beans, pigeon peas and sorghum. There was moderate mean household consumption of the following food items within the last 7 days: vegetables, oil and fats and main staples (Cereals; tubers; plantains etc.)). On the other hand, there was low mean consumption of sugar, pulses/beans and fruits. Whereas, there was very low mean household consumption of meat/fish and milk and dairy products within the last 7 days. The three main ways household obtained their food in the past 30 days were mainly from own crops production, own livestock production and wild foods. While there were very limited contributions of market/shop purchase to household food access across the study areas in Magwi County.

Approximately, about 40% of households have poor food consumption score (FCS), 32% have borderline, while 28 % have acceptable FCS. In this context there is the need for government,

Despite these benefits of smallholder's involvement in sesame value chain in terms of improved availability and acess to food and thus to their enhanced food security, they continue to face several challenges at the production and value addition levels. At the production level some of the challenges farmer encountered included pests and crop diseases, heavy weeds infestation and poor soil fertility, shortages of labor/high cost and lack of access to ox-plough services/high costs, lack of/ or poor road infrastructure for access to inputs and services, climate related constraints (variable rain/drought/dry spells. Flooding), lack of access to high quality sesame seeds, shortage of storage facilities, poor access to extension services and the lack of/limited knowledge and skills on good agricultural practices among others. At the value addition stage the challenges included the limited access to simple processing equipment and to semi-industrial processing machines, poor knowledge on postharvest handling and value addition, the lack of postharvest handling equipment such solar driers. And tarpaulins for drying sesame seeds

Overall, this study provides evidence that the participation of smallholders in the sesame value chain contributed significantly in improving their livelihoods in terms of improved food availability and access from sesame production and from the consumption of food products from local processing o4f sesame. Hence both the physical production of sesame crop and value addition to raw sesame contributed to increased food availability and enhanced access and thus to improved food security at the household level. In this context there is the need for the government and development partners to devise and implement strategies and policies that support smallholder's sesame producers. These measures when properly and effectively implemented by the concerned authorities and adopted by Smallholder farmers are expected to strengthen the sesame value chain and enhance its positive impact on their food and nutrition security.

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