

Factors Determined Contribution of Female Framers to Household Food Security

—A Study of Female Farmers in Northern Kordofan

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Abstract

The study aimed to explore the role of female farmers in securing food for their households. The study targeted female farmers in North Kordofan state as the population of the study where 309 female farmers were selected by the use of multi stage stratified sample technique from five villages (Kazgail, Farris, Alebnoya, Shoshai and Fartangool), of Shiekan locality. Structured questionnaire was prepared and administered to the sampled respondents, by face-to-face interviews. Major features of socio-demographic profile of female farmers were the young age and high illiteracy rate with considerable number of female-headed household with high number of dependents. While 100% of female farmers practiced farming, 37.9% of them farming was the sole source of living while 62.1% in addition to farming had other sources of living secured. Were 98% of female are framers, they involved in full time farming while only 2% practiced par time farming. Subsistence farming was the main pattern of farming practiced by 95% of female farmers. Female farmers cultivated different types of crops (Millet, Sorghum, Sesame, Okra and beans) to satisfy the need of family consumption and to ensure household food security. 23.9% of female farmers cultivated their land alone without support from their families or hired labors. While 86.1% received helped form members of their family labour Female farmers to secure food also supplied livestock and processed food. Female farmers interviewed were the principle producers of food in subsistence agriculture and providers of day-to-day family subsistence. Several types of agricultural tenure were available in the study area 72.8% of female farmers interviewed owned the land most of whom were originally from the area 7.1% of female farmers used community land and 6.6% used common land while 12.3% hired land. The study concluded that female farmers in the study areas played major roles in their households” food security from production to consumption. It is worth

mentioning that they are the backbone of small-scale agriculture, farm labor, and day-to-day family subsistence. So yet their contribution is uncountable, because of the subsistence nature of their work which is considered as invisible family production. In order to enhance women smallholder farmers' efforts to achieve food security and sustainability, governments, farmers' organizations, financial services providers, civil society organizations and other relevant bodies should work in collaboration to ensure the empowerment of female farmers.

Keywords

Female Framers, Household, Socio-Demographic, Securing Food, Female-Headed Household

1. Background

Household food security is defined as the ability of all household members to secure enough food to ensure adequate dietary intake for each member of the household at all times, in order to lead an active, healthy life and adequate food for meeting the dietary needs, either from its own production or through purchases. While food security at the national level is a crucial factor in achieving overall food security, adequate access to food supplies at the individual and household levels is the ultimate measure of success of any food security strategy (Rukuni, 2002). Sudan's food security is mainly determined by rainfall, particularly in rural areas where more than 65% of the population live and depend on the agriculture sector as the main livelihood, e (Mahgoub, 2014: 85).

Sudanese women have an effective role in food security. According to Mohamed Ahamed Osman Ibnouf and Fatma Osman Ibnouf (2016), participation of females in the traditional rain-fed agricultural areas reaches 78 percent in North and South Kordofan. In addition women play a major role in backyard plots, a finding that is consistent with what is reported in the literature across developing countries (Mukadasi & Nabalegwa, 2007). Study conducted by Fatma Osman Ibnour (2009) indicated the contributions of women in food security in North Kordfan Time spent in work activities: longer working days for women: the results of a survey in rural Western Sudan show that women work more hours than men due to their multiple roles in family farm, home gardening, food preparation, post-harvest activities and income activities. The role and contribution of female farmers in *North Kordofan* is fundamental in securing food at household level. Women get involved in the farming activities mainly between June and October in Northern Kordofan State. Food processing and preparation are also activities performed by female farmers to secure food at household level. The study is carried out to explore the Factors that determined the production of food for households by female farmers.

2. Methodology

The study is explanatory and descriptive in nature which provides numerical description of some part of the population and explains events using comprehensive questionnaire directed to households of female farmers.

The study conducted in five villages in *Shiekan* locality *North Kordfan*. Traditionally, *North Kordofan* is an agro-pastoral community, and the main source of livelihoods is a combination of rain-fed cultivation and livestock keeping. The key economic activity is farming, followed by animal husbandry and trade (FAO, 2013). The majority of the population (79%) relies on the traditional farming agricultural system, it's considered as one of the most important components of the agricultural sector in the Sudan, and their activities contribute to the households' food security and rural development.

309 of female farmers selected as sample from female farmer headed household in *Shiekan* locality by the used of multistage stratified random sampling Data was then analyzed using both descriptive and inferential statistics. For descriptive statistics, frequency distributions and percentages were used while for inferential statistics regression was used to analyze the quantitative data. The SPSS computer software (Version 21) aided the analysis. The results of the survey were presented using tables.

3. Specific Objectives

The study explores the following situations and patterns of production utilized by female farmers

- Socio demographic characteristics of Female farmers.
- Participation of female farmers in household's Chores.
- Types of crops and Patterns of farming.
- Land size and Ownership.
- Agricultural labor.
- Agricultural Activities performed by Female farmers.
- Tools used and Method of cultivation utilized by female farmers.
- Use of fertilizers.
- Role of Rural Women in Livestock Management.
- Food processing.

4. Results

Socio Demographic Characteristics of Female Farmers

The study targeted females of different age groups as a majority (79%) were less than 45 years of age and, the age group 46 - 55 had the least percentage of female farmers (6.1%). While most of the respondents (59%) were married, there were 22% single 4% divorced, 11.3% widowed and 6.8% separated 0.6%. 33.7% had primary education and only 20.7% of the respondents had secondary school education, a majority 43.4% were illiterate. 20.7 of female farmers were headed their households. 56.3 of female farmers their household had 6 - 10

members, 36.6% had between 11 to 15 members and 7.1% had more than 15. Farming was only source of leaving for 37.9 of female farmers while 62.1 in addition to farming had other sources of living (see **Table 1**).

Participation of Female Farmers in Household's Chores

The results ensure that all female farmers did their household daily activities and provided basic services for family members, on them in the majority of responsibilities inside and outside the home. However, most of the hard work, which was done without payment, was imposed on them as social obligation. 100 of female farmers responsible for Cooking cleaning 91.3% of female farmers took care of their children. Water fetching were the activities done by 91.3 of female farmers followed by 80.6 collected wood for households (sees **Figure 1**).

Table 1. Frequency distribution of female farmers according to socio demographic characteristics.

Socio Demographic Characteristics	F	%
Age		
less than 5	244	79.0
6 - 10	19	6.1
11 - 15	46	14.9
Total	309	100.0
Educational level		
Illiterate	134	43.4
Primary	104	33.7
Secondary	64	20.7
University	7	2.3
Total	309	100.0
Number of members of the households		
6 - 10	174	56.3
11 - 15	113	36.6
More than 15	22	7.1
Total	309	100.0
Female headed household		
Headed	64	20.7
Household member	254	79.3
Total	309	100
Main source of livelihood		
Farmers	117	37.9
Farm/other activities	192	62.1
Total	309	100

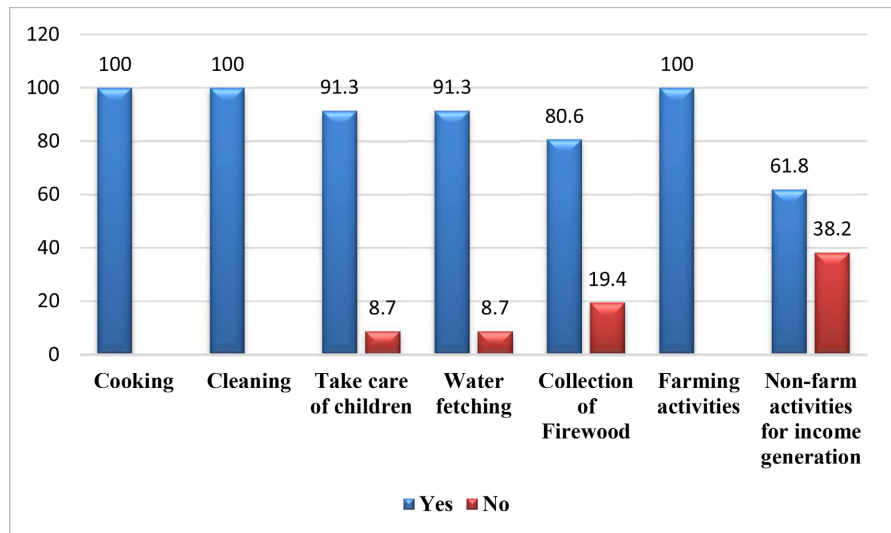


Figure 1. Distribution of female farmers according to their involvement in household and nonfarm activities.

Distribution of female farmers according to their involvement in household activities

The activities

Activities	Frequency	%
Cooking		
Yes	309	100
Cleaning		
Yes	309	100
Take care of children		
No	27	8.7
Yes	282	91.3
Total	309	100
Water fetching		
No	27	8.7
Yes	282	91.3
Total	309	100
Collection of Firewood		
No	60	19.4
Yes	248	80.6
Total	309	100
Farming activities		
Yes	309	100
Non-farm activities for income generation		
No	118	38.2
Yes	191	61.8
Total	309	100

Situation of Production of Food by Female Farmers

Many interrelated factors determined the production of food for households by female farmers

Types and Pattern of Farming

98% of female framers involved in full time farming while only 2% practiced par time farming. Subsistence farming was main pattern of farming practiced by 95% of female farmers (Figure 2).

Types of Crops

Main source to secure food for the household was crops cultivated by female farmers. Female farmer’s cultivated different types of crops to satisfy the need of family consumption to ensure household food security. Millet was main crop cultivated by the female farmers as stable food followed by sorghum and ground nuts. Luba and okra were also cultivated by most of female farmers. Sesame and Hibiscus were grown by most of female farmers to generate income to secure other items of food needed by the households. Female farmers assigned piece of land Zariba to grow okra cucumber and watermelon (Figure 3).

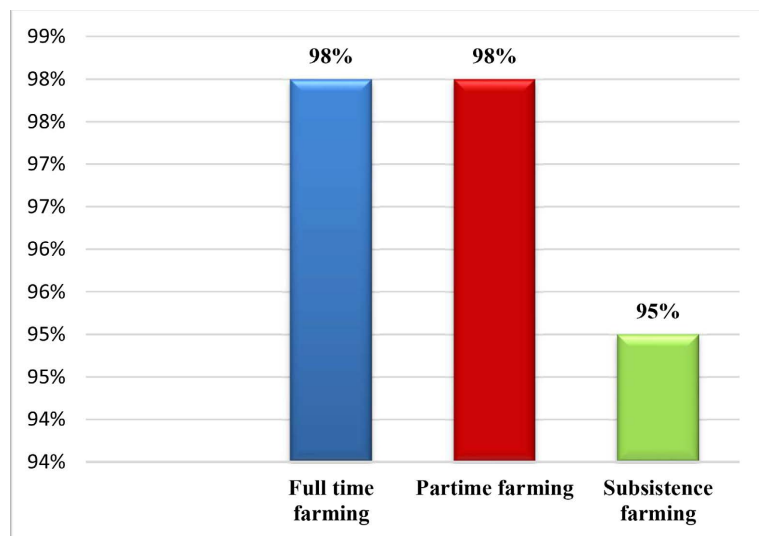


Figure 2. Types and pattern of farming.

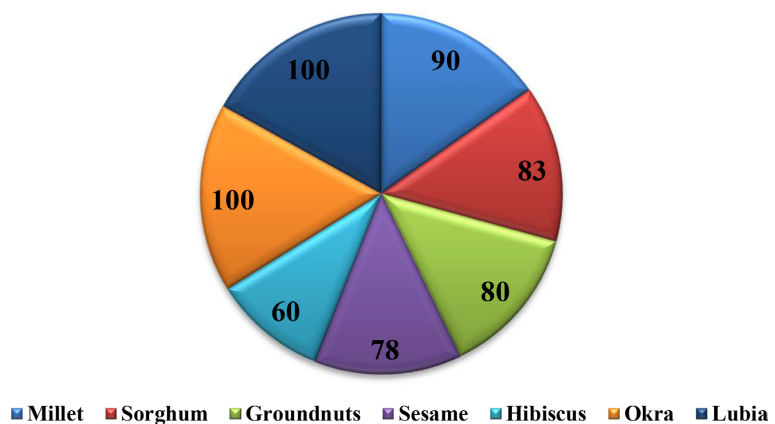


Figure 3. Distribution of female farmers according types of crops grown

Box 1. Description of Crops grown by female farmers for household food security.

Millet is considered one of the most important food crops and is of great importance in human and animal life. People in study area cultivated millet as the main source of food. It is one of the most important food crops, it cooking at home in several forms is porridge, mdida, kisra and balila.

Sorghum represents the second crop for food after millet the study found female farmers cultivated it in clay lands near the Khiran. This crop is characterized by productivity in a very short period and ability to resistance of the pests and birds and contributes significantly to human and animal food and increase of income and surplus in the same season or after the production of the new crop, the residue use as animal fodder and building materials.

Groundnuts and sesame, were grown for the marketing and food processing and also used as feed for animals, fodder it called soung.

Hibiscus, the local name is Angara, it is considered a source of income for women because they can work as paid workers in other lands in the evening (this period od day it's called Dahwa). It is grown as a supplementary crop not a basic one in the agricultural rotation. It is also grown in mixed with other crops, which increases the amount of production and cultivated area, or alone planning, the agricultural operations hibiscus are done by hand, the green part of the plant is used for cooking with onions, peanuts or use as animal feed.

The okra is grown for its green lentils, which are either cooked or dried (called waka) of the first popular in the area for flexibility of uses in household and economic benefit the result shows 48.5% cultivated it. The okra is cultivated in tilapia due to its fertilization, drainage quality and ventilation, also is cultivated in heavy land and sandy soil, It is also grown in mixed with other crops. It is cultivated in the autumn in June and July and in winter period in October and November to take advantage of the high prices when scarcity in the market.

The crop is ready for harvesting after 45 - 50 days and the harvest lasts for 2 - 3 months. For high quality of productivity, fruits are harvested every 3 - 5 days. This will prolong the production season, increase the harvest, and improve its quality. After harvesting the okra is dried, collected and stored inside the house, it sale in case of large production.

The luba is an important vegetable legume crop, especially with the high prices of animal protein, so it is good for the high protein content; it is grown in order to get its dry seeds and cooking in Varity food. The cultivation of luba is successful in clay and sandy lands rich in organic matter with good drainage. The luba harvested within 80 days from plant to harvest. The society depends on it in their food until planting and cultivation of other crops, sometimes growing with other crops, so the result shows 43% cultivated luba. Watermelon It is cultivated in organic rich lands and has nutritional benefits, It is also grown in mixed with other crops. This crop varies from one year to another depending on the amount of rainfall, and a small number of them cultivate it.

Land size and Ownership

Female farmers interviewed were small and marginalized farmers. The cultivated area was less than 10Mochas for 82% of female farmers (see **Table 2**). It is found 34% of female farmers could not utilized al the land they owned because of the lack of availability of sufficient funds to provide the needs of agriculture followed by lack of labor's due to the non-presence of all family members (see **Tables 2-4**).

Land size and ownership

Land Ownership

Several types of agricultural tenure were available in the study area 72.8% of female farmers interviewed owned the land most of whom were originally from the area 7.1% of female farmers used community land and 6.6% used common land while 12.3% hired land (see **Figure 4**).

Jubraka (Zariba)

Jubraka is piece of land located to vegetable productions belong to family or donated by the shikh. In study area jubraka was not near the houses, but these small areas are encroaching within the agricultural land (called zariba), located

Table 2. Respondents According to size of Cultivated land.

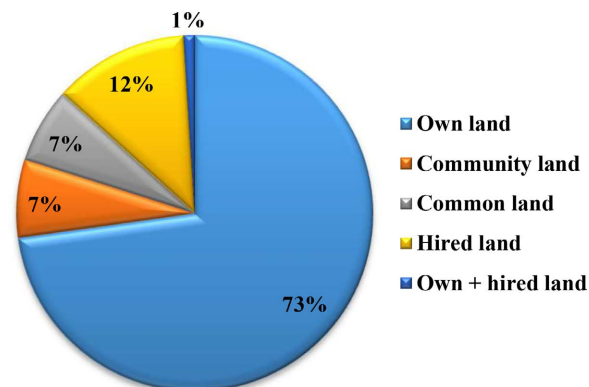
Range Mokhamas	Frequency	%
Less than 10	256	82.8
10 - 20	42	13.6
21 - 30	9	2.9
31 - 40	2	0.6
Total	309	100.0

Table 3. Cultivated all land in last 12 months.

	Frequency	%
No	105	34.0
Yes	204	66.0
Total	309	100.0
Land is not cultivated		
Range	Frequency	%
0 - 10	97	31.4
11 - 20	8	2.6

Table 4. Reasons for not cultivating all land.

Reasons	Frequency	%
Not enough labour	41	13.3
Traditional hand tools	13	4.2
Not enough money	44	14.2
Fallow rotation to conserve	5	1.6
Household activities	2	.6

**Figure 4.** Distributions of land according to ownership of the cultivated land.

to grow vegetables as okra, oilseeds. Jubraka plays a major role in household food security by distinguishing it with fast-growing crops to save farmers from

the tight summer period. In addition to the variety of products, including the various vegetable crops, such as vegetables, which are eaten fruits and leaves, and grains and oilseeds that are stored for times of need, the study showed female farmers used Jubraka to secure household food but few of them owned jubraka.

Agricultural Labor

23.9% of female farmers cultivated their land alone without support from their families or hired labors. While 86.1 received help from members of their family labour (see Figure 5) Some agricultural activities need hire extra external labours 38.2 female farmers hired labors (see Figure 6).

Agricultural Activities Performed by Female Farmers

Planting and post-harvest activities were the farm activities conducted by 100% of female farmers. Only 27.9 of female farmers did the activity of land preparation because land preparation done manually most of them utilized family labors and some hired labors. Weeding and harvesting activities done by women (see Figure 7).

Tools Used

73.5 of Female farmers used traditional tools in agriculture and 26.5% of Female farmers used tractor to prepare their lands (Figure 8).

Method of Cultivation Utilized by Female Farmers

Traditional rain-fed farming is the dominant pattern in the region and only manual machinery is used for agricultural production. Despite the existence of

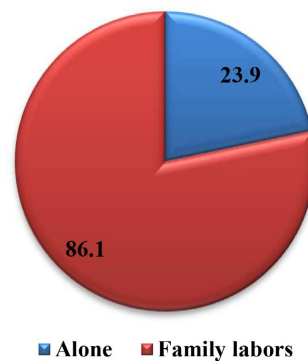


Figure 5. Agricultural labors.

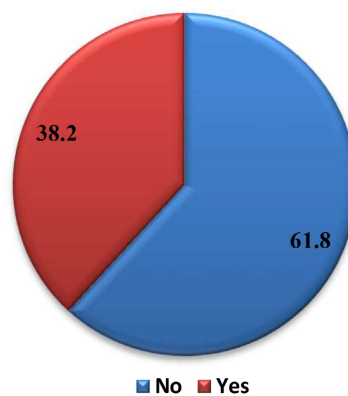


Figure 6. Hired labor for few farming activities.

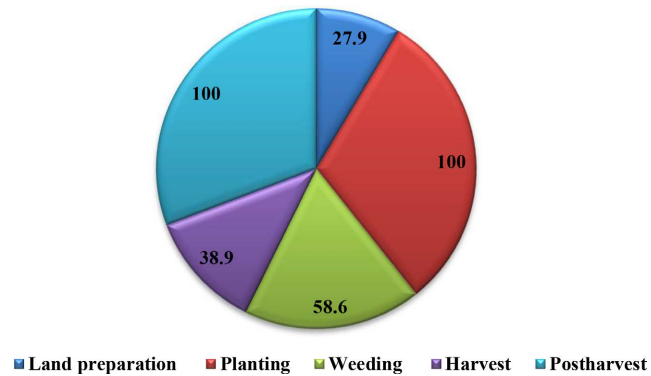


Figure 7. Agricultural activities performed by female farmers.

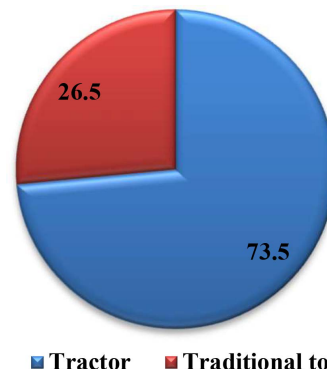


Figure 8. Distributions of female farmers by the used of the agricultural tools.

Box 2. Female farmers used their indigenous knowledge to grow their crops.

Agouz Zaraat (It's an unregulated way to plant crop seeds, and it is not necessary to determine the total land area), they created a new method of cultivated land in the world, this confirms the weakness to provide solutions of their problem of traditional rain-fed agriculture and fraud to ensure the food security of their household to avoid food shortage..

Thinning shows, too few have identified the crops that were planted with specific spaces.

Mobile Farming System

In this agriculture tradition area, all female farmers follow the mobile farming system, which is a method that preserves soil fertility and prevents erosion.

Agricultural Rotation

In these areas, that mean the agricultural Rotation

Cultivate half the land with maize or millet, and the other half is grown with other crops or left without growing (boor). The recommendation strictly forbids repeated maize cultivation in the same land for two consecutive years (Source Researcher Field work 2018) (Rawia Mahmoud, field work 2018).

approved technologies, but there is no use animals draught as well as weakness in the use of semi-modern technology and therefore its lead to decrease productivity and the cultivation of all land owned by farmers. The absence of intermediate technology, which lies between simple and advanced, and is available in the world, and the agricultural renaissance in many countries, but we are deprived of

Table 5. Type of fertilizer used.

Fertilizer	Frequency	Percent
Chemical	30	9.7
Natural	279	90.3
Total	100	100.0

them because of the lack of scientific research and lack of interest in agriculture.

Use of Fertilizers

The survey data indicated high use of natural fertilizers (90.3%) (Table 5).

Role of Rural Women in Livestock Management

Sheep and goats were raised by most of female farmers in the study area. The goats for their drought-tolerant their ability to graze to a low level, they feed by crop residues after harvesting, The goat were utilized to secure milk at household level The Care was collective rather than individual, which reduces production costs relatively, does not require high-cost sheds, and may have simple umbrellas or structures to accommodate Livestock system represent the one of the source of income of the household, and the animals are represented by small animals such as sheep and goats.

Food Processing

The result of the study indicated the responsibilities of female farmers on food processing the activities that sustain food supply in the long term. Female farmers used various means to preserve foods and effectively smooth household consumption over time in study area. Food-grains such as sorghum, pearl millet, beans and groundnuts are dried under the sun to increase their shelf life before storage in underground pits or traditional grains stores. Women process the following crops

- Groundnut
- Sesame
- Millet
- Hibiscus

5. Discussion

Most of the female farmers interviewed were young active and eager to work in agriculture while considerable number who were over fifty five also were active and contributed to secure food for their families. The participation of young women as food producers gives an indication to increase the role of women on agriculture due to migration of male counterparts. This result goes in line with result of study by *Fatma Osman Ibnouf (2011)* found that In Western Sudan Region, there has been a growing number of female-headed households (FHH) resulting from conflicts and the male outmigration from rural areas of the Region. This has caused females in women-headed households to become responsible for farming.

Generally the results indicate low level of education of female farmers in kaz-gail locality, while few of educated women also contributed to food security of their households. The higher illiteracy rates prevailing among women compared to men limit their ability to understand technical information and adopt new technologies those aim at increasing agricultural productivity (FAO, 2010).

Married women were among the main contributors to food security at household level while unmarried the single widowed and divorced also participated in securing food for their households.

The study found that the majority of female farmers lived in large family groups: extended and compound families, this increases their responsibilities to secure food for big families the household size has a direct correlation to food consumption and, therefore, a greater need in terms of food security. The women heading larger households have to, therefore, work extra to satisfy the household needs. This calls for more coping strategies in times of food insecurity. When a household is large then more resources are likely to be needed to meet the needs of its members. This implies that more resources are required to secure food for household members. Considering number of female farmers were headed, their household's. This increased their burden as food producers and breadwinners (Mavole et al., 2016).

Household Activities

The study found women in addition to their sole roles in food production they heavily involved in household activities and other non-farm activities. The most difficult outdoor activities practiced by women were the water fetching and wood collecting. However, most of the hard work, which is done without payment, is imposed on them socially. According to FAO 2011 Sudanese women's contributions within and outside the household are often overlooked due to gender inequalities that undermine their status. It is found Cooking and child care are the main daily activities, which consumed considerable amount of times of female farmers in study area. This result goes with the results of a survey in rural Western Sudan show that women work more hours than men due to their multiple roles in family farm, home gardening, food preparation, post-harvest activities and income activities. This is consistent with the findings of Fatima Ibnouf (2009) to assess women's role in providing and improving household food security in rural Sudan. The study indicates that, during agricultural season, women work longer hours than men in contribution of food production and income activities beside their triple roles. In addition to this, (Ahmed et al., 2012) they proved that, through their studies women as a Key to Agriculture and Food Security in Sudan. Women in North Kordofan contribute in general livelihood, like in agriculture they are works 14 hours in both agricultural production income generator and home activities, while men work only eight hours per day.

The study indicated that female farmers in addition to household activities and agricultural production also involved in income generating activities. Fe-

male farmers involved in farming activities mainly between June and October in Northern Kordofan State. Beside their agricultural activities, female farmers were also involved in other income generating activities such as produced butter and cheese from milk and oil from groundnut and sesame. Moreover, they made carpets, mats, and ropes using local raw materials, such as wool and palm tree leaves, in addition to their participation in feeding animals and marketing animal by-products and agricultural crops.

Land size and Ownership

The study indicated female farmers cultivated small size of land even some female farmers had unable to utilize all the land because of lack of labors and facilities. Women owned small land some of them did not own land hired small piece of land. All female farmers' utilized small land near the house called Jubraka. The results of ownership and size of land of female farmers explained by [FAO \(2011\)](#) study the majority of women have limited or no access to or control over land. In some African countries, women are rarely allocated land in their own right, particularly in patrilineal areas. Land is allocated to men, who are the heads of household.

Farm Activities Performed by Women in the Study Area

Patterns of male, female and joint responsibilities for agricultural activities have varied over time, but the present study demonstrates that more women were responsible for farming tasks than in the past. [Aldeshoni \(2005\)](#) suggested that women perform 60% of all agricultural work in the traditional agricultural sector of western and eastern Sudan. While data collected in the previous study showed that, owing to male out-migration, women were responsible for 70% - 80% of agricultural activities ([Ibnouf, 2011](#)). But the female farmers from the study areas (5 villages) mostly carried out all agricultural activities, included land preparation, seeding, weeding, and hand harvesting and also the most physically demanding activities such as bush-clearing, pruning, ploughing and hoeing, even though these tasks have been traditionally done by men. This result is supported ([Rukuni, 2002](#)) in sub-Saharan Africa, women contribute 60 to 80 percent of land preparation through hoeing In addition they are also engaged in weeding, harvesting, transporting, storing, marketing, food processing, fuel and water collection

Female farmers used traditional tools in agriculture and depended mainly on traditional knowledge without access to technologies This therefore shows that the female farmers still lagged behind in the adoption of modern technologies ([Asenga & Kayunze, 2020](#)), hence argued use of primary tools and low level of managerial skills lowers the efficiency and consequently lowers farm output, these make the households to be food insecure.

Traditional rain-fed farming is the dominant pattern in the region and only manual machinery is used for agricultural production. Despite the existence of approved technologies, but there is no use animals draught as well as weakness in the use of semi-modern technology and therefore its lead to decrease produc-

tivity and the cultivation of all land owned by farmers. The absence of intermediate technology, which lies between simple and advanced, and is available in the world, and the agricultural renaissance in many countries, but we are deprived of them because of the lack of scientific research and lack of interest in agriculture.

6. Conclusion

In recent years there has been increased recognition of the crucial importance of women's contribution to household food security. The study indicated women are responsible for farming tasks than in the past due to male out-migration. It can be said that female farmers performed the most physically demanding activities such as bush-clearing, pruning, hoeing, even though these tasks have been traditionally done by men.

It is found that, the female farmers used traditional tools depended mainly on traditional knowledge without access to technologies. It is worth mentioned that used of primary tools lowers the efficiency and consequently lowers farm output. These make the households to be food insecure.

The study argues that rural women are using locally available diversified food resources to sustain their household's food supplies and thus achieving household food security. As women are the main subsistence producers and users of natural resources, it would be useful to recognize and integrate women's indigenous knowledge in the conservation and management of these resources to ensure their sustainability.

It can be said that the processed and preserved food items are essential ingredients in the daily diets and during food shortage times. Moreover it can be said post-harvest activities, which refer to preserving and processing food products, are essential for household food sources. Processed and preserved food products assist to ensure a year round food supply and hence contribute to smooth household food consumption

7. Recommendations

In order to enhance women smallholder farmers' efforts to achieve food security and sustainability, Governments, farmers' organizations, financial services providers, civil society organizations and other relevant bodies should work in collaboration and ensure the followings are done;

- Provision of good quality seeds and planting materials.
- Promotion of value addition. Appropriate arrangements should be put in place to enable organized female farmers' groups to access the agro-processing funds designated for small scale farmers.
- Climate Change mitigation and adaptation. Special attention needs to be put in mitigating the effects of climate change and addressing all possible adaptation measures. Water harvesting techniques should be promoted and sizeable investment should be put into promoting irrigation.

All these interventions need concerted efforts with the different stakeholders

involved, especially Governments, female farmers' or Farmers' Organizations and civil society organizations.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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