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Original Article

The Role of Home Gardening in Achieving Food Security in the Nile River State: A Case Study of Village 6, Manasir – Ald-Damer Locality – May (2024) – February (2025)

Intisar Mohammed Bakheit[1], Nour Eldin Ahmed Abdulla[2]

Nile Valley University.

Corresponding Author : Intisarbakheit72@gmail.com

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Abstract *- Home gardening in the Nile River State is a long-standing agricultural practice deeply rooted in the community. This practice contributes to achieving food security, providing additional household income, and enhancing balanced nutrition. The study aims to highlight the role of home gardening in strengthening food security in the Nile River State, as it has become an effective means of improving food availability through small-scale crop production to meet household needs. However, this practice faces many challenges that require in-depth study to identify appropriate solutions, with a focus on the area of Village 6, Manasir – Ald-Damer Locality, as a model that can be developed and replicated. The experiment targeted Village 6, Manasir, in Ald-Damer Locality to train women in home gardening. Home gardens were established for 150 households within spaces ranging from 100 to 200 square meters each. Winter crops were planted in November, including onions, eggplants, sweet peppers, hot peppers (chilies), arugula, zucchini, cucumbers, and tomatoes. This followed a training course designed to equip participants with the knowledge needed for small-scale gardening. Follow-up showed good production, which reflected positively on family nutrition. A questionnaire-based analysis methodology was used to gather detailed information on home gardening practices, challenges, and future prospects. Continuous monitoring and evaluation were conducted throughout the experiment, with technical support and appropriate technologies proposed to ensure success, leading to abundant yields that met the project's objectives.*

Keywords - *Home gardening, Food security, Nile River State, Rural economy, Sustainable rural development.*

1. Introduction

Home gardening is one of the key pillars for achieving food security and promoting sustainable development, particularly in rural communities. It has become an effective tool for improving both food availability and economic well-being. Globally, regionally, and locally, home gardening plays a role in improving food security by providing fresh, nutritious vegetables and fruits to households, thus enhancing nutrition—especially for children and the elderly. It also generates additional income through the sale of surplus produce in local markets.

Moreover, home gardening helps preserve biodiversity by encouraging the cultivation of diverse local varieties of vegetables and fruits. This contributes to protecting biological diversity and aids adaptation to climate change by ensuring sustainable food sources.

In light of socio-economic changes, women's roles have expanded beyond traditional boundaries, enabling them to contribute significantly to development through community engagement, beyond their academic, leadership, and entrepreneurial responsibilities.

Women also play a prominent role in urban agriculture, which develops their skills, supports household income, and helps lift communities out of poverty, defined as the inability to meet basic needs, often resulting from inflation and rising prices.

Research Problem: The rural and urban communities face increasing food insecurity, rising living costs, limited household income, the impact of climate change, and a lack of access to sustainable agriculture practices.

Objectives of the study
To assess the home gardening practices in the targeted areas
To evaluate the contribution of home gardening to household nutrition and income generation
To analyze the role of home gardening
To recommend improving home gardening practices for sustainable food security

1.1. Definition of Home Gardening

Home gardening is a safe agricultural practice conducted by families within small spaces at home to produce essential daily needs of vegetables, fruits, spices, and ornamental plants. It provides safe, healthy food free from excessive use of pesticides and chemical fertilizers, thus ensuring a continuous supply of vitamins and minerals for human health [1].

1.2. Role of Home Gardening in Food Security

1.2.1. Achieving Self-Sufficiency

Home and community gardening significantly contribute to providing essential food for families by using household or small agricultural spaces to grow crops such as onions, tomatoes, eggplants, zucchini, lettuce, and arugula, reducing dependency on markets and aid.

1.2.2. Improving Food Quality

Home gardening produces healthy crops free from harmful pesticides, thereby improving public health.

1.2.3. Reducing Costs and Increasing Income

It decreases food purchase costs, and surplus produce can be sold in local markets to generate income.

1.2.4. Promoting Environmental Sustainability

Encouraging organic farming and sustainable practices helps protect natural resources, improves soil fertility, and reduces environmental pollution by using organic fertilizers instead of chemical ones, lowering production costs and producing healthier crops.

1.3. Challenges Facing Home Gardening

- Shortage of agricultural inputs such as seeds and fertilizers.
- Water scarcity, especially during summer, in Village 6, women face additional water shortages due to electricity fluctuations.
- Pests and diseases that damage crops.
- Lack of modern agricultural knowledge among small farmers.
- Marketing difficulties due to poor infrastructure.

2. Literature Review

2.1. Home Gardening

An effective method for achieving food security, particularly in urban areas[1].

2.2. Family Farming Worldwide

Family farming is the most common form of agricultural production worldwide, producing about 80% of the world's food by value and providing the largest source of employment. With more than 500 million family farms globally, the UN declared 2014 the International Year of Family Farming to highlight its role in agricultural, environmental, and social policies[2].

2.3. Home Gardening in Sudan

Home gardening has played a significant role in rescuing Sudanese families from hunger and malnutrition by growing vegetables at home to meet daily needs, especially after the events of April 2023. However, smallholder farmers face major challenges, particularly in Sub-Saharan Africa, due to a lack of support, insecure resource rights, and inconsistent policies, with women disproportionately affected despite performing most agricultural labor[3].

2.4. Factors for Success in Home Gardening

- Awareness of its importance and provision of training.
- Access to good production inputs (seeds, organic fertilizers) and a reliable water source.
- Training in agricultural operations.
- Linking home gardening with marketing channels.

2.5. Definition of Food Security

Food security is the condition in which all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs for an active and healthy life[4].

2.5.1. Importance of Food Security

Food security is one of the modern concepts in today's world. It is of great concern to nations and peoples who recognize that food is one of the most essential priorities directly linked to human life. From this standpoint arises the importance of food security, as countries have focused on both the quantity and quality of the food consumed by humans, which provides them with health, vitality, and productivity[5].

2.5.2. Pillars of Food Security

- Food Accessibility: **(**Markets – Individual income – Preferences)
- Food Availability: (Provision of food by the state)
- Food Utilization: (Health, activity, and productivity outcomes resulting from food use)
- Food Stability: (Related to the previous three pillars – access, availability, and utilization – meaning the stability and sustainability of food security.)[6]

2.5.3. Main Causes of Food Insecurity

Food security is a core goal of the United Nations Sustainable Development Goals (SDGs)**,** where Goal 2 aims to "End hunger, achieve food security, improve nutrition, and promote sustainable agriculture."[7]

Conflict, wars, climate change, and economic shocks are among the main causes of food insecurity**.** The proportion of people suffering from hunger in Africa is much higher than in other world regions – about 20% compared to 8.5% in Asia**,** 6.5% in Latin America and the Caribbean**,** and 7.0% in Oceania[7].

These factors affect agricultural and food systems by impacting arable land, improved seed stocks, livestock, and irrigation systems. All of these contribute to crop shortages, food crises, and rising prices. Moreover, climate fluctuations and extreme weather conditions negatively affect agricultural productivity and increase the demand for food imports[8].

The second SDG seeks to end hunger and malnutrition by 2030, and Sudan is one of the signatories and implementing countries of these goals. However, ongoing conflicts have hindered progress. Conflict and insecurity have created a complex food crisis that continues to affect millions of people due to movement restrictions, disrupted markets and essential services, hindered agricultural production and livelihoods, and reduced access to humanitarian aid.[9]

2.5.4. History of Food Security in Sudan

Food security was officially defined in 1996 by the FAO. Sudan is considered one of the pioneering countries in food security. Since the 1950s, Sudan has established a Food Security Department within the Ministry of Agriculture. In 2003, Sudan established an official Directorate for Food Security, and in 2008, a Technical Administration for Food Security was created. Due to economic shocks, Sudan has witnessed a significant rise in food prices, with basic commodities increasing by 130%–296% in May 2023 compared to the average of the previous five years. Inflation increased due to several factors, including the reduction of markets—especially in urban centers like Khartoum, North Darfur, and Gezira States—limited food supply chains, the sharp depreciation of the Sudanese pound, and decreased agricultural production in the previous season[10].

2.5.5 Current State of Agriculture in Sudan

Sudan is characterized by great environmental diversity in climate, soil, and geological formation. Agriculture plays a major economic and social role, as most Sudanese people depend on farming and livestock for their livelihoods. Most agriculture in Sudan is rain-fed, and fluctuations in rainfall negatively impact production rates. However, between 2011 and 2019**,** agriculture and the food system played only a limited role in Sudan's economy *(FAO)*. In addition**,** climate change has become a major threat to food security, especially in arid and semi-arid regions of sub-Saharan Africa, where Sudan is among the most affected countries[11].

2.6. Types of Agricultural Crops

Agriculture in Sudan includes both plant and animal production.

Plant production comprises horticultural crops and field crops.

- Field crops: Cash crops such as wheat, sorghum, millet, sesame, rice, cotton, sugarcane, sunflower, and peanuts, among others. These are cultivated on large areas, with government support for production inputs, and play a major role in the national economy.
- Horticultural crops: Export crops such as vegetables, fruits, ornamental plants, and medicinal and aromatic plants, which are cultivated on smaller scales by skilled producers with capital and trained labor. These crops are highly profitable, play a major role in nutrition by providing minerals and vitamins, and contribute significantly to exports and agro-industries[12].

Table 1. Gaps in Basic Crops Before the Sudan Conflict (4)

Crop	Available (000 tons)	Usage (000 tons)	Gap (000 tons)
Rice	22.15	97.82	75.67
Wheat	387.90	2830.84	2442.94
Maize	6.00	49.43	43.43
Millet	683.54	835.90	152.36
Sorghum	3329.14	3990.78	661.64

The gap in wheat is the largest compared to other cereal crops. Production of all cereal crops is below national demand**.** Sudan requires approximately 3.38 million tons of wheat and sorghum, in addition to smaller amounts of millet and maize[13].

2.6.1. Agricultural Situation in River Nile State

River Nile State is one of Sudan's 18 states. It is bordered by Khartoum State to the south, the Northern State to the north and west, and Kassala and Red Sea States to the east. It lies between latitudes 16–22°N and longitudes 30–32°E, covering about 142,000 km².

The climate ranges from semi-desert to desert, with annual rainfall between 150 mm in the south and 25 mm in the north. Temperatures range from 47°C in summer to 8°C in winter. The population is approximately 1.21 million[14].

The state has hosted large numbers of internally displaced persons (IDPs) who fled from conflict-affected states since April 2023. International and local observers estimated that over two million people have been displaced to this state.

Reports from UN agencies and related organizations indicate that food security in Sudan in general—and in River Nile State in particular—faces many challenges that require joint governmental and non-governmental efforts to bridge the food gap caused by the war that has lasted for more than a year and a half.

The total cultivated area for the early summer season of 2023 was 101,796 feddans, with an implementation rate of 61%, including:

Table 2. Cultivated Area by Crop Type

Crop Type	Cultivated Area (Feddans)
Sorghum	8,960
Fodder	67,751
Vegetables	9,630
Onions	2,757
Various horticultural crops	2,284
Other crops	9,652

In the late summer season, 326,811 feddans were cultivated, including:

Table 3. Distribution of Cultivated Area

Crop / Land Type	Area (Feddans)
Irrigated crops	2,328
Rain-fed crops	251,535
Irrigated crops	33,756
Rain-fed crops	2,609
Irrigated vegetables	13,411
Rain-fed vegetables	17,340
Onions	2,046
Cotton	1,014
Oilseeds	163
Horticultural crops	1,215
Other crops	1,564

Winter Season (2024)

The targeted cultivated area for the 2024 winter season was 700,000 feddans, including 80,000 feddans of wheat. The remaining area was allocated to legumes, onions, potatoes, spices, vegetables, and fodder crops.

2.7. Home Gardening Initiative (Village 6 – Manaseer, River Nile)

Under these critical conditions affecting displaced women and families who lack basic needs such as shelter, food, water, and clothing, the Center for Environmental and Rural Development Studies, Nile Valley University, in collaboration with the Sudan Organization for Tree Planting and Protection (Al-Jabraka), launched an initiative to empower displaced women by teaching them home gardening techniques and best agricultural practices to help them produce healthy, affordable food for their families.

2.7.1. Details of the Home Gardening Area (Village 6 – Manaseer, Rural Atbara)

Village 6 – Manaseer, located 50 km east of Atbara, was one of the resettlement villages built to compensate residents affected by the construction of the Merowe Dam. Although the village was well planned, it was not fully inhabited due to administrative and social factors. Local authorities in Atbara saw the village as a solution for hosting IDPs, accommodating more than 3,000 displaced families (about 25,000 people)—mostly women, children, and the elderly. The women organized themselves into a Women's Committee to secure their rights and manage community-based activities that help reduce financial and psychological burdens on displaced families.

3. Research Methodology

3.1. Study Area

The experiment targeted Village 6, Manasir, in Ald-Damer Locality

3.2. Research Method

A descriptive approach was used to analyze the study.

3.3. Research Tools

A questionnaire and interviews were used, including information about participants, crop types, irrigation methods, and challenges. The questionnaire had three sections:

1. Personal information (Age and education level).
2. Types of crops grown.
3. Challenges facing home gardening.

3.4. Study Population

Women of Village 6, Manasir, participating in the initiative (150 women).

3.5. Study Location

Ald-Damer (Village 6, Manasir).

3.6. Study Period

September 2024 – February 2025.

4. Agricultural Techniques Used

After supervisors received training at the Agricultural Research Station in Al-Hadiba, practical training took place at the village school in a demonstration plot of 1,200 m²:

- On 22 October 2024, seedlings, seeds, and tools were distributed to women by group leaders.
- Detailed explanations were given to 150 women on practical implementation using a demonstration plot divided into 24 m² beds for arugula and onion, and ridges and furrows for zucchini, cucumber, eggplant, sweet pepper, and chili.
- Land was prepared by the Technology Transfer Department in Ad-Damer, fertilized with organic compost, and irrigated before planting.

4.1. Planting and Follow-Up

On 29 October 2024, planting took place a week after land preparation. Seeds were sown in beds, seedlings transplanted after germination at Al-Hadiba nursery (45 days old), and cucurbits planted alternately along ridges.

In the second stage, home planting began:

- Each household received 25 seedlings (15 eggplants, 10 peppers, 10 chilies).
- 4,200 seedlings were distributed in total.
- Each household's planting was supervised to ensure correct methods.

4.2. Monitoring and Evaluation

Daily and weekly monitoring was conducted by supervisors and technicians. Follow-up included pest and disease observation and problem-solving.

5. Extension Bulletins

Ten bulletins were distributed to group leaders, each covering one crop in detail (land preparation, planting schedule, irrigation, growth monitoring, and pest management).

6. Local Innovations for Pest Control

The main challenge was the irrigation water shortage due to prolonged power cuts. Women transported water manually from the canal despite the distance.

Another challenge was rodent infestation, particularly attacking chili and sweet pepper seedlings. Women devised the idea of covering plants with mosquito nets, which proved effective.

7. Results of the Questionnaire Analysis

7.1. Demographics

Table 4

Ages	Percent%
20-40	66.7
41-60	33.3

- All participants were female.
- Ages: 20–40 (66.7%), 41–60 (33.3%).

Table 5

Education level	Percentage(%)
Illiterate	5%
Read and write	15%
Primary education	30%
Secondary education	45%
Higher Education	5%

- Education: Secondary (45%), University (30%), Primary (15%), Illiterate (5%), Other (5%).

Table 6. Crops Grown

Variety	%	Number
Zucchini	25%	38
Eggplant	25%	38
Pepper	15%	22
Cucumber	15%	22
Chili	15%	22
Onion	5%	8
Arugula	5%	8

- Zucchini (25%), Eggplant (25%), Pepper (15%), Cucumber (15%), Chili (15%), Onion (5%), Arugula (5%).

Table 7. Challenges

Challenges	%
Water shortage	55%
Pests	45%
Lack of knowledge	30%
Lack of suitable soil	20%
Lack of support and awareness	25%

- Water shortage (55%), Pests (45%), Lack of knowledge (30%), Lack of suitable soil (20%), Lack of support and awareness (25%).

Table 8. Support Needed

Support Needed	%
Seeds and fertilizers	70%
Training courses	65%
Agricultural tools	40%
Technical advice	35%

- Seeds and fertilizers (70%), Training courses (65%), Agricultural tools (40%), Technical advice (35%).

Table 9. Impact on Family Income

Impact on Family Income	%
Improved	75%
No change	10%
Unsure	15%

- Improved: 75%
- No change: 10%
- Unsure: 15%

The questionnaire analysis indicated that of households reported an improvement in family income 75%, although the most challenging issues were identified as water scarcity 55% and pest infestation affected45%, therefore the participants' demand for seeds, fertilizers, and training exceeded available support.

The results demonstrate that home gardening has a positive significant impact on household nutrition and food availability, despite existing constraints.

8. Discussion and Conclusions

The study underscores the need for sustained agricultural extension services, rather than the short – term interventions, to ensure long-term impact. Integrating home gardening into local food security policies significantly enhances its contribution to rural livelihood.

Home gardening in Village 6, Manasir, targeted displaced families affected by Sudan's recent conflicts, focusing on women as the backbone of the household.

The initiative, through theoretical and practical training, enabled women to plant in small spaces (50–200 m²) at home and in a communal demonstration field. Crops grown included onions, zucchini, cucumber, eggplant, sweet and hot peppers, and arugula.

The program improved self-sufficiency and nutrition for displaced families and provided extra income through surplus sales.

Challenges such as water scarcity emerged as major limiting factor, pests, lack of awareness, and limited technical support remain barriers. Addressing these will enhance sustainability.

9. Recommendations

1. Provide drip irrigation systems to improve water use efficiency.
2. Conduct training on sustainable agriculture and pest management.
3. Supply quality seeds and organic fertilizers at subsidized prices.
4. Establish local cooperatives for resource sharing and marketing.
5. Support small-scale water projects (e.g., wells) and promote natural pest control methods.
6. Increase investment in both plant and animal agriculture with financial and technical guidance.
7. Secure safe agricultural zones and ensure timely input distribution to rural areas.
8. Support smallholders, women, youth, and displaced persons to engage in productive small-scale projects for self-sufficiency and national food security.
9. Provide solar energy to the wells and pumps to ensure a continuous water supply.

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