

## **CHALLENGES TO ACHIEVE FOOD SECURITY DUE TO CLIMATE CHANGE A CASE STUDY AT EL-RAWAKEEB AREA, SUDAN**

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**Abstract:** Sudan is widely considered one of the world's most climate change vulnerable countries. It affects all aspects of life indicated in increasing droughts, high rainfall variability, depletion of water sources, and desertification of millions of hectares of agricultural and range land and human livelihoods where considerable number of Sudanese citizens facing acute food insecurity. The present study was conducted to minimize food insecurity by providing Introducing income generating units to household at ElRawakeeb area (latitudes 15°2' and 15°36' North and longitudes 32° 0' and 32°10' East), which is subjected to climate change and consequently desertification. Households were the target group since they experienced direct effect due to their long stay and their knowledge in animal hardening. Ten families of theses households were selected to be provided with Sudanese Nubian goats and were then trained for keeping them. The milk produced from the goats were sold and the profit gained is equivalent to 5817.1 SDG/month. Part of this profit was used to sustain family needs while the rest was kept the project running. The project was associated with environmental training to sustain natural resources and to mitigate climate change. These activities included restoring plant cover by trees planting, increasing environmental awareness through informal seminar conductions and group discussions. The overall effect of such activities improved plant cover by over 60% of the previous status and increasing knowledge.

**Keywords:** Sudan, Nubian goats, Food security, Climate change, El-Rawakeeb.

### **Introduction**

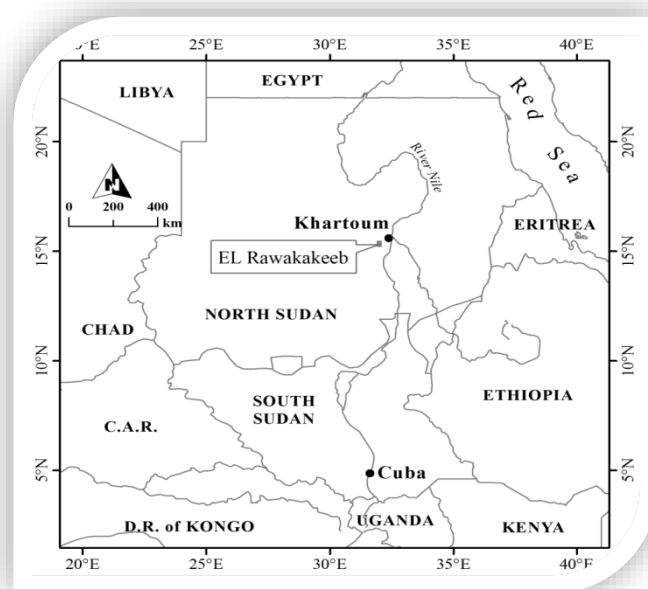
Climate change refers to long-term shifts in temperatures and weather patterns. Due to natural and/or human activities. The consequences of climate change include intense drought, desertification. Water scarcity, warmer temperature and sever fires, rising sea levels, flooding, melting polar ice, declining biodiversity, Shabani, et al (2023). The United Nations Committee on World Food Security (CFS,2024), defines food security as a situation in which “all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their food preferences and dietary needs for an active and healthy life. They added that level of food is secured when the person meets a minimum of 2400 and more calories per day. Furthermore, the World Bank (2023), reported that the projections for the year 2024 indicate prolonged food security crises, with full-scale armed conflicts being their main catalyst. Over 50% of people projected to experience high levels of acute food insecurity in,

Nigeria, Sudan, Ethiopia, Yemen, and Myanmar. The United Nations World Food Program states that there are five phases of food security ranging from Phase 1, “food security” when people have access to sufficient, safe, and nutritious food to meet their dietary needs to the worst, Phase 5, when a famine is declared. Famine is the most severe phase of food insecurity and means a complete lack of access to food and other basic needs. Accordingly; famine is met when 20% of households face extreme food shortages, 30% of children suffer from acute malnutrition, 2 persons in every 10,000 die from starvation, disease, and malnutrition. Food insecurity doesn't have an income qualification, although it is closely associated with poverty. However, not all people living below the poverty line are considered food insecure and people who live above the poverty line are still susceptible to food insecurity. Poverty exists when people lack the means to satisfy their basic needs. Also, poverty usually associates with poor health, low levels of education or skills, an inability or an unwillingness to work. IPCC (2019), reported that food insecurity. The most important ones are high food prices and disruptions in global food supplies for example due to war. There is also climate change, desertification, water scarcity, land degradation, agricultural diseases, pandemics and disease outbreaks that can all lead to food insecurity. Desertification is defined as land degradation in arid, semi-arid and dry sub-humid areas resulting from human activities, and climatic variation, (UNCCD, (1994). It leads to significant food insecurity, shortage in drinking water, low incomes, lack of job opportunities and consequent poverty, Ahmed et al (2008). A case study was conducted at El Rawkeeb dry area where the local community depends on has traditional agriculture, animal husbandry and labor in nearby cities. This study was aimed to improve the living standard and enable the local community involved fully in development activities and increase their knowledge and awareness on combating desertification and sustainable use of the natural resources.

## **Materials and Methods**

### **Study area:**

According to Abdellatif, (2018), El Rawakeeb area, “latitudes 15°2' and 15°36' North and longitudes 32° 0' and 32°10' East, (Figure 1), was selected as a study site. The prevailing climate is characterized by low annual rainfall ranging from 100-180mm and 1800mm. evaporation potential. The soil of the study area is sandy clay loam, alkaline, poor in nitrogen and organic matter but moderate in bicarbonate and potassium contents and rich in sodium content and the natural vegetation is composed mainly of Acacia Desert Scrub, where can be included in the “*Acacia tortillas – Maerua crassifolia*” subdivision of semi-desert.



Figure(1): Location map of El Rawakeeb area, (source: Abdellatif et al,2018)

### **Income generating units**

The Sudanese Nubian goats are selected as income generating units since these animals are generally believed to have a high tolerance of deprivation of water and food and of good milk and meat production both quantitatively and qualitatively, Ali and Mirghani, (1983). These animals were brought from North state as pure breed and subjected to continuous veterinary examination before distributed to local household.

### **Methods:**

#### **Population Sample:**

El Rawakeeb area is inhabited by 3900 persons belong to 850 families mainly originated from Jamaia and Hawkweed tribes. Thirty families of the total 850 households is 850 were classified as poor and selected as sample project participants.

#### **Demographic study:**

The selected families were examined for their some demographic information including age, education level and livelihood via questionnaires to correlate demographic parameters with food security trials in El Rawakeeb area.

#### **Distribution of income generating units:**

Nubian goats were selected as income generating tools for the poor households. The 30 families were divided into 3 groups each one consisting of 10 families. The study was carried out by providing 10 Nubian Goats to the selected 10 families.

**Study follow up:****Demographic follow up:**

The study follow up was done via questionnaires which **was** designed to collect data on demographics and socioeconomic status.

**Sudanese Nubian Goats follow up:**

Nubian goats were monthly monitored for animal performance and milk production, also subjected to veterinary examination and vaccinations.

**Awareness raising:**

The local community was trained to cope with desertification and climate change cause and effects. This was done through conduction of informal seminar s and group meetings and discussions. Also, the local community was trained to participate in restoring plant cover in the area.

**Results:****Demographic data**

Analyzing the data obtained from the questionnaires revealed that the age group of the targeted household ranges between 18- 45 years old, and most of them received eliminator y educations, whereas others are illiterate as shown in figure (2). The mean family size is six person/family. The family income of all studied families depend on rational agriculture and free work of the fathers. Household add to family income by herding animals on nearby natural vegetations.

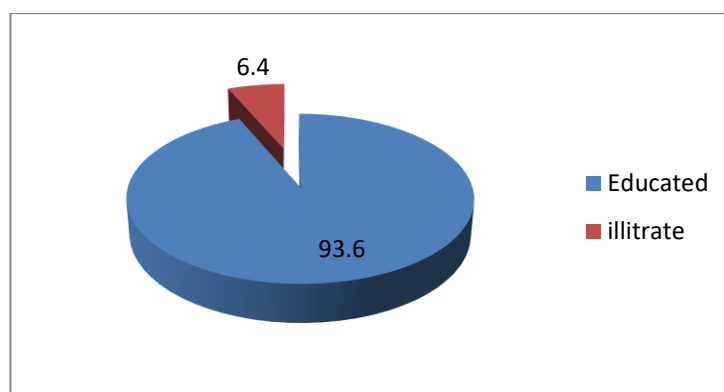


Figure (2). Education level of household target group at El Rawakeeb area

**Income generating units:**

The income generating units were examined to access their role in increasing family income and improving living standard. Monthly monitoring of animal performance showed that these

goats produced 1.13 litter of milk every day. Each family consumed approximately 0.454 litter per day and sold the rest. The profit gained is equal to 190 Sudanese pound every day which is equivalent to 5817.1 Sudanese pound monthly. According to the household answers they spend some of this money in buying basic grocery needs and keep the rest to run the project, Table(1).

**Table (1). Monthly profit of Sudanese Nubian goats distributed for household in El Rawakeeb area as income generating units.**

| <b>Items</b>            | <b>Nubian goats</b> |
|-------------------------|---------------------|
| Fodder                  | 15000               |
| Veterinary services     | 330.9               |
| <b>Total cost (1)</b>   | <b>15,330.9</b>     |
| <b>Output</b>           |                     |
| Milk/L/month            | 34                  |
| Price/L                 | 622                 |
| <b>Gross income (2)</b> | <b>21,148</b>       |
| Profitability = (2)-(1) | 5,817.1             |

Source: Author, 2022

### **Awareness raising**

The local community especially gender participated significantly in restoring plant cover through planting seedlings and following up their performance. These activities resulted in improving plant cover as shown in Figure (3) knowledge about desertification cause and effect is greatly improved when the oral seminars were conducted. Women are persuaded not to cut trees and also to participate in combating programs. They have showed appreciated efforts to help researchers in planting trees and preventing animal random grazing. Women also share their indigenous, (Figure 4).

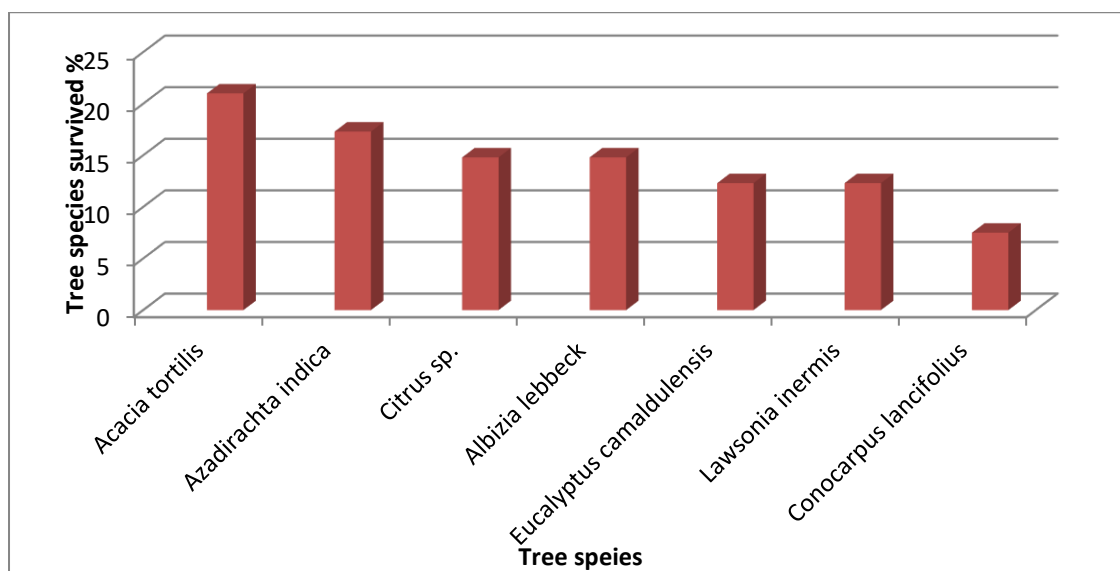


Figure (3). Survival of tree species planting by household in El Rawakeeb area  
Source: (DRI annual scientific report 2012).



Figure (4). Household participating in planting seedlings at El Rawakeeb area (source, DRI annual scientific report 2022)

## Discussion:

### Demographic data

The studied household group studied showed to be educated and of middle age which assist in applying the project objectives. Li, (2023), indicated that education level is an important factor in social and individual economic development. It is widely believed that higher levels of education provide individuals with better income growth prospects.

### **Income generating units**

Provision of Sudanese Nubian goats as income generating units was proved to increase household income by 5,817.1 SDG and thus subsequently improved their family livelihood. Soodan, et al (2020), assessed the role of goats in augmenting income of selected beneficiaries. Their results indicated significant in income increase upon breeding goats for milk production significant effect in augmenting community income. Kaumbata, *et al.* (2020), conducted a study to determine tangible and intangible benefits of local goats to in low income community in Malawi. The results showed that local goat enterprise to local community was profitable and economically viable. Goats accounted for 61.2% of the total livestock household income.

### **Awareness raising**

The local household were received information on climate change and desertification and their expected role in combating desertification and mitigate effect of climate change by conducting informal seminars and establishing group discussion. Also, these households were trained on planting trees and irrigating them to establish from seedlings through demonstration activities done by the project technical team. The tree performance was periodically evaluated through regular on site visits where the best growing tree was given a prize as an incentive to plant cover restoration as a tool to combat desertification and climate change. Nasruddin, *et al* (2020), evaluated community participation mitigating climate change effects. The results showed that community participation induced significant mitigation activities and in reducing the negative impacts of climate change. CSRD (2024), stated that empowering the local communities is one of the most effective ways to combat desertification by take ownership and drive the solutions. Household are the most affected since they spend most of their time at affected. Awareness raising could be done through seminars, workshops, and other forums where they can share their concerns and opinions. Providing education and training among households on sustainable land-management practices, water conservation and planting trees techniques that help them combat desertification and promoting sustainable livelihoods and increasing income

### **Conclusions**

Introducing income generating units to household at ElRawakeeb area proved to increase family income and improving their living standard. It assisted them save some of their money to cover more daily activities and expenses. Engagement of household on restoring plant cover to mitigate climate change effects showed significant role of community participation in ecosystem restoration and sustainable use of natural resources based on awareness raising.

## Recommendations

- Increasing number of family participated in the project are recommended to add to increase families income.
- Increasing families' income through added value to their dairy products

## Acknowledgement

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