

## **Exploring the wheat supply crisis and its impact on Food Security in Sennar City, Sudan.**



**A thesis for the degree of Master of Science (MSc) in International Management of Development (Food and Nutrition Security) from Van Hall Larenstein University of Applied Sciences**

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## DEDICATION

This Thesis is a gift for my brother's soul Taha Ibrahim who raised me, I wish you can be with me now to see how far I made, I am sincerely grateful to my Mam who always believes in me. I hope this thesis contributes to my hometown's development and Sudanese prosperity.

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## List of abbreviations

FAOSTAT	Food and Agriculture Organization Corporate Statistical Database.
AFD	Alafandi For Development Company
IPC	Integrated Food Security Phase Classification (IPC)
HFIAS	Household Food Insecurity Access Scale
FCS	Food Consumption Score
MENA	Middle East and North Africa
MOFEP	Ministry of Finance and Economic Planning
IAMDP	Integrated Agricultural and Marketing Development Project
IFAD	Integrated Agricultural and Marketing Development
FDG	Focus discussion group

## ABSTRACT

The study aimed to explore the correlation between wheat flour supply and food security in Sennar city and to recommend interventions for improving food security and planning projects for wheat flour distribution by commercial actors. The study focused on Sennar city households' food security which aims to investigate its correlation with wheat flour supply. Simple random sampling was employed to choose respondents to conduct two different surveys. Data collection and analysis were conducted using qualitative methods. Interviews with household members, focus discussion groups, and key informant interviews with participants in the wheat flour supply chain were used to gather primary data. Data were analysed using qualitative data analysis techniques.

Findings indicate that In Sennar city, households' first preference of based food is wheat bread, despite of its rising prices, which illustrates the important role of wheat flour in the food security of the household in Sennar city. The result of the study indicates that the rising population in Sennar city will increase the demand for wheat flour consequently. The study findings indicate that. 76,1 % of the target population not having enough food because of the high prices and weak purchasing power due to the high inflation rate in the microeconomic of Sudan. The study results find that the households coping strategies for wheat flour fluctuation and rising prices are several, the main strategy is making wheat bread in homes instead of bringing the wheat bread from the bakeries shops, and some households have started consuming other based food options to cope with their difficulties in accessibility to wheat bread due to the high prices. Finally, the study concludes that the food security of Sennar city is highly correlated and affected with the wheat flour supply which is affected by the international price shocks due to the high dependence on imported wheat rather than the local production of wheat supply.

# Chapter 1: Background to Study

## 1.0 Introduction

This thesis was developed in order to fulfill the Van Hall Larenstein University of Applied Sciences' requirements for the master's degree in management of development with a specialization in food and nutrition security. Alafandi for Development (AFD), a private company that primarily distributes flour and wheat to the states of Sudan, is the commissioner of this study and the source of its funding.

The goal of this study is to investigate the interrelation between wheat flour supply and food security in the context of wheat supply fluctuations in Sennar city, to enhance the effectiveness of interventions in the households' food security situation. This thesis consists of the background of the study, and the objective of the thesis. Then the identification of the research problem and research questions will be explained. The literature review will describe the topic to be studied and its relevance, and the perspectives of the different authors.

The chapter on research methodology will outline how the study will be undertaken and how the information gathered will be analyzed. The limitations of the study and considerations of doing research will be explained at the end of the thesis.

## 1.1 Background

In Sudan's post-independence history, wheat flour and flatbread have played a major role in Sudanese consumers' food security. Wheat and wheat bread have become not only key food staples in Sudanese households, but wheat is also the main calorie resource for Sudanese households (Abdelaziz, 2022. Wheat subsidies, wheat markets and food security in Sudan: Current state and options for the future). The majority of milling companies have storage facilities in Port Sudan, which serves as the nation's primary entry point for imported wheat. Typically, imported wheat is shipped to Khartoum, where large processing companies use 80% of it, while the remaining 20% is shipped to other milling companies across the nation (FEWS NET, 2015; IFAD, 2017; Dorosh, 2021; Resnick, 2021).

Around 21 per cent of the total population in Sudan is under crisis according to IPC, 2022 classification. In Sudan, people are suffering from a protracted nationwide crisis of food security, wheat prices are sharply increased by the disruption of wheat imports and the rising inflation rate. 40% of the total Sudan wheat supply imports came from Russia and Ukraine in 2021. The international prices of crops will rise based on the disruption of the 2022 and 2023 agriculture seasons in Ukraine, That concludes, one out of three consumers in Sudan will be affected by the disruption of the international wheat prices. Sudan depends largely on Russia's wheat export, importing around 73 per cents from Russia of wheat in 2020, according to Global Network calculations based on FAOSTAT. Sudan faces a high level of corruption among politicians and a comprehensive economic crisis, which has resulted in widespread chronic hunger, as well as humanitarian crises and famine (Thomas, E. and de Waal, A., 2022, Hunger in Sudan's Political Marketplace).

The subject of this thesis is also politically significant, as proven by large-scale protests in recent years following changes in the subsidized price of wheat bread and the increase in fuel prices (Abdelaziz, et al., 2013). Foreign



exchange shortages that limited wheat imports, low productivity of domestic wheat farmers, and increases in bread production costs for bakeries contributed to high wheat flour prices. Bread shortages caused by the rising demand for bread, High inflation effects on purchasing power of the households which lead to less food accessibility, and the fluctuation in the international wheat supply caused by the Russian and Ukraine war is a reason added to the above (Abay, et al., 2022).

The wheat policy of the Sudanese government was designed to satisfy numerous aims such as stabilizing wheat prices, creating incentives for domestic production, securing imports, and ensuring food security. Demand for wheat has grown rapidly in the last 15-20 years, mainly driven by population growth, urbanization and changing consumer preferences for bread and other wheat products in the Sennar state. Sennar city is the main city of the Sennar state and the largest centre of wheat consumption, but also rural Sennar city households consume wheat-based food, often selling sorghum and millet to buy wheat.

In 2021 the Sudanese transitional government decided to end the governmental wheat subsidies which increased wheat bread prices (Abdelaziz, 2022), In addition, the inflation increased between 2011 and 2022 which has a significant impact on the city consumers. The government justified the decision of ending the wheat subsidies scheme based on its plan to have new loans and financial support from the International Monetary Fund and Club de Paris. In Sennar city, the residents are struggling to pay for their needs for wheat bread and other food items. The study focuses on food security and wheat flour supply in Sennar city.

## **1.2 Study area**

Sennar is a city located in Sennar state in Sudan, the main resident groups are farmers, government employees, and private sector workers the city is located at the Blue Nile river. It is also home to a small number of pastoralists. It is the home of 505,845 residents according to Integrated Food Security Phase Classification (IPC, 2022). Sennar City mainly hosts three different household groups, the biggest group is the private sector employees, the second largest group is the government employees, and the last group is the farmers. The rural area of Sennar city consists of several rural residential neighborhoods near the Sennar dam area, the majority of inhabitants in the rural countryside are villages that host farmers, and they depend on the Sennar city market for their food purchases. The data of this research will be collected from Sennar City, in the form of interviews, focus discussion group (FDG), and two different surveys, one is Food Consumption Score (FCS) and two is Household Food Insecurity Access Scale (HFIAS).

Sennar city residential areas are separated by the Blue Nile River and Sennar Dam Lake. The centre of Sennar city has ten different neighbourhoods. Two rural neighbourhoods were located on the east side of the Dam side with most of its resident working as farmers, and the rest were located on the west side of the dam side, and they are considered urban with the majority working in the private sector and the public sector.



Figure 1. Sennar state (google map, 2022)



Figure 2. Sennar city, Sudan (Google map, 2022)

### 1.3 Research Problem:

Households in Sennar city suffer from a shortage of wheat supply, high prices of wheat flour, and low flour supply availability. Food distribution companies can't ensure staple wheat flour supply with reasonable prices because of government policy and control over the wheat flour market. Prices of wheat flour are even anticipated to rise by 84 per cent by bakeries in 2022 (Abdelaziz, et al., 2022).

The Ukraine war with Russia rises further the prices of wheat because Sudan imports its wheat supply mainly from Russia. There is a lack of studies on the relationship between wheat supply and food security between 2011 and 2022

in Sennar city. Therefore, it is very difficult to identify a new strategy for private sector actors to ensure wheat flour supply which increases both the food availability and secures staple wheat supply to meet the huge demand. Studying Sennar City's microeconomic condition will highlight the key factors contributing to the issues with the declining supply of wheat flour, and the results of this study can benefit to other similar Sudanese cities.

## **1.4 Research Objective**

To improve the sustainability of Sennar city food security by exploring the relations between wheat flour supply and Sennar city food security, and to recommend interventions for improving food security and planning projects for wheat flour distribution by commercial actors.

### **Specific objectives**

- To study the microeconomic data of Sennar city food security data between 2011 and 2022 to identify the significant trend and causes.
- To investigate the data of the wheat supply chain of Sennar city.
- To explore the degree to which Sennar people have become dependent on wheat to achieve food security.
- To study the impact of the current crisis in Russia-Ukraine on the supply chain of wheat and its availability and accessibility (affordability) by households in Sennar.
- To study the factors influencing food security in Sennar city.

## **1.5 Main Research Question:**

What is the effect of the wheat crisis on the food security of Sennar city households?

### **Sub Questions**

- I. What has been the impact of the wheat supply crisis on private sector actors in Sudan?
- II. What has been the impact of the wheat crisis on the food security households living in both the urban and rural neighborhoods in Sennar city?
- III. How have private sector actors, in particular distribution companies and bakeries, responded to the strong increase in the international wheat prices?
- IV. What has been the impact of high wheat prices on food security of urban households and rural households in Sennar city?
- V. What are the coping strategies of the households with the fluctuation of wheat flour supply in Sennar city?

## Chapter 2: Literature reviews:

### 2.1. The impact of the wheat supply crisis on food Security and private sector actors in Sudan:

Millions of tons of grain have been waiting at the Ukraine ports due to Russia's naval blockade, which has decreased world supply during a food crisis. Moscow accuses Kyiv of starting the standoff while carrying on with a destructive war that weakens Ukraine's ability to produce food and sell it (Oxford Analytica, 2022, "Russian war aims and grain plans to fuel global crisis", Expert Briefings). Alison Bentley in his study "Broken bread, 2022, avert global wheat crisis caused by invasion of Ukraine," states that the war in Russia has brought attention to the vulnerability of the world's food supply. A long-term strategy is required to feed the globe in a changing environment.

Due to the great dependency on imported food from the international market, the Middle East and North Africa (MENA) area is especially vulnerable to the international trade shocks (Abay, et al., 2022). Abay study presents data on how food systems and policies affect sensitivity to price shocks in three MENA countries: Egypt, Sudan, and Yemen. by rising the food prices because of the high dependance on imported food.

The international food crisis is associated with the increase in food prices which likely influence the urban poor the most, because of lacking the social protection net policy and food subsidies. Based on the literature, there is clear evidence of fluctuation in the international wheat flour supply, also the literature shows the food crises in Sudan which affect Sudan's food security.

### 2.2 The impact of food crisis on households in Sudan:

According to Nour, S.S.O.M. and Abdalla, E.M., 2021, the authors of Food security in Sudan, Nour states that most households (77%) are food insecure in Sudan to varying degrees, with 32.9 percent of households being seriously food insecure, while 23 per cent of households in Sudan is food secured. The authors discovered that most rural households are seriously food insecure in Sudan, the households are insecure in different degrees, depending on their wealth levels, the rich household are the least effected, the most vulnerable group are the employees of both public and private sectors with a fixed income.

the May 2022 report of the Integrated Food Security Phase Classification (IPC) which is a set of tools and methods for classifying the kind and degree of food insecurity for policy support. The IPC divides areas suffering from acute food insecurity into five categories: Minimal, Stressed, Crisis, Emergency, and Famine. The response objectives for each of these phases are different. It showed that 177,045 residents of Sennar state are in phase three of acute food insecurity, which makes 35 per cent of the whole population of Sennar city under crisis phase. it illustrated that in September 2022, 9,8 million faced high acute levels of food insecurity in all Sudan.

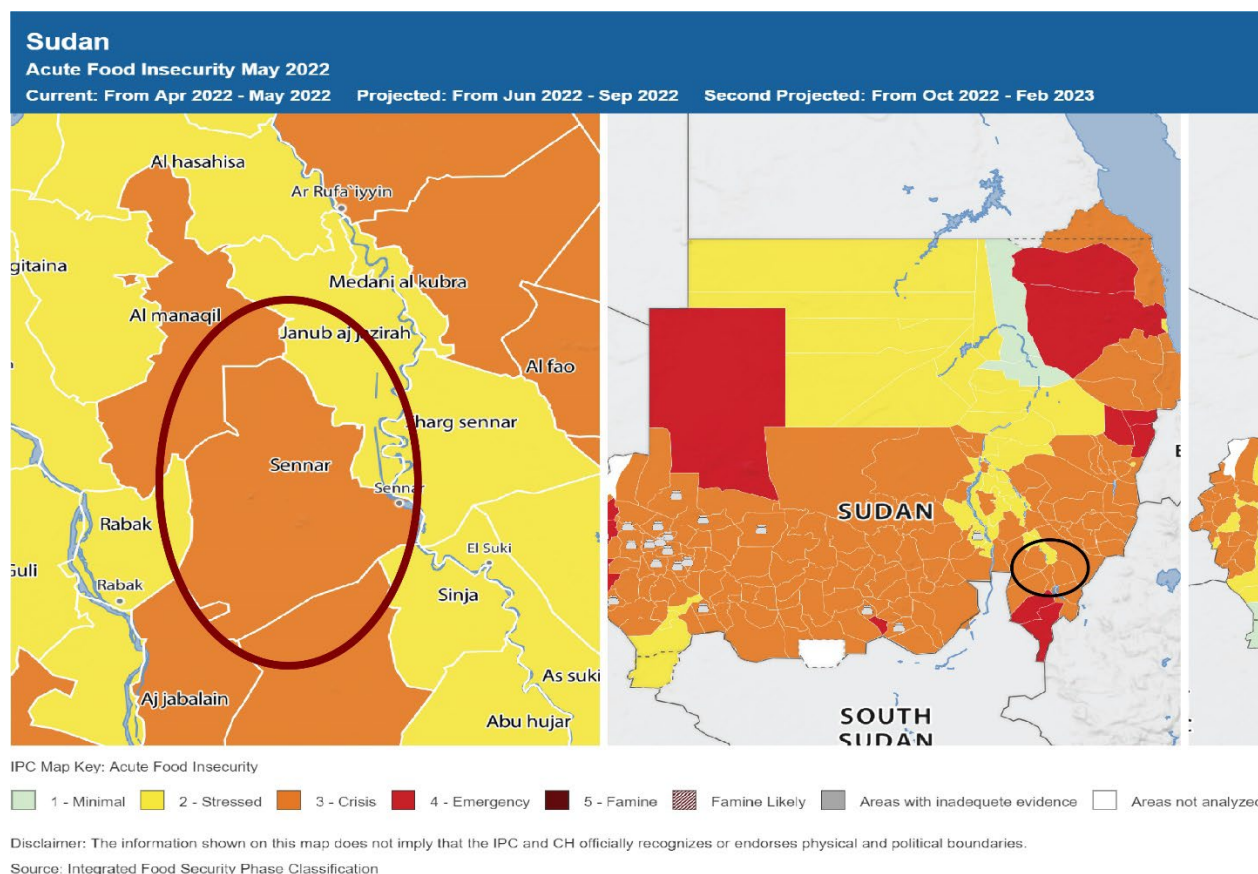


Figure 3. (IPC Sudan food insecurity classification, 2022)

## 2.3 The response of the government of Sudan and private sector actors to the wheat crisis:

Wheat flour and bread have played a crucial part in the country's political economy. Increased bread prices sparked protests in 2019, which has proven the importance of wheat flour for the Sudanese community (Abdelaziz, F. 2022). Adding to that, Abdelaziz reports that wheat is a strategic and political good in Sudan and has played a central role in the country's economy during successive regimes.

Disruptions in Sudan's wheat value chain usually led to shortages of wheat bread, price spikes, and political unrest, which proved the significant effect of wheat on food security in Sudan. Since South Sudan's independence in July 2011, which resulted in a significant decline in oil revenues for Sudan, rampant inflation and an overvalued exchange rate caused even more severe price distortions and prompted several significant policy reforms to address macroeconomic imbalances. The Sudan government subsidized wheat flour, although large price increases in the sales price of flour to bakeries and the price of subsidized wheat bread were a result of significant price reforms that took place in late 2018 and early 2021. The massive street protests that were sparked by the wheat bread price increase from 14.3 to 42.9 SDG/kg (1.0 to 3.0 SDG for a 70-gram loaf) in December 2018 helped bring down the Bashir regime in April 2019. The impact on bakeries profit decreased by raising the prices, mainly because of the wheat flour price which is sold to them. The estimated total bread subsidy increased. The subsidies suspended by the government on late 2021 by Hamdok prime minister government. (Dorosh, P.A., 2021).



## 2.4 The conceptual framework:

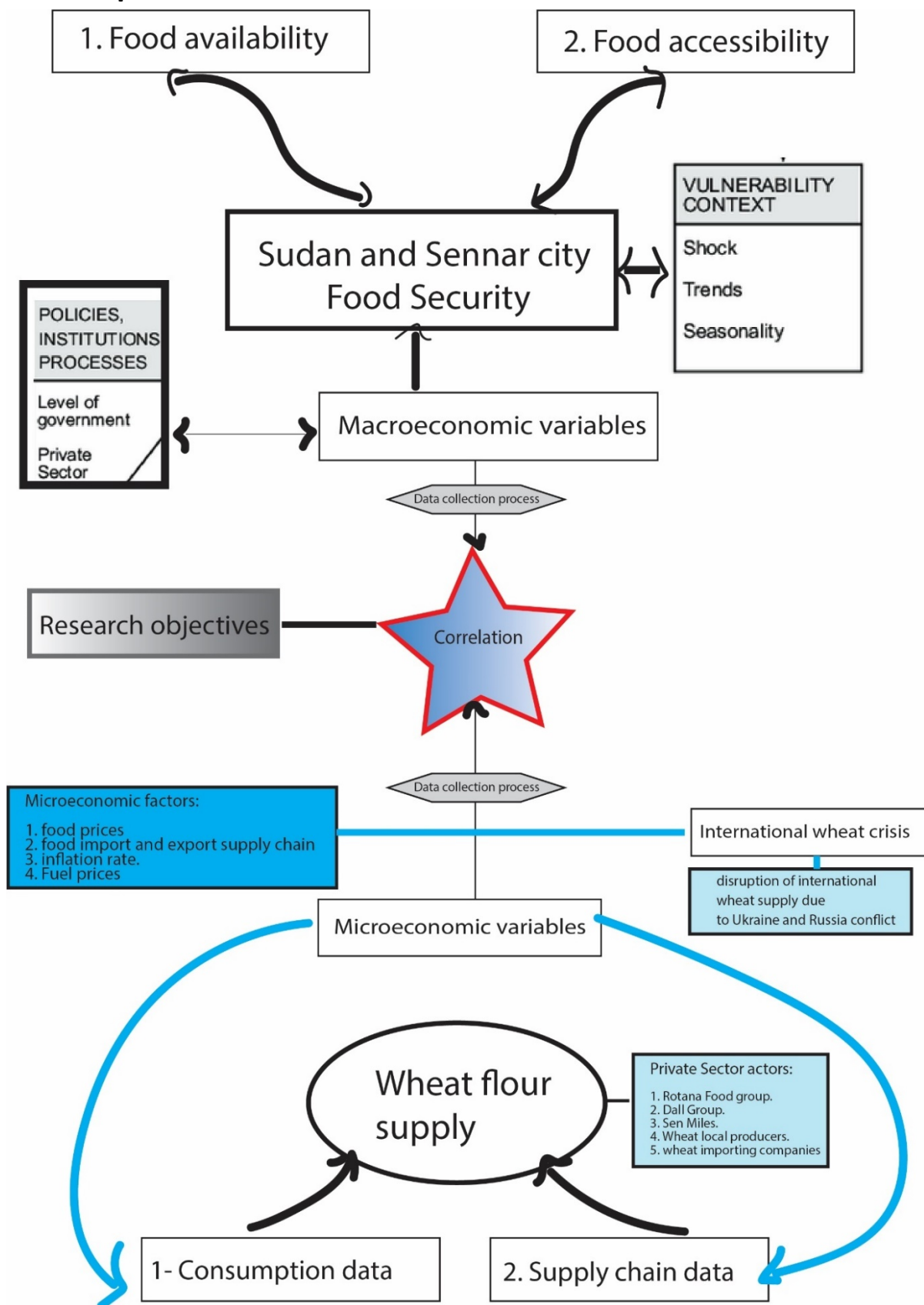


Figure 4: Conceptual framework

The author of this study designed the conceptual framework. The framework explains the variables that have an impact on the supply of wheat as well as food security in Sudan. describing the information gap and how the research plan will address it using the key variables that were elected based on the literature.

The conceptional framework illustrates the links between the main variables of wheat supply chain actors with the effects of microeconomic factors such as inflation rate, fuel prices and import and export figures. Moreover, it explains how food security of Sennar city has direct effect by the availability and accessibility of food and how the microeconomics play a role on this. However, the framework states the knowledge gap of the lack of study on the correlation between food security of Sennar households and the wheat flour consumption change which the research aims to explore.

The aim of this study is to explore the correlation between food security in Sennar city and the wheat based food and how can be affected by each other, the framework explains the main factors which influence the food security of Sennar and wheat value chain and at the same way, it points to the missing data in which the research aims to investigate which is the correlation between the wheat supply and the food security condition in Sennar city.



## Chapter 3: The methodology of the research

### 3.1 Introduction

This chapter will outline the research strategy that will be used in the study. It will demonstrate and justify the research design chosen, as well as provide information about the research techniques to be employed. The study area, population, and sample method will all be discussed. It will conclude by focusing on the data analysis process. The researcher is using both qualitative data collection tools and quantities, both suitable to answer of each sub-question. Aiming to answer the sub-research questions, The author of this study needs to investigate the reasons for the research problems which required interview different key interviewees. This type of study requires an exploratory qualitative research design for understanding this phenomenon and answering the research questions. The study will use a qualitative research design to determine the factors that cause research problem. Although, using quantities data collection tools is important to measure the food security of the study area in numbers and percentages, since food security is one of the two themes the study aims to explore so that the research can contain both the reasons and variant data and the numbers and percentages.

### 3.2 Research population:

The target population of this study is the households' which is referred to any group of individuals lives in the same house in Sennar city. Around 505,845 humans are living in Sennar city according to IPC data 2022. Based on the land department in Sennar data, the city has 16082 households in 13 neighborhoods. The following is a summary of the data collecting methods used to answer the sub-research questions and, altogether, to answer the main research question

#### 3.2.1 Random Sampling:

Random samples will be taking to fill the questionnaires based on households' number in Sennar processing by the random sampling formula. Sennar city has 16082 houses which hosts 16082 households in 13 neighborhoods, and to represents the whole target households the random sample formula was calculated and result is 17 samples should be taken in each surveys to represent the whole research targeted population. (annex 1)

### 3.3 The data collection methods purposes:

This study gathers primary data by using a questionnaire as the main method of data collection and semi-structured interviews to investigate the interviewees opinions, and it will use focus discussion groups to investigate about the coping strategies and food consumption habits of Sennar households. In addition to the qualitative data, filling and analyzing food security indication, the researcher is using the following quantities instruments to collect primary data about food security levels in Sennar city. In particularly,: Food Consumption Score (FCS) questionnaire and Household Food Insecurity Access Scale (HFIAS). the researcher conducts 17 questionnaires for each FCS and HFIAS based on randomly sampling for Households number in Sennar city. These two standard questionnaires were chosen because the researcher needed to measure the food security of Sennar city in numeric shape and in percentages, therefore the HFIAS and FCS is perfect to illustrate different food security related conditions in percentages. Based on the population

size, the random sampling size was calculated and 17 questionnaires were filled to represent the whole households in Sennar city.

In shape of qualitative data. In aim to investigate the wheat flour supply chain in Sennar city, Three Key persons interviews, one is aim for wheat flour supply chain actor, the second with private sector distribution centre and the third interview with bakery owner, discussion group of 5 participants representing the targeted household categories to cover all financial level in Sennar city.

The qualitative method used in this study is: Focus discussions group (FDG), held with a small group of people who have specialist knowledge or interest in a particular topic. FDGs are typically conducted with 5 to 10 participants. They will be directed based on a small set of guiding questions that will aid in gathering data relating to coping strategies and food security in Sennar city. FDG is designed to probe for in-depth information. Group of 5 participants is gathered to conduct the FDG who represent the rich and poor rural household in Sennar and the urban rich and poor household.

Semi-structured interviews: A qualitative research method and Semi-interview relies on the collection of data using questions. one participates in three interviews, one of whom is the interviewer who asks the questions. This tool is chosen because it effective on extract information regard the wheat supply crisis in depth with the related interviewee who work in this sector.

### **3.3.1 Impact of wheat supply crisis on the food security of Sudan and Sennar city**

What has been the impact of the wheat supply crisis for private sector actors in Sudan

- A) Key informant interviews with key private sector actors in the producer factory and in Sennar city wheat distribution centre using semi-structured interviews. Firstly, interview with Dr. Nibras Hussein the CEO of Routan Miles, one of the three main wheat manufacturers in Sudan, and he also Sudan Ministry of Commerce consultant. Secondly, Mr. Alagib Ahmed Osman, the Financial manager in Sega miles distribution centre of Sennar city, Sega miles is the biggest wheat flour producer in Sudan. Finally, Mr. Amaad Abdulgadir Babikir, one of the largest bakeries owners on Sennar city (see annex 4)
- B) Desk Study, based on studies, reports from international agencies such as United Nations, scientific papers, and academic books, I will collect data about Sudan food security and the international wheat market to answer for sub-question number one.

### **3.3.2. Adaptation strategies and their success by wheat value chain/private sector actors:**

How have private sector actors, in particular distribution companies, responded to the strong increase in international and national wheat prices?

- A) Key informant interviews with key private sector who produce the wheat flour in Khartoum industrial area and distribute it allout Sudan state and Sennar City using a semi-structured interviews exploring the coping and adaptation strategies and their level of success.

- B) Focus discussion groups: Conducting one focus discussion group with different income source categories, with rich rural and urban household representers, as well as poor rural and urban households representers in Sennar city to find answers to questions two about food security crises in Sennar city and what their adaptation and coping strategies.

### **3.3.3 Impact of increased wheat prices on urban and rural households in Sennar city and its contribution to household food insecurity:**

What has been the impact of the wheat crisis on wheat flour regarding the food security of rich and poor urban and rural households in Sennar city?

A) Household Food Insecurity Access Scale (HFIAS): to measure the impact of the strong increase in wheat flour on household food accessibility and availability. Using an adapted form by the researcher to focus on wheat consumption and its relation with its prices and its availability. The researcher add two question, question number 10 and question number 11 which focused on wheat based food consumption, prices and availability.

### **3.3.4 Coping strategies of urban and rural households in Sennar city in face of wheat crisis:**

How have households coped with and adapted to high prices, fluctuation of wheat flour supply, including wheat-based food items in trying to maintain their food security.

- A) Undertake the Food Consumption Score (directly mentioning and concentrating on wheat food items) of urban and rural households that expressed high levels of food insecurity because of high wheat flour versus urban and rural households that expressed relative low levels of food insecurity as a result of the high wheat flour.
- B) Operating focus discussion groups: Conducting one focus discussion group with different income source categories, with rich rural and urban household representers, as well as poor rural and urban households representers in Sennar city to find answers to questions two about food security crises in Sennar city and what their adaptation and coping strategies.

- C) Collecting data of change that highlight success/failure of coping strategies.

Conducting a discussion group to explore the coping strategies for poor and rich urban households and poor and rich rural households.

### 3.3.5 Data collection table:

Method of Collecting Data	Selection of Participants	Answer research question
Key informants' interviews	(3) key informants: 1. Alagib Ahmed Osman (Sennar city wheat flour distribution Financial manager in the distribution centre) 2. Dr. Nibras Hossein (CEO of Rotana Miles ) 3. Mr, Amaad Abdulgadir Babikir (local bakery owners)	a) What has been the impact of the international food crisis on the wheat supply chain for private sector actors in Sudan?  b) What has been the impact of the international food crisis on the food security of urban and rural households in Sennar?  c) How have private sector actors, in particular distribution companies, responded to the strong increase in the international wheat prices? (annex 4)
Focus Group Discussions (5 people per group)	(3) Different household in Sennar city (households) 1. Rich urban household. 2. poor urban household. 3. Rich rural household. 4. poor rural household.	a) What has been the impact of high wheat prices on urban households and rural households?  b) What are the cope strategies of the households against the fluctuation of wheat flour supply in Sennar city?  (annex 5)
Questionnaires:	(1) Household Food Insecurity Access Scale (HFIAS): conducting in different motherhoods to scan the food security level in Sennar city. 17 random samples was taken	a) What has been the impact of high wheat prices on urban households and rural households? b) What are the cope strategies of the households against the fluctuation of wheat flour supply in Sennar city?

	(2) Food Consumption Score (FCS): 17 random samples were taken.	
Disk Study:	1.Comparing IPC data. 2.Analysing recent scientific papers. 3.Studying recent research about the research topic.	a) What has been the impact of the international food crisis on the wheat supply chain for private sector actors in Sudan?  b) What has been the impact of the international food crisis on the food security of urban and rural households in Sennar?  c) How have private sector actors, in particular distribution companies, responded to the strong increase in the international wheat prices?

Table 1: Data collection table

### 3.3.6 Household Food Insecurity Access Scale (HFIAS):

Firstly, collecting few key informants familiar with the conditions and experiences of household food insecurity (access) in the areas where the survey will be conducted. Using this tool, researcher finds out about the effect of high wheat prices on both urban and rural household food security in Sennar. The questionnaire includes 11 questions that assess the intensity of food insecurity on a scale of one to nine (access) and it will take 17 individuals by random sampling to fill them, the 17 individuals randomly chosen based on the number of the households in Sennar city which is 16082 households, identified to represent the whole household population in Sennar city using the random sample formula. (annex 3)

### 3.3.7 Food Consumption Score (FCS):

The "Food consumption score" (FCS) is a composite score based on food frequency and dietary diversity. It is based on a household's frequency of consumption of various food types in the seven days leading up to the research. A weight is assigned to each of the food groups that make up the food intake score.. Sennar city has 16082 house and the random sample formula result is 17 respondents so the researcher made 17 questionnaires to represent the whole target population. (annex 2)

The researcher will examine four distinguished groups based on the major food items they consumes, using this tool to examine both poor and rich urban, and rich and poor rural households based on their income resources in Sennar city to investigate their coping strategies against the fluctuation in wheat supply and its prices which will contribute to answering sub-question number 5, in addition to explore the food dietary of Sennar household. .

### 3.4 Analysis Data:

The data collection in the Sennar city will begin on July 25th. The process will consist of three steps: data collection from random households in the city, the households selected by the random sample based on the whole population size of the household in Sennar which is 16082 house in Sennar city, the calculated resesult is 17 samples to represent the whole population size, data sorting and undertaking to ensure that the data collected from the field is rearranged, and data analysis to produce a summary of the data collected from the field. The quantitative data gathered in the field will be coded and imported into SPSS software to show the data in a readable format.

### 3.5 Research plan:

After receiving administrative approval to collect data, the thesis research will be scheduled for three months (annex 4).

#### Expected risks and limitations

Risk	Effect	Probability	Management
Limited of transportation	Minor	Low	Rent a taxi
Political unrest in Sudan and the people of the daily demonstration	Major	High	Using security and issue clearance from the government officers.
	Moderate	High	Use a waterproof bag to keep my books, money and mobile, waterproof boots, Umbrella, and raincoat.
Rain during the data collection.			

Table 2: Expected risk and limitation

### 3.6 Duration of the research

The study will last three months, from July to September, with 5-6 weeks of data collection in Sennar city (depending on study participants' availability) and the remaining time for report preparation. If necessary, follow-up interviews based on the data analysis may be considered.

### 3.7 Research team and timetable:

Almoaz Abdoulrahim is a research assistant, hired to conduct the questionnaires under the supervision of the main researcher. The interviews and the focus group discussion will be conducted together.

### 3.8 Timetable graph:

The calendar is starting July 2022 and endings in September.

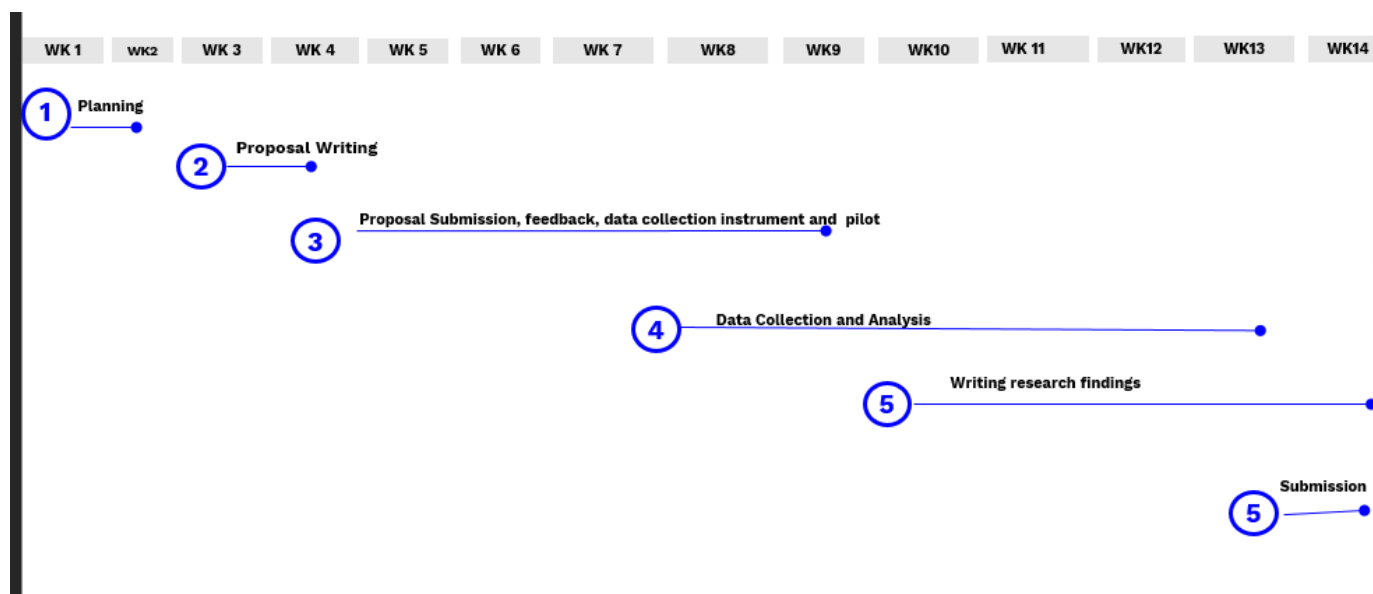


Figure 5: Timetable graph

### 3.9 Ethical considerations in research

1. Maintaining the respondent's safety and avoiding any harmful questions to the respondents

As a researcher, it is my responsibility to collect data while also ensuring the physical, social, and psychological well-being of the researcher and the respondents, as well as the respondents' privacy concerns.

2. Informing respondents and acquiring explicit consent to conduct with them the questionnaires, interviews, and the focused discussion group.

This includes information on the study's benefits, hazards, funding, the time it needs, the goal of the study, how data will be recorded and stored, and the research's expected output.

#### 3.9.1 The advantages of the researcher being one of the local in the study area:

3. The researcher one of the local residents of Sennar city and he has large connection with actors in the private sector and government. The researcher anticipated the responses rate will be high and the people will collaborate with the research data collection tools.

## Chapter 4: The result

### 4.1 The profile of respondents:

The participants of the study belonged to the city of Sennar. They were from the Sennar state which is one of southern states of Sudan. The respondents were the representers of the households. The respondents represent four groups, the poor and rich urban household which located on the urban area of Sennar city, as well as the rich and poor rural household which located on the rural neighborhoods in Sennar city. Most of them were families living in the same house. Those were the respondents of the Food Consumption Score (FCS), Household Food Insecurity Access Scale (HFIAS), and the Discussion focused group. The interview respondents were actors in the wheat supply value chain.

In the discussion group, five participants were engaged, Dr. Mohammed Idris, Tarig Alsadig, Ibrahim Qurashi, Abdullah Gib Albary and Alameen Ibrahim, they represent poor urban and rural household of Sennar, and rich urban and rural household as well. In the interviews, three interviews were conducted with Alagib Ahmed Osman (Sennar city wheat flour distribution Financial manager in the distribution centre), and Dr. Nibras Hossein (CEO of Rotana Miles), and, Mr, Amaad Abdulgadir Babikir (local bakery owners). The survey respondents of the study lives Sennar city 13 neighborhoods. 88% of the 34 random samples are between 31 and 60 years, meaning they are primarily young. While the rest are 12%, meaning they are older than 61. Based on the study's findings, the results illustrate that Most households have children; 92% have children between 0-12 years, while others have more than ten children. All vast majority of the household were married couples (91%), the 9% were men groups live in the same house.

Indicators		Occurrence	Percentage
Age (years)	21-60	30	88
	61-85	4	12
Household member	0-10	31	92
	11-25	3	8
Relationship status (Marital)	Married	32	91
	Men group	2	9

Table 3: Profile Respondents table

### 4.2 Food Security situation in Sennar city with the focus on wheat supply:

Bellow the result is the Surveys results for Food Consumption Score Questionnaire and Household Food Insecurity Access Scale (HFIAS), illustrated by charts and graphs which concentrate on the food security measures of Sennar city households in percentages and numbers. 17 questionnaires were filled, and analysis based on their guidelines of each one to represent the household population size in Sennar city.



#### 4.2.1 The Food Consumption Score results:

Based on Food consumption score, 17 questionnaires were conducted in Sennar city randomly , Using a random sampling method to represent the whole size of the household in Sennar city and below is the result of it.

The survey aims to measure the consumption level in different household in order to indicate the level of food consumption in three profile level, one is acceptable, two is borderline, three is poor consumption level.

Based on the FCS guidelines the calculation of these food groups and weight will lead to three ranges of food consumption score which illustrated bellow:

Food Consumption Score	Profile
0-21	Poor
21.5-35	Borderline
> 35	Acceptable

Table 4: Food Consumption Table

The details consumption scores:

Consumption score	the sample No
77	1
35	2
48	3
21	4
56	5
24	6
47	7
33	8
65	9
53	10
42	11
22.5	12
28	13
65	14
83	15
58	16
82	17
49.44	The average

Table 5: Food Consumption score

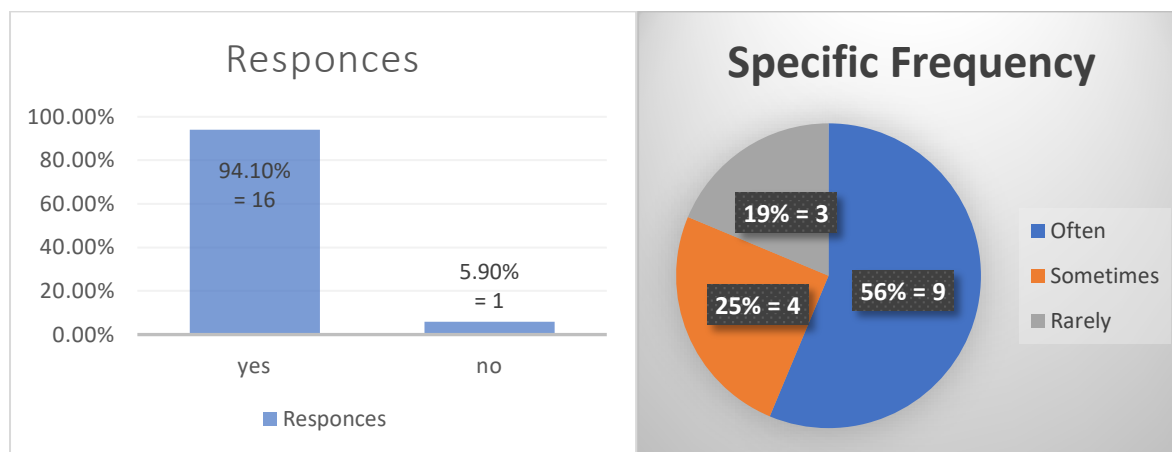
The survey result household consumption score in FCS, 64,7 % scored acceptable consumption score, while 29,4 stayed on borderline level. Only 5,8 % of Sennar population has poor consumption level.

In the FCS result, the vast majority is under classification of acceptable level of food consumption score (64,7 %). While 29,4 % were under borderline level. Only 5,8 % has poor consumption score in Sennar city. The average consumption score is 49,44 which is under acceptable household consumption level.

#### 4.2.2 The Household Food Insecurity Access Scale (HFIAS) results:

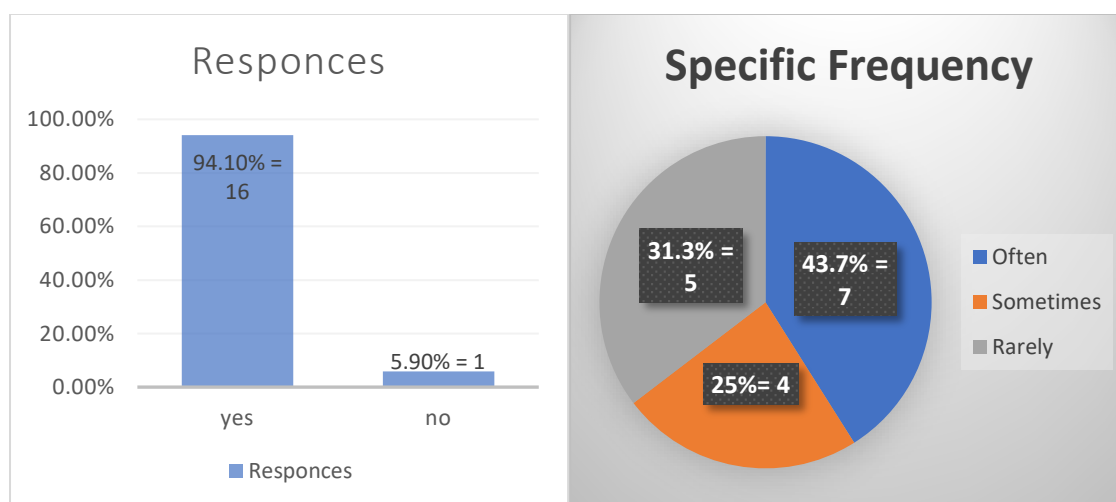
The HFIAS information is used to anticipate the prevalence of household food insecurity in a targeted population. It is uniquely able to detect aspects of food insecurity including decreased access to a sufficient quantity or quality of food which required in this study to measure the wheat-based food and the psychosocial manifestations of anxiety and uncertainty around food access, which can also affect health and wellbeing (Ballard et al., 2013) Based on 17 Survey which contain 11 questions, this are the results: the result in shape of graphs which illustrates the number of respondents of each question and the number of respondents for each frequency in each question.

Question 1 In the past four weeks, did you worry that your household would not have enough food?



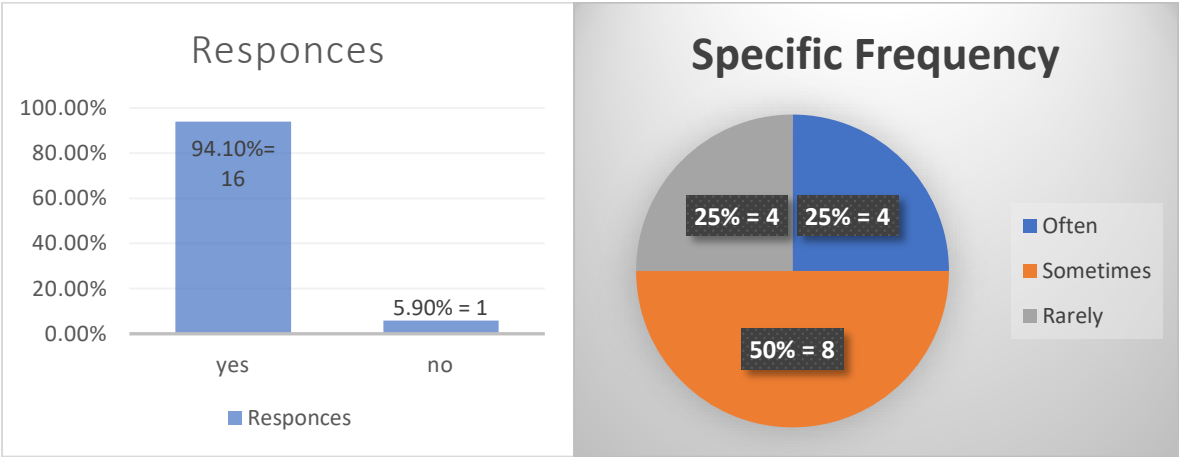
Graph 6: HFIAS question 1 graph

Question 2 : In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?



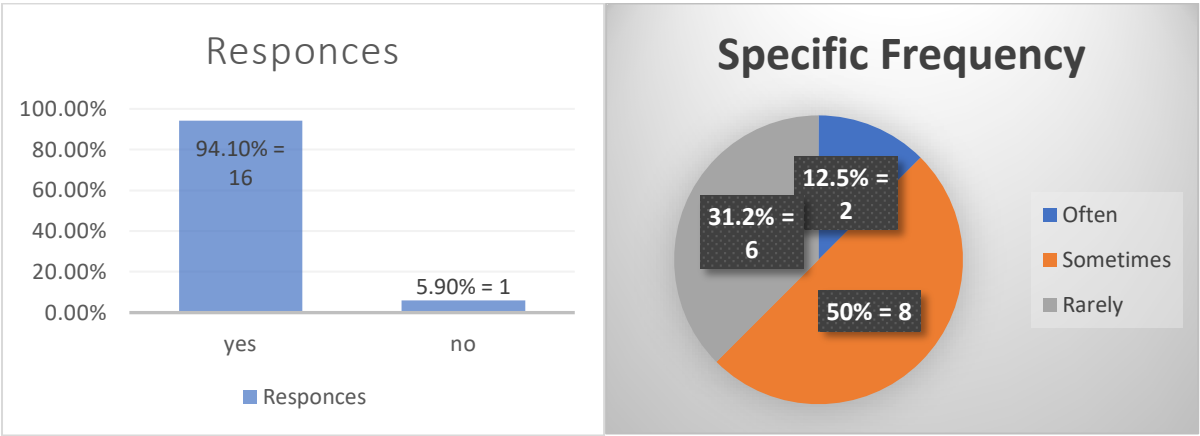
Graph 7: HFIAS question 2 graph

Question 3: In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?



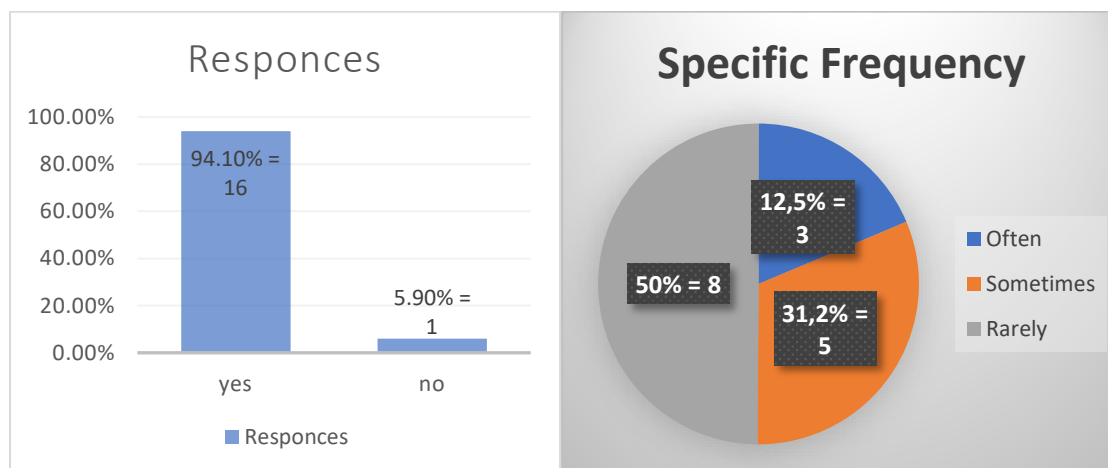
Graph 8: HFIAS question 3 graph

Question 4: In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?



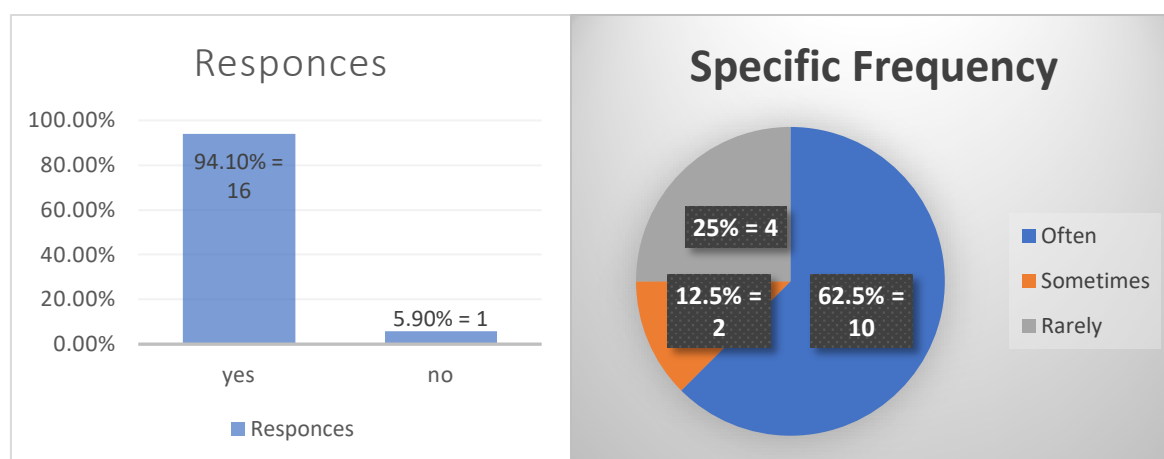
Graph 9: HFIAS question 4 graph

Question 5: In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?



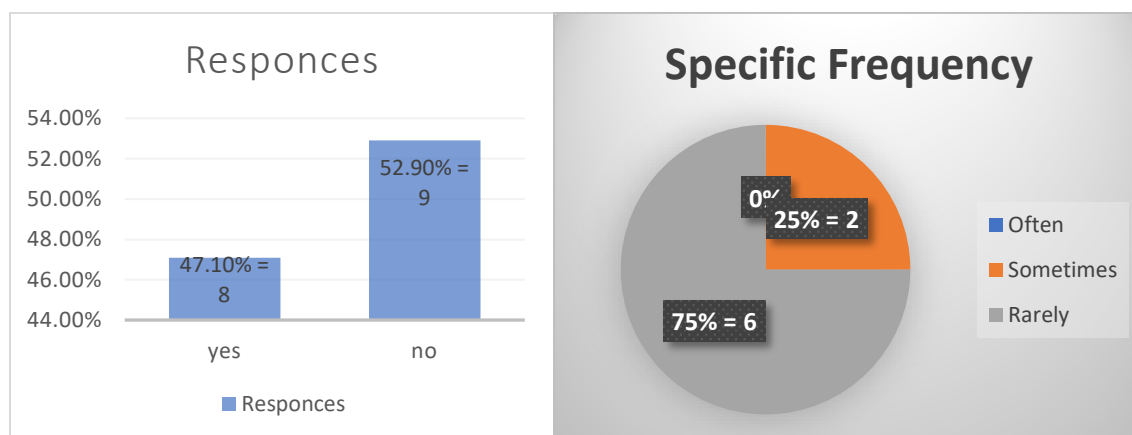
Graph 10: HFIAS question 5 graph

Question 6: In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?



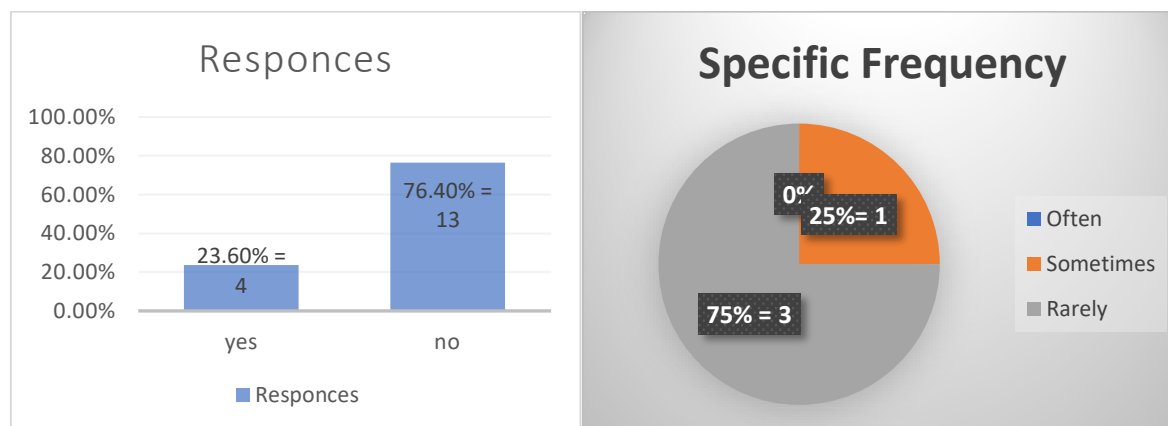
Graph 11: HFIAS question 6 graph

Question 7: In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?



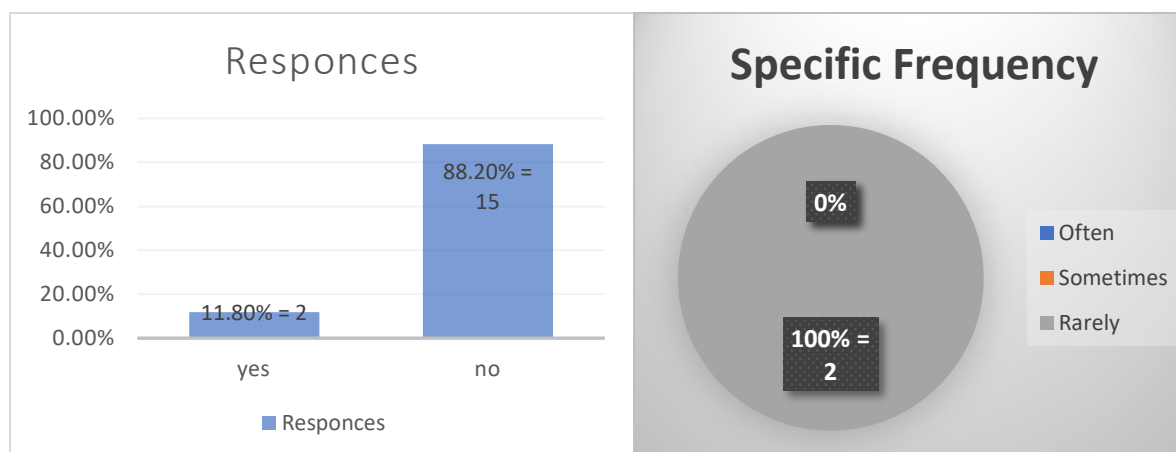
Graph 12: HFIAS question 7 graphs

Question 8: In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?



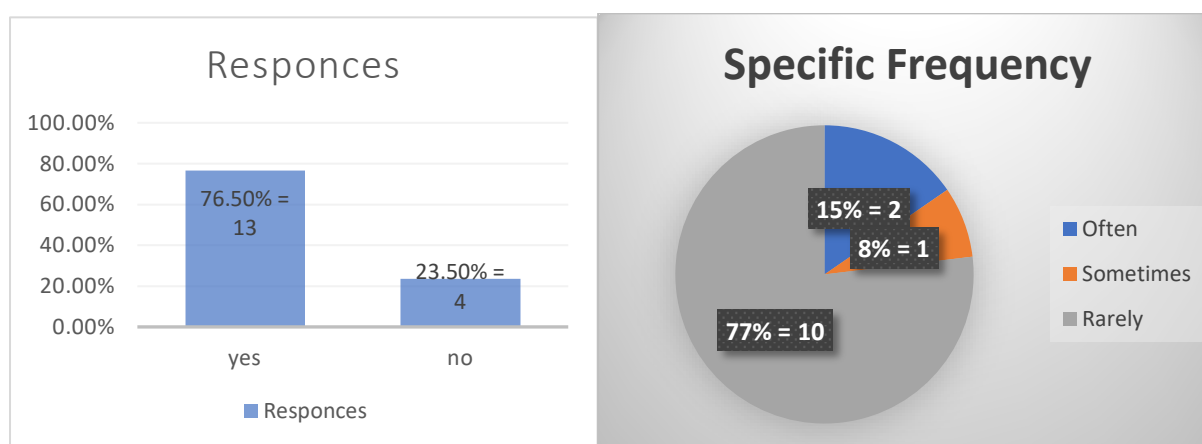
Graph 13: HFIAS question 8 graphs

Question 9: In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?



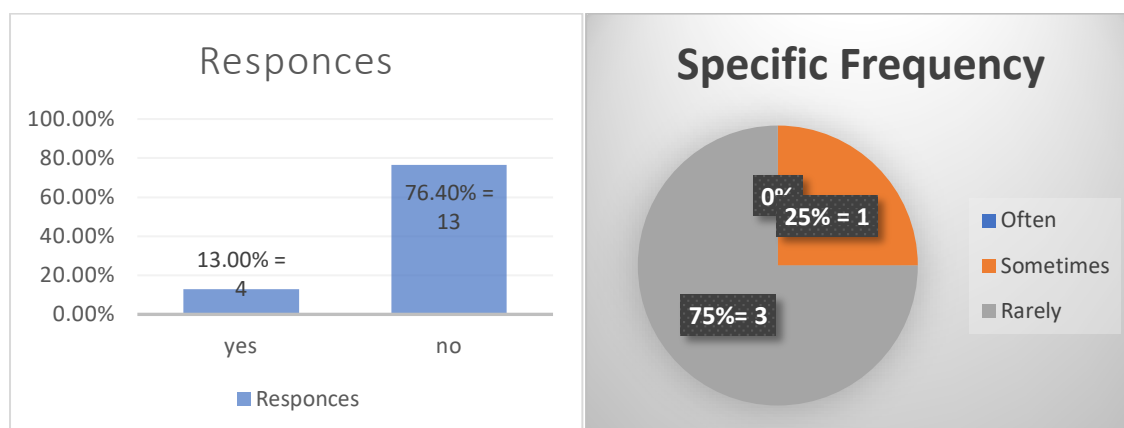
Graph 14: HFIAS question 9 graph

Question 10: In the past four weeks, did you or any household member go a whole day and night without eating wheat-based food because of prices?



Graph 15: HFIAS question 10 graph

Question 11: In the past four weeks, did you or any household member go a whole day and night without eating wheat-based food because of availability issues?



Graph 16: HFIAS question 11 graphs

HFIAS is concentrating on related conditions regarding the access to food in the past 30 days, in bellow you find some concluded results based on the HFIAS questions: HFIAS indicates that 76,5 % of the household population does not have enough wheat-based food because of the rising prices based on question ten, according on Household Food Insecurity Access-related Conditions analysis. While 13 % not having wheat-based food because of availability of wheat flour in the market. based on HFIAS analysis, 24,9 % of the population were food secured as categorized on food insecurity access categories in response to question one in HFIAS which is the percentage of household who states that rarely worry about not having enough food. According to Household Food Insecurity Access Scale (HFIAS) responses, 94.10 % don't have sufficient food quality, while 47.10 % of the households in Sennar city did not have enough food quantity which makes them face the risk of malnutrition. 76,5 % of the target population finds difficulties in having enough wheat-based food because of the prices.

### 4.3 The impact of the wheat supply crisis on the private sector and food security in Sudan:

The study finds that all the interviewees with the wheat flour supply chain actors were confirming that the demand for the wheat flour and the wheat bread is increasing (Dr. Nibras, 17 August, 2022). Dr. Nibras Hosain who cites that one of several reasons of the fluctuation of the wheat prices in Sudan is the Ukraine and Russia war, because they are the major wheat suppliers in Sudan. The high inflation rate in Sudan, which causes the increase in wheat prices. The government subsidies for wheat is stopped completely since 2020, Nibras added. Regarding the international food crisis, 85% of Sudanese wheat supply imported from the international market, Russia, Ukraine, and Australia were the main wheat suppliers to the wheat flour manufactures (Dr. Nibras).

*"The recent Russia and Ukraine war severely affects the wheat shipping orders and now the available wheat in the international market has higher prices ". (Dr. Nibras, 17 August ,2022)*

The consumption of the wheat flour increases by the rising demand in Sennar city, in 2019, the sales figures was 200,000 bags, while in 2020, it was sold 250,000 wheat flour bags, and 275,000 bags in 2021. Because of the recent fluctuation on the international wheat supply, the factory shipping duration to Sennar is increased which make the costumers orders delivered in 5 days instead of 2 days with extra cost, 95% of the wheat flour payers are the bakeries' shop owners. (Alagib Ahmed Osman, 6 August, 2022).



**Photo 1: Interview no 2: Alagib**

*“The reason for the rising of wheat flour consumption is the preferring of wheat bread over other based food options by the households in Sennar “. (Alagib, 6 August, 2022).*

Amaad Abdulgadir Babikir is the owner of a bakery shop in Sennar city who reveals that the demand for the wheat bread is rising, and the consumer of the bread is continuously paying the bread despite of the rising prices. Alagib cites that the reasons of the increase in wheat flour price were the rising inflation rate and the drop of the Sudanese's pound currency value which are one of the microeconomic indicators.

The study findings that the effect of the international wheat crisis is causing the rise in the bread prices, and because of the dependence on the international wheat in producing wheat flour in Sudan, the inflation and the fluctuation of the Sudanese pound value, the prices of the wheat flour increase, however, the household in Sennar continues to pay for the wheat bread despite the rising prices. The three interviews illustrate the effect of the international food crisis on the private sector actors and the consumers' responses.

#### **4.4 Private sector actors, in particular distribution companies and bakeries, responses to the strong increase in the international wheat prices:**

The study finds that Sudan has high dependency in imported wheat which makes Sudan vulnerable to the international wheat prices shocks.

*“I paid new shipping wheat from Russia in the past month with 12% extra price before the rising international wheat price, that because of the effect of the Russian and Ukraine war on the international wheat prices “. (Dr. Nibras, 17 August, 2022).*





**Photo 2: Interview no 1: Dr. Nibras**

Over the past ten years, imports have provided about 85% of Sudan's wheat supply, costing the nation about \$500 million US annually (FEWS NET 2015; World Bank 2020a). However, due to significant real exchange rate instability, rapid depreciation of the Sudanese pound, and high macroeconomic inflation, the price and profitability of wheat imports have fluctuated largely. Sudan gave up its system of fixed exchange rates, which at the time was 370 SDG to 1 USD (Mohiedeen 2021). This resulted in a 580 percent devaluation of the currency, raising worries about further inflation after the price of all consumer goods had already increased by more than 300 percent at the time (Baldo 2021).

The total removal of fuel subsidies in June 2021, which came before Sudan received debt relief from the IMF in that month under the Highly Indebted Poor Country (HIPC) program (Radio Dabanga 2021a), further raised the cost of production for farmers and bakeries for non-subsidized goods like water, yeast, cooking gas, labour, and oil. Farmers consequently had to pay higher input costs, such as gasoline for machinery. Due to production costs rising faster than the official wheat bread sales price, many bakeries went out of business and the household in Sudan faced difficulties in bread availability consequently. This literature illustrates the issues in which the wheat flour supply chain faces in Sudan and in particular in Sennar.

The Russia-Ukraine crisis has directly contributed to a significant rise in market actors' level of uncertainty. Rising price volatility in commodities that are traded internationally both reflects and contributes to this uncertainty, which influences marketing and production decisions (e.g., Feder et al., 1980; Moschini and Hennessy, 2001) and encourages speculative market activity. Farmers find it more difficult to decide what to grow and how much to trade when prices fluctuate, businesses are less likely to invest in agriculture and food, and ultimately, consumer decisions are impacted by higher prices and/or less availability. Several policy responses, particularly export restrictions, in response to the war and the price increase have made the situation worse (Laborde, Mamun, 2022). These factors may drive up food prices further.

## **4.5 Coping strategies of households against the fluctuation of wheat flour supply in Sennar city:**

Investigating the coping strategies, making wheat bread in houses instead of paying the bread from the bakery shops is one of coping strategies against the unavailability of readymade wheat bread in the bakeries' shops. Consuming different based food such as maize and rice is additional coping strategies, in addition. All the participants in the discussion focus group agree that using wheat flour to make other based food in the houses is the main coping strategy with any fluctuation in wheat flour and bread supply in bakeries shops.



*“The wheat bread is the main food based in my household because it easy to pay, in the recent months, However, I don’t have sufficiat cash to pay all the bread I need so I make now bread in my home “. (Ibrahim Qurashi, 29, August 2022)*



**Photo 3: Focus Discussion Group**

Food is available on the market; but the purchasing power is weak. Tarig reveals that eating two meals a day instead of three is one of the coping strategies when there are limited financial resources to pay enough food.

*“Sorghum and rice are the main alternative to the wheat bread in Sennar city “. (Dr. Mohammed, 29 August, 2022).*

For many of the study participants their first preferences of the based food is wheat bread despite of its high prices which illustrate the important role of wheat flour in the food security of the household in Sennar city, consuming with wide range of different dishes is the main reason for them to eat wheat bread, the respondents explanation. In the side of the wheat flour chain actors, The wheat flour private sector actors anticipate that the demand for the wheat flour will increase because of the rising in the population in Sennar city. However, some of the study respondents starting consuming other based food option such as rice and maize. Other eating two meals a day instead of three as a coping strategy when there is limited accessibility to food.

The study findings reveal that making bread in households’ home by using wheat flour is one of coping strategies against the unavailability of wheat bread in bakeries shops. While Tarig Alsadig adds rice in his meals as an alternative when he wouldn’t be able to have bread.

*“Using wheat flour to make other based food is the main coping strategy with any fluctuation in wheat flour and bread supply in bakeries shops “. (Tarig, 29 August, 2022)*

The study finds that food is available on the market, however, the purchasing power is weak. that eating two meals a day instead of three is one of the coping strategies when there are limited financial resources

*“In the net shells, the inflation is main reason behind the weak purchasing power of the households in Sennar city “. (Amaad,20 August, 2022)*

## Chapter 5 The Results Discussion:

In Sennar city, households first preferences of the based food is wheat bread, despite of its rising prices, which illustrate the important role of wheat flour in the food security of the household in Sennar city. The reasons for the preference of wheat bread is its capability of consuming wheat bread with wide range of different dishes, and the high availability of wheat bread in bakeries shops, almost every neighbourhoods has several bakeries shops. The result of the study indicates that the rising population in Sennar city will increase the demand of wheat flour consequently; this finding agrees with (Abay et al., 2022), who indicated that in the past 15 to 20 years, there has been a sharp increase in demand for wheat, largely due to population growth.

In addition, The study finds that 85 percent of consumed wheat is imported from Russia, Ukraine and Australia, which make Sudan wheat highly vulnerable to the international food prices shocks due to the high dependence on imported wheat; this study proves (Breisinger, C. et al. ,2022) results in his study The Russia-Ukraine war: Implications for regional food security and potential policy responses, Breisinger cites that MENA countries have heavy reliance on food imports and wheat is one of the main food Sudan is largely imports, the Middle East and North Africa (MENA) area which Sudan one of them, particularly vulnerable to trade and prices shocks, Breisinger reveals that the Russia-Ukraine war will have diverse effects on poor and non-poor households as well as rural and urban households within MENA countries. Urban poor are likely to suffer the most from the Russia-Ukraine war because of the related prices increases in food, especially in those nations where social protection and food subsidies are lacking.

The results of the research indicate that the households in Sennar city has different coping strategies against the rising wheat bread prices, the study finds that all the households in Sennar city continues in consuming the wheat bread nonetheless, that was supported by the study of Abay, 2022, he cites that consumers tastes was shifted for wheat bread and other wheat-based products (wheat bread) in Sudan, in the past 10 – 15 years, even rural poor households consumes wheat bread and frequently sell sorghum and millet to pay for wheat bread, In most years. However, Abays in his study reliance on quantitative data method, without extensive observation or data on interaction between insiders to verify the reports, may have led to a bias towards normative discourses and public perceptions rather than actual practices, while this study depends on both quantitative and qualitative data collection method in focus of food security of the study area in relation with the wheat supply.

The study also finds that housewives were responsible for making food in their household. In many cases, they are the one who bring the food from the market which reflect on the important role of females in the household and on the food security of the households' members (Nour, et al., 2021). This is in line with the study findings which confirm that the households prefer wheat.

The study illustrates that The vulnerability context in Sennar city has different elements, inflation is the most factors behind the weak purchasing power, which decrease the accessibility of the households for food in Sennar, prices shocks, low income, bad infrastructures and local unstable currency value were the other microeconomic vulnerability effecting the accessibility dimension of food security in Sennar city; these findings were supported by Dorosh, P., 2021, who indicates that The functioning of markets is crucial for ensuring affordable food prices and food security. Wheat markets are frequently not well integrated, necessitating improvements in infrastructure and institutional framework. However, in Sudan, weak business environments, unstable political and economic conditions which illustrate the macroeconomic aspects, and a lack of market infrastructure, institutions, and information frequently have a negative impact on food markets. In the policy side, only 10% of budgetary funds were set aside for economic affairs in the 2021 fiscal year by government of Sudan, including mining, industry, and agriculture (MOFEP 2020). The production of wheat and the markets for wheat supply would also benefit from additional investments in the broader agricultural and industrial sectors. This covers purchases of fertilizers, seeds, pesticides, and agricultural extension, as well as irrigation investments. The researcher of the study finds that the weak government supports policy is one of the main reasons behind the low performance of food market which is illustrated in the shape of low availability and accessibility of households to the sufficient food.

The microeconomic factors which the study explored is playing major role on wheat flour fluctuation in prices and availability in Sennar city which influence the food security of Sennar households because of the great reliance on wheat bread as a main based food. The study argues that the wheat supply has a correlation effect with the food security of Sennar city, since the other alternatives of wheat flour have weak accessibility and availability compared to wheat supply chain which mainly depend on imported wheat.

The study has important influence factor is that the researcher is one of the residents of the study area and the researcher has long experience working on wheat flour distribution project in the area, which enable the researcher to analyse interviews and discussion group in-depth to explore the study findings. That role of the researcher can facilitate the potential influence on the results study.

*“developing knowledge through casual interaction and participation in everyday activities of the study focus area, and gaining insights into the subjects' overall daily lives as a result. By making these decisions, I sacrificed efficiency for inclusivity, flexibility for consistency, and generalizability for in-depth thoroughness, the classical ethnographic aspect of my case study approach entailed living among the research population for an extended period, building rapport through informal interaction and participation in everyday activities, and so gaining insights into the overall daily lives of those under study. By making these choices, I traded off”. (Mohammed Ibrahim, 2022)*

In reflection for the research process, the research process was smoothly progress in the data collection field stage, conducting the interviews with the worm welcome of the interviewees, organizing the focus discussion group was interactive, and the FDG was energetic and has rich information about the coping strategies of the wheat bread fluctuation. The short time for the data collection is the only limitation the study has in the point of views of the study researcher, because measuring the food security in-depth required conducting data collection several time to compare the change through time. However, rain was heavy, and it caused the researcher a delay of two week of stopping the survey.

*“The city of Sennar really need a study in which the food security can be measure in focus to design intervention for the food accessibility in the area”. (Dr. Mohammed Idris, 29 August 2022)*

In reflection of the quality of the study findings, the study findings were almost proven by the literature through the study disk, although the study has focus on exploring the food security and wheat flour consumption. This study has potential limitations; two significant limitations could be addressed in future research. Firstly, the study focused on the effect of the wheat flour on the food security of the study area, still, the future study can explore the other related factors which influence the food security of the study area. Secondly, the second limitation was insufficient sample size for statistical for the study area because there are informal neighbourhoods in the study area, measurements after only the population of formal neighbourhoods will leave marginal error, both these limitations need future studies to know the magnitude of their influence.

## Chapter 6: The conclusion and the Recommendations

### 6.1 The conclusion:

This research aims to explore the relations between wheat flour supply and Sennar city food security, and to recommend interventions for improving food security and planning projects for wheat flour distribution by commercial actors. Based on qualitative and quantitative analysis, food security and wheat flour have been correlated, because of the high dependence on wheat flour as the based food for the household in Sennar city and the preferences of wheat bread over the other food-based options, the food security of the households in Sennar would be vulnerable to any fluctuation in wheat supply.

The study confirms that The vast majority of the household in Sennar depend largely on wheat flour as the main based food and despite of the rising prices of the wheat flour, the majority of the household in Sennar continue consume wheat bread as a main based food, it illustrates the importance of wheat-based food in the household's food security in Sennar city. The Demands for wheat flour is rising, the reasons behind this are the preferring of the Sennar households of wheat bread, the rising population in the study area and the large availability of the wheat bread compared to the other option. Despite of fluctuations in prices in wheat flour, the vast majority of household in Sennar depends largely on wheat flour as the main based food. The study explored Vulnerability context which reveals that food availability in the city is not the issue, the food accessibility is the main issue since the purchasing power is low and the income of the household is not sufficient to pay enough food with high quality and variety. The national inflation is the main microeconomic cause of the weak purchasing power.

85 per cent of wheat supply is imported coming from Russia and Ukraine, that's has exposure Sudan consumers to any international wheat prices shocks because of the high dependence on imported food. Inflation and losing Sudanese pound value are the measure microeconomic indicators which effect the wheat private sector actors. private sector actors, in particular distribution companies and bakeries, responded to the strong increase in the international wheat prices by rising the prices of wheat flour after they finds the rising demand of the wheat flour, which illustrate the impact of wheat supply crisis which influence food security of the households in Sennar city. The consumption of household's profile in Sennar is 64,7 % score which is acceptable consumption score profile. However, 76,1 % of the household population does not have enough wheat-based food.

The study investigates the impact of high wheat prices, the impact of it was profound on the urban households and rural households in Sennar city, 76 % consumes limited food meals with less quantity because of their weak purchasing power in face of the rising prices food, although they still prefer wheat bread and other wheat-based food over the other option such as sorghum and rice. In face of the wheat flour fluctuations in Sennar city, the households have several coping strategies. Eating two meals in a day, making wheat bread at homes, eating other based food option such as sorghum are the main households coping strategies in Sennar city. Therefore, it can be concluded that the wheat crisis affected the food security of the households in Sennar and it correlate with each other, and the author declare no conflict of interest.

## **6.2 The Recommendations:**

Based on the insights spotted from the study, the following recommendations are suggested as a main priority for development intervention to reduce the effect of wheat crisis on food security and build the resilience of Sennar households.

### **Recommendations to both Local and International NGOs**

1. There is a need for a short-term intervention to enhance food accessibility of the households in Sennar city, such as providing cash transfer program and food assistance.

### **Recommendations to wheat private sector actors**

2. There is a need to improve the market campaign of the wheat company to suggest new way to make wheat bread at homes.
3. Providing the market with less wheat flour prices.
4. A bottom-up approach with effective decentralization and active social involvement in the planning of the marketing campaigns.
5. Promoting reform within structures of wheat value chain in the direction of enhancing the local wheat production.

### **Recommendation to the research institutions and universities**

6. Developing scientific and research programs can contribute to a better understanding of microeconomic factor, vulnerability context, and food taste preferences, its impacts, and mitigation alternatives.

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## Random Sampling formula

$N$  = Population size  
 $z$  = z-score  
 $e$  = margin of error  
 $p$  = standard of deviation

$$\text{Sample Size} = \frac{\frac{z^2 \times p(1-p)}{e^2}}{1 + \left( \frac{z^2 \times p(1-p)}{e^2 N} \right)}$$

## Food consumption score survey:

	Food Items	Days eaten in past week (0-7days)	Source of food	
			Primary	Secondary
1	Bread/wheat			
2	Rice			
3	Maize			
4	Tubers			
5	Groundnuts and pulses			
6	Fish (eaten as the main food)			
7	Fish powder (used for flavor only)			
8	Red meat (Sheep,goat,camel)			
9	White meat (poultry)			
10	Vegetable oil, fats			
11	Eggs			
12	Milk and dairy products			
13	Milk in tea and small amounts			
14	Vegetables (including leaves)			
15	fruits			
16	Sweets, sugar			



## Annex 2

### Calculation of the Food Consumption Score and the Food Consumption Groups

Food groups and weight			
Food items		Food groups	weight
1	Wheat flour-based food	Main staples	2
2	Cassava, potatoes, sweet potatoes		
3	Maize, maize porridge, rice, sorghum, millet pasta, bread, and other cereals		
3	Beans, peas, ground nuts and cashew nuts	Pulses	3
4	Vegetables, leaves	Vegetables	1
5	Fruits	Fruits	1
6	Beef, goat, poultry, pork, eggs and fish	Meat and fish	4
7	Milk, yoghurt, other dairy	Milk	4
8	Sugar, sugar products, honey	Sugar	0.5
9	Oils, fats and butter	Oil	0.5
10	Spices, tea, coffee, salt, fish powder, small amounts of milk for tea.	Condiments	0

#### Typical threshold values

Food Consumption Score	Profile
0-21	Poor
21.5-35	Borderline
> 35	Acceptable

## Annex 3.

### Adapted Questionnaire Format: Household Food Insecurity Access Scale (HFIAS)

No	Question	Response Options	CODE
1.	In the past four weeks, did you worry that your household would not have enough food?	0 = No (skip to Q2) 1=Yes	.... ___
1.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	.... ___

2	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	0 = No (skip to Q3) 1=Yes	.... __
2.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four 3 = Often (more than ten times in the past four weeks)	.... __
3	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	0 = No (skip to Q4) 1 = Yes	.... __
3.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four 3 = Often (more than ten times in the past four weeks)	.... __
4	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	0 = No (skip to Q5) 1 = Yes	.... __
4.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four 3 = Often (more than ten times in the past four weeks)	.... __
5	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	0 = No (skip to Q6) 1 = Yes	.... __
5.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four 3 = Often (more than ten times in the past four weeks)	.... __
6	In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?	0 = No (skip to Q7) 1 = Yes	.... __
6.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks)	.... __

		2 = Sometimes (three to ten times in the past four 3 = Often (more than ten times in the past four weeks)	
7	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	0 = No (skip to Q8) 1 = Yes	.... ___
7.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four 3 = Often (more than ten times in the past four weeks)	.... ___
8	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	0 = No (skip to Q9) 1 = Yes	.... ___
8.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four 3 = Often (more than ten times in the past four weeks)	.... ___
9	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?		.... ___
9.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four 3 = Often (more than ten times in the past four weeks)	.... ___
10	In the past four weeks, did you or any household member go a whole day and night without eating wheat-based food because of prices?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four 3 = Often (more than ten times in the past four weeks)	.... ___
10.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four 3 = Often (more than ten times in the past four weeks)	.... ___
11	In the past four weeks, did you or any household member go a whole day	1 = Rarely (once or twice in the past four weeks)	.... ___

	and night without eating wheat-based food because of availability issues?	2 = Sometimes (three to ten times in the past four 3 = Often (more than ten times in the past four weeks)	
11.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four 3 = Often (more than ten times in the past four weeks)	.... __

#### Annex4

#### Interviews questions list:

Interview	Questions
<b>Interview one with Dr. Nibras Hussein</b>	<ul style="list-style-type: none"> <li>7. What the changing trend on wheat supply figures the last period?</li> <li>8. What the effect on governmental subsidies plan on your sales figures?</li> <li>9. What the main challenge the wheat flour producers have?</li> <li>10. What the alternatives of Ukraine wheat import for you as a flour producer?</li> <li>11. What the new plan to increase the wheat flour sales figures?</li> </ul>
<b>Interview two with Mr. Moatasim Algack</b>	<ul style="list-style-type: none"> <li>1. What the main change on your sales figure after lifting the government control of wheat flour due to stopping of wheat flour subsidies?</li> <li>2. What the main challenge you have as a bakery owner?</li> <li>3. What your marketing plan to increase you bread sales?</li> <li>4. How your customers respond toward the change of bread prices in the last period?</li> </ul>

Interview three with Mr. Ahmed Ali Alshikh	<ol style="list-style-type: none"> <li>1. Could you illustrate the steps in which the wheat flour going through till reaching the final consumers?</li> <li>2. What the main change which is taking place as distribution agent in Sennar city?</li> <li>3. What your distribution figure trend in the last period?</li> </ol>
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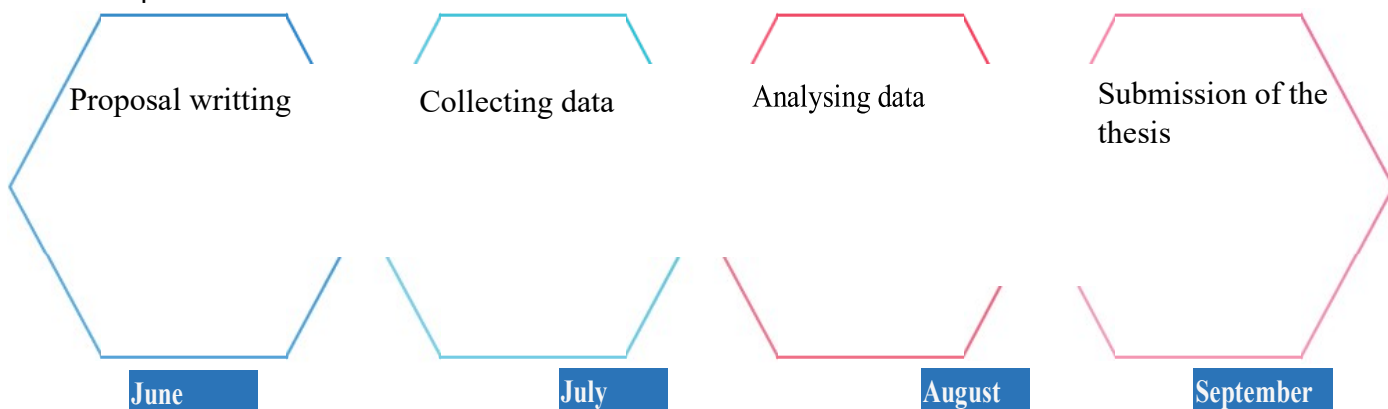
## Annex5

### Discussion group Topic point:

Food security	<ol style="list-style-type: none"> <li>1. Food diet of Sennar city household.</li> <li>2. Wheat based food types.</li> <li>3. Coping strategies increased against food prices.</li> </ol>
Wheat flour crisis	<ol style="list-style-type: none"> <li>1. Coping strategies for increased bread prices.</li> <li>2. Alternatives of wheat-based food.</li> <li>3. Wheat flour supply chain stages.</li> <li>4. Effect of the government subsidies.</li> </ol>

## Annex6

### Research plan



## Annex7

Land department households' numbers in Sennar city official letter:

