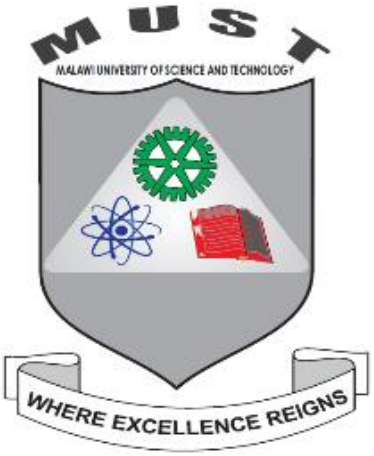


[SUITABILITY OF SORGHUM GRAIN FOR FAMINE RESPONSE: CASE OF PHALOMBE, T/A KADUYA, SOUTHERN MALAWI]

[JUSTICE MZUMARA]
Thyolo, Malawi

Dissertation submitted to Ndata School of Climate and Earth Sciences of the Malawi University of Science and Technology in partial fulfilment of the requirements for the Bachelor of Science degree in Disaster Risk Management

July, 2021

DISSERTATION APPROVED BY:

SUPERVISOR:

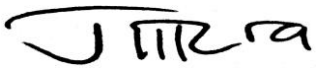
Mrs T. Mtewa Signature: 

ASSESSOR:

Title, Initials, Name Signature: _____

DECLARATION

I **Justice Mzumara** do declare that this is my own work submitted to Ndata School of Climate and Earth Sciences of the Malawi University of Science and Technology in partial fulfilment of the requirements for the Bachelor of Science degree in Disaster Risk Management. No one has ever done this study in any university.



Signature……

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ABSTRACT

Sorghum is considered underutilized food crop in Africa and Malawi. Although it is recognized that sorghum has potential benefits to human health and its adaptability to changing climate, the grain is not accorded the research support comparable to hybrid crops. The increase in population and changing climate makes it feasible to pay attention to the future of sorghum grain to realize its benefits. The main objective of the study was to establish the extent to which sorghum grain can be suitable for famine response complement to maize grain. It included an assessment of nutritional value of sorghum and exploration of community knowledge on the use the grain. The study further involved establishing implications of sorghum as complementary food item in humanitarian response. The qualitative data collection techniques were used to obtain an understanding of the community and humanitarian actors in relation to the consideration of sorghum in response to recurrent food shortages and hunger. The techniques include; key informant interviews and focus group discussions. Focus group discussions were conducted with randomly selected VDCs in T/A Kaduya. The collected data was then analysed by thematic approach. This brought an understanding of local community knowledge on the use of sorghum and sorghum products. The key informant interviews were conducted with the Disaster management officer for Phalombe district and the VDC Chair for Kaduya area. The aim of the interviews was to understand how food response is done and therein make an inference of implication that can be brought by including sorghum in the response and relief aid. The desk study of nutritional composition of sorghum was conducted and the results revealed that sorghum has almost similar composition to other commodity grains that are used in food aid except for protein effectiveness. The study is expected to bring into light some of the factors for less recognition of sorghum grain. The results established by this study may be used in making future plans to promote sorghum and reduce recurrent food crisis.

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ACRONYMS/ABBREVIATIONS

%:	Percent
ADC:	Area Development Committee
DoDMA:	Department of Disaster Management Affairs
DRM:	Disaster Risk Management
FAO:	Food and Agricultural Organisation
FGD:	Focus Group Discussion
g:	grams
ID:	Identification
Kcal:	kilocalories
Kg:	Kilogram
MUST:	Malawi University of Science and Technology
MUSTREC:	Malawi University of Science and Technology Research Ethics Committee
MT:	Metric tones
T/A:	Traditional Authority
VCPC:	Village Civil Protection Committee
VDC:	Village Development Committee
WHO:	World Health Organisation

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1. INTRODUCTION

1.1. Background

Famine is described as "a catastrophic disruption of the social, economic and institutional systems that provide for food production, distribution and consumption" (Phillips, 2007). Scientific studies show that famine have occurred in every part of the world throughout history (Phillips, 2007). Millions of people, mainly in Africa, still suffer food shortages and occasionally face famine (Phillips, 2007) and Malawi is no exceptional. Heavy reliance on rain fed agriculture and frequency of natural hazards has resulted in particularly vulnerable livelihoods in Malawi and more generally in developing countries (Menon, 2007). Weather shocks such as droughts, floods and high temperature frequency decrease food production and increase in food insecurity in Malawi.

Since its independence in 1964, through 1980s, Malawi was a self-sufficient producer of maize in non-drought years (Oygard et al 2003). In 2001, however Malawi has depended on commercial imports and food aid to meet its national needs. In 2002 food shortages led to famine in Malawi, this happened to be the worst disaster recorded since 1949 (Devereux, 2009). Between January and April 2002, several hundreds of Malawians had died of starvation and hunger related diseases (Devereux, 2009) . Between 2004-2006 and 2007-2009 Malawi underwent a period of declining food security (FAO. 2018) coinciding with the 2015 flooding and 2015/2016 drought which also led to food shortages.

Malawi's diet consists mainly of maize, starch roots (Cassava and potatoes) and fruits (e.g. plantains) (MALAWI, 2019), but maize is the dominant crop across the country making up the majority of the peoples' caloric intake. Diversification or stabilizing the food sources in order to reduce food security risks can mitigate famine vulnerability as (Nangoma, 2007) points out. According to (USAID , 2019), maize yields have increased with more use of organic fertilizer but long-term sustainability is unclear because of soil nutrient depletion. This should give an insight of the need

to find an alternative crop to complement the maize supply especially in famine or food shortage crisis.

1.2. Problem statement

Malawi ranks first in the world in per capita consumption of maize for food (Wilson, 2014). This indicates how dependent the country is on maize which is a staple food for Malawi. Being the strategic food crop, the poor maize yield almost inevitably result in food shortage and famine in the country (Malawi Government, 2007). As evidenced by current changes in climate change, the future for maize is unpredictable, hence the need for complementary food crop. Due to increased population, decreased water supply as a result of climate change, the drought resistant food crop is vital for human utilization (Adebo, 2020). Alternative cereal crops grown in Malawi include Sorghum, Millet and rice. Strengthening Sorghum production is considered to be the best option for improving food, nutrition security and livelihoods in developing countries and Africa in particular.(Nyon N, 2020). However, sorghum does not receive the needed support considering its potential for health and its adaptability to changing climate (National Research Council, 1996). There exist a lot of suggestions attributed to this lack of recognition which requires a research. However, plant breeders in Malawi focus much of their research on hybrid varieties ignoring local crops like sorghum and millets due to their perceived low economic value (Malawi Government, 2007). If sorghum can be accorded support in terms of research comparable to maize, wheat and rice, it can contribute to a great deal more to food supplies than it does at present (National Research Council, 1996). Lack of awareness on health benefits, lack of gluten making less amenable to certain recipe preparations are thought to make the grain less preferred (Rajendra Prasad M.P, 2010). Further, the present lack of interest, production and consumption of sorghum in Malawi is thought to be a result of attached social stigmas that these crops are to be used only as hunger-foods and consumed by the poor. This study is a stride toward understanding the bearing that the underutilized state of sorghum has in famine response in Malawi (T/A Kaduya in particular).

1.3. Study Rationale

The rationale of this study is to boost the food supply system of Malawian communities in response to famine resulting from changing climate which has a negative implication on maize, the staple food crop for the country.

1.4. Main and Specific Objectives

The main objective of this study was to establish the extent to which sorghum grain can be suitable to be promoted as a maize complement and be supplied to famine stricken individuals as response or relief aid.

The specific objectives of the study were;

1. To assess nutritional value of sorghum grain.
2. To explore community knowledge on the use of Sorghum
3. To establish implications of sorghum as complementary food item in humanitarian response

1.5. Research questions

a) Does sorghum grain contain required nutritional value to meet dietary needs?
b) Are local residents knowledgeable about sorghum benefits?
c) Can sorghum make a difference in relief aid?

1.6. Study hypothesis

The community is unlikely to prefer sorghum as complementary source of dietary needs.

1.7. Significance of the study

This study will fill the existing gap of minimal research support accorded to local crops such as sorghum by providing an understanding of the perceived benefits of sorghum and the attached factors that make it underutilized. It brings into light the reasons for less recognition of sorghum despite the potential to alleviate hunger. The study is aiming at improving diversification of food crops to deal with food shortages and hunger. The results established by this study will also help humanitarian actors to be flexible in the choice of alternative food to be supplied to famine survivors while being held accountable of the quality of the humanitarian response as stipulated in sphere standards.

2. LITERATURE REVIEW

Sorghum (*Sorghum bicolor (L) Moench*) is a crop similar to corn in regards to agronomic and nutritional value (Arthur Behling Neto, 2017). It is a dietary staple food of more than 500 million people in more than 30 countries, and belongs to the elite handful of plants that collectively provide more than 85 percent of human energy (National Research Council, 1996). The potential for sorghum grain to support food security is very clear regarding its nutritional composition and adaptability to climate change. Sorghum is not only cheap to produce, but also has higher yields. For example, a recent study in Mexico found that it produces about twice as much grain as maize (2724kg/ hectare versus 1508 kg/ hectare) (National Research Council, 1996).

Studies on the composition of sorghum indicate that the grain is a good source of carbohydrates, polyunsaturated fatty acids(PUFAs), minerals, vitamins and some essential amino acids (Adebo, 2020). On average, sorghum grain composition is similar to maize and wheat, providing 70% carbohydrate, 12% protein and 3% fat (Rhodes, 2014). It is clear from this composition that sorghum is a health food just as other Cereal grains making the staple food at the present time. However, despite all these potential benefits, the grain never receives recognition in terms of research support as compared to hybrid crops. As a result of this, they seem to have been underutilized in Malawi and Africa as whole. Lindsay 2010, asks a question "if sorghum is so well known and accepted in Africa, why is it not available to alleviate hunger in African population". This is also a question that this study intends to provide solutions as this is exactly the case in Malawi as a nation. Some researchers (Board of Science and Technology for International Development 1996) say that part of the problem is that sorghum has not been developed into products for major urban areas and thus lacks markets (United Sorghum Checkoff Program and Lindsay, John,, 2010). It was not clear if this has a bearing on the culture of famine response in Malawi, and this has been unveiled through this study.

In Malawi, Myriam Faucher, 2019 conducted a research which was aiming at understanding the nutritional role of the so-called "orphan crops" in Malawian diet by investigating the implications of expanding their consumption while considering consumer preferences. The results from this study indicates that a shift towards these alternative cereals would increase intake of calories, proteins and some minerals (Myriam Faucher, 2019). However, it is hard to completely shift from what the community is used to as a staple food (maize). Instead, sorghum can provide a good food supply to complement maize, and thus the focus of this study from famine response perspective.

3. RESEARCH METHODOLOGY

This chapter describes how the research study was undertaken. These include; the study area, research design, sampling technique, sample size, data collection, data analysis and analysis techniques.

3.1. Study area

Phalombe is situated in the Lake Chilwa Phalombe plain in the southern region of Malawi (FAO, 2014). The zone is very poor and food insecure with few opportunities to generate income and the main livelihood is subsistence farming on small plots of land (USAID , 2019). Rainfall ranges from 700-1000mm from October-March. The area is impacted by dry spells during key crop stages and flooding. As of 2015, a population of 120,627 was affected by hailstorm and dry spells leading to an estimate of 6-8 months food deficit that required 7,921MT of maize (MALAWI GOVERNMENT, 2015). According to FAO 2014, 65% of population in Phalombe is below the poverty line and 42% is classified as ultra-poor. The district has six Traditional Authorities (T/As) which include; Chiwalo, Jenala, Kaduya, Nkhulambe, Nazombe and Mkhumba

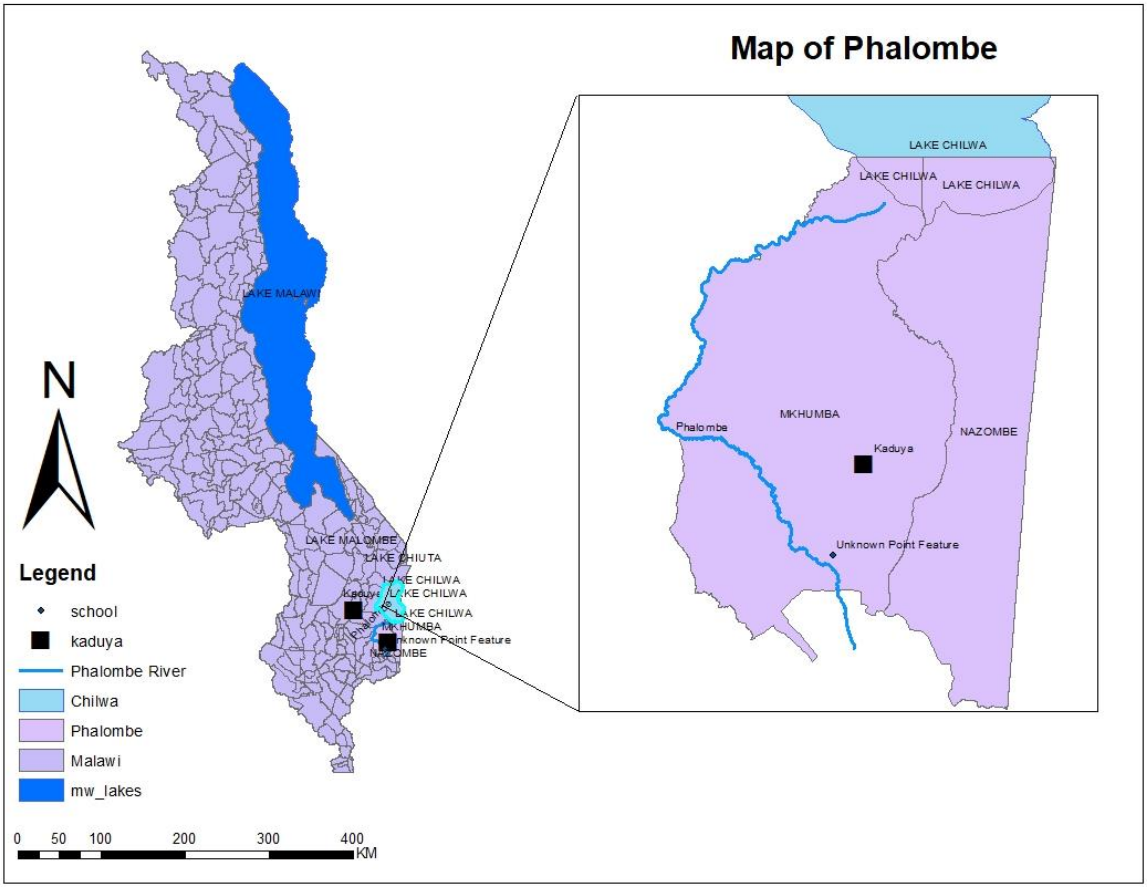


Figure 1: Showing T/As in Phalombe District and the location of study area

Study design

The study adopted the cross sectional case study design using mixed research approach where qualitative and quantitative data collection techniques and analysis were employed. The quantitative data include sorghum nutritional values whereas the qualitative data include the primary data obtained through FGDs and key informant interviews. The data was then analysed and discussed, this was also supported by the suggested recommendations. The following figure provide an illustration of the steps and procedures followed by this study.

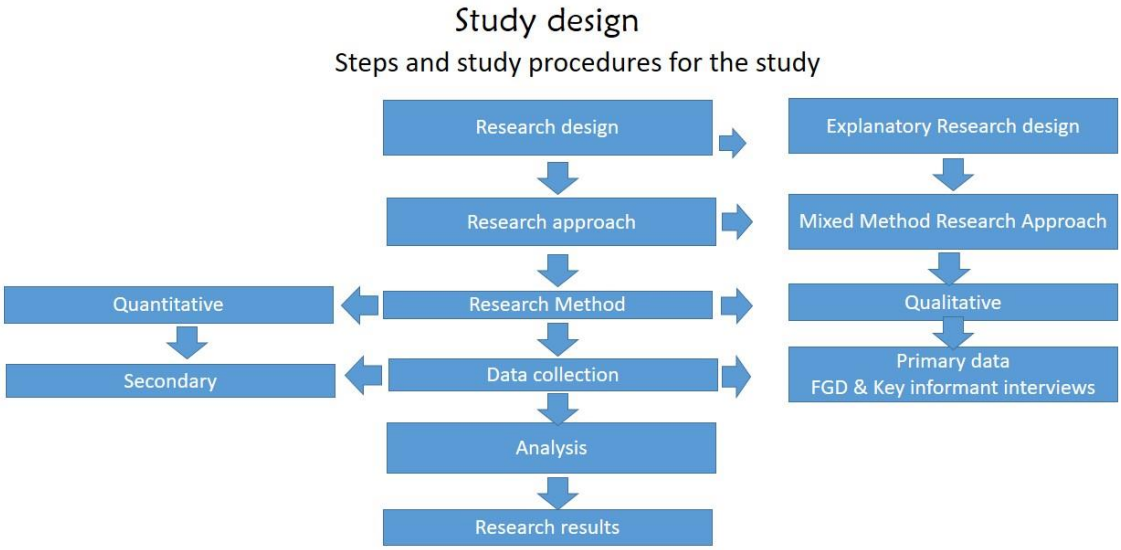


Figure 2: showing the study design

3.2. Study sample and Sampling technique

The technique used in the study is Cluster sampling. In this technique, the population is divided into groups called clusters, usually having a common location. Then, some of these clusters are randomly selected and each member of that cluster is included in the sample (Woodbary, 2002). According to information obtained from (FAO, 2019), T/A Kaduya has ten group village headmen namely; Chabe, Chabuka, John, Kaduya, Mankhanamba, Mtawa, Nalingula, Nampinga, Nyezelera and Thunga which gives a total of ten VDCs, however, it was discovered that the area has extra group village heads upon reaching the study area. According to the information provided by the Traditional Authority T/A Kaduya, the area had a total of thirteen VDCs, this was due to newly initiated villages which include; Manasi, Horo, and Matepwe.

Participant recruitment and selection is a key phase in focus group discussion (Tobias O. Nyumba, 2018). Four VDCs were randomly selected from the area of T/A Kaduya. Participants were recruited by the researcher with the help of the senior Chief Kaduya. All the VDCs present in the area were numbered, the numbers were written on small pieces of papers from which the Chief could pick one piece at a time without looking at it.

The VDC corresponding to the picked number qualified to be included in the sample. The selected VDCs were; Manasi, Migowi (from group Kaduya), Thunga and Matepwe. However, as argued by (Jordan Civil Society Program, 2012), the number of focus groups is usually related to the budget of the study and time constraints. He further argues that it is highly recommended for beginners not to exceed the number of 4-6 focus groups per project to avoid pressure of time constraints and analysis complexity. Due to budget and time constraints only three groups were interviewed. This did not have significant implications on the results cognizant of the fact that the saturation was reached with these three groups (saturation is the situation when you have already heard the range of ideas and stop getting new information). Every member belonging to the selected VDC qualified to be a potential participant.

There is varying suggestions amongst scholars on the number of participants per group. Mishra, 2016 proposes that a focus group usually consist of 10-12 people whereas (Jordan Civil Society Program, 2012)recommends that a focus group typically involves group session of six to ten participants. However, Mishra further argues that The optimum size for a focus group is six to eight participants, but can work successfully with as few as three and as many participants keeping in mind that Small groups risk limited discussion occurring, while large groups can be chaotic, hard to manage for the moderator and frustrating for participants who feel they get insufficient opportunities to speak (Mishra, 2016) . In this study, the smallest group had five participants and the largest group had twelve participants, and a total of twenty six participants took part in all FGCs. Purposive sampling was used to select experienced individuals in relief aid for the interview both from government and community.

3.3. Materials and Methods

3.3.1. Materials

The study used the following materials;

Plane papers, pen, marker, FGD guide, Interview guide, voice recorder.

3.3.2. Methods

The study used focus group discussions, semi-structured interviews and desk study of nutritional data from published reports.

3.3.2.1. Focus group discussions

A focus group discussion is a form of group interview in which a small grouping is led by a moderator (interviewer) in a loosely structured discussion of various topics of interest (Mishra, 2016) . It is more than just getting people together but a special grouping in terms of purpose, size, composition and procedures with a purpose to listen and gather information in a pervasive environment created by the moderator guided by a discussion guide that constitutes the outline of the major questions (Jordan Civil Society Program, 2012) . Three focus group discussions (FGD) were conducted with twenty six participants from village development committees. The groups consisted of both males and females, and were all selected from are of T/A Kaduya in Phalombe district. English focus group discussion (FGD) guide was developed by a researcher (Appendix 2). The focus group discussion guide was then translated to Chichewa (the native language in the study area). The study required that participants provide their views and opinions to the questions asked, and their responses were recorded by a mobile recorder. The aim of the focus group discussions was to explore the views of participants based on their knowledge and experience on the extent to which sorghum can be a suitable crop in responding to recurring food shortages and famine.

Pilot Focus Group

The purpose of the pilot focus group was to ascertain whether focus group discussion guide provided the necessary information. It determined the appropriateness of the questions and identified areas that needed to be modified, deleted, or added. Modifications were made to the focus group discussion guide based on the outcome of this pilot focus group. These modifications included the deletion and rewriting of some questions because of redundancy.

3.3.2.2. Interviews

Interviewing is a technique that is primarily used to gain an understanding of the underlying reasons and motivation for people's attitudes, preferences or behaviours (Ajayi, 2017).A total of two Key informant semi structured interviews were conducted. The main aim of the interviews was to seek the views on the use of sorghum grain in responding to food shortages as a relief aid complement to other food items provided during food crisis. The interview with Kaduya ADC Chair person was conducted to obtain their experience and point of view pertaining to the procedures that are followed to receive food aid, and their point of view on sorghum as complementary food. Key informant interview was also conducted with Desk officer for Disaster risk Management representing Relief personnel from the Department of Disaster Management Affairs (DoDMA). The aim was to gain more understanding on the famine response culture that is followed and seek views on introducing Sorghum as a complementary food to maize during food crisis.

An English interview guide was developed by a researcher (Appendix 3). The guide was structured in a way to enable an interviewee provide the views based on experience and opinion representing the Humanitarian actors. The same Interview guide was restructured in a way to enable the interviewee provide the responses based on experience representing the community, this was translated to Chichewa to suit the language of ADC Chair.

3.4. Data analysis

FGDs and Interview data analysis

Analysing qualitative data typically involves immersing oneself in the data to become familiar with it, then looking for patterns and themes, searching for various relationships between data that help the researcher to understand what they have, then visually display the information and writing it up (Kawulish, 2004). The data analysis strategy adopted by this research is thematic analysis. This is an approach to analysis of data generated from mixed methods used by case study research (Hesse-Biber, 2010). Thematic analysis was used to analyse the FGD and interview transcripts.

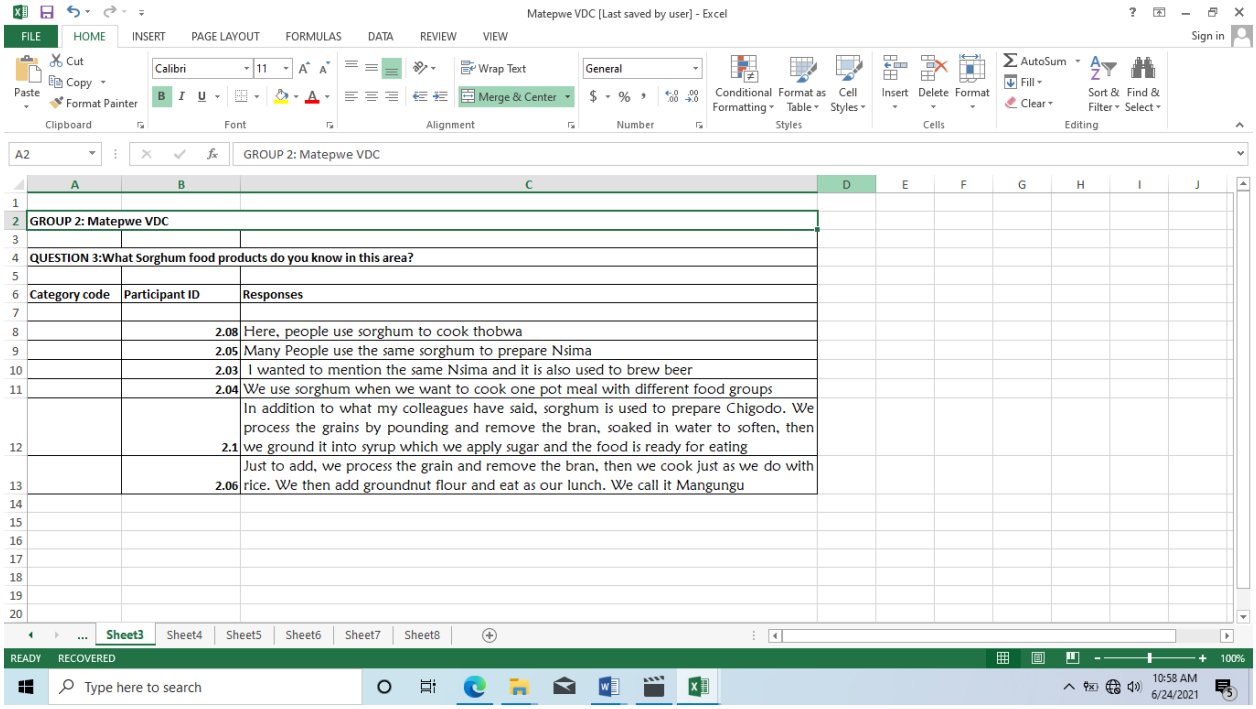
The analysis begun by transcribing all focus group and interview recordings while inserting notes into transcribed materials where it is was observed that a comment is required for discussion purpose. The transcripts were then translated to English and cleaned up by removing non-essential words. Each thought, idea or comment was assigned an ID representing the participant and group number. For example, an idea from participant 4 in group 3 was assigned 3.4.

The following steps were followed to enter the lines into an Excel data base

COMPILE:

1. Use a separate Excel data base spreadsheet for each group
2. Within each spread sheet, use one sheet per each question
3. Label three columns on each sheet (one for coding, another column for participant ID and the last column for responses)
4. Enter each separate response or idea on a separate line with participant ID attached.

The coding column was filled in during the next phase (Analysis)



	A	B	C
1			
2	**GROUP 2: Matepwe VDC**		
3			
4	**QUESTION 3:What Sorghum food products do you know in this area?**		
5			
6	**Category code**	**Participant ID**	**Responses**
7			
8		**2.08**	Here, people use sorghum to cook thobwa
9		**2.05**	Many People use the same sorghum to prepare Nsima
10		**2.03**	I wanted to mention the same Nsima and it is also used to brew beer
11		**2.04**	We use sorghum when we want to cook one pot meal with different food groups
12		**2.1**	In addition to what my colleagues have said, sorghum is used to prepare Chigodo. We process the grains by pounding and remove the bran, soaked in water to soften, then we ground it into syrup which we apply sugar and the food is ready for eating
13		**2.06**	Just to add, we process the grain and remove the bran, then we cook just as we do with rice. We then add groundnut flour and eat as our lunch. We call it Mangungu
14			
15			
16			
17			
18			
19			
20			

Figure 3: Showing data entry

ANALYZE:

When all comments and ideas were entered, common categories or themes were identified across entries for each question. The identified categories were assigned a number.

The following step was to assign the number of the category that best fits each entry on the sheet, then the Excel "Sort" function was used to group the entries by the category. If some entries seem inconsistent for their category, they were re-categorized.

The process was repeated for each group.

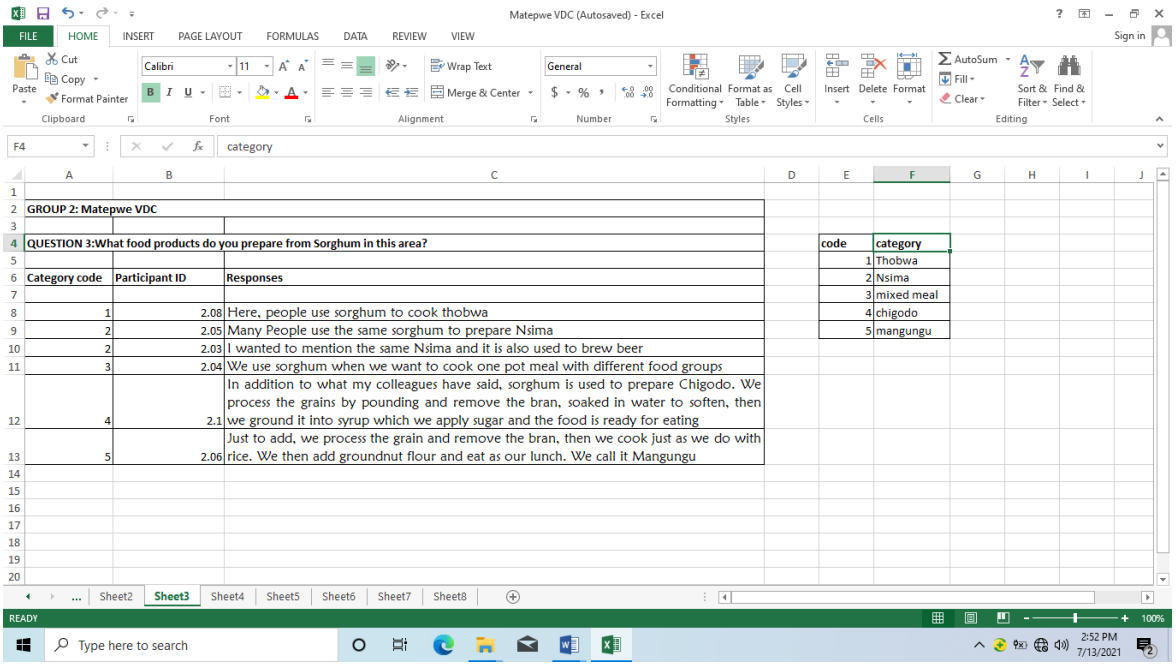


Figure 4: Showing data coding

After analysis of all the groups, the following step was synthesizing the analysed data. This involved writing short paragraph summarizing each category sub themes while noting similarities and differences across groups. Quotes were added to each sub-section.

3.5 Ethical Consideration

As in any other type of scientific research conducted on people, the researcher has to guarantee to protect the integrity of participants. In this regard, the study was reviewed and approved by the Malawi University of Science and Technology Research Ethics Committee (MUSTREC). Permission was provided by Phalombe district council through endorsing the data collection reference letter which was issued by Ndata School of climate and earth Science of MUST. For security purposes, the reference letter from district commissioner was also referred to the Officer In charge of Phalombe district Police Station who endorsed it and kept one copy of the letter. Finally the traditional authority of the area endorsed the letter and allowed access for data collection in the area. During data collection exercise, Informed consent was obtained from the participants by filling in the consent form (see appendix 4). The participants were informed about the significance of the study and that the participation in the study was on a voluntary basis and therefore, free to withdraw anytime they wanted. The research participants were also assured of total confidentiality of their participation and that the information collected was to be used for the study and not for any other purpose. The rules guiding the discussions were red to participants the before the commencement of the discussion (see Appendix 1 for a Focus Group Protocol). During the interviews, the participants were treated with respect and dignity regardless of their gender status or position in the VDC.

4. RESULTS AND DISCUSSION

4.1. Introduction

The main objective of the study was to establish the extent to which sorghum grain can be suitable as a maize complement to be supplied to famine stricken individuals as response. This objective was achieved by focusing on specific objectives which included analyzing sorghum nutritional potential from existing literature, assessing community knowledge on the use of sorghum and exploring the challenges that lead to underutilization of sorghum and establish implications of sorghum use as complementary food item in humanitarian response. The aim is to improve food diversification and ensure effective famine response in Malawi, particularly to the people of **T/A** Kaduya in Phalombe district. The results and discussion section presents the findings of the study in the order of specific objectives. The results have been discussed with references to literature and reinforced with quotations from FGD and Key informant interview respondents.

4.2. Demographic information

Twenty six people participated in the focus group discussions. Out of this number 38.5% were males and 61.5% were females.

Table 1: Showing Participants by sex

Group # and Name	#of Participants	Males	Females
1. Manasi VDC	5	1	4
2.Matepwe VDC	12	5	7
3.Migowi VDC	9	4	5

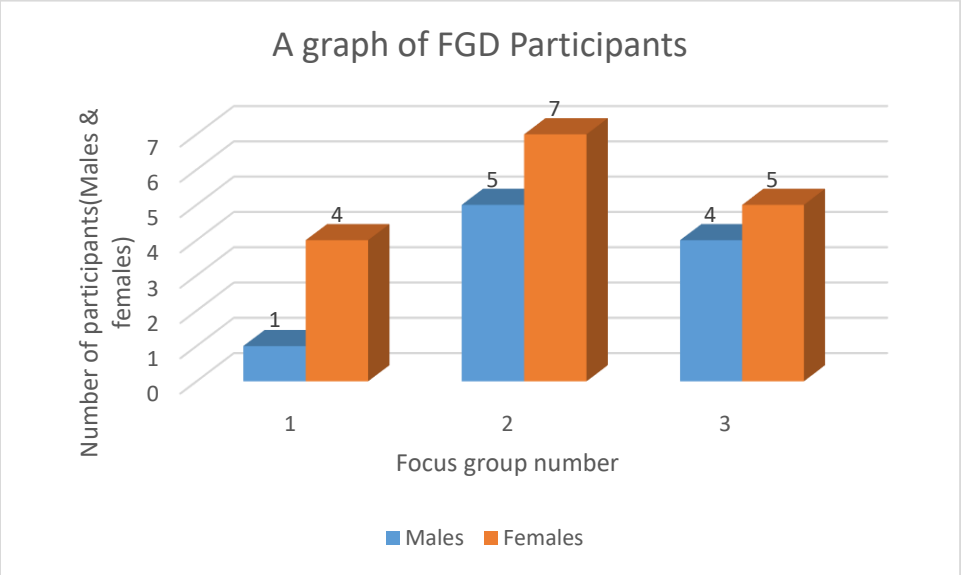


Figure 5: Showing graph of participants by their sex

Two key informant interviews were conducted. The one with the Disaster relief officer for Phalombe district and the other one with ADC Chair of Kaduya area.

4.3. To assess nutritional value of sorghum grain.

The results from the desk study of sorghum nutritional composition of sorghum indicates that sorghum proteins, carbohydrates, fats, fibre and other mineral elements and vitamins. This study focused much on carbohydrates, proteins and fats as these are the major elements and play significant role in human diet. The energy composition of sorghum has been compared with other commodity grains that are used in relief aid.

Table 2: showing Nutrient comparison of commodity grains used in food aid

Nutrient Comparison of the commodity Grains: Sorghum, Wheat, Corn, and Rice					
Nutrient	**Unit**	**Sorghum 100g**	**Wheat 100g**	**Corn 100g**	**Rice 100g**
Energy	kcal	339	333.5	365	365
Protein	g	11.3	11.7	9.4	7.1
Total Fat	g	3.3	1.8	4.7	0.7
Carbohydrates	g	74.6	73.3	74.3	80

Source: United Check off program & Lindsay, 2010

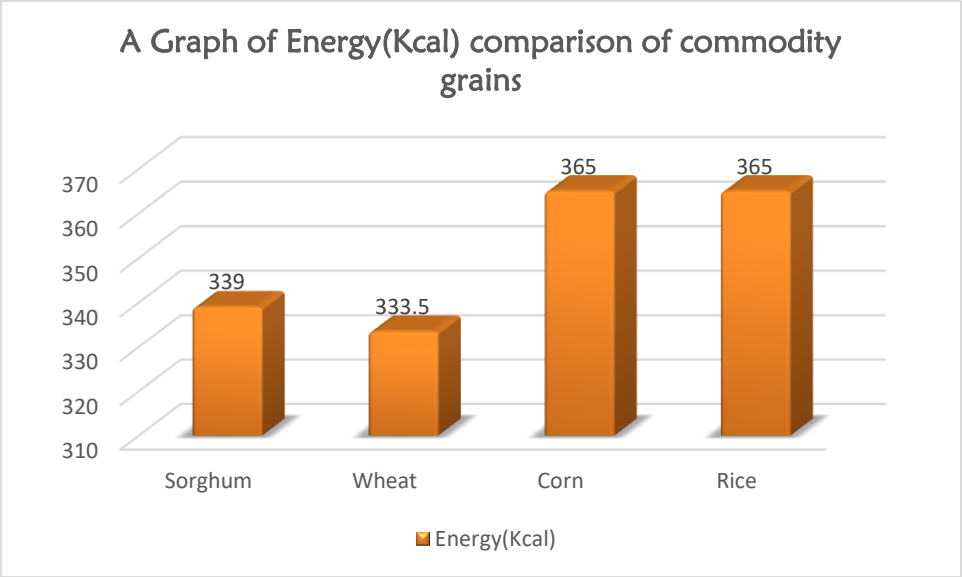


Figure 6: Showing Graph of energy comparison of commodity grains used in food aid

The comparison of the energy higher percentage of energy content than wheat and lower energy value than that of corn and rice.

Carbohydrate percentage per 100 g dry weight of commodity grains were compared and analysed as illustrated in the figure below

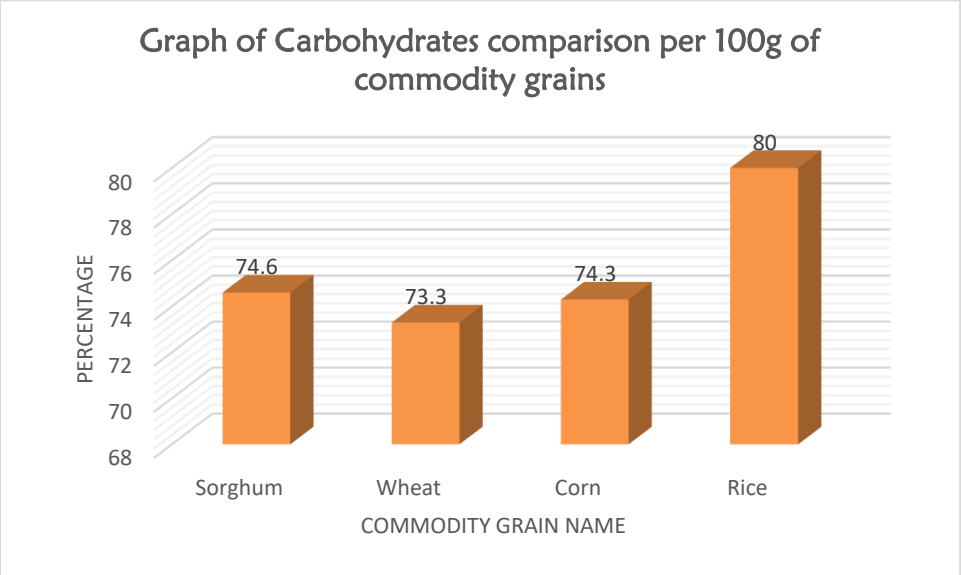


Figure 7: Showing Graph of Carbohydrate comparison per 100 g of commodity grains used in food aid

Studies on the composition of sorghum indicate that the grain is a good source of carbohydrates, polyunsaturated fatty acids(PUFAs), minerals, vitamins and some essential amino acids (Adebo, 2020). In the study to examine the effect of supplementation of sorghum flour (Sorghum bicolor L. Monech) with white bean flour (Phaseolus Vulgaris) and the effect of cooking and fermentation on the nutritional value of the composite flour, chemical composition of sorghum flour was 92.7%, 2.38%, 2.86%, 2.77%, 9.75%, 74.93% for dry matter, ash, crude fibre, fat, protein and carbohydrates, respectively (Mohammed, 2005). These nutrients are essential in maintaining human health just like other cereals that are used in food aid. In terms of energy per 100g dry weight of commodity grains used in food aid, sorghum ranks the lowest relative to corn and rice which are usually used in Malawi.

However the difference is not so significant and can make a great deal difference if used alongside corn and rice. On average, sorghum grain composition is similar to maize and wheat, providing 70% carbohydrate, 12% protein and 3% fat (Rhodes, 2014). As indicated from the table and graphs above, there is no significant differences in terms of the nutritional values in these commodity grains. However, not all proteins in sorghum are digested in humans. Prolamins (Kafirins) constitute the major protein fractions in sorghum, followed by glutelins, Kafirins are hydrophobic, rich in proline, glutamic acid and contain little lysine. Lysine of sorghum protein provides only about 45% of recommended FAO\WHO requirement. (Mohammed, 2005) . The problem in protein quality is large proportion of prolamine, an alcohol-soluble protein that has low digestibility in humans. (National Research Council, 1996).

Another problem is that tannins, which occur in the seed coats of brown sorghum grains depress the body's ability to absorb and use nutritional ingredients such as proteins (National Research Council, 1996). Although this is the case, none of these drawbacks is a serious barrier to sorghum's grander future as the challenges can be alleviated by proper processing of the brown seeds to reduce tannins (National Research Council, 1996). White bean can be used to increase the protein content of sorghum based foods. The study by Mohammed, 2005 shows that supplementation of sorghum flour with white bean flour followed by fermentation and cooking is a potential process for developing food product with high nutritional value.

The desk study of Sorghum nutritional composition used in this study establishes that sorghum has the nutrient composition that can meet the dietary needs of victims of food shortages and hunger.

4.4. To explore community knowledge on the use of Sorghum

The results from focus group discussions (FGD) used in this study show that a significant number of households in the area of **T/A** Kaduya use sorghum. Information derived from the FGDs reveals a number of factors that make people of **T/A** Kaduya prefer Sorghum. These factors have been discussed below as perceived benefits of Sorghum.

1. Tolerance to wide range of climate and soil conditions

Most farmers consider growing Sorghum as a backup for poor maize harvest arising from low or very high rainfall. In places where maize does not do well, farmers usually plant sorghum on such pieces of land just because sorghum performs well on such area. This is in support of what Dr. Austin Phiri, the chief Agriculturalist at Vumbwe research station responded to the question "whether Sorghum is biased to specific conditions", his response was that Sorghum does not have bias to any climate or soil conditions. Sorghum withstands high rainfall even some waterlogging areas. Recent research in Israel has shown that it also has some tolerance to salt, an increasingly useful feature for any crop these days, and it can endure hot and dry conditions. (National Research Council, 1996).

Responses from FGD participants indicates that sorghum crop endures insufficient rainfall and does better even when rainfall is excessive and saturated soils making it a factor to attract more farmers to venture into sorghum cropping. The following were some of responses

There's a difference between Maize and sorghum in terms of drought resistance, sorghum is resistant to drought conditions. However, we have experienced circumstances where even sorghum does not do well due to low moisture in extreme draught condition.

Sorghum is grown in huge quantities in water prone area because it is moisture tolerant so we plant more sorghum so that if maize dries due to high moisture we should still have something to harvest.

2. Low digestibility

Much as some people don't prefer Sorghum for its low digestibility, many take this as an advantage especially during period of food crisis which they say the food lasts longer in their bodies which help them save food during hunger period.

When we eat Sorghum, we differentiate it with maize flour Nsima because we take so long before we want another food, we just keep doing our jobs without complaining of hunger.

3. Provide an escape window during food shortages and hunger.

Most people in the area of T/A Kaduya grow sorghum to top up there food supply and be self-reliant during hunger periods. In addition, most households deliberately keep their sorghum for use when their maize is complete while waiting for the next harvest period.

In the past, our ancestors could not experience food shortages or hunger, the reason is that they were growing more sorghum. They were growing both maize and sorghum unlike these days where sorghum is being underutilized compared to maize.

Sorghum has the ability to cushion the households when they run out of there food supplies therefore it is a reliable food compliment which can help alleviate problems associated with recurrent food crisis.

4. Business

The farmers in T/A Kaduya expressed that Sorghum has low market prices, instead they usually keep and sell in October when prices are relatively higher. In addition, sorghum is sold in a processed form by cooking Thobwa and sell it in local markets. Thobwa is highly selling local drink preferred by many people around Kaduya area.

4.4.1. Challenges facing Sorghum use

United Sorghum Check off Program & Lindsay 2010, asks a question "if sorghum is so well known and accepted in Africa, why is it not available to alleviate hunger in African population"? A number of suggestions have been proposed in relation to this question. Some researchers say that part of the problem is that sorghum has not been developed into products for major urban areas and thus lacks markets (United Sorghum Checkoff Program and Lindsay, John,, 2010). " Lack of awareness on health benefits, lack of gluten making less amenable to certain recipe preparations are thought to make the grain less preferred (Rajendra Prasad M.P, 2010). It is also suggested that the present lack of interest, production and consumption of sorghum in Malawi is a result of attached social stigmas that these crops are to be used only as hunger-foods and consumed by the poor. This study identified a number of factors hindering sorghum use in the area of T/A Kaduya, some of these factors support those suggested by other scholars.

1 .Poor market

Sorghum market in Malawi is very poor when compared to other cereal crops like maize. The lower price relative to other cereals demotivate farmers to grow sorghum in large quantities hence leading to decline in overall yield.

The same marketing problem has an effect on consideration for response and relief aid as indicated by Disaster relief officer for Phalombe District council. When asked about challenges that are likely to be faced if sorghum is to be promoted or considered in response and relief aid, the response was the concern about the poor market for sorghum.

We are looking at the market itself, yes we can have sorghum, we can have response in sorghum but when the response has come to an end and we still have Sorghum, what will we do with it? Because we do not have markets for these small crops, thus why it is not considered as a major crop and as a crop that can be used in response.

2 .Lack of improved seeds

Improved seed is very important if farmer are to harvest bumper yields. However, plant breeders in Malawi focus much of their research on hybrid varieties ignoring local crops like sorghum and millets due to their perceived low economic value (Malawi Government, 2007). Most respondents from all the groups complained of this as one of the factors hindering them from growing sorghum. It is an issue of great concern to the people of T/A Kaduya that when rains come, they struggle so much to get good seeds. They instead go for local variety which they say has a problem of late maturity.

3. Lack of knowledge on sorghum based food products and value addition methods

This study identifies that most of the farmers in T/A Kaduya grow sorghum. Although this is the case, it is evident from their responses that most of them have little knowledge on how to prepare good food from sorghum. Mostly, the food products known by people in the area are local in nature. For instance, when asked to mention sorghum foods they are familiar with, the first response in all groups was Thobwa, other foods known are Nsima, Mangungu, Chigodo and beer. None of the participants mentioned of the industry based food. This also relates to why sorghum lack markets as there is no or less industry producing sorghum food products.

4. Land scarcity

Increase in population has led to demarcation of previously large pieces of land amongst family members. This presents a big challenge to prioritise sorghum on the small pieces because as maize becomes their first priority due to perceived importance of maize over sorghum. As a result, sorghum is just planted within maize fields in column lines.

5. Associating Sorghum farming to poverty

There is a great tendency of people to consider growing much sorghum usually when they do not have asserts such as fertilizer to apply to their maize fields. This has led to development of a perception by many people that sorghum is for poor people who cannot afford to buy fertilizer as such it makes Sorghum farming lose its trajectory. When asked what usually comes into people's minds when they see a farmer who has grown sorghum on a relatively large piece of land, responses from all the focus group discussions conducted were pointing out the lack of fertilizer as a factor that forces most farmers to opt for Sorghum.

6. Lack of support and knowledge on best farming methods

This study establishes that poor harvest of sorghum is attributed to poor cropping systems and methods used by farmers in Kaduya area. Most farmers grow sorghum in maize fields which prevent it to perform to its optimal level due to competition for nutrients, air and other soil ingredients. Although mixing sorghum with maize is attributed to scarcity of land, it in part due to lack of knowledge to make good harvest from small pieces of land.

7. Poor coordination for response

On the part of response, it seems there is poor coordination among humanitarian actors, VCPCs and the community in terms of the assessment of food the required during response period. Although post disaster needs assessments are conducted to determine the number of households in need of food and types of food required, the communities are never given a chance to choose or demand what they need. When asked about the procedures that are followed before the aid is provided, the As the ADC Chair explains, the humanitarian actors bring the food aid depending on their capacity which usually does not suffice the total affected population. The maize that these humanitarian actors provide only benefits a few households, and therefore sorghum could do a difference if considered according the ADC Chair.

8. Lack of Promotion

Sorghum crop lack support from government and local authorities in terms of strategic plans plan to promote the crop. According to the Disaster Management Officer for Phalombe district, if it can be promoted from the grass root level supported by a comprehensive assessment, it can surely make a difference.

The DRM Officer expressed the need for an increased research to achieve strategic promotion of sorghum.

We need to explore these small crops, the crops that are not regarded as dominant. We need to do a lot of research, the nutritional... What can people get from them, and from that thus where we can promote it to say we have cooperatives that can do sorghum, at the same time have a market for that, because we can't just plan for Sorghum for response, what if it doesn't work, so we need a step-by-step approach to see what is working.

A comprehensive assessment can provide a basis on which plans to strengthen and promote sorghum can be made. This requires efforts by central government in collaboration with local authorities to implement the initiative.

4.5. To establish implications of sorghum as complementary food item in humanitarian response

This study established that the dominance of maize has made minor commodity grains such as sorghum not to be recognised in strategic plans including relief aid planning. The results from key informant interviews indicates that sorghum has never been used in any response as relief food item provided to food deficient households in Phalombe district and T/A Kaduya in particular. This is attributed to supply of sorghum in terms of who can supply the grain in such amount to suffice the total affected population. The poor marketing of sorghum is also an issue of concern that demotivate humanitarian actors include sorghum in their response. There is a worry of what will happen with the sorghum left after the completion of the response because there is no reliable market for the grain. There is also a growing tendency by humanitarian actors that provide relief food items to use the assumption that people hit by food crisis cannot prefer sorghum hence exclude it from response plan. Contrary to this assumption, the ADC Chair for Kaduya area suggests that it is poor coordination between humanitarian actors and the affected communities that results in exclusion of sorghum in relief aid. According to the Chair, the hunger survivors are not given an opportunity to choose or propose what food items they need, this implies that if given the opportunity they can surely go for sorghum.

The sole purpose of humanitarian response is to save lives of the disaster affected individuals. Sphere standards recommend that humanitarian response must ensure that the dignity of the affected individuals is respected, this dignity is lost when people do not have enough food to maintain their health. All humans regardless of age, health status, or environment, need nutrients and adequate calories to sustain life, therefore Sorghum flour would be an excellent ingredient choice for emergency ration bars with its inherent gluten free characteristic (United Sorghum Checkoff Program and Lindsay, John,, 2010). The DRM officer for Phalombe district suggest that consideration of sorghum in future responses can improve the effectiveness of the response by ensuring that a significant number of population is reached out with enough food.

However, this has to be based on comprehensive assessment on how people may welcome the idea of introducing sorghum in the response and strengthening its use. In support of using sorghum to respond to famine, United Checkoff Program & Lindsay, 2010 recommends that in countries such as Sudan, Ethiopia and Chad, with a history of sorghum agriculture, dietary sorghum should be continued to be encouraged and made available (United Sorghum Checkoff Program and Lindsay, John,, 2010). Borrowing this idea, the informed decision to promote and strengthen sorghum use in the response can be made by taking it to communities that already have sorghum history such as T/A Kaduya and assess the impact. It is this assessment that can inform the plans to promote the crop and be considered in relief aid.

5. CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

The primary purpose of this study was to boost the food supply system in Malawi and specifically the area of T/A Kaduya in Phalombe. The main focus was to explore the less considered food crop (Sorghum) in terms of the extent to which this grain can be suitable to be promoted as a maize complement and be supplied to famine stricken individuals in response or relief aid. This is in reaction to recurrent food shortages and hunger that is affecting rural communities.

The results from this study revealed that Sorghum has almost similar nutrients composition with other commodity grains that are used in food aid. However, sorghum has a minor problem in term of protein effectiveness in humans due to low digestibility of Kafirins and the presence of tannins. These challenges can be alleviated through proper processing of the grain and supplementation with white bean flour to improve protein effectiveness. This implies that there is no major drawback in terms of nutritional composition to prevent sorghum grain use in food aid.

To explore the community knowledge on sorghum use, this study used focus group discussions. It is revealed that most households in T/A Kaduya use sorghum in their diet. However, they lack knowledge on modern food preparation and value addition methods to maximise nutritive effectiveness of sorghum food. In exploring the knowledge of sorghum use, the study results have brought a comprehensive understanding of some of the factors why sorghum remains an underutilised grain despite the potential to alleviate hunger.

The study has further established that sorghum can make a good compliment to food items used in response and relief aid. The plans to include sorghum in future response require an assessment of the impact by introducing it to communities that already have sorghum history and make an informed decision based on how it has worked.

5.2. Recommenations

The study made the following recommendations

a. Future studies must consider doing lab analysis of nutritional composition of locally grown sorghum.
b. Experimental studies on impact of fertilizer application to sorghum have to be conducted to improve the total grain yield per hector.
c. More studies need to be done on improving protein effectiveness of sorghum grain including studies on reducing tannins.
d. Government should establish good markets to buy sorghum from farmers in their locality.
e. Government should develop strategic plan to promote sorghum farming in order to boost food supply system of a nation. These may include introduction of seed distribution points to make sorghum seed available to farmers as well as employment of extension workers to encourage farmers grow sorghum by teaching them good cropping practices.
f. District authorities must consider formation of cooperatives which may be growing sorghum and establish some fields as demonstration areas to attract farmers to grow sorghum
g. Encourage the establishment of companies to promote sorghum based food production.
h. Seed manufacturing firms to pay attention to production of sorghum seeds as well as investing there effort and money in research to improve sorghum seed quality.
i. Households have to be taught methods of cooking and value addition methods to improve nutritional effectiveness of sorghum-based food.
j. Humanitarian actors should consider including sorghum in relief food items starting with communities that have sorghum history.

5.2.1. Challenges

This study encountered the following challenges

a. Lack of funding for data collection exercise. This is a major challenge since no amount of money was allocated for this purpose hence the study relied on researchers fund which restricted the number of FGDs conducted. The number of FGDs was reasonably reduced to attain saturation of ideas.
b. Time pressure. The data collection exercise for this study required a great deal of time considering the nature of the data collection tools used. This was very challenging due to other academic activities in the course of the study.
c. Unavailability of sorghum nutritional data. Vumbwe research station had no available nutritional data for sorghum. This means there was need to undertake lab test which was impossible due to funding problem and time required for the analysis. The study therefore used the desk study of published materials that have written or did an assessment of sorghum nutrient composition.

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APPENDICES

Appendix 1: Focus group discussion Protocol

FOCUS GROUP DISCUSSION INTRODUCTION

WELCOME

Thanks for agreeing to be part of the focus group. I don't take your willingness to participate in this discussion for grunted.

INTRODUCTION

My name is **Justice Mzumara**, a final year student at Malawi University of Science and Technology

PURPOSE OF FOCUS GROUPS

I'm conducting a study on the topic "Suitability of Sorghum grain for famine response". The reason for these focus groups is to find out from your experience, the extent to which sorghum grain can be suitable in responding to famine as a maize complement. I need your input and therefore want you to share with me your honest thoughts in an open manner.

GROUP RULES

1. I WANT YOU TO DO THE TALKING

I would like every one of you to participate. I may therefore call you at some point if I haven't heard from you.

2. THERE ARE NO RIGHT OR WRONG ANSWERS

Everyone is entitled of his/her opinion. Please express your thoughts or experience whether in support or in disagreement with what others have said.

I want to hear a wide range of opinions.

3. WHAT IS SAID IN THIS DISCUSSION END RIGHT HERE

I want everyone to feel free and comfortable to share his/ her thoughts even if it is sensitive that has surfaced.

4 I WILL BE RECORDING THE GROUP DISCUSSION

I want to capture everything you have to say. Be assured that your names will not appear in my report. Your responses will be identified by an ID.

An ice breaker, then the question session Begins.

Appendix 2: Focus Group Discussion Guide

FOCUS GROUP GUIDING QUESTIONS

ENGAGEMENT QUESTIONS

1 What varieties of sorghum do people in this area grow?

2 From your experience and observation, what is the most grown sorghum variety? Why do you think is the reason for this?

EXPLORATION QUESTIONS

3 What food products do people make from sorghum in this area?

4 Why do you think some people prefer sorghum and others don't (provide reason and justification)

5 what are the benefits/ advantages of growing sorghum

6 what are the challenges associated with sorghum farming

7 what comes into your mind when you see someone in your area growing sorghum in a relatively large of land

EXISTING QUESTION

9 is there anything you want to say or you would love to clarify if given one more minute to do so

ENDING REMARK

Thank you all for taking part in this focus group discussion. I greatly appreciate your participation.

Appendix 3: Interview Guide

INTERVIEW GUIDING QUESTIONS

1 What in kind food items are provided to communities in response to famine?

2 Have you ever tried at any circumstance to supply famine survivors with sorghum as part of response or recovery relief aid (if yes, what was the observed impact of the support? If not explain what you think are the reasons for that)

3 What is the response culture/ procedures that are followed for your department/ office to provide in kind food items in response Famine?

4. What do you think are the benefits of providing famine survivors with sorghum as a food complement to what is usually supplied?

5 What can be the challenges associated with providing sorghum grain as a compliment to other food items in famine response?

6 Do you have anything to say or comment as we come to an end of our interview?

END OF INTERVIEW

Appendix 4: Consent Form

THE INFORMED CONSENT FORM

My name is **Justice Mzumara**, a final year student at Malawi University of Science and Technology (MUST). I am conducting a study on the topic "SUITABILITY OF SORGHUM FOR FAMINE RESPONSE". The aim of the study is to explore the sorghum grain potential to provide the required dietary needs and further understand the existing knowledge on the utilization of the grain.

I would like to request for your participation in the study by providing necessary data regarding the study.

You are assured that the information provided will only serve the purpose of the study.

Any question pertaining the study is welcome. You can also ask by contacting my supervisor (**Mrs T. Mtewa**) Email. tmtewa@must.ac.mw

Consent Statement

I_____ (*Name of Participant*) am willing to take part and do declare that I **was not** forced to take part in this study.

Signature Date

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Appendix 4: Sorghum samples captured at Vumbwe research station



Appendix 5: a Sorghum field in the area of T/A Kaduya



Appendix 6: FGD Participants (Matepwe VDC)



Appendix 7: A researcher collecting FGD data

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Moderator getting ready for FGD



Moderator Facilitating Discussions



Appendix 8: FGD Participants and Moderator (Manasi VDC)



Appendix 9: A Researcher in the Study Area

