**,CHAPTER ONE: INTRODUCTION**

**1.INTRODUCTION.**

**1.1Background of the study.**

Sorghum, bicolor Moench, is the fifth most important cereal globally after rice, wheat, maize and barley. It constitutes the main food grain for over 750 million people who live in the semi- arid tropics of Africa, Asia, and Latin America (Food Security Department, 2004).

The Sorghum grain belongs to the genus of flowering plants which are native to tropical and subtropical regions of all continent. Its origin can be traced down to Northeastern Africa where it was first cultivated 8000 years ago. It is one of Africa’s pride as It belongs to the list of indigenous fruits and crops.

The main sorghum producing countries around the globe include Nigeria, USA, Ethiopia, Sudan, Mexico, Brazil, Burkina Faso, Australia, India, China and Argentina among others.Argentina ( United Sorgton/ Checkoff Program, 2016)In the USA, sorghum is traditionally grown throughout the Sorghum Belt, which runs from South Dakota to Southern Texas, primarily on dryland acres. Farmers planted 5.7 million acres and harvested 365 million bushels in 2018. Sorghum farmers had another strong year, harvesting an average of 72.1 bushels per acre (USCP,2016) In Africa and the world, Nigeria is one of the countries on top of the list of sorghum producers. **Over the years, it has experienced a tremendous growth and boost in its economy due to sorghum cultivation. In 2012, Nigeria cultivated about 5.6 million hectares and the annual production was estimated to be about 2.8million tones as reported by Agriculture Nigeria.** In South Africa, Sorghum grown in the drier areas of the northern provinces in South Africa where it is planted between mid-October to mid-December. The Free State produces about 50% of South Africa’s sorghum. The average production yield of the grain’s seed is 2 ton/ha

Sorghum production in Kenya has been relatively stagnant over the years. The largest groups of producers in Kenya are small-scale subsistence farmers (Food Security Department, 2004; Rohr Bach, 2003). Being poor in resources, most of sorghum farmers have only minimum access to production inputs and improved credit facilities for their purchase (Food Security Department, 2004). Siaya County’s climate is among the most conducive for sorghum and millet production n Kenya. Currently only 500 of acres of land in Siaya County are under sorghum yet the region has the potential of 5000 acres (CGA,2019). In Siaya county, Rarieda and Bondo are the leading sub counties in sorghum production, followed by Ugenya, Alego /Usonga, Gem and Ugunja respectively. The varieties doing well in the region include

Gadam, Sila and Advanta (CGA,2019).

**1.2: Problem statement.**

**Alego sub county in Siaya county has embraced sorghum production for a very long time. The climate and the soil are believed to be suitable for groundnut production. However, currently farmers are not getting as much yield and profit as they expect and with some experiencing some losses. This slight decline in production and sales has led to questioning on what really is affecting sorghum production.The study therefore intends to investigate the factors leading to low sorghum production in Alego sub county, Siaya County, Kenya.**

**1.3: Purpose of the study.**

**The study intends to investigate the factors leading to low sorghum production in Alego sub county, Siaya County, Kenya.**

**1.4 :Objectives of the study.**

**1.4.1 :General objective.**

**To investigate factors affecting sorghum production in Alego sub county, Siaya County.**

**1.4.2 :Specific objectives.**

1. **To determine how availability of agricultural technology influences sorghum production in Alego Sub county, Siaya County.**
2. **To determine the impact of agricultural credit facilities to sorghum farming, Alego sub county in Siaya County.**
3. **To investigate the effect of farm inputs on sorghum farming, in Alego sub county, Siaya County.**

**1.5: Research questions.**

1. **What are the factors influencing sorghum production in Alego Sub county, Siaya county?**
2. **How does the availability of agricultural technology influences sorghum production in Siaya county?**
3. **What is the impact of agricultural credit facilities to sorghum farming and marketing in Siaya county?**
4. **What are the effects of availability of farm inputs to sorghum farming in Siaya county?**

**1.6: Justification of the study.**

***1.7: Limitations of the study.***

* ***In Siaya county most of the farmers use their local language and have little or no knowledge of the national languages hence communication barrier.***
* ***Most of the farmers are also illiterate which also leads to difficulty in communication.***
* ***In Siaya county, most of the roads leading to the farms are impassable during the rainy season therefore limiting movement which will affect data collection.***
* ***There is inadequacy in capital which will hinder carrying out of the whole research.***

***1.8: Scope of the research.***

***Collection of data will be carried out in Alego Sub county, Siaya county, Kenya.***

***It will be among small holder sorghum farmers with one and above acres of land covered with sorghum.***

***1.9: Definition of significant terms.***

**CHAPTER TWO: LITERATURE REVIEW**

**2.1. GLOBAL OVERVIEW.**

Sorghum is the fifth most important cereal crop in the world and the third most important cereal crop in the United States (FAS/USDA, 2011). The main sorghum producing countries around the globe include Nigeria, USA, Ethiopia, Sudan, Mexico, Brazil, Burkina Faso, Australia, India, China and Argentina among others.Argentina ( United Sorghum Checkoff Program, 2016). Worldwide, sorghum yield was 66.2 million metric tons for the 2010-2011 trade year with the United States being the world’s second largest producer, behind Nigeria (FAS/USDA, 2011). Sorghum is produced for feeds or human consumption but there is increasing cultivation for bioethanol production (FAOSTAT, 2005; National Sorghum Producers, 2006). It ranks fifth in cereals for global production (FAOSTAT, 2005). It is the second most important cereal in sub-Saharan Africa (FAO, 1995).

About 90% of the world’s area under sorghum lies in developing countries, mainly Africa and Asia (Devries et al., 2001; FAO, 1995). Approximately 50% of soghurm produced is for human consumption (National Sorghum Producers, 2006). World sorghum production peaked over the period 1979-1981 at 66 million MT, although the decline to present levels has largely been due to two countries, the United States and China, which accounted for 6.2 million MT between 1981 and 1990 (FAO, 1995). This decline has been attributed to farmers planting more profitable crops in the east (such as pulses and oilseeds), policy interventions and the availability of more drought resistant maize varieties in the United States, resulting in the expansion of the maize belt further west into traditional sorghum areas (FAO, 1996).

In the USA, sorghum is traditionally grown throughout the Sorghum Belt, which runs from South Dakota to Southern Texas, primarily on dryland acres. Farmers planted 5.7 million acres and harvested 365 million bushels in 2018. Sorghum farmers had another strong year, harvesting an average of 72.1 bushels per acre (USCP,2016). The production was as follows; Kansas -- 2.8 million acres, Texas -- 1.55 million acres, Colorado -- 355,000 acres, Oklahoma -- 300,000 acres and South Dakota -- 260,000 (USCP,2018). Sorghum exports have represented a large portion of the U.S. sorghum marketplace over the last few years. International sorghum customers have included Mexico, China, Japan and many other countries. **According to Vanguard Newspaper, using the breakdown of data obtained from the United States Department of Agriculture (USDA), USA’s output was projected at 8.4m metric tonnes. This combined with other countries producing sorghum produced 59.34 million tonnes around the globe same year.**

**2.2. AFRICA OVERVIEW**

Sorghum, as one of the staple foods in Africa, is more preferred due to its hardiness as a crop, and its ability to thrive in both cold and arid areas.In West and Central Africa, the increase in sorghum area was more than two-fold from 1972 to 2008 (7.39 to 16.59 million ha), while production increased by almost four times during the same period (4.24 to 16.08 million tons). However, there was 22% reduction in area. Nigeria is one of the countries on top of the list of sorghum producers. **Over the years, it has experienced a tremendous growth and boost in its economy due to sorghum cultivation. In 2012, Nigeria cultivated about 5.6 million hectares and the annual production was estimated to be about 2.8million tones as reported by Agriculture Nigeria. Between 2015 and 2017, it rose up to 2nd place in the world as regards sorghum production. This is after the USA which came first place. According to Vanguard Newspaper, using the breakdown of data obtained from the United States Department of Agriculture (USDA), USA’s output was projected at 8.4m metric tonnes and Nigeria with 6.4m metric tonnes in 2017. The latest USDA report forecasts that sorghum production will rise to 60.6 million tonnes in 2018 and there would likely be no changes to the rankings. This means Nigeria will still take 2nd place globally.**

In South Africa, Sorghum grown in the drier areas of the northern provinces in South Africa where it is planted between mid-October to mid-December. The Free State produces about 50% of South Africa’s sorghum. The average production yield of the grain’s seed is 2 ton/ha

**2.2. EAST AFRICA (EA)**

Sorghum production in EA has increased significantly from the early 1970s to 2009, while there has been a marginal (18%) increase in productivity from 800 kg/ha to over 940 kg/ha during the same period In Tanzania, sorghum is the number five staple crop grown in the semi-arid parts mainly for subsistence, but farmers also bring their harvests to the major local markets including Dar-es-Salaam for sale, which consists less than 2% of the harvest, (Rohrbach and, Kiriwaggulu, 2007). IThe country has a production capacity of 0.5 million tons per year. Tanzania grows the traditional and improved varieties of sorghum. One of the hybrid types is sorghum bicolor or L. Moench. The main growing areas include Tabora, Mwanza, Shinyanga, Mtwara, Dodoma, and Singida among others.

**2.3KENYA OVERVIEW.**

Sorghum production in Kenya has been relatively stagnant over the years. The largest groups of producers in Kenya are small-scale subsistence farmers (Food Security Department, 2004; Rohr Bach, 2003). Being poor in resources, most of sorghum farmers have only minimum access to production inputs and improved credit facilities for their purchase (Food Security Department, 2004). The factors like low profitability of sorghum, less demand as a food grain has not dithered its importance. Farmers still continue to grow sorghum though to a certain minimum level, the household food/fodder security level. (Muui et al 2013). Wartman et al (2006) identified five major sorghum producing areas in Kenya which were coast, Rift valley, Easter-central, Western and Nyanza provinces. Sorghum production per year in these areas ranges between 3000ha in Coastal province to 50000 ha in Nyanza province ,

While total food production of all cereals has risen considerably during the past 35 years, Siaya production has stagnated. Siaya County’s climate is among the most conducive for sorghum and millet production n Kenya. Currently only 500 of acres of land in Siaya County are under sorghum yet the region has the potential of 5000 acres (CGA,2019). In Siaya county, Rarieda and Bondo are the leading sub counties in sorghum production, followed by Ugenya, Alego /Usonga, Gem and Ugunja respectively. The varieties doing well in the region include Gadam, Sila and Advanta (CGA,2019). The seeds are drought resistant and take shorter time to yield in addition to fetching better prices in the market compared to maize. Currently, one can harvest more than 15 bags of sorghum from an acre of land selling each kilo for Sh. 32( Kenyanews.go.ke).

**CHAPTER THREE: METHODOLOGY OF THE STUDY.**

**3.1: Introduction**

The chapter contains the various methods that were used to collect data and the information necessary for the study. It discussed what was to be done with the aim of obtaining reliable data. It includes research design, target population, sampling procedures and method of data analysis together with the ethical issues.

**3.2: Study Area**

Alego sub county is in the current Siaya county. The population consists mostly of small scale farmers practicing subsistence agriculture. Some of the crop planted include: maize, sorghum, beans, cassava, millet, sweet potatoes and vegetables. They also keep cattle, goats, sheep, donkeys and poultry. The soil textures ranges from loamy to sand. Traditional methods of farming, for instance, use of bullocks, traditionally regarded seeds and the use of hoes for weeding and ploughing is very common. Modern technologies such as the use of tractors, hybrid seeds, fertilizers are also used but by a smaller population of households.

**3.3: Research design**

The study was using a descriptive survey to investigate the sorghum production in Siaya county, Alego sub counwiy. intend to use descriptive research design. There are three main types of descriptive method; observational methods, case study and survey methods. They may include open ended, closed ended and partially ended or rating scale questions (Jackson S.L 2010) (Jamie hale m, s 2018)

The researcher will be in charge of all the interviews. The study will pick on a sample size that will represent the whole area. This being a case study, the researcher will collect data from 30 respondents who are small scale farmers involved in sorghum cultivation. The farmers will have to be sorghum farmers, as this would give more information about the topic of research. The researcher will sample 10 respondents from female headed households, 10 respondents from male headed households, 10 respondents where both male and female members of the household are present. This criterion will enable the researcher to get varied answers to the questions and hence give balanced informed results about the factors causing less sorghum production.

**3.4: Sample size and sampling procedures**

**3.4.1 Sample size**

A total of 30 sorghum farmers will be sampled from Alego sub county of Siaya .Purposive sampling was used to identify specific farmers who produce sorghum.The interview will be carried out through a questionnaire. The researcher will sample 10 respondents from female headed households, 10 respondents from male headed households, 10 respondents where both male and female members of the household are present.

**3.4.2: Sampling procedures**

Simple random sampling procedures; provide the base in which the other more complex sampling methodologies are derived. The researcher must first prepare an exhaustive list (Sampling frame) of all the members of the population of interest. The sample is drawn so that each person or item has equal chance of being drawn during each selection round (kanupriya 2012).

Non-probability sampling procedures; it is used in some situations, where the population may not be well defined. The most common reason for using non-probability sampling procedure is that it us less expensive than probability sampling procedure and can often be implemented more quickly (Michael 2011).

**3.5: Data collection instrument**

One type of data was used, that of sorghum farmers. The questionnaires will be taken by the researcher to the selected farmers . It will be more objective because they gather responses in a standardized way while ensuring confidentiality. Both open ended and closed ended method of questions will be used.

**3.5.1: Validity of data collection instrument**

The process of developing and validating an instrument is in large part focused on reducing error in the measurement process. It is a systematic error in measurement. The validity of an instrument represents the degree in which a test measures what it purports to measure.

**3.5.2: Reliability of data collection instruments**

The research instrument should yield consistent results after repeated trials under the same condition overtime. The same questionnaires will be used by the sample population which will be randomly divided into halves on the basis of even and odd numbers.

**3.6: Pilot study**

The researcher will check the validity of the instruments by studying the responses to the questions and also identify gaps in the instruments in relation to the research objectives and how to address them prior to the study.

**3.7: Data collection procedures**

The researcher will collect the primary data using a structured closed ended and unstructured open-ended questionnaires. The researcher will drop and pick the questionnaires from the sample sorghum farmers. The respondents will be given enough time to fill the questionnaires and a follow up will be done.

**3.8: Data analysis techniques**

Raw data from the field will be collected using questionnaires. All these questionnaires will be carefully examined to check on their completeness and consistency. The most commonly used data analysis methods will be content analysis, one of the most common methods of analyzing qualitative data and narrative analysis for analyzing content from various sources such as interviews of respondents, observations from the field or surveys.

A serial number will be given and the number identified for each respondent, each objective will be analyzed, described and interpreted on the basis of responses and the data was used to generate reports. It will be analyzed through descriptive statistics where frequencies, percentages and total will be used. Descriptive statistics are the most appropriate for the study because they would help in description, analysis and interpretation of circumstances as they will be at the time of study. The data collected will be edited, organized and analyzed using SPSS.

**3.9: Ethical issues**

During the study, there will be high professional maintenance of ethics of conduct to ensure the respondents privacy and confidentiality is safeguarded. Every effort will be taken to ascertain that no plagiarism occurs. During the research study no physical or psychological harm or cruelty will be triggered.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |
|  | August | September | October | November | December | January |
| Problem Identification |  |  |  |  |  |  |
| Proposal Writing |  |  |  |  |  |  |
| Data Collection |  |  |  |  |  |  |
| Data Analysis |  |  |  |  |  |  |
| Report Documentation |  |  |  |  |  |  |
| Presentation and Submission |  |  |  |  |  |  |

**4.1: BUDGET**

|  |  |
| --- | --- |
| **Activity/Material** | **Cost** |
| Transport | 2, 000 |
| Printing | 1, 000 |
| Photocopy | 1,000 |
| Field assistance | 5, 000 |
| Accommodation | 2, 000 |
| Printing papers | 1, 000 |
| Communication | 1,500 |
| Stationery | 500 |
| Miscellaneous | 4, 000 |
| **Total** | **18, 000** |

**I'm Marion Otwar, student at Rongo University, taking Agricultural Economics and Resource Management. I'm carrying out a research on production, processing and marketing of groundnuts in Siaya County, Kenya. The information shared will be private and confidential. I'm asking for your kind cooperation. Please tick where appropriate.**

**FACTORS LEADING TO LOW SORGHUM PRODUCTION, IN ALEGO SUB COUNTY, SIAYA COUNTY, KENYA.**

***Questionnaire.***

***GENERAL***

Tick where necessary

1. Gender of the farmer

Male. ( ) female. ( )

2. How old are you?

18-30. ( ) 30-40. ( ) above 40. ( )

3. Which level of education did you attain?

Primary level. ( ) secondary level. ( ) Tertiary level. ( )

4. What is your marital status?

Single( ) married ( ). divorced ( )

***PRODUCTION***

1. How much land do you have?

1-5 Acres ( ) Above 5 Acres ( )

2. How many kilograms of sorghum do you produce annually?

1000-2000. ( ) 2000-3500. ( )

3. How much money do you make annually?

5000-10,000( ) 10,000- 20,000 ( ) above 20,000 ( )

4. Which methods of farming do you employ?

Mechanised ( ) Unmechanized( )

6. Which labor do you use?

Hired labor ( ) family labor. ( )

7. Where do you get money to buy the inputs

From friends. ( ) Loans. ( ) Savings. ( )

8. At how many shillings per kilogram do you buy the sorghum seeds per kilogram?

10-20( ). 20-70( ). Above 70( )

9. How many 50kg bags do you sell per month?

5-10 ( ) above 10( )

10. How much do you sell per 50kg bag?

2000-3000 ( ) above 3000

11. Which method of marketing do you use

Internet. ( ) Word of mouth. ( ) Through Social media

**AOBs**

said that farmers will be trained and given access to farm inputs, variety of seeds and direct access to the market for their produce.“Through the Farm to Market alliance we are targeting the Kenya Breweries Limited market in Kisumu. The farmers should take advantage of the ready market where they will be paid within seven days after delivery,” Etemesi said.Mr Ndubi reiterated that the famers in the Bondo need to grow sorghum as cash crop alongside maize which is grown for subsistence because the area does not have any other cash crops.At the end of the first season of the campaign towards the end of 2018, more than 6,800 small scale farmers from across the county had earned over Sh. 390 million from the 12,642 metric tons of the produce sold to the beer making giant, says a report by the county director of agriculture, Isaac Munyendo.Munyendo says that the farmers, who had over 10,539 acres under the crop, supplied the sorghum through aggregators and registered farmer groups contracted by the EABL.According to one of the farmers who planted the crop and later sold the harvest to EABL, George Spencer Wambiya, the white sorghum is a blessing in disguise for Siaya farmers.“I was able to sell my harvest and retained a 90 kilogram bag for consumption,” says the 37 year old farmer from Karindi village in Kabura /Uhuyi sub location, South West Alego location.He says that the sorghum, when ground into flour, makes very good porridge and its ugali is heavier and tastes better, unlike the traditional sorghum that many people in the county prefer.Wambiya said he harvested 13 bags of 90 kilograms each of the Gadam variety from his two acre farm and sold a kilogram at Sh 32 to an aggregator.The farmer, who ventured into farming four years ago, however says that the venture has several challenges, key among them, the birds menace.White sorghum farmer, George Spencer Wambiya who laments that birds were a serious threat to the success of the venture“Having spent about Sh. 20,000 on the venture, I made close to Sh. 15,000 profit within two and a half months that the crop takes to mature” he says adding that he would have harvested more had it not been for the birds which attacked his crop.He says that birds start attacking the crop within the second month and a farmer must spend a lot of time in the farm chasing them away.The farmer laments that when EABL agents were going round encouraging farmers to take up the crop, they were promised that a chemical to deter the birds from causing damage to the crops will be availed but this did not come.He says that the birds menace made him lose massively and if a way could be found to minimise the attacks, then farmers would reap big from the venture.Another challenge that the farmer noted in his new found cash crop was lack of inputs such as seeds and fertiliser.“The seeds were availed late, same as subsidised fertiliser which were not enough and we had to buy the expensive inputs from local agro-vet shops,” he says.An aggregator who coordinates the purchase of white sorghum in Siaya, Linet Akoth Otieno describes the “Jilishe Kisha Uuze” initiative by EABL as a good venture with a lot of potential in future.Speaking to Kenya News Agency during a farmers meeting at the Siaya Agricultural Training centre, Linet said the market for white sorghum was big and can absorb more and urged Siaya farmers to take advantage of this.“Besides cash, it is good for food security,” she says adding that the farmers will end up with money in the pocket which will enable them take care of family needs such as the cost of education and health care.“Perhaps the best thing, apart from ensuring money in the pockets, is that our raw material is used to make legal and safe drink to cushion our people from illegal liquor that is taking a toll on our youth,” she added.Linet, who, through her company, Lyeve Enterprises Ltd. Siaya handled 1,500 farmers with approximately 500 acres, said she paid the farmers Sh. 6,400,000 for the 200 metric tonnes delivered during the first season in August, 2018.She said that her company was paying farmers Sh 32 per kilogram delivered and it was cash on delivery.Another aggregator, Farm to Market Alliance that is a subsidiary of the Cereal Growers Association handled about 300 farmers from various parts of the county and managed 97.5 tonnes, says its coordinator, Brian Etemesi Sande.Sande says that He says that the crop, if planted and taken care of well, will have a big positive impact on the local economy.“We are buying at Sh. 32 per kilogram while maize at this time is sold at even Sh 20 per gorogoro (two kilogram tin) at harvest time,” he says and challenges the locals to embrace the crop.Sande however advises the farmers to ensure that they plant only four varieties of the white sorghum, that is; Sila, Gadam, KARI Mtama1 and Advanta as these are the only ones that EABL buys.He says that unlike in the first season when farmers were supplied with seeds, the coming season will see those interested in the venture buy seeds from the approved stockists.“In 2018, EABL gave seeds but just about 20 per cent were planted while the rest is probably still in the hands of individuals,” he told a farmers meeting attended by other stakeholders at the ATC.On challenges, both Sande and Linet are in agreement that threshing of the crop was a big challenge to the farmers during the first season.“The farmers brought produce full of dust and some even had weevils, an indication of poor post-harvest handling,” said Linet.The aggregators also complained of transportation challenges, adding that poor access roads made them incur a lot of expenses as they had to go for the crop right in the farms.Siaya county executive committee member for agriculture, Charles Ogada hails the venture as a good enterprise which offers a ready market to small scale producers. “Their price at farm gate if fair,” says the county minister for agriculture.He however calls on the small scale farmers to come together in groups and take advantage of economies of scale if they are to reap big in the venture.“Our farmers can benefit more if they consolidate their activities as they will be able to access inputs and even labour at fair cost hence maximising on their profit,” says Ogada adding that if they stick to the current way of doing things where each farmer is on his or her own, they may not reap enough.For years, Barley was EABL’s raw material of choice but in 2009, the company decided to include Sorghum in its brewing process hence the heightened campaign to have local farmers go back to the crop that many had despised over the years.In a bid to ensure success of the venture, the company, through the department of agriculture helped develop a value chain that helps promote the crop, with farmers receiving continuous training on best practices and post-harvest handling.Kenyan farmers now have a ready market and opportunity to make good returns from sorghum farming.and its proximity to the Sh. 15 billion refurbished EABL plant in Kisumu means local farmers are poised to benefit more.