Effect of Precipitation on Food Security in Kasebwera Parish, Butenga Sub County, Bukomansimbi District, Uganda

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***Abstract:*-Over 800 million people in the world are food insecure where 180 (23%) million are found in the Sub Saharan Africa. The study establishes the relationship between precipitation and food security in Kassebwera parish, Butenga Sub County, Bukomansimbi district, Uganda. The study employs both cross-sectional and descriptive survey designs which included mixed methods data collection approaches. The study targets 1996 people from who 322 respondents were determined using Krejcie and Morgan sample size formula. Data was collected through observation, interview and questionnaire. Quantitative data was organized, edited and coded and entered into the SPSS for analysis into descriptive and inferential statistics while qualitative data was transcribed as per the tools, grouped into themes, categorized and analysed using content value analysis. Results reveal that, an increase in precipitation by 100% retards food security by 58.7%. Therefore, precipitation had a negative correlation to food security which implies that in the area, precipitation (rainfall, hailstorms and drizzle) had significant effect on food security. There is a negative significant relationship between precipitation and food security with correlation coefficient of (r = -0.587; p > 0.000).The study recommends that, the government, district in collaboration with the NGOs should sensitize, create awareness and build capacity of farmers in Soil and water conservation practices, implement and enforce supportive environment and natural resources law and policies.**

Key words: **Awareness, food security, precipitation, SMART agriculture**

I. INTRODUCTION

Food security has been and remains a key issue to address across the globe so as to harness quality of life of the masses and thus this study is built on drought and food security.

Literature indicates that, richer societies have more ways of securing livelihoods and those options translate into resilience (Khalafallah, 2006). He further asserts that, the availability of food on the market is obviously correlated with food security, but the relationship is not absolute, and many other factors act to determine whether an individual can buy, prepare, eat and utilize it efficiently. Smith and Haddad, as cited in Khalafallah, 2006) further reveal that, between 1970 and 1995 increased food availability accounted for only about one quarter of the global child malnutrition reduction. Thus, it is noted that, food production is necessary to eliminate food insecurity, but it is seldom sufficient. For example, there are more hungry children in countries that have a surplus of cereals that in countries that had a deficit (Scherr, as cited in Khalafallah, 2006). This implies that, countries with food deficit have had their citizens having challenges with quality of livelihoods in terms health, nutrition, and immunity.

Interestingly, over 800 million people in the world are food insecure where 180 million (23%) lie Sub Saharan Africa (Anderson, as cited in Lolemtum *et al.,* 2017). IGAD as cited in Lolemtum *et al.* (2017) indicates that, Africa in 20 years more than 11.5 million people are in need of food assistance that is Djibouti, Kenya, Somalia and Ethiopia. Worse still, Government of Kenya (GU) declared an impending drought as a national disaster with an estimate of 1.6 million people affected. Lolemtum *et al.* (2017) add that due to poor performance of rainfall, the drought continued to affect both pastoral and marginal agricultural based livelihood zones and the impact on household's food availability as well as livestock productivity and it also resulted into high food prices (IFRC, as cited in Lolemtum*et al.*, 2017). This is also evidenced in areas of Uganda where food prices have risen due to changes in weather parameters leading to diseases outbreak, stunted growth, low production and impassable transport networks thus, a menace to for security.

There is low rates of food security is in Kasebwera parish which has been as a result of drought with its constructs such as prolonged dry spell, hot temperature and change in rainfall patterns (Nabunya, 2017). It could be noted that, the late onset of rains and prolonged dry spells with diverse changes in rainfall patterns, rainfall intensity and distribution together with indiscriminate tree cutting for fuel and search for fertile land to aid farming has greatly contributed to the advancements in drought and its effects to food security (Musoke, 2017). Hence, limited food availability, access and utilization resulted into malnutrition, kwashiorkor, low labour productivity thus low production and low households' incomes in Kassebwera parish. Accordingly, the disastrous consequences of drought experienced between 2015/2016, led to increase in the price of foodstuffs for example, a kilo of posho almost hit 4000/= Uganda Shillings and a jerry can of water increased from 800/= to 3000/= Uganda Shillings (IPC,

2017; Nabunya, 2017; Nakitende, 2016). During this period, women and children had to wake-up early in the morning at around 3:00am tofetch water from distant places (Government of Uganda, 2017; Nabunya, 2017). Regrettably, this deprived off children a right of access to education, risks of rape and murder in the wee hours to fetch water from longer distances (IPC, 2017; Nabunya, 2017). Therefore, the study examined the effect of temperature, precipitation and wind on food security in Kassebwera parish, Butenga Sub County located in Bukomansimbi district of Uganda.

II. LITERATURE REVIEW

2.1 Effect of precipitation on food security

Precipitation takes form rain, sleet, snow and hail (FAO, 2008) where all these forms have effect to the food security and livelihoods in any country where they occur. In Uganda for example the common forms precipitation are rainfall, hailstorm, snow and drizzle which are rarely written about in the literature. Akudugu, Dittoh & Moham (2012) assert that, the increase in frequency and severity of wind and storms have been as a result of climate change. This means that, such increase affect negatively the transit at air and seaport terminals as well as changing transports thereby causing food accessibility problem across countries. Interestingly, the changes in precipitations and high temperatures result into the rising sea-levels (Lolemtum, 2017).

The effect of rainfall variability is threatening food production system, leading to losses of food insecurity (Murali & Ajifi, 2014; Akudugu, Dittoh & Moham, 2012). A study in India by Murali & Ajifi (2014) indicates that erratic rainfalls had impacts on agriculture, food security. The study adds that the changing weather patterns such as less predictable seasons, increasing effects of erratic rains or prolonged droughts are the most important factors threatening sustainability of agriculture and food security as well as livelihoods (IPPC as cited in Murali & Ajifi, 2014). In India for example erratic rainfall patterns in terms of delayed monsoons, season shifts, droughts and floods have had adverse impacts of food security and livelihoods of a number of farmers and labourers in Jinjgir-Champa district (Murali & Ajifi, 2014).

It is worth important to note that, the declining rainfall has reduced pasture thus impacting on livestock production and food availability negatively (Ibidi…p.23), the changes in rainfall reliability, onset and cessation can cause crop failure and hunger (DfID, 2008). Goulden as cited in DfID (2008) noted that, there will be a significant increase in mean annual rainfall beyond 2060 with highest percentage in December, January and February. With such projections, the current state of heavy storms was not considered/ was overlooked. Currently, heavy rains are received in the months of March-May and September – December in some countries like Uganda. For example these torrential rains have occurred in Uganda after the prolonged dry spell and their disastrous effects have been felt in most of the areas of greater Masaka, Gomba, Butambala and Busiro (Bukedde, 2018; Daily Monitor, 2018; DfID, 2008). The occurrence of such rains had left the regions seeking refuges from the neighboring regions. DfID (2008) emphasizes that erratic onset and cessation of the rain season resulted into crop failure and low yields of staple foods like beans, cassava, maize, mattooke as well as a reduction in additional varieties and outbreak of crop pests and diseases. Hepworth & Goulden (2008) claim that, road network maybe cut off by storms. This implies that, changes in rainfall patterns have adverse significant impacts on all the dimensions of foods security as well as livelihoods.

Additionally, weather shocks and changes in precipitations will have an impact on productivity resulting alternation in prices, demand and supply, profitability and trade in India (Kaur, 2017). He further clarifies that, increased rainfalls had adverse effects on productivity grounds and crops like wheat, sorghum and maize were affected mostly due to low precipitation levels (Ibidi…p.4). It is also revealed that, sudden shock in the magnitude and the time of rainfall and the occurrence of natural calamities like floods, droughts, tsunami and winds led to instability in agriculture sector thus, impacting on food security (Kaur, 2017). Therefore, excess rainfall and drastic weather changes have adversely affected the production of Jowar impacting on life of those depending on farm in Karnataka (Kaul & Ram, 2009, as cited in Kaur, 2017). It is noted that, any changes in weather conditions especially, a rise in the temperature variations or variations in the precipitation levels makes water bodies a suitable habitat for pests. This implies that, the multiplying pests and a wide spread of diseases are a great cause of concern for farmers as they bring in agricultural losses hence, food unavailability.

IPCC (as cited in Kaur, 2017) notes that, further availability in precipitations could also result in the spread of malaria across the arid regions in Asia. This informs that, the rise in sea water levels and increased precipitation levels, higher chances of flooding may lower the capacity of food utilization thus, a rise to numerous nutritional diseases. In Ghana for example, rising temperatures and changes in precipitation patterns contributed to rising sea level thus an effect to livelihoods of those populations living in the coast regions (FAO & IPCC, as cited in Akudugu and Alhasan, 2014). The reports add that, these have worsened the situation through their impacts to the dimensions of food security.

Lule (2016) notes that, change in season have not only affected agriculture production, but also the weather patterns. He adds that, the weather patterns in turn have been manifested in form of floods and drought affecting the poor who tend to be the ones that live on land which is prone to the flooding. For example, in Bududa district, Eastern Uganda, people living around Mountain Elgon have been forced to live in temporally structures during heavy storms which later results into landslides and mudslides. Thus the victims have continued to be poorer as most of them have been displaced and resulted in the internally displaced persons (IDP).

Fascinatingly, on 15/9/2018 in Buwunga, Bugiri district, hailstorms occurred and devastatingly damaged crops, animals, people and their property (Correspondent for Bukedde TV, Agataliiko Nfuufu, 2018). Furthermore, In Wakiso district, a similar catastrophic event happened on 17/9/2018 in the villages of Kyambazi, Kimeeza and Buwaali all found in Kyengera town council. This resulted into destruction of crops like cassava, maize, beans and bananas. The community presented their outcry to the area Member of Parliament and Office of the Prime Minister to help them with food aid (Correspondent for NTV Akawungeezi, 2018). It was also reported on 12/9/2018 by a correspondent for NTV Akawungeezi from Mityana Municipality that, lightening and thunder had killed two people and injured one and several of food crops were destroyed. Further, a thunder killed one person in Bugiri after a heavy rainstorm of 8 hours (Metro Fm News, 2018).

Additionally, another devastatingly event occurred on 11th. October, 2018 at Bukalasi in Bududa district and killed over 50 people, destroyed crops, killed animals and also destroyed housing. The heavy storms coupled with high volumes of water flow through the rivers resulted into mudslides which caused serious death and destruction of property. It was revealed that, families in the lower areas of River Manafua, and slopes of Mount Elgon were hit most. With such instances, the four facets of food security are no more and there were chances of emergence of outbreak of diseases, poor quality supply, and malnutrition, in the affected communities especially in Bubiita and Buwalo villages (NBS TV News, 2018). This implies that, people have no food, housing, health and any other services required for a better life.

Likewise, in Kyannamukaaka and Buwunga Sub Counties, Masaka district, limited rains affected crop production. The farmers reported that, the seeds they planted failed to germinate due the drizzles received could not support germination and growth of the seed sown. Others confirmed that, they ate all the seeds which were kept for sowing after a failure to have favourable rains to favor their germination. Those farmers who had just sown their seeds were frustrated for the insufficient rains occurring after a long while and could not support their crops that had managed to germinate (Mukisa, 2018).

Palatino (2010) reports that, heavy rains in Thailand, Vietnam and Philippines triggered flood-related disasters in rural areas that had adverse significant effects on food security in those regions. He adds that, the event came at a particularly bad time as many farmers had not yet harvested their crops. The floodwater worsened the situation as they resulted into rotting of the food stuffs and hence increased food insecurity and malnutrition. The field crops were destroyed and farmers were left devastated as all of the crops were wiped out by Typhoon Megi. Palatino (2010) clarifies that National Chamber of Commerce; Thailand estimated $234 million agricultural losses due to typhoon Megi.

Regrettably, Uganda for example, in Bukomasimbi district, one of the residents asserted that, raw mangoes had become their best meal as they could eat a single meal per day which meant only at night (Kisekka, 2016; Ssali, 2015). It was also revealed that, this insufficient food supply was a result of the little rainfall with uneven distribution both in time and space hence failing agricultural production. Residents noted that, they were planting in time for two seasons but the area was receiving irregular rains to sustain crop growth (Kisekka, 2016; Ssali, 2015), thus the area has been stuck with hunger. The community had failed to harvest food in two consecutive seasons, thus for survival food aid was paramount to rescue people in the areas seriously hit by the prolonged drought which had led to famine (Rugunda, as cited in Kisekka, 2016). Kato (2018) adds that, in the cattle corridor, cattle suffer due to lack of pasture which leads to the keepers to migrate to other areas of the country. He further notes that, since animals are fed on naturally grown pasture, absence or unreliable rains affect the animals more which also impact on the farmers as it lowers their income due to death of their animals. This has been evident in areas of Teso, Nakasongola, Ankole, Nakaseke and Karamoja where many animals died due no or limited rains that cannot favour pasture regeneration and growth (Kato, 2018).

Fahim & Haidary (2018) claim that, a huge shortfall in snow and rains across Afghanistan over the normally wet colder months affected winter harvest, threatening the already precarious livelihoods of millions of farmers and sparking warnings of severe food shortages. This implies that, the country is faced with an estimated shortfall of 2.5 million tonnes of wheat this year, more than two million people could become severely food insecure and would be in desperate need of humanitarian assistance in the next months as warned by the UN (Fahim & Haidary, 2018). They also reported that, tens of thousands of sheep and goats had died and many farmers had the seeds for the next planting season, as rivers and wells dried up and pastures turn to dust. Further, they assert that lack of precipitation in Balkh had left most of its farming and grazing lance parched. Therefore, because of such instances, more than 450,000 farmers and nomadic herders in the province of Balkh slaughtered their cattle, goats, or sold them for a pittance. Fahim & Haidary (2018) claim that, because of little or no rains, prices of sheep and goats have plunged as farmers rush to sell their animals before they become even weaker. As at the same time, the cost of fodder had soared and most of the country's animals were in urgent need of food.

III. METHODOLOGY

3.1. Study Area

This presents the villages in Kassebwera parish which the researcher visited while in the field for data from the respondents. These villages where considered for the study because they make Kassebwera parish to which the study was undertaken. The parish was considered for the study because

it was of the parishes seriously hit food insecurity due temperature changes in the area. The villages from which the respondents were found include; Buyovu, Gayaza, Kakukuulu, Kanyogoga, Kassebwera, Katoma, Kawaala, Kikondeere, Kiryamenvu and Nkalwe as indicated in Fig. 3.1:

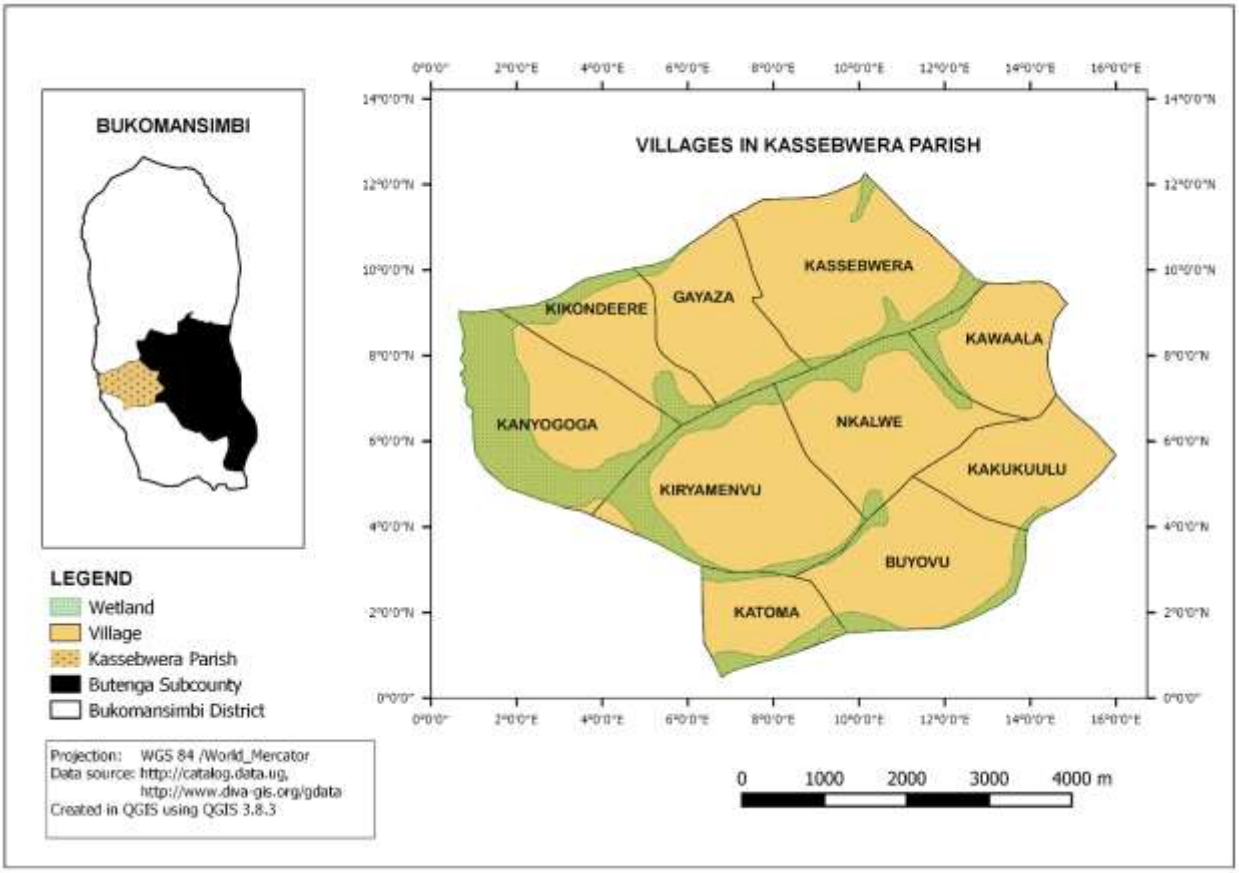

Fig. 3.1: Location of Kassebwera parish in Butenga Sub County, Bukomansimbi district

Source: http://catolog.data.ug, http://www.diva-gis.org/data. Created in QQGIS 2.18, 2019

3.2. Research design

The study employed cross-sectional and descriptive survey designs to assess the association between temperature and food security in Bukomansibi district of Uganda. In the study cross-sectional and descriptive survey designs were used to assess the adjustments to the farmers and community members in the area. The cross-sectional and descriptive survey designs were employed to yields a large amount of data at one point in time from a sizeable population in an economic way. Thus, this enables the researcher to generalize results for entire population. The cross-sectional design allowed the collection of quantitative data which is analyzed quantitatively using descriptive and inferential statistics (Amin, 2005).

3.3. Study Population

This is a total number of objects of interest to the researcher (Oso & Onen, 2005; Bailey, 2012). The study targeted a total of 1996 people who included farmers (crops & animals) (1881), administrators (17), Financial manager (17), Office of the Chief Administrative Office (4), District planners (5), Natural resources officers (15), Health Services Officer (12), Community based services officers (8), Religious leaders (10), NGOs officers (15), LCIII Chairperson (1), Parish officer (1) and LCI Chairpersons (10). Therefore, the study targeted various people (stakeholders) due to sensitivity of the problem under investigation and the relevancy of the study findings not excluding the gender factor.

3.4. Sample Size

The study determined a sample of 322 respondents to participate in the study. The sample size was calculated using Krejcie and Morgan 1970 sample size calculation formulae as indicated below:

$$s = X^2NP\,(1-P) \div d^2\,(N-1) + X^2P(1-P)$$, where;

s = Sample size

X^2 = Chi-square value for 1 degree of freedom at the desired confidence level, (3.841)

N = Population size

P = Population proportion (assumed to be .50, as it provides the maximum sample size)

d = Degree of accuracy expressed as a proportion (.05)

Therefore, $X^2NP(1-P) \div d^2(N-1) + X^2P(1-P)$

$= 3.841x1996x0.5 \div (0.05)^2(1996-1) + 3.841x0.5(1-0.5)$

$= 1916.659 \div 5.94775 = 322.249$

Therefore, the sample size for the study was 322 respondents

3.5. Sampling procedures

The study employed both purposive and simple random sampling techniques to select the respondents basing on their knowledge, competences and experiences to provide crucial information presumed vital to the study. Purposive sampling techniques help to collect firsthand from the specific respondents for example, effect of temperature, food security, costs of food products from the respondents (Ahuja, 2005; Creswell & Plano, 2011). In addition, the technique is economical in nature, minimizes time wastage and provides reliable information to the study (Kothari, 2004). This is supported by Gall & Meredith (2003) who argue that specific information is obtained when purposive sampling in employed. Therefore, the technique was used to collect data from the key informants that is; CAO, Administrators, Local Councils officers, NGOs, District Planning Unit, Health services officers, Community based services providers and Finance controllers.

On the other hand, simple random sampling technique was also used to select respondents to participate in the study. In the study, simple random sampling technique was employed as a qualitative approach to eliminate bias through giving each respondent a chance of being selected to participate in the study. Simple random sampling technique is a strategy that, adds credibility to a sample when the potential purposeful sample is large than one can handle. Additionally, in cases of small sample size, the goal was credibility, not representative hence, the ability to generalize research findings.

3.6. Data collection methods/ instruments

3.6.1. Interview

The researcher employed interviews which involved semi-structured and in-depth interview to gather data from the participants. An interview is a proposed discussion between two or more people (Kaln & Cannell as cited in Saunders, Lewis & Thornhill, 2007). In the study, key informants' interviews were conducted to the respondents with knowledge and experience to provide local facts, attitude & beliefs on drought and food security. Interviews were chosen provide to valid and reliable data which are relevant to research objectives. However, for this study, the researcher employed semi-structured and in-depth interviews to collect qualitative data from participants. For this case, questions varied depending on data required, and the researcher recorded responses using various recorders such as phones and notebooks. In order to obtain more information from the participants, the researcher probed more from the respondents through unstructured interviews (informal). Accordingly, the researcher conducted interviews with specified participants (key informants) based on the set questions but with predetermined answers reflecting on the specific objectives and research questions. The researcher ensured an appropriate timeframe for the interviews, gender and avoided annoying statements on the side of the interviewees.

3.6.2. Questionnaire

The researcher used a questionnaire as a tool to collect information from the sampled respondents. A questionnaire is a data collection tool were the person answering the questions actually records his or her own responses (Kevin, cited in Saunders, Lewis & Thornhill, 2007, p.354). The questionnaire was used as an efficient tool to collect responses from a larger sample prior to quantitative data. Using the self-administered, the researcher designed and delivered the questionnaire by hand to the respondents who were unable read and write as per the specified and agreed time. The questionnaires were filled by the respondents according to their convenience. The questionnaire included both close-ended and open-ended; the close-ended questions were ranked on a five (5) likert scale that is 1-Strongly Disagree, 2-Disagree, 3-Neatral, 4-Agree and 5- Strongly Agree and the opinions from the respondents were gathered as specified. In addition, open-ended questions captured information from both independent and dependent variables of the study.

3.6.3. Observation

Finally, the researcher employed observation method to collect information on the affected farms, households, plants, animals and environment. Observational data are the information collected through observing directly what is currently happening (Stake, 2010). In the study, the researcher employed direct observation because of their importance in observing valuable insights in the environmental and social context in the study. The researcher observed elements affected by drought (plants, animals, water bodies, vegetation), malnourished children, poverty hit households and the environment. During observation, focus was put on crops, livestock, local surroundings, living conditions and interactions between the people.

3.7. Reliability and validity

3.7.1. Reliability

Reliability refers to the consistence of research instruments (Arya *et al*., 2002; Kothari, 2004; Amin, 2005). Therefore, before administering the questionnaire and other tools, sampling procedures were tested by the experts more than two times (tests) for a two-day period to establish the problems

with specific questions, test household selection procedures and receive constructive criticisms. Thereafter, the researcher conducted a pilot study to ensure reliability through administering the questionnaire to the respondents two times at different intervals. The researcher ensured that the respondents answer the questions like in the main study. Later, the responses were calculated with a statistical test of Cronbach Alpha test reliability. Thus, variables with at least Cronbach Alpha of 0.7 from the two sets of data were considered reliable.

Table 3.1: Reliability Statistics

S/N	Variable	Number of items	Cronbach Alpha(α)
1	Precipitation	07	0.781
2	Food Security	20	0.757

Source: Pretest field data (2019) as extracted from SPSS

3.7.2. Validity

Validity refers to the extent to which an instrument measures what it claims to measure (Arya *et al.,* 2002; McQueen & Krussen, 2002) or concern to whether the variable is the underlying cause of item co variation (Devillis, 2003). This implies that, respondents are less likely to complete and return questionnaires perceived to be inappropriate. Consequently, to ensure validity, the researcher discussed the questions with the supervisor before forwarding them to two independent experts of Climate Change and Food Security at Makerere University for verification. This cleared ambiguities caused by the instrument and the experts assisted to refine the instruments focusing on study objectives and content validity index was computed through;

CVI = No. of items rated relevant ÷ Total No. of items in the instrument

Thus CVI = 50/68 = **0.735**

3.8. Data analysis

Quantitative data collected through the questionnaire was organized, coded and entered into SPSS Software for cleaning and analysis to generate descriptive and inferential statistics. Data analyzed helped to establish the relationship between temperature and food security; effect of wind and food security, and effect of precipitation and food security. Thus, all these were achieved through the use of Pearson product correlation coefficient and regressions analysis. Qualitative data was transcribed as per the instrument used to collect it from the respondents. Data from the respondents was grouped into subthemes and categories to attach meanings until the final viewpoint was reached. Thus, the researcher used content analysis techniques to analyze data gathered through interview and observation. The content analysis examined the intensity with which certain words used, implying that, for effectiveness of total responses from instruments are classified and recorded into pragmatic content matrix (Komb & Tromp, 2006) and aid the practice.

IV. RESULTS AND DISCUSSION

4.1. Effect of precipitation on food security

This was based on the second objective of the study, "to investigate the effect of precipitation on food security in Kasebwera parish". This was in relationship with a research question, "What is the effect of precipitation on food security in Kassebwera parish?" Therefore, all these were answered through a series of questions, and these were rated on 5 point Likert scale ranging from Strongly Disagree (SD) =1 to Strongly Agree (SA)=5, and the results are shown in Table 4.1:

Table 4.1: Effect of precipitation on food security in Kasebwera Parish

Statement	N	Min	Max	Mean	Std. Deviation
Precipitation affects food security	187	1	5	4.96	.371
Rainfall affects food availability	187	1	5	4.06	.477
Rainfall affects food access	187	1	5	4.08	.528
Rainfall affects food utilization	187	1	5	4.52	.912
Hailstorm affects food availability	187	1	5	4.84	.700
Hailstorm affects food access	187	1	5	4.90	.530
Hailstorm affects food utilization	187	1	5	2.71	1.263
Drizzle affects food availability	187	2	5	4.16	1.232
Drizzle affects food access	187	1	5	2.43	.994
Drizzle affects food utilization	187	1	5	2.46	.985
Valid N (listwise)	**187**				

Source: Primary Data, 2019

As indicated in Table 4.1 above, when the respondents were asked whether, "precipitation affects food security", the respondents agreed that, precipitation affects food security (Mean=9.46; rStdev=.371). Therefore, results it Table 4.1 above also revealed that, the respondents agreed rainfall affects all the elements of food security that is, food availability (Mean=4.06; Stdev=.477), food access (Mean=4.08; Stdev=.528) and food utilization (Mean=4.52; Stdev=.912). Further, the respondents agreed that hailstorms affect both food availability (Mean=4.84; Stdev=.700) and food access (Mean=4.90; Stdev=.530). However, the respondents were moderately neutral that hailstorms affects food utilization (Mean=2.71; Stdev=1.263). On the other hand, the respondents agreed that, drizzle affected food availability (Mean=4.16; Stdev=1.232), but the respondents disagreed that drizzle affects both food access (Mean=2.43; Stdev=.994) and food utilization (Mean=2.46; Stdev=.985). This implies that, majority of the respondents agreed that, precipitation affects the facets of food security in Kassebwera Parish.

When asked whether, "precipitation affects food security," the respondents agreed. In this study precipitation was measured by rainfall, hailstorms and drizzles. Results show that, the different measures of precipitation had effect on food security differently. Results agreed with Kaur (2017) who states that, weather shocks and changes in precipitations would have an impact on productivity resulting alternation in prices, demand and supply, profitability and trade. Further, Lule (2016) notes that, change in season have not only affected agriculture production, but also the weather patterns hence affecting food security. The results in addition, concur with Palatino (2010) who reports that, heavy rains in Thailand, Vietnam and Philippines triggered flood-related disasters in rural areas with adverse significant effects on food security in those regions. Regrettably, the heavy storms coupled with high volumes of water flow through the rivers resulted into mudslides in Bududa, which affects all the four facets of food security. Further, there were chances of emergence of outbreak of diseases, poor quality supply, and malnutrition, in the affected communities especially in Bubiita and Buwalo villages (NBS TV News, 2019).

Respondents further agreed that, rainfall affects food availability and they agreed represented the negative effect of rainfall to food security. It was revealed that, the rainfall amounts received in the areas was not sufficient for crop production which eventually lowered food availability in the area. The respondents further asserted that the rainfall received is low and unreliable with low capacity to sustain crop growth. Therefore, this accelerated food unavailability by the households in the study area. Fascinatingly, on 15/9/2018 in Buwunga, Bugiri district, hailstorms occurred and devastatingly damaged crops, animals, people and their property (Bukedde TV, 2018). This implies that, such rains greatly posed a threat to food availability among the households. One of the respondents reported that, she had grown his crops but were swept away by the torrential rains and remained with nothing. For example, the torrential rains had occurred in Uganda after the prolonged dry spell and their disastrous effects had been felt in most areas of greater Masaka, Gomba, Butambala and Busiro (Bukedde, 2018; Daily Monitor, 2018). On the other hand, another respondent revealed that, her case was different and she stated that, the unreliable rainfall was a disasters for her garden. The results concur with DfID (2008) which noted that, declining rainfall had reduced pasture thus impacting on livestock production and food availability negatively, the changes in rainfall reliability, onset and cessation can cause crop failure and hunger.

More to that, the respondents agreed that, rainfall affects food access. According to the respondents, food access meant having foodstuffs any time you need them without any limitations. However, in the area due to heavy storms, the gardens were devastatingly affected which reduced access to food. This further concur with Kaur (2017) who revealed that, sudden shock in the magnitude and the time of rainfall and the occurrence of natural calamities like floods, droughts, tsunami and winds led to instability in agriculture sector thus, impacting on food access. It was also reported that, because it had taken a long time without raining, when it rains in a day, it rains "cuts and dogs" which paralyzed all food access routes by the households. It was revealed that, since the area receives unreliable rainfall coupled with heavy storms, lightening and thunders access to food becomes a menace. The results are supported by Hepworth & Goulden (2008) who claimed that, road network maybe cut off by storms. This implies that, changes in rainfall patterns have had adverse significant impacts on all the dimensions of foods security (access) which eventually affects their livelihoods.

Additionally, respondents agreed that, rainfall affects food utilization. It was noted that, in cases where insufficient rainfall is received, food production is very low which implies that, food utilization is also affected. Respondents revealed that, due to inadequate rains in the area, household had limited access to food, thus, a single meal a day. One of the respondents reported that, his family could only afford a single meal because they had not enough food as their crops were seriously affected by while survived were greatly affected by strong shine. It was observed that, children were stunted, and also malnourished. Respondents revealed that, because of poor food utilization and lack of a balanced diet, they incurred too much costs for treatment for better health.

Interestingly, respondents agreed that, hailstorm had effects on both food availability and utilization. Hailstorm relates to occurrence of rains coupled with rain stones which impact on growing crops in any given area. The results are in agreement with on Bukedde (2018) which asserts that, the occurrence of hailstorms in Buwunga, Bugiri district devastatingly damaged crops, animals, people and their property. This implies that, such a disaster reduced food availability among the households. According to the respondents, this was commonly received after a long time of absence of rainfall. In addition, hailstorms limited access to food which later affected the well-being of the households. When such a form of precipitation is received, its effect was felt by the farmers and crop productivity. This implies that, food supply and availability was low and also limited access to food will be experienced among the households in the year to come. Respondents further revealed that, during such situations, access to food is a jeopardy. Further, respondents stressed that, you may have the money but food is unavailable and accessible too. This impacted most on the production capacity of the family members, which further worsened the well-being of the family and households. The respondents noted that, hailstorms destroyed their tomatoes, cassava, maize, beans and bananas.

However, the respondents were moderately neutral when asked whether hailstorm affects food utilization. This implies that, the respondents were not certain about the effects of hailstorm on food utilization. However, hailstorms have had adverse effects on food utilization. Unfortunately, no literature

was found specifically focusing on hailstorm and food security. Additionally,

> *"I can say that, hailstorm has had effects on food utilization in that, when hailstorms occur, the plants and food crops are affected which lowers their utilization by the households. For example, food crops had stone-like substances which limited their usage and for vegetables, when they are hit by hailstorms, they eventually rot and could not be eaten or used by households to improve their nutrition and immunity."*

It was observed during the study that, a recent catastrophic event had just happened, and hit cassava, bananas, maize, and beans among others to unrecognizable situation. With reference to observations, respondents added that, they could not eat their cassava because it was so bitter (akaawa), and beans rot due the hailstorms.

One of the respondents reported that, all his vegetable plots were spoiled due to hailstorms, this meant that, their utilization by the family was hindered. One of the respondents asked,

> *"Based on what I had observed what should be done to rectify our vegetables so as to improve food security especially food utilization in the area?I responded to him that, he should remove all the leaves and apply fungicides (Dithane M45 &Lidomil) and pesticides (Ducucyper&Ducuacelemectin) to the vegetables they would be ok and I referred him to a Crop Agronomist and Agricultural Extension Officer in the area for further guidance and solutions."*

As to whether, "drizzle affects food availability," the respondents agreed with a mean of 4.16 and a standard deviation of 1.232. The results indicated that, drizzle had adverse effect on food supply and availability in the study area. The respondents also revealed that, the drizzles could not support any seeds to germinate and those who had their seed sown, suffered seriously. The findings concur with Mukisa (2018) stated that, planted seeds could not germinate due the drizzles received. He further adds that, those farmers who had just sown their seeds were frustrated by insufficient rains which occurred after a long time, hindered their crops which had managed to germinate.

One of the respondents reported that, his family had planted maize, beans and groundnuts, unfortunately, the seeds did not germinate well and even those few which had managed to germinate, they could not be sustained by the drizzles received. Another respondent added that,

> "*I used a lot of money to buy seeds as inputs, but most of them were wasted due to failures of sufficient waters to support the seeds into the soil. Additionally, those who also had cash crops especially coffee were seriously affected and they had little to sell and support their families in terms of the basic needs and school fees. Drizzles did not only affects crops but also hinged more on the animals, implying that, the respondents were unable to get output from the animals. Further, the cost of the animals went down and the money collected from animals' sales were too low to support their daily needs. Therefore, the respondents reported that, we could not support ourselves and families because all our crops failed, the animals which would have been sold for incomes suffered sickness and others died and even the coffee which has all along supporting us more, could not do so for this period (7/4/2019)."*

Additionally, when the respondents asked whether, "drizzle affect food access and utilization, the respondents disagreed with means of 2.42 & 2.46 and Standard deviations of 0.994 & 0.985 respectively. Results show that, the respondents were not aware of the effect of drizzle on food access and utilization. It was revealed that, when drizzles are received, they do not support germination as well as growth of the plant, implying that, no food will be availed, accessed and eventually, poorly utilized. The respondents further noted that, with such instances, they had failed to get enough food for the households. They further reported that, since we had no harvests for long time due to drizzles, our source of has been food aid and purchased form the market. The findings agree with Rugunda (as cited in Kisekka, 2016) who claimed that, the community had failed to harvest food in two consecutive seasons, thus for survival food aid was paramount to rescue people in the areas seriously hit by the prolonged drought which had led to famine.

4.2. Correlation between Precipitation and Food Security

Ho: There is no significant relationship between precipitation and food security in Kassebwera parish

H1: There is a significant relationship between precipitation and food security in Kassebwera parish

Therefore, accept or reject the hypothesis, the researcher established the relationship between precipitation and food security, and the results from Pearson's two tail statistic indicated that, there is a negative significant relationship between precipitation and food security with correlation coefficient of ($r = -0.587$; $p > 0.000$) and the results are presented in Table 4.2:

Table 4.2: Precipitation and Food Security

Variables		**Food Security**	**Precipitation**
Food Security	Pearson Correlation	1	-.587**
	Sig. (2-tailed)		.000
	N	187	187
Precipitation	Pearson Correlation	-.587**	1
	Sig. (2-tailed)	.000	
	N	187	187
*****. Correlation is significant at the 0.01 level (2-tailed).***			

The results in Table 4.2 above indicate that, an increase in precipitation by 100% retards food security by 58.7%. Therefore, precipitation had a negative correlation to food security which implies that in the area, precipitation (rainfall, hailstorms and drizzle) had significant effect on food security. Thus, this gave a basis to reject Null Hypothesis (Ho) and accept the Alternative hypothesis: There is a significant relationship between precipitation and food security in Kassebwera parish and accepted an Alternative Hypothesis (H1) that is,

> *"There is significant ($r = -.587^{**}$; $p > 0.000$) relationship between precipitation and food security in Kassebwera parish. This is so, because the P-value is greater than the correlation value. This implies that, what sought to be correct was later found to be wrong as a result of a statistical test. Therefore, precipitation had no relationship with food security in Kassebwera parish."*

The results indicate that, an increase in precipitation by 100% retards food security by 58.7%. Therefore, precipitation had a negative correlation to food security which implies in the area, precipitation (rainfall, hailstorms and drizzle) had no impact on food security. The results do not agree with IPPC as cited in Murali & Ajifi (2014) which indicate that, the changing weather patterns such as less predictable seasons, increasing effects of erratic rains were important factors threatening sustainability of agriculture and food security. This implies that, the theoretical observation and thinking differ from scientific testing as indicated by the results from the correlation of the study.

V. CONCLUSION

For this, the researcher established the relationship between precipitation and food security, and the results of Pearson's two tail statistic indicated that, there is a negative significant relationship between precipitation and food security with correlation coefficient of ($r = -0.587$; $p < 0.000$) and the results are presented in Table 4.19 below. The results further indicate that, an increase in precipitation by 100% retards food security by 58.7%.

VI. RECOMMENDATIONS

1. The study also recommended that, soil and water conservation practices such as: irrigation, tree planting, mulching, manure application and runoff water harvesting and storage should be enhanced to the households by the help of the NGOS, Local and Central governments.
2. Government support, Law and Policy: this should focus on environmental protection, waste management, regulate agricultural practices in wetland, control illegal tree felling, control and regulate on land ownership, enforcement of environmental regulations and alternative energy sources, energy use and conservation among the households by the district authorities.
3. Sensitization, awareness and capacity building should be enhanced among the households to be adapt to precipitation effects on food security in the area. This should involve tree planting, faster growing plants/crops, SMART agriculture, food utilization, and runoff water harvesting technologies.

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