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FEMINIZATION OF AGRICULTURE AND COPING WITH CLIMATE VARIABILITY IN THE UPPER EAST REGION OF GHANA

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Abstract
The paper investigated the nexus between feminization of agriculture and coping with climate variability in five selected districts of the Upper East Region in Ghana. The districts were selected because there were women farming groups present in those districts. The study employed both quantitative and qualitative methods and data obtained were analysed using descriptive analysis. The result indicated that 25 (14.5%) of women farmers out of 173 would out-migrate because of climate related factors such as increasing temperature and shortening of rainy days. The study further saw that most people migrate because of decrease in food production, infertile land and poverty. For women farmers of the Upper East Region out-migration and planting trees to absorb the harsh effect of the sun are the mitigating efforts mostly adopted. As a result, women farmers resort to animal rearing (4.0%) and food processing (18.5%) to survive the dry season. Their challenge is lack of capital for agricultural inputs and land. It is recommended that families of migrant male farmers should support female farmers with farmlands. The government and benevolent organizations must also give them financial support, climate smart measures and inputs.

Key words: Income, Poverty, Land, Climate Smart Measures, Migration, Food Processing

Introduction

Climate change increases precipitation in some regions while there are decreases in others such as the Savannah Ecological Zone (IPCC, 2007). It may sometimes increase the frequencies of heat stress, drought and flood events (IPCC, 2012). Climate change and or variability, impacts negatively on biological and agricultural systems (UNDESA, 2013). In a drought situation, a significant proportion of a state is affected (Raleigh & Jordan, 2010). There is no scientific evidence to link the incidence of climate change and variability to anthropogenic activities but human activities may trigger its severity (Bouwer, 2011). The Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) (AR5) has reported that the changing climate is exceptional (IPCC, 2014) and has led to varied degrees of climate variability (Maddison, 2006). According to Christensen *et al.* (2007) climate variability is the spatio-temporal variation of climatic conditions beyond individual weather events. Climate variability is associated with unreliable rainy season and affects agricultural productivity leading to out-migration of people (Akudugu *et al.,* 2012).

Male household heads who are traditionally supposed to fend for their families out-migrate in search of well-paid jobs in cities and urban communities of southern Ghana (Regmi & Tisdell, 2002). Out-migration of male residents from northern Ghana to urban areas in southern Ghana has received much attention (Opare, 2003; Tanle, 2003; Awumbila and Ardayfio-Schandorf, 2008; Yeboah, 2008). Most of these studies suggest that, migrants from northern Ghana migrate to southern Ghana to seek jobs and livelihoods (Manuh, 2001). Migration is used as a means of livelihood diversification (Ellis, 2000; Sabates-Wheeler *et al.,* 2005). According to studies by Songsore (2003); Anarfi *et al.* (2000); Opare (2003) and Awumbila and Ardayfio-Schandorf (2008) migration is a male-dominated activity. In their studies, Opare (2003); Obeng (2005) and the World Bank (2011) have noted that migration is due to economic differences between southern Ghana and northern Ghana.

Migration creates changes in family structure, sources of income and affects agriculture labour force of both sex-

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es. Just like other regions in Ghana, women are engaged in farming in the Upper East Region. Where more males out-migrate than females, more women are pushed into agriculture to enable them meet the needs of their families. This phenomenon is known as feminization of agriculture (FAO, 2010). According to Bhadra (2007), feminization of agriculture is a situation where the number of male and female labour force in agriculture is unbalanced which is exacerbated by improved communication and transportation. Due to male migration, women have assumed the role of household heads and increased their participation in agriculture as farm hands to generate income or engage in actual food production to feed their families (Gartaula *et al.,* 2010). Paudel *et al.* (2012) have indicated that, feminization of agriculture is taking place in many nations and the causes and consequences are regional or national specific. A study by Cornhiel (2006), concluded that out migration of the male-labour force is a major cause of feminization of agriculture (Kelker, 2009; Kelkar, 2010) as farm hands (Sujaya, 2006; IFAD, 2005).

Even though the number of women in agriculture is increasing, women are marginalized for cultural reasons. Empowering women in agriculture enables them to contribute effectively to food security. Kabeer (2001) indicated that women empowerment is expanding their abilities to strategic life choices. An empowered woman is able to ensure good health and nutrition for her children and also take care of her own physical and mental well-being (Smith *et al.,* 2003). Budlender (2003) argued that household headship depends on age, sex, customs and economic conditions across societies and cultures. In the Upper East Region, lands are owned by husbands who gives portions to their wives (Fafchamps & Quisumbing, 2008) if they are present. It is perceived that female-household heads are poor because they are unable to save their earnings. As a result, there is no equity in the possession of assets between male and female-headed households (Peterman *et al.,* 2011).

In the Upper East Region of Ghana, women's labour in agriculture is both formal and informal or unpaid for and goes unrecorded (Fontana and Paciello, 2010). In order to empower women in agriculture, governments, civil society organizations, the private sector and individuals must recognize the role of women in agriculture (FAO, 2010). However, the support for women in agriculture is thwarted by climate variability. There have been several studies on climate variability and female agriculture labour, but little attempt has been made to investigate the coping mechanisms of female farmers in the Upper East Region. The focus of the study is therefore to find out the coping mechanisms of women farmers in the period of climate variability. Specifically, the study looked at the perception of female farmers to climate change and their coping mechanisms.

Methodology

Study Area

The study was conducted in the Upper East Region of Ghana which is located between latitudes 10º 30′ and 11º 00′ North of the Equator and longitudes 0º and 1º 30′ West of the Greenwich Meridian within the White Volta River Basin. The Region has two international boundaries with the Republics of Burkina Faso to the north and Togo to the east. The other boundaries are the North-East Region and Upper West Region of Ghana to the south and west respectively.

Study Design

A three-stage sampling (random, snow ball and purposeful sampling) method was used to select the districts and the respondents for the study. A purposeful method was used to select Kassena Nankana, Bolgatanga, Bawku West, Binduri and Garu districts because they have meteorology stations for climate data. The sample size of one hundred and seventy-three (173) female farmers from a sample frame of four hundred (314) (Krejcie and Morgan, 1970) who belong to farmer-based organizations and were registered with Ministry of Food and Agriculture (MoFA) were randomly selected for a survey. The figure was arrived at through the use of the formula proposed by Krejcie and Morgan (1970) as shown in equation (1).

According to them,

S = *required sample size*

$$S = \frac{X^2 NP(1-P)}{d^2(N-1) + X^2P(1-P)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots eqn\,(1)$$

confidence level (3.841)

N = *The population size* = 314

X^2 = *table value of Chi − square for* 1 *degree of freedom* (df) *at desired*

maximum sample size)

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d = *the degree of accuracy expressed as proportion* (0.05)

From the information above;

$$= \frac{3.841(314)(0.5)(1-0.5)}{(0.05)^2(314-1)+(3.841)(0.5)(1-0.5)}$$

$$= \frac{301.5185}{1.7428}$$

$$= 173.01$$

$$= 173$$

The sample size was proportionally divided by the districts based on the population figures of the Upper East Region for the districts (GSS, 2010).

Also, fifty-seven (57) farmers (46 female farmers whose husbands had out-migrated and 11 male farmers who were migrant returnees) were selected by the use of snow balling for focus group discussions. In all, five focus group discussions were held with an average of eleven members in each group. Key informants from relevant stake holders in agriculture were purposefully selected for in depth interviews. Informant interviews were conducted with staff from MoFA, Water Users' Association (WUA), Irrigation Company of Upper Region (ICOUR) and Northern Rural Growth Programme (NRGP) using key informant interview guide.

Additionally, a desk study was carried out to review technical reports, policy documents, relevant theoretical perspectives, and available data on climate variability, out-migration and feminization of agriculture. The desk study provided in-depth information on the concepts and experiences, lessons learnt and emerging issues which assisted in designing a focus group discussion, questionnaire and interview guides for the study. Desk studies which is also called systematic inquiry by the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2012) provides understanding of data collection and how to cope with the complexity, ambiguity, incomplete information, mismatched view points and conflicting objectives (Kent, 2012). This helps to avoid false presentation of data (Moon, 2007) and inaccurate projection of reality (Kingdom, 1997). For example, UNESCO (2008) in 2008 suggested that by 2015, 18 million people would be required to achieve Universal Primary Education. Four months down the line, the same organization reported that, 1.9 million teachers would be required to achieve Universal Primary Education by 2015 (UNESCO, 2011). Desk study is therefore important to examine important and practicable policy implications and interventions (UNESCO, 2012).

Pre-testing of the survey questionnaire was done at Zuarungu in the Bolgatanga Municipality from 3rd December, 2019 to 8th December, 2019 and corrections were made before interviews were conducted. Data collected from the survey were analysed using IBM SPSS Statistics Version 20 to calculate the frequencies and percentages. Summaries of information from key informants were presented based on themes.

Results and Discussion

Age of Respondents

From table 1, the majority were in the age bracket of 30-34 and the lowest were aged sixty (60) and above. The numbers of female farmers begin to reduce from the age of 30-34. This is because many husbands begin to settle down with their families. Also, below the age of 30-34 the interest of the female farmers is to cultivate food crops unlike those who were much younger.

According to one of the respondents;

reservoirs. These findings showed that one of the important push factors for out-migration in the Upper East Region of Ghana was the delay in the onset of rain. When the rains delay farmers out-migrate to other areas outside their home regions to farm or do menial jobs to support themselves. Also shortening of rainy days was one of the factors impeding crop production. This is because when the rainy days are shortened the optimum water required for individual crops will not be met and this will result in low yield. Similarly, early cessation of rain equally reduces the amount of water needed for crop production. The respondents saw increasing tem-

Table 1. Age Structure of Female Farmers

Age group	Number of respondents	Percent
18- 19	15	8.7
20-24	17	9.8
25-29	22	12.7
30-34	34	19.7
35-39	20	11.6
40-44	25	14.4
45-49	14	8.1
50-54	10	5.8
55-59	9	5.2
60 and above	7	4.0

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I cultivate water melon and yellow melon for sale. During the harvest time customers normally comes from the Northern Region to buy and I get immediate cash. Farming has enabled me to pay for my school fees and acquire basic needs such as under wears pomade without relying on my husband (Faustina, 30-years).

Marital Status of Respondents

Some female farmers who were divorced (8.7%), widowed (4.0%) or never married (1.2%) were household heads. For those who were married (84.4%), the household headship was in the hands of their husbands and so they were supported to acquire land and farm inputs to ensure food security in their homes. Table 2 shows the marital status of female farmers during the study.

Sources of Information on Climate Variability for Female Farmers

All respondents said they have heard of climate change. Majority of them said they heard of climate change from radio discussions. This was followed by 65 respondents who said they heard of climate change from staff of Ministry of Food and Agriculture (MoFA). Another ten respondents said they heard of climate change from Farmer Based Organizations (FBO) (Table 3).

Table 2. Distribution of Female Household Heads of Respondents

Marital status	Number of respondents	Percent
Married	146	84.4
Co-habitation	3	1.7
Divorced	15	8.7
Widowed	7	4.0
Never married	2	1.2

Table 3. Sources of Climate Change Information to Female Farmers

Source of climate information	Number of respondents	Percentages (%)
MoFA	65	37.6
NGO	8	4.6
Radio	83	48.0
TV	4	2.3
FBO	10	5.8
From school	3	1.7
Total	173	100.0

The opportunity to hear of climate information was based on the possession of electronic devices such as television and radio or sensitization by field officers from the Ministry of Food and Agriculture or non-governmental organizations. The major source of information for the female farmers was the radio. This is because, most mobile phones used by women have radio on them and every district has a radio station. As such it was easy for the female farmers to resort to the radio for information and entertainment. Also, the Ministry of Food and Agriculture (MoFA) posts extension officers to rural farmers. It was therefore not surprising that, besides the radio the MoFA staff were their sources of climate change information at the community level. The survey indicated that only 1.7% had the opportunity to hear of climate change while they were in school. According to the Upper East Regional Director of the Ministry of Food and Agriculture;

Some non-governmental organizations (NGOs) such as Northern Rural Growth Program (NRGP), International Institute for Tropical Agriculture (IITA) and research institutions like the Savannah Agricultural Research Institute (SARI) helped in educating farmers on climate change and coping strategies. Every district has a farmer based organization. These organizations have leaders who train and share knowledge with their colleagues or invite technical people to give them training and information on climate change, agriculture and gender related topics (UER Director, MoFA).

Climate Change and the Push Factors for Male Out -migration

There are a lot of climate related push factors affecting agriculture in the Upper East Region. The survey indicated that the evidence of climate change by female farmers is decreasing food production as a result of delay in the onset of rain. Thirty-eight respondents said the delay in the onset of rain in recent times was an indication that certain changes had occurred in the environment (Table 4).

The push factors were the reasons why migrants in Upper East Region migrate for greener pastures elsewhere in Ghana. The effect of the delay in the onset of rain was felt by the short period of rainy days and increase temperature. It was observed that, the push factors were interdependent. When the rainy days are reduced, the amount of water collected in reservoirs and dugouts decreases. High atmospheric temperature resulted in high evapotranspiration and the drying up of the reservoirs.

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Table 4. Climate Related Push Factors of Migration Promoting Feminization of Agriculture

Push factor	Frequency	Percent
Delay in the onset of rain	38	22.0
Increased temperature	12	6.9
Shortening of rainy days	18	10.4
Early cessation of rain	30	17.3
Decreased rainfall amount	20	11.6
Increased drought	25	14.5
Increased floods	15	8.7
Drying up of dugouts	10	5.8
longer dry season	5	2.8

These findings showed that one of the important push factors for out-migration in the Upper East Region of Ghana was the delay in the onset of rain. When the rains delay farmers out-migrate to other areas outside their home regions to farm or do menial jobs to support themselves. Also shortening of rainy days was one of the factors impeding crop production. This is because when the rainy days are shortened the optimum water required for individual crops will not be met and this will result in low yield. Similarly, early cessation of rain equally reduces the amount of water needed for crop production. The respondents saw increasing temperatures and decreasing rainfall amount as the cause of decreasing food production. This assertion is similar to that of Lobell *et al.* (2011); that each degree rise in temperature would result in decrease yield of food crops in the Savannah Ecological Zone.

Reasons for Out-migration to Seek Greener Pastures in the Upper East Region

It was reported by 43 respondents that the main reason for out-migration was decrease in food production. The least of the reasons given for out-migration was to pay medical bills (Table 5).

Increasing temperatures and reduction in rainfall amount were earlier reported to be the cause of low crop yield (Issahaku et al., 2016). It was reported by the women during a discussion that, the rainy season used to be six months but now it is four months (June – September) and even with this, the rains do not last till the end of the month of September. Agriculture in the Upper East Region is rain dependent as such when the rain fails crops do not do well. Farmers who are interested in producing crops such as rice that needs more water will have to migrate to southern Ghana where the average rainfall figures are more than 1200 mm (Gordon, 2006). Also, increase in temperature results in a reduction in humidity and soil moisture and a reduction in crop yield. Agriculture is therefore climate sensitive in the Upper East Region since it is rain dependent. If planting is done at the end of June or early July it is not possible for the crop to mature within the short rainy season. Farmers who cultivated crops that take longer time to mature are disadvantaged and they relocate to places where they are sure of at least six months of rainfall. Some of the participants also said the start of the rainy season is now shifting backward (to later in the year). This is because previously, farming used to start in April in the region but now it begins late in June. Participants at the focus group discussions indicated that between 60 and 70 percent of women in the region are engaged in agriculture. The World Bank (2007), reported that poverty and economic inequality existed in the north and that the northern regions had the lowest per capita income. Male farmers in northern Ghana particularly, the Upper East Region are normally forced to migrate to southern Ghana to look for food and income (GSS, 2015).

Table 5. Reasons Why People Migrate From Their Home Region

Push factors of out-migration	Frequency	Percent
Poverty	40	23.1
Personal effects	30	17.3
Decreased food production	43	24.8
No livelihood	25	14.5
Infertile land	20	11.6
Medical bills	5	2.9
School fees	10	5.8

Participants reported that, they experienced periodic flooding during years of heavy down pour. Floods normally destroy and wash away farms and also food stuff that has been stored for use during the lean season. Floods also result in the loss of soil nutrients. Some of the participants reported that, their homes were washed away during floods. The Upper East Region is located in the Northern Savannah Zone and is conducive for the cultivation of maize, rice, sorghum, millet, groundnut and livestock as was found by Songsore (2003). However, rainfall is erratic and results in periodic floods and droughts (EPA, 2011). This invariably makes it difficult to establish specific planting times and farmers tend to engage in guessing suitable planting dates which are not suitable for food security. Another adaptive mechanism

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is that farmers do multiple plantings during the cropping season as the first crops planted normally withers and they have to replant; planting multiple times is resource demanding and further cuts the profits gained by the farmers. It is based on this that Nelson *et al.,* (2007), concluded that ecological zones with high rainfall and low temperatures get more crop yield and a reduction in poverty than those with low rainfall and high temperatures.

The 46 female farmers whose husbands have out-migrated from the Upper East Region indicated that, 15 (31.6 %) went to Ashanti, 9 (19.3 %) to Brong Ahafo, 6 (14.0 %) to Eastern, 4 (8.8 %) to Western, 5 (10.5 %) to Central and 7 (15.8 %) to Greater Accra Regions. Those who migrated to the national capital were not looking for agriculture-related jobs since there are no farm lands in the national capital but other unskilled jobs such as gathering of metallic scraps, security work, cleaners and head porters.

Preferred Climate Change Adaptation Strategies in the Upper East Region

When the female farmers were asked of their preferred adaptation measures to climate variability, tree planting was ranked the most preferred choice. This is because of the awareness that trees can reduce the effects of wind storms, reduce erosion and above all, increase the nutrient content of their farm lands. Also 25 respondents indicated that out-migration was the easiest adaptive strategy to climate change or variability. This is a seasonal occurrence during the dry season when bread winners migrate out of the region to work for money. This action is intended to be temporal but sometimes they are enticed by friends or host families to stay a bit longer than earlier planned. Adopting early maturing seeds was preferred by 16 respondents (Table 6).

Climate variability causes hardship to female farmers and it is important that steps are taken to address them. For example one of the female farmers reported that;

Initially, my husbands remitted me monthly but because of asset accumulation it gets to a point when he does not send any money home. As an adaptation strategy, reservoirs and dugouts have been constructed by the government and nongovernmental organizations to ensure all year farming. Notable among them is the Tono Reservoir which was constructed in 1975 and operationalized in 1985 (Gordon, 2006).

Other dugouts constructed later were meant for animal watering and domestic purposes. Participants were aware that the construction of the reservoirs and dugouts was for the inhabitants to adapt to the effects of the low rainfall amount and increase crop production in the Region.

Table 6. Climate Change Adaptation Strategies by Respondents

Climate change adaptation	Frequency	Per cent
Tree planting	35	20.2
Mixed farming	17	9.8
Mulching	13	7.5
Contour ploughing	15	8.7
Out-migration	25	14.5
Adopting early maturing seeds	16	9.3
Avoiding tree cutting	12	6.9
Avoiding bush burning	17	9.8
Zero tillage	10	5.8
Early farming	5	2.9
Shifting cultivation	8	4.6

Participants, during a focus group discussion, also indicated that*;*

> *Because of the reduced number of rainy days, they have resorted to the use of improved seed varieties which are provided by MoFA and the Savannah Agricultural Research Institute (SARI)* (FGD, Kassena Nankana).

These seeds take an average of two months to harvest instead of the usual three months by most indigenous crops. These improved seeds are fast gaining grounds in the region and there are fears that, soon the indigenous seeds will go extinct. It was suggested by participants that a hybrid seed variety would be more appropriate. According to the participants, mixed crop was another strategy used in the region. These crops such as maize, millet, groundnuts and beans are normally planted on the same piece of land.

A key coping strategy that was also mentioned during the focus discussion was mixed farming and avoidance of bush burning. The respondents indicated that, mixed farming is an opportunity to get organic manure freely from the animal droppings since both crops and animals are kept together. It also ensures economic and food security because the farmer can sell her farm produce to get income and also food.

The participants were of the view that income generating activities give them hope because they ensure that when

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their crops fail they can still buy food for their families.

Table 7 gives a summary of the income generating activities engaged in by female farmers in addition to crop production.
Majority of the respondents were engaged as farm labourers to enable them generate income. The effect of this activity on the lives of the women was immediate because they are paid immediately the day's activity was over.

Institutional Support for Farmers in the Upper East Region

Table 7. Income Generating Activities of the Farmers

Livelihood	Frequency	Percent (%)
Animal rearing	7	4.0
Sale of Vegetables	19	11.0
"Dawadawa" production	14	8.1
Shea Butter production	18	10.4
Weaving(eg. hats, mats, baskets)	8	4.6
Fish mongering	5	2.9
Pottery	4	2.3
Mining	3	1.7
Groundnut cake processing	17	9.8
Food processing	15	8.7
Sewing	12	6.9
Hairdressing	6	3.5
Farm labour	26	15.0
Donkey cart transport	5	2.9
Fire wood harvesting	14	8.2

Region

The overwhelming majority of participants (95%) indicated that they got diverse support from governmental and nongovernmental organizations in the region. The study showed that Ghana Social Opportunities Project (GSOP) construct feeder roads to ensure that food stuff is easily transported to market centres; The Agricultural Development Bank and the Toende Rural Bank (TRB) give loans to farmers and educate them on the need for early planting as a result of the erratic rainfall and decreasing number of rain days. The Ministry of Food and Agriculture (MoFA) encourages farmers on zero tillage; reduction in the use of agro chemicals; discouraging bush burning; supporting farmers with agro inputs; giving fertilizer subsidies and extension services. Other institutions that give support to women farmers are Northern Rural Growth Programme (NRGP); Presbyterian Agriculture Services; International Institute for Tropical Agriculture (IITA) and Savannah Agricultural Research Institute (SARI). Details of the institutional support are given in Table 8.

Challenges of Agriculture Faced by Respondents

When respondents were asked to indicate the challenges, they were facing, 46 out of the 173 female farmers said acquisition of agro inputs was their major challenge and 32 of them said lack of fertilizers.

Table 8. Institutional Support for Agriculture Work Force in the Upper East Region

Name of Institution	Support given to women farmers
Banks eg. Agricultural Development Bank and the Toende Rural Bank	Give loans and educate farmers on early preparation of land due to erratic rainfall pattern Support the district value chain developers to develop drought resistant seeds to be supplied to farmers Collaborate with Northern Rural Growth Programme on the value chain development
Northern rural growth programme	Build the capacity of farmers; Organize farmers into groups Support farmers through the rural banks
Ministry of Food and Agriculture	Instituted the Sustainable Water and Land Management Project to reduce the impact of climate variability. Encouraging zero tillage; Encouraging the reduction in the use of agro chemicals; Discouraging bush burning; Supporting farmers with inputs eg seeds; Gives farmers fertilizer subsidies; Support farmers with money to plough Gives extension services to farmers; Promote afforestation Encourage the use of drought resistance seeds
Savannah Agricultural Research Institute	Research to arrive at the best seed varieties for farmers
Forestry Services Commission	Provide seedlings to aid in afforestation

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This is because weeding large farm size manually is difficult and the ability to own and use weedicides would have helped them. Also they need weedicides and rodenticides to protect their farms from parasitic organisms. As a result of poor soil nutrients, fertilizer application is necessary to improve yield. Table 9 is the distribution of the challenges of the female farmers in the Upper East Region.

Some women farmers whose husbands have out-migrated were still seen as visitors by their husbands' relatives. Participants indicated that those who were fortunate to get land have to face another problem of reduced soil fertility due to run off. Participants reported that, their average yield per acre for maize was five (5) bags and no one can increase the yield without adding fertilizer. Fertilizer subsidies are not given at the right time. Fertilizer subsidy which is the only subsidy enjoyed by farmers is available from the beginning of June to the end of September each year. As a result, there are times when the farmer needs this fertilizer for dry season farming and the subsidies are withdrawn for the season. In addition, low financial capacity of women farmers is a challenge.

Table 9. Responses to Challenges Facing Women Farmers

Challenges of crop production	Frequency	Percent
Lack of inputs	46	26.6
Lack of fertilizers	32	18.5
Lack of agriculture machinery	11	6.4
Inadequate land	25	14.5
Lack of cash	20	11.6
Lack of knowledge	17	9.7
No market for produce	12	6.9
Inadequate labour	10	5.8

Women farmers were poor and could not afford to hire the services of farm hands to work on their farms. The participants also said that inadequate equipment such as tractor; harvesters; bad roads and lack of transport in the communities make ploughing, and harvesting and transportation of farm produce very difficult.

Furthermore, participants were not happy that most dugouts and reservoirs which were to ensure all year-round farming dry up in the dry season. They reported that from January-June most of the dugouts dry up. Consequently, they find it difficult to do dry season farming and household projects such as building and construction have to delay until the rains start again.

Climate threat such as irregular pattern of rainfall was a major concern to women farmers. Irregular rainfall sometimes makes plants to dry up and farmers have to re-plant. Most participants were of the view that, they lack ready market for their farm produce. This is made worse by the fact that many market queens from Southern Ghana prefer vegetables from neighbouring Burkina Faso. This is because they allege that vegetables from Burkina Faso taste nicer as compared to that of Ghana and also do not rot easily. Also, poor road networks joining the market centres and the farms are some challenges that are impeding agriculture in the Upper East Region. Most crops get rotten because there are no vehicles to transport them. In some instances, while the vehicles are available, the roads are so bad that the vehicles spend so many hours to get to the nearby market centres. This makes the farm produce get rotten before they get to the consumers. A participant observed that;

Vegetables get rotten because there is no ready market for us. Our plea is for the government to supplement the supplies to the school feeding programme by purchasing food stuff locally (Awonpoka, Bawku West).

Even though there are many institutions which support farmers in the Upper East Region, their efforts are not coordinated as there were still many challenges as such a collaborative effort is needed to provide the needed interventions (Laube *et al.*, 2012). Female participants indicated that, they do not have access to land as the traditional inheritance system gives precedence to males (Awumbila and Ardayfio-Schandorf, 2008). The challenges associated with climate variability become more serious when they are combined with socio-economic factors such as inadequate land, low or unavailable credit and inputs (Maddison, 2007; Deressa *et al.,* 2008). As a result of the difficulty in adjusting to the changing climate and the socio-economic conditions, rural farmers are made poorer than expected.

Conclusion

The study concludes that the increasing numbers of females in agriculture-related activities were due to the absence of their husbands at home due to out-migration. Women in agriculture are marginalized in the areas of land ownership because male family members have the right of inheritance to land in the Upper East Region. The efforts made by female farmers in food crop cultivation are thwarted by the delay in the onset of rain, unpredictable rainfall pattern and increased temperatures. These factors are attributed to climate change and

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those who have no alternative livelihoods have no option but to migrate in search of food during the dry season. In other to survive in the long dry season farmers adopt animal rearing, dawadawa processing, ground and shea processing as mitigation measures. The study recommends that governmental and non-governmental institutions involved in agriculture must increase their technical, financial and logistical support base to female farmers in the Upper East Region. It is important that climate change education be included in the curriculum of basic schools in Ghana. Families must also make their female children to be part of their inheritance of land and wives of absentee or migrant farmers must be given part of their family lands to enable them expand their farming activities.

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Ethical Approval
All respondents consented to participate in the study.

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Competing Interests
No conflict of interest.

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