

Gender Dimensions on the Effects of Seasonal Variations in Temperature and Rainfall on Cassava Production: A Study of Smallholder Farmers in Central Region, Ghana

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Abstract

This paper assesses the extent to which male and female cassava farmers suffer the adverse effects caused by seasonal variations in temperature and rainfall. Using a combination of cluster, stratified, and simple random sampling techniques, structured questionnaires were administered to 252 smallholder cassava farmers in the Awutu Senya District of the Central Region, Ghana. The study showed that 99% of men compared with 95% women cassava farmers experienced decreasing yields from year to year, because of seasonal variations in temperature and rainfall. Again, 86% of men and 72% of women farmers often delayed the harvesting time of cassava either because of extended drought period, or because of the delay in the onset of the rainy season. While 72% of women farmers reported that they experienced crop losses due to drought or too much rain, similar effects were experienced by 69% of men farmers. Besides, it emerged that the majority of women farmers were heavily affected by the consequences of climate variations on cassava production as compared with their men counterparts. This paper makes strong case for activities that will build the knowledge and skills-base of the farmers so that they can deal with the effects of seasonal variations in temperature and rainfall on cassava production.

Keywords: *gender dimension, seasonal variation, cassava, production, smallholder farmers*

Dimensions Sexospécifiques Des Effets Des Variations Saisonnières de Température et de Pluviométrie Sur La Production de Manioc: Une étude Sur les Petits Exploitants de la Région Centrale du Ghana

Résumé

Ce document évalue dans quelle mesure les agriculteurs mâles et femelles de manioc subissent les effets néfastes causés par les variations saisonnières des températures et des précipitations. À l'aide d'une combinaison de techniques d'échantillonnage en grappes, stratifiées et aléatoires simples, des questionnaires structurés ont été administrés à 252 petits producteurs de manioc dans l'arrondissement d'Awutu Senya de la région centrale, au Ghana. L'étude a montré que 99 % des hommes contre 95 % des femmes cultivateurs de manioc ont vu leurs rendements diminuer d'année en année, en raison des variations saisonnières de température et de précipitations. Là encore, 86% des hommes et 72% des femmes agriculteurs ont souvent retardé la récolte du manioc, soit en raison d'une période de sécheresse prolongée, soit à cause du retard dans le début

de la saison des pluies. Alors que 72% des agricultrices ont déclaré avoir subi des pertes de récoltes en raison de la sécheresse ou de pluies trop abondantes, des effets similaires ont été constatés chez 69% des hommes. Par ailleurs, il est apparu que la majorité des agricultrices étaient fortement touchées par les conséquences des variations climatiques sur la production de manioc par rapport à leurs homologues masculins. Ce document présente des arguments solides en faveur d'activités qui permettront de renforcer les connaissances et les compétences des agriculteurs afin qu'ils puissent faire face aux effets des variations saisonnières de température et de précipitations sur la production de manioc.

Mots-clés: *Dimension de genre, variations saisonnières, manioc, production, petits exploitants*

Introduction

The impacts of climate variation have serious implications on agriculture. They may have the potential to hinder rural women's capacity to secure their livelihoods and pose yet new challenges to the agricultural sector by increasing poverty and reducing ability to confront food insecurity. Consequently, the Bali Action Plan (Banda, 2009) has suggested that if productivity in agriculture is to be improved, a search for climate-smart technologies and a study of the effects of climate variation on gender should be done (Banda, 2009). According to Dankelman (2010), climate variation impacts are not gender neutral. This implies that the burden of the effects of climate variation on livelihoods can be evaluated from gender perspectives. As such, the degree to which men and women are affected by climate variation can be considered as a function of their gender.

Acheampong *et al.*, (2017) have observed the poor acceptance of improved varieties and climate-smart technologies and opined that the diffusion of the information and technologies were not gender-based. However, Dzah (2011) in an earlier study recognized the importance of perception of gender groups as important factor in decision making. Thus, if climate variation research and interventions are to be targeted to men, women, youth and aged farmers, there is the need to understand how each gender group

perceive and respond to climate variation in order to devise adaptation strategies that each gender group prefers. A gender perspective on climate variation therefore enlightens the differences in how men and women are affected by climate variation, their different views and their concerns of climate variation.

It is against this background that the Food and Agriculture Organisation (FAO, 2010b) has indicated that, agricultural development will be severely curtailed if the risks posed by variation in climate elements are not addressed. Agricultural production remains the main source of livelihoods for most rural communities in developing countries especially in Sub-Sahara Africa (SSA) in particular. Here, agriculture provides the source of employment for more than 60 percent of the population and contributes about 30 percent to the Gross Domestic Product (GDP) (OECD/FAO, 2016).

Gender issues in policy debate on climate change and adaptations to climate variations were first raised at the United Nation's 2005 World Conference on Disaster which produced the Hyogo Framework for Action (2005-2015). The framework recommended that gender perspective should be integrated into all disaster risk management policies, plans, decision-making processes, and even those related to risk assessment, early warning, information management, education

and training (ISDR, 2005). The IPCC (2007) IV Assessment Report has stressed the significance of adaptation measures for poverty reduction, especially among crop producers. Adaptation measures are important to help vulnerable groups to effectively face extreme weather conditions Adger *et al.* (2003); however, perception precedes measures to adapt to climate variation effects.

Studies on effects of climate variations in temperature and rainfall on food crop production have been carried out in Ghana (Chemura, Sshauberger & Gornott, 2020; Aninagyei & Odame Appiah, 2014; Armah, Odoi, Yengoh & Obiri, 2011). However, a few of these studies attempt to take a gender perspective. Consequently, the study seeks to bridge this research gap by throwing more light on the phenomenon regarding climate variations and crop production from a gender perspective. This paper therefore explores the gender dimensions of the effects of seasonal variations in temperature and rainfall on cassava production from the perspectives of smallholder farmers. Specifically, it seeks to examine the effects seasonal climate variation on cassava production from a gender viewpoint and gender-based effects of seasonal climate variation on income of cassava farmers.

Theoretical Underpinnings

Gender theory originates from ethnographic observations and anthropological studies of what is considered to be male and female in different cultures and eras. Gender theorists have discovered that the different roles and norms of men and women, are in fact socially determined. This means that gender is a social and cultural construction created by the society one lives in. Four theories that underpin gender development and found to be relevant to the present study are the psychodynamic theory by Sigmund Freud, symbolic interactionism by George Herbert

Mead, the social learning theory by Fagot, and the standpoint theory by MacKinnon. (Scott & Linda, 2014). This paper examines the effects of variations in climate with a focus on gender dimension, which the European Commission (2011) referred to as "integrating sex and gender analysis into research. That is ways in which the situation and needs of, and challenges facing, women and men, girls and boys differ, with a view to eliminating inequalities and avoiding their perpetuation, as well as to promoting gender equality within a particular policy, programme or procedure (European Commission, 2011). This paper adopts all the definitions that emphasise the social attributes and opportunities associated with being male and female and how these impacts different social relations in the study area. Gender in this paper connotes what is allowed or disallowed to an individual, opportunities and disadvantage ascribed to farmers which are determined by established social and cultural norms and by public and private institutions because he/she is male or female or masculine or feminine.

Pullen and Knights (2007) opine that individuals authenticate their gender when they conform to the conventional norms of the society. In conforming to the norms, authentic women must be feminine, passive, and subordinate, while authentic men must be masculine, aggressive, and possess an excess of confidence (Pullen & Knights, 2007). As Boateng *et al.* (2006) argue, male characteristics that are respected and encouraged in Ghana include virility, strength, establishing authority, power and leadership qualities, the ability to offer protection and the ability to bear physical and emotional pain.

One way of overcoming gender challenges is gender mainstreaming. Gender mainstreaming is a strategy to promote gender

equality. Studies have shown that gender mainstreaming develops organizational and procedural changes (Caglar, 2013). Gender mainstreaming can be implemented by creating and building up a gender expertise within an organization (Caglar, 2013). Some scientists say that gender mainstreaming not only provide a focus on the inequality between men and women, but it also ensures that women's rights are addressed. It enlightens situations where the needs of men and women are different, it also ensures that each gender group would have equal access to the solutions (Alston, 2014).

Materials and Methods

Data Collection and Sampling

The study was conducted in four communities in the Awutu-Senya District of the Central Region of Ghana. The District was selected on account of its vibrant agricultural and agricultural-related activities. Besides, it is a popular cassava growing community where both men and women farmers are actively involved in the business. The study employed a combination of cluster sampling, stratified sampling and simple random sampling to select 252 small-scale cassava famers comprising 145 males and 107 females.

In terms of the sampling method, after the four communities, namely Awutu Breku (the district capital), Senya Beraku, Bawjiase, and Bontase, were randomly selected, the farmer population within each community was grouped (stratified) into male and female, with each gender group representing a stratum. Sample units were then drawn from each stratum based on the proportion of the stratum relative to the total size of the farmer population of a selected town. Stratifying the population by gender ensured that variations among sampling units within each gender group was lower compared to variations when dealing with the entire population. At the same time, between strata, there was a high

degree of variability. Additionally, focus group discussions were held with cassava farmers divided into two groups based on gender (male and female). The gender-based groups were formed in order to obtain gender specific information within the context of the study and the driving forces fostering the gender-based behaviors.

Data Analysis

Data were analysed using the Statistical Package for Social Science (SPSS) Version 22 and Microsoft Excel 2013. Statistical tools were used to produce sample statistics such as means, and proportions of the various samples. Descriptive statistics such as frequencies and diagrams such as bar graphs, charts and trends were used to summarise the results of the data analysed.

Results and Discussions

Gender Dimensions of the Effects of Seasonal Variations on Cassava Production

According to Vorsah (2015), gender-based analysis of climate variation impacts on crop production is necessary to understand how the identities of women and men determine different vulnerabilities and capacities to cope with climate variation impacts and also how to tackle both the causes and consequences of the variation.

The effects of climate seasonal variations on cassava farmers from a gender perspective revealed disparities (Figure 1). According to the findings, adverse effects such as decreasing cassava yields, delayed harvesting and increased incidence of cassava root rots were reported by the majority of the men. On the other hand, majority of the women reported on issues of crop losses and delayed planting. For example, 99% of the men compared with 95% women farmers (Figure 1) experienced decreasing yields from year to year, because of seasonal variations in the

climatic elements. Again, 86% of the men and 72% of the women farmers often delayed the harvesting time of cassava either because of extended drought period, or because of the delay in the onset of the rainy season. The results indicated that, 50% of men and 41% women said they experienced root rot due to excessive rainfall. These findings are largely supported by Ali, Deininger, & Markus (2011) who observed that gender differences existed with regard to the impacts of climate variation on agriculture, with males and females facing different risks and vulnerabilities, and at different levels.

There were instances where more women suffered adverse effects caused by seasonal variations than the men. For example, 72% women reported that they experienced crop losses as a result of drought or too much rain, while 69% men experienced the same effect caused by drought or too much rain. Seven percent (7%) women compared with 5% men had to delay the planting time as a result of extended drought period. More women (49%)

indicated that they suffered no adverse effects from seasonal variations. These findings clearly show different experiences by men and women with regard to the adverse effects caused by seasonal variations in the climatic elements.

There were other related cases for which the effects of seasonal climate variations on cassava production had led to reduced incomes due to smaller tuber sizes, food shortage, high labour cost, increased debts, and high incidence of pest and diseases (Figure 2). There were also gender differences regarding the indirect effects of seasonal variations on cassava production. The majority of women reported cases of reduced incomes (78%) and increased indebtedness (16%) due to smaller tuber sizes and high incidence of pests and diseases. On the other hand, it was the majority of the men who reported of food shortage and labour cost due to poor crop yields and proliferation of weeds on farms. For example, during group discussion sessions with the women, the

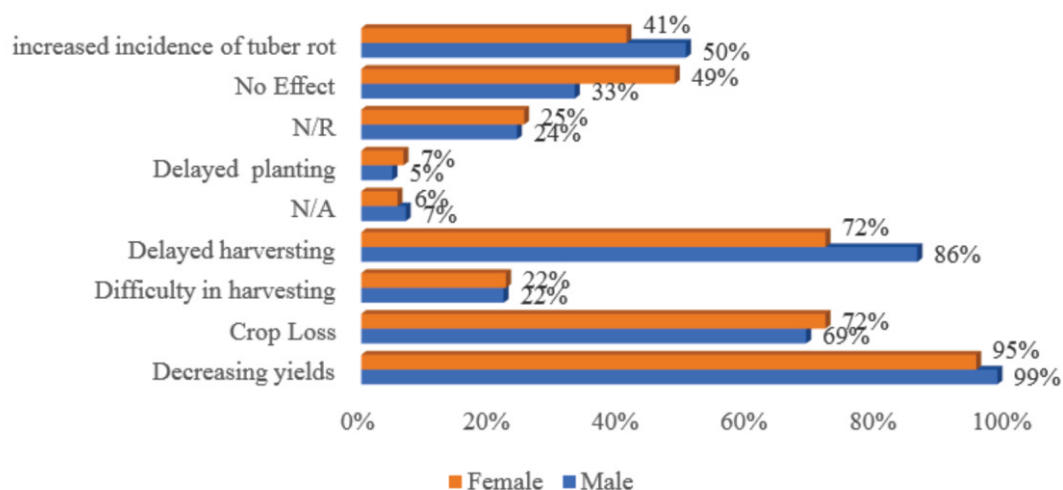


Figure 1: Seasonal climate variation and cassava production by the different gender group.

Source: Survey data

concerns of one of them was captured verbatim in the following statement:

“Between the farming seasons of 2012 and 2013, we suffered crop failures due to improper timing of the raining season and also using crops that were not drought resilient. As a result, we virtually had no money to support our husbands in the running of the households. Some of us had to rely on borrowing of money which was not sufficient. This situation affected the food supply to the house. The children suffered a lot. Their education also was affected since they were constantly being sent home to come and collect school fees because we were running late in the payments of school fees.”

The sentiments of one of the men farmers, on the other hand, were captured in the following words during the focus group discussions:

“Periods of low yields affected our ability to provide three square meals for the house. This situation usually

affects our incomes so badly that we are unable to meet our financial obligations to the households which indirectly affects the entire family.”

Intra Gender Analysis

In terms of the effects of favourable and unfavourable weather conditions, some gender dimensions were observed (Figure 3). Although both male and women farmers suffered some effects on yield that emanated from weather challenges, the majority of men reported high and moderate cassava yields per hectare under favourable weather conditions. Fifteen percent (15%) of the men compared with 13% of women reported high cassava yields per hectare under favourable weather conditions; again 32% men compared with 21% women reported moderate cassava yields per hectare under favourable conditions. On the other hand, the majority of women reported moderately low yields of cassava per hectare, that is between 15-20 maxi bags/ha under favourable weather conditions. The number of reported cases for moderately high yields under favourable

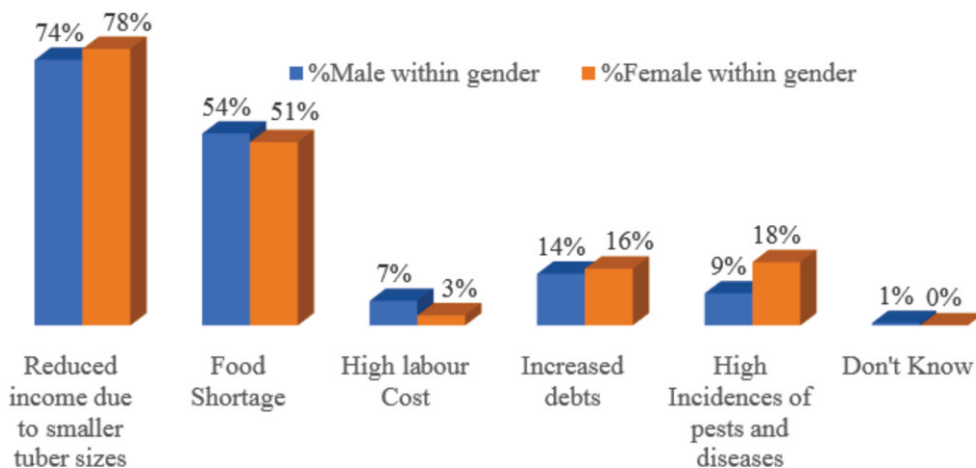


Figure 2: Other gender-based effects of seasonal climate variation on farmers

Source: Survey data

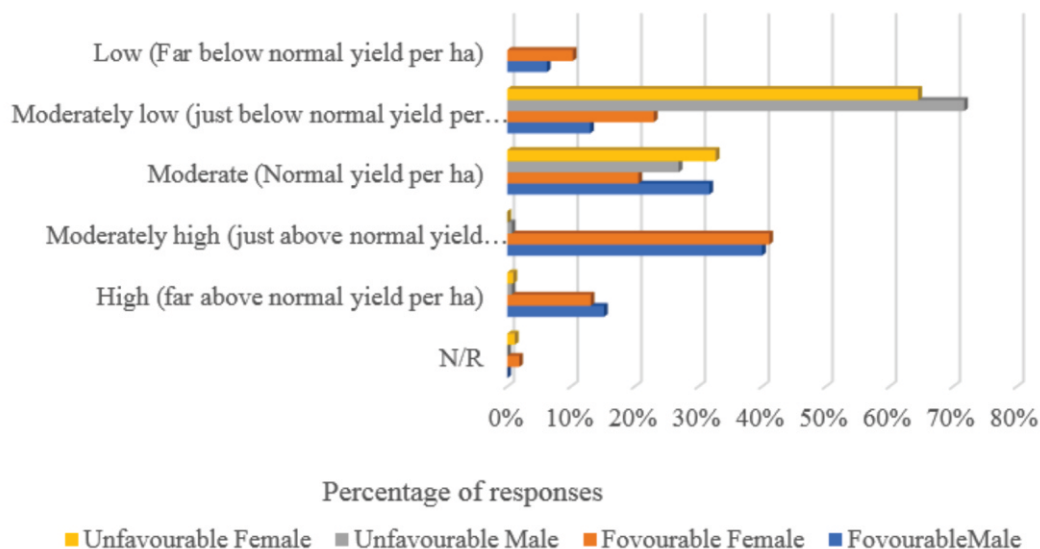


Figure 3: Gendered responses to cassava yields according to favourable and unfavourable weather conditions

Source: Survey data (2018)

weather conditions was almost even across the two gender groups (41% for women and 40% for men). Under unfavourable weather condition, the number of reported cases were insignificant for both males and female with regard to high and moderately high yields. This implies that yields were very poor under the harsh climatic conditions. However, with respect to moderate and moderately low yields; more women reported moderate yields, while more men reported moderately low yields (Figure 3).

Gender and Effects of Seasonal Variation on Income

The effects of seasonal variations in temperature and rainfall on income have some gender disparities. For example, there were more women earning less than GH¢100 to GH¢1900 per hectare under both favourable and unfavourable weather conditions (Figure 4). But as one moves into the higher income

earnings, majority of the respondents earning above GH¢1900 per hectare from cassava proceeds were men, under both favourable and unfavourable weather conditions.

The above findings suggest that, the situation for which majority of women were those badly affected by crop losses, reduced incomes due to smaller tuber-sizes, increased debts and high incidence of pests and diseases could be attributed to their poor financial base and low educational background. According to the findings, the men owned more farmlands than the women. Majority of the men had farms ranging from two to more than four farms compared to the women with an average of two farms. The results also indicated that it was the women gender which had majority of its members with no or very limited educational background.

The larger assets of the males strengthened

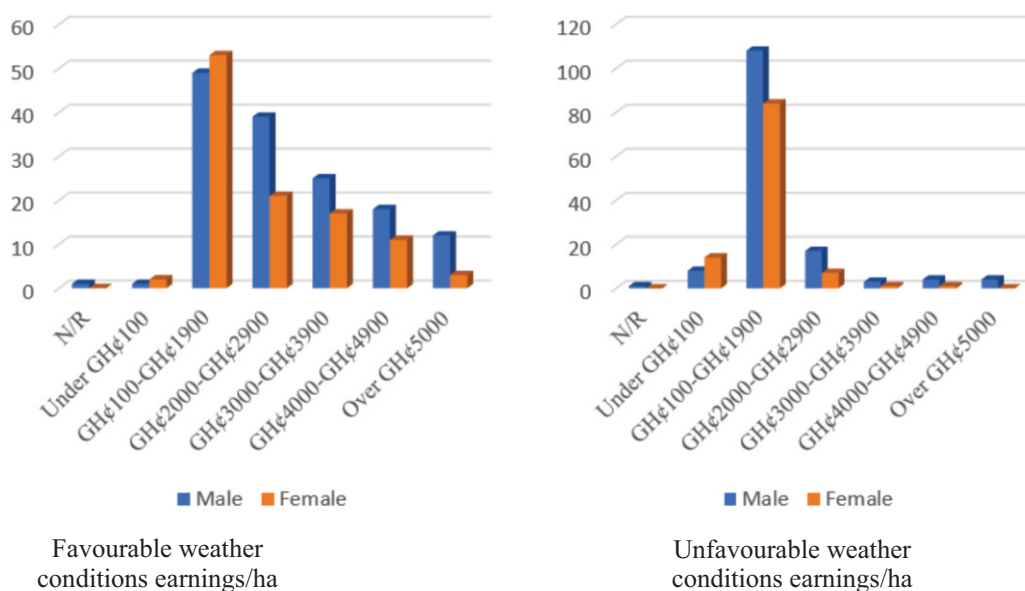


Figure 4: Gender and effects of seasonal variation on income

Source: Survey data (2018)

their financial base which probably enabled them to cope well with variations in the climatic elements than the females. This is corroborated by the findings of Brouwer *et al.* (2007), Gbetibouo (2009), Deressa *et al.*, (2009) and Bryan *et al.* (2013) which concluded in part that, the lack of resources or assets to be used to adopt practices that would minimise risks to climate variation impacts could increase effects of climatic impacts. The findings also agreed with Goh (2012), which revealed that, climate variation could have greater consequences with gendered nuances for farmers with smaller income base. The findings of the presents study further revealed that, it was the majority of the males who were able to delay the harvesting of their crops. This suggested that, the females did early harvesting even during unfavourable weather conditions due to financial pressure, since their asset-base were

smaller, compared to their male counterparts. This is confirmed by majority of the female respondents during the focus group discussion sessions, one of whom expressed her sentiments as follows:

“We usually harvest some of the cassava within five months of planting to either sell for money to support the family up-keeping or use as food in the house instead of the normal 8 to 12 months after planting depending on the variety.”

The findings further revealed that while the adverse effects of climate variation affected the women's capacity to support the day-to-day upkeep of the house, the men on the other hands could not adequately meet their financial obligations to the family. Besides, the children had to endure food rationing and the embarrassment of being sacked from schools due to their inability to pay school

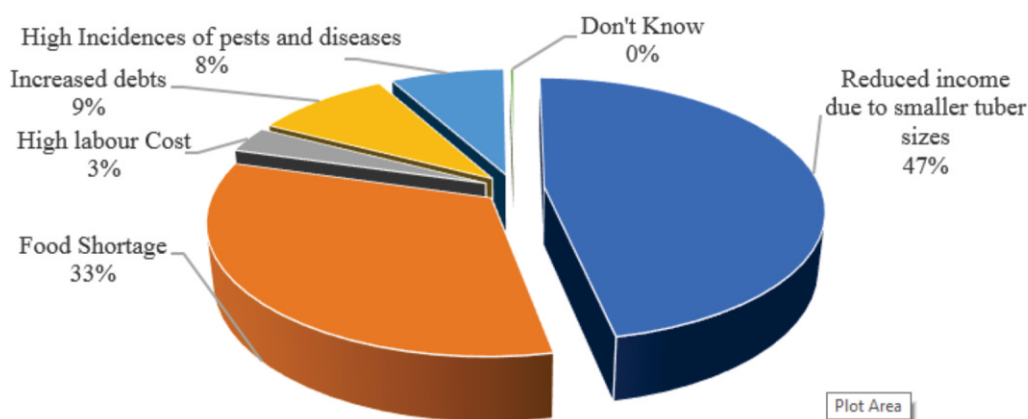


Figure 5: Indirect effects of seasonal variation on cassava production

Source: Survey data (2018)

fees on time. This demonstrates an aspects of gender dimension of the effects of climate variation on cassava farmers. These findings are consistent with those of Goh (2012).

Disparities existed between gender groups with regard to income accruing to them from the proceeds of the cassava business. According to the findings, majority of the women farmers earned incomes from under GH¢100 to GH¢1,900 per hectare in both favourable and unfavourable weather conditions, while the men earned between GH¢2,900 and over GH¢5,000 per hectare from cassava sales under the same conditions. The reasons for these disparities can also be attributed to the gender difference in the access to land. The males had advantage over the females in terms of access to land as alluded to by the male opinion leader from Awutu Breku during an interview session. As a result, the males were able to make more income from large or multiple farmlands than their female counterparts irrespective of the weather conditions. These findings confirm

those of FAO (2012) that indicated that, in Ghana, men held three times more farms than women, and eight times medium to large-sized farms (of 5 acres or more) due to cultural norms that favour male ownership of land over females. The findings again suggested that asset accumulation was very essential for tackling the adverse effects of climate variation. As a result, equity in access to land for both male and female was crucial for addressing climate variation effects among farmers.

The magnitude of the adverse effects suffered by each gender was assessed using the level of support individual farmers received from their spouses. According to the findings, majority of the males received support either financially, or on the farm, from their wives than the female counterparts. That meant that, the males were more likely to alleviate the full effects of climate variation than the female farmers due to the support they received from the spouses. Hence the majority of female farmers bore heavier burdens emanating from

the consequences of climate variation on cassava production as compared to the male farmers. The findings confirm Dzah (2011) assertion that women, particularly the married ones, have other responsibilities such as helping husbands on their farms. This phenomenon could probably explain some households' power dynamics between men and women which tend to influence the differences in the shocks of climate variation experienced by men and women (Carr, 2008).

The findings of the study showed a great sense of awareness of climate variation among respondents. Respondents' observations showed that both male and female farmers had similar or identical perceptions of temperature and rainfall trends over the past three decades. These perceptions also match well with the climatic records of the study area, which showed increases in drought conditions, erratic rainfall patterns, diminishing rains, increasing temperatures and the occurrence of dry spells during the past three decades. Despite the similarities in perceptions, the males were more accurate in their description of the climatic trends.

The probable reason why more female farmers perceived rainfall and temperature differently could be that their perceptions were affected by factors such as education and their experiences as farmers. The findings indicated that, majority of female farmers were without formal education, or had very limited formal education. The findings also indicated that, majority of farmers in the youthful age category were females. These are factors that are likely to affect one's interpretations and conclusions of climatic trends such as rainfall and temperature patterns over time (Mamba, 2016). It thus stands to suggest that because females were more disadvantaged in terms of their low levels of formal education and less experience in farming, they were not able to recognise

that the rainy seasons were decreasing and that the drought periods were increasing.

With regard to perception about the causes of climate variation, again majority of males perceived climate variation to be associated with land degradation. A handful of respondents, majority of who were females, believed that variation was a curse from God. These differences in perception could also be due to the fact that there were more educated and elderly and hence experience male farmers in the study communities than females.

Although both male and female farmers suffered from adverse effects of climate variation, the two genders suffered different impacts. Adverse effects were felt more by the men with respect to decreasing cassava yields, delayed harvesting due to extended drought, late planting and increased incidence of cassava root-rot. The males suffered more from decreasing yields probably because the majority did not adopt improved cassava production practices or climate smart technologies. Females on the other hand suffered more from crop losses and low or reduced incomes probably because they had less access to land, hence were majority owners of single farmlands of smaller sizes.

The women were affected more by the negative impacts of climate variation because females suffered more from reduced incomes and increased indebtedness. These could affect one's ability to make ends meet. One important factor with a higher tendency of reducing a farmer's vulnerability to the adverse effects of climate variation identified is the support received from spouses. The support took various forms such as help on the farm, financial support with proceeds from non-farming business or advice. Respondents who received support from their spouses

indicated that they were able to overcome to a greater extent, the challenges from climate variation because of their spouse's interventions. Majority of the beneficiaries of this kind of support were males. Hence the male farmers were able to cope well with the adverse effects of climate variation than their female counterparts.

The gender dimensions of the results on perceptions indicated that, gender is a significant social factor within the study area. It influences the perception of individuals about climate variation. This has been corroborated by the findings of Tazeze *et al.* (2012), which indicate that, the sex of a household head is a significant determinant in perception of climate change and variation. Results of the present study have shown that, it was through the male-dominated perception that erratic rainfall, long drought periods, increasing temperatures and decreasing rainfall pattern were found to be associated with climate variation. These perceptions were more consistent with the results of the climatic data of the study area. Majority of the males (67%) associated seasonal variations with environmental degradation. On the other hand, females were in the majority of those who perceived that rainfall amounts were increasing, and the dry season periods were also decreasing. The latter perception was not in conformity with the empirical data of the study area. A few of the female respondents were of the view that the current climate variation is the punishment from God, or a natural phenomenon, which no one can prevent. This conclusion drawn by the majority of the female could be as a result of their religious belief coupled with the lack of formal education. Hope and Jones (2014) indicated that both Christians' and Muslims had relatively low perceptions of urgency for environmental issues, particularly climate variation, due to beliefs in an afterlife and divine intervention.

Indirect Effects of Seasonal Variation on Cassava Production

Both male and female respondents reported some indirect adverse effects of the changing weather patterns on cassava production as shown in Figure 5. The indirect effects were as a result of direct effects such as reduced yields, crop failure, delayed planting, delayed harvesting and increased incidence of pests and diseases. Some indirect effects manifested themselves in the reduction of the incomes from cassava proceeds, in food shortages and in increased indebtedness caused by poor yields resulting mainly from the outbreak of pests and diseases. For example, 47% of the respondents said that they suffered reduced incomes from the proceeds of cassava, while 33% experienced food shortages due to low yields or total crop failure due to seasonal variations in the rainfall pattern. A few respondents (9%) had their debt situations worsened due to complete crop failure (which they attributed to prolonged drought), while 8% experienced very poor yields because of proliferation of pests and diseases caused by excessive rainfall. These findings are in line with that of Bebbington (1999) who has observed that extreme weather events such as droughts, high temperatures and erratic rainfall would greatly deplete the financial resources of those who heavily depend on agriculture, a climate sensitive sector, for their livelihoods by destroying crops. Again, Ampaabeng & Tan (2012) state that climate variation increases the incidence of pests and diseases in crops posing serious threats to crop yields, human health and the attainment of livelihoods.

Conclusions

The study showed some disparities in the effects of climate seasonal variations on cassava farmers from a gender perspective. It

concluded that 99% of the men compared with 95% women farmers experienced decreasing yields over the last 30 years, because of seasonal variations in temperature and rainfall. Again, 86% of men farmers and 72% of women farmers often delayed the harvesting time of cassava either because of extended drought period, or because of the delay in the onset of the rainy season. While 72% of women farmers reported that they experienced crop losses as a result of drought or too much rain, 69% of men farmers experienced similar effect. The majority of women reported cases of reduced incomes (78%) and increased indebtedness (16%) due to smaller tuber sizes and high incidence of pests and diseases. On the other hand, it was the majority of the men who reported of food shortage and high labour cost due to poor crop yields and proliferation of weeds on farms. Fifteen percent of the men compared with 13% of women reported high cassava yields per hectare under favourable weather conditions with 32% men compared with 21% women reporting moderate cassava yields per hectare under favourable conditions. It also emerged from the study that men owned more farmlands than women. On the other hand, the women had majority of their members with no or very limited educational background; a situation which had implications for their readiness to adopt climate-smart agricultural technologies and their income levels. Hence the majority of women farmers bore heavier burdens emanating from the consequences of climate variation on cassava production as compared with the men farmers. Respondents' observations; however, showed that both men and women farmers had similar or identical perceptions of temperature and rainfall trends over the past three decades. These perceptions also match well with the climatic records of the study area, which shows increases in drought conditions, erratic rainfall patterns, diminishing rains,

increasing temperatures and the occurrence of dry spells during the past three decades. Adverse effects were felt more by the men with respect to decreasing cassava yields, delayed harvesting due to extended drought, late planting and increased incidence of cassava root-rot. The women, on the other hand, suffered more from crop losses and low or reduced incomes probably because they had less access to land, hence were majority owners of single farmlands of smaller sizes. The men were thus, able to cope well with the adverse effects of climate variation than women.

These findings have valuable implications for policy, and may serve the basis for the needed policy orientation that will ensure the effective mitigation of the negative effects of climate change on male and female farmers. This paper's point of departure, which is supported by (Mamba, 2016), is premised on a school of thought that suggests that ability to deal effectively with the effects of seasonal variations on cassava production is a function of one's education and experience. On the strength of this premise, it is recommended that Ghana's Ministry of Food and Agriculture (MoFA) builds collaboration with the Ghana Meteorological Agency to develop training programmes on early warning signs, simple weather reading kits and climate variation. This will help improve farmers' knowledge of climatic trends and how to respond to climate variation impacts when the signs are showing.

One of the key vulnerability factors of female farmers to climate variation is lack of access to land resources, which is facilitated by some cultural and social norms existing in the study area. It is recommended that cultural practices leading to the acquisition of land should be reviewed to ensure equity in land acquisition. This is because cassava cultivation in the areas is done by a large number of females,

hence it is only fair that land acquisition by both males and females for farming purpose should be made equally accessible. This can be achieved through consensus-building involving local authorities, the District Assembly, traditional leaders and farmers (including leaders from both the male and female gender groups), where land issues are dispassionately discussed and agreements reached.

Another important vulnerability determinant is access to credible weather information. Here women are more disadvantaged. As such, it is essential to have a system of information that is equally accessible to all farmers without biases, due to gender. Access points and legitimate community information sources pertaining to weather and good agricultural practices should be created by the District Assembly and MoFA to ensure easy and free access to climate-smart information. All farmers should be encouraged to patronise these dissemination platforms for credible information that will be beneficial to them. The ideal situation will be the case where information is tailored to the decision-making needs of farmers, and delivered on time. To strengthen female farmers' access to credible weather information, they should be encouraged to join social groups such as Farmer Based Organisations and other women's organisations.

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