Effectiveness of climate change adaptation among smallholder farmers in rural Ghana

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Climate change has gained center stage at global development debates and negotiations due to the grave negative impacts of climate change on the earth system particularly the living component of the earth and essential life sustaining resources. Developing economies in Africa and Asia have been pronounced to be particularly vulnerable to climate change due to the high dependence of their economies on climate sensitive sectors such as agriculture, forestry and energy. In addition, poverty is very high in these economies, with majority of the poor employed in agriculture that serves as the backbone of these economies (Connolly-Boutin & Smit, 2016). According to the latest report of the Intergovernmental Panel on Climate Change, a further increase in global temperature by 1.5^{o}C will come with great negative implications on sustainable development particularly in Africa and Asia where extreme changes in climate have been reported (IPCC, 2018). Consequently, addressing the menace of climate change has taken two main dimension: mitigation and adaptation, with the former mostly suitable in developed economies while the latter is largely practiced in developing economies due to the fact that the impact of climate change in developed economies is yet to be experienced while developing economies are already bearing the brunt of climate change impact (Collier, Conway, & Venables, 2008).

Studies have reported that farmers around the world have responded to climate change using multiple adaptation strategies underpinned by local environmental knowledge and climate change perception (Gyampoh, Amisah, Idinoba, & Nkem, 2009). Fertilizer application, application of weedicide, drought resistant and improved crops varieties have been reported. In addition, changing planting date, livelihood diversification, crop diversification, irrigation and diet based adaptation strategies such as reduction in number and size of diet as well as change in staple food consumption have been reported as some adaptation strategies employed particularly by smallholder farmers across the world. Notwithstanding the importance of adaptation in socioeconomic development particularly in developing economies, studies have largely focused on identifying the adaptation strategies employed by smallholder farmers to respond to climate change, with less attention on the effectiveness of adaptation as a conduit to

promote food security and livelihood particularly in rural communities. As such, this study was carried out to first identify the adaptation strategies of smallholder farmers in rural Ghana and then examine the predictors of adaptation and effective adaptation.

To achieve these objectives, the study adopted a quantitative exploratory case study, with Adansi North District of Ghana as the case. Through a multistage sampling that comprised of cluster and simple random sampling techniques, 378 smallholder farmers were selected from 15 communities in 7 operational areas in the district. Questionnaire survey served as the main data collection instrument and data collection lasted for six months, from April to September 2018. The collected data was entered into Statistical Package for Social Sciences (SPSS) version 20, after which preliminary analyses such as outliers and normality test were carried out using frequency, box and scatter plots and line graph (Pallant, 2016). Two binary logistic regression analyses were performed in addition to frequency analysis of smallholder farmers' adaptation strategies.

The findings reveal that smallholder farmers in the district have responded to climate change using multiple on/off farm and diet based adaptation strategies that are mostly self-induced, with some level of external support. The major adaptation strategies employed by smallholder farmers in the district include crop diversification, delayed farming, fertilizer application, planting early maturing crops, livelihood diversification and extension services. A unique finding from the study is the application of So-Klin (a washing detergent) to control fall armyworms by a section of the respondents while farmers particularly cocoa farmers have resorted to the application of chicken droppings as alternative to chemical fertilizer which was hinted to be costly. The study also found that marital status, knowledge of climate change, education and years of farming experience significantly influence adaptation strategies of smallholder farmers. In addition, the study noted that effective adaptation which has to do with improving food security and livelihood is influenced by marital status, weedicide application, planting early maturing crops and change in staple food consumption.

The study therefore concluded that smallholder farmers in the district have responded to climate change. Nevertheless, most of the adaptation strategies are self-induced which is very worrying particularly looking at the low adaptive capacity of smallholder farmers. The study again concluded that smallholder farmers' ability to adapt to climate change is dependent on socioeconomic characteristics of farmers. The study recommends the need for more government interventions to improve adaptive capacity of smallholder farmers. In addition, it is recommended that mass climate change education must be promoted while the capacity of local institutions such as extension services must be strengthened with technology, personnel and infrastructure to provide services that are aligned to the needs of smallholder farmers.

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