

学位論文の要旨 (論文の内容の要旨)
Summary of the Dissertation (Summary of Dissertation Contents)

論 文 題 目

Dissertation title

CLIMATE CHANGE, AGRICULTURAL PRODUCTIVITY AND POVERTY IN GHANA'S CONTEXT:
MACRO-MICRO ANALYSIS

広島大学大学院国際協力研究科

Graduate School for International Development and Cooperation,
Hiroshima University

博士課程後期 教育文化専攻

Doctoral Program Division of Educational Development and
Cultural and Regional Studies

学生番号 D112023

Student ID No.

氏 名 ZAKARIA AMIDU ISSAHAKU

Name



Seal

備考 論文の要旨はA4判用紙を使用し、4,000字以内とする。ただし、英文の場合は1,500語以内とする。

Remark: The summary of the dissertation should be written on A4-size pages and should not exceed 4,000 Japanese characters. When written in English, it should not exceed 1,500 words.

Summary of Dissertation

Agriculture is the backbone of the economies of most developing countries, manifested in terms of its contribution to Gross Domestic Product (GDP), exports and employment. Agricultural sector has strong linkages with the rest of the economy including agro-processing and hospitality industries, education, agro-chemicals and financial and business services sectors. Evidence consistently shows that agricultural growth is highly effective in poverty reduction. Studies in Côte d'Ivoire and Indonesia demonstrate the effectiveness of the agriculture in poverty reduction. The contribution of the agricultural sector to the economies of many developing countries may be undermined by changing and uncertain climate. Agriculture is heavily dependent on the weather and climate in many developing countries, and any change in climate can have perverse effects on agricultural production.

Most studies on climate impact tend to focus on direct sectoral impact ignoring the indirect effects. Few studies attempting to capture the indirect effect of change in climate is conducted at global, regional and country levels, which has less focus on its effects on households. This study combines general equilibrium and partial equilibrium models to analyze both the direct and indirect effects of change in climate on the food crops sub-sector in Ghana. More specifically, this study analyzes the impact of climate change on welfare of farm families through its impact on agricultural productivity. To do this, this study uses Feasible Generalized Least Squares (FGLS) and Structural Ricardian models to analyze the impact of climate change on yields and net revenues of major food crops, respectively, as the first step. Climate change impacts on net revenue per hectare are modeled as agricultural productivity shock parameters. At the second step, a CGE model is used to analyze the logical structure of the Ghanaian economy. The climate change induced productivity parameters are introduced as shocks in the macro model. This

allows for the analysis of the impact of climate change on macro aggregates like gross sectoral output, import and exports as well as aggregate welfare measures like GDP and equivalent variation. At the third and final step, the macro impact of climate change is traced to the household level by linking the CGE model to a micro-simulation model. This allows for the estimation of poverty impact of climate change.

Impact of climate change on yields of major food crops do not always match its impact on net revenues. In this study, yields and revenues of maize and sorghum tend to move in the same direction. For instance, the impact of climate change on maize rice is negative and this is matched by reduced levels of maize revenue. Climate change will increase sorghum yield and this matched increased earnings from the cultivation of sorghum. In the cases of other crops, climate change impact on yields and revenues tend to move in the opposite direction. For instance, climate change raises cassava yield but its impact on net revenue is negative. Climate change will have yield-reducing effects on yields of rice and yam, but its impact on their net revenue will be positive. This conclusion makes crop yield a weak predictor of the climate change impact on the welfare of farming households.

The pervasive nature of climate change will surely have some indirect effects beyond the sector where shocks originate from. It is immediately known that climate change will negative effect on cassava and maize while its effect on other crops is positive. Apart from the direct effect on sectoral output, imports and exports, the climate change induced productivity shock spreads thought the Ghanaian, although in most of cases, the effect is minimal. One notable sector where the indirect effect of climate change will be palpable is the livestock. Climate change will reduce livestock output and exports but it will induce increased importation of livestock into the country.

It is a difficult exercise to establish direct link between climate change and poverty. Most previous studies attempt to link climate change to poverty are not successful in truly linking climate change and poverty. Against this backdrop, this study uses a combination of analytical tools to indirectly establish a link between poverty and climate change

Results of this study show that climate change induced productivity shock will worsen poverty levels among farming households in Ghana with variation across socioeconomic groups. In general, climate change will worsen poverty levels of all farmers, but, surprisingly, farmers with tertiary education will be worse affected. It may be due to the fact that this category of farmers tends to be engaged in the commercial cultivation of some food crops which make them susceptible to climatic variability. If they adapt, they will also benefit the most from their efforts. By location, climate change will not initially affect poverty levels of farmers residing in coastal and savanna ecological zones, but poverty depth and severity will increase. From 2020, climate change will worsen all measures of poverty, which will be ameliorated by adaptation through crop switching. Although adaptation may be beneficial to farmers, the stubbornly high poverty levels in the savanna zone may call for additional policy measures to deal with this canker. By civil status, climate change will worsen poverty incidence of married farmers, but has not effect on that of farmers who are single. Poverty depth and severity of categories will worsen. With adaptation, however, the poverty risk increasing effect is reversed. By gender, climate change will not affect poverty incidence of female farmers in the initial years but it will do in the latter years. For male farmers, climate change will worsen poverty levels throughout the projection period. Adaptation will reduce poverty risk among both male and female farmers but female farmers will benefit more.

This study suggests streamlining of input markets to ensure access to fertilizer, use of heat and drought tolerant seeds, and efficient pesticide/herbicide application for subsistent food crop farmers. In addition to input markets, programs to promote access to output market should be supported to ensure that improved crop yields is not achieved at the expense of net revenue growth. The study also recommends use of community-based radio and other media outlets, and extension officers to disseminate climate related information and technological innovations to farmers in order to avert projected plummeting yields of some major food crops resulting from climate change and to optimize use of farm inputs and technologies in farming. Female headed households have proven to be better managers of household resources to improve members living conditions. A policy to empower female household heads in particular and female spouses in general will help optimize use of household resources to combat debilitating poverty among food crop farmers. Microcredit schemes whereby women groups are trained and given business loans can help empower women and reduce their vulnerability. Married or divorced household heads are more at risk of poverty vis-à-vis household heads who are single. Social protection programme which links support to the obligation of household heads to enroll children in schools, joining national health insurance schemes or immunization can lessen financial burden of farm families in a more sustainable way. Poverty is higher among older or less educated farm families with high dependency ratio. General training in functional literacy will not increase farmers' acceptance of productivity enhancing technical innovations, but also make them employable in the non-agricultural sector thereby enhancing family. Most poor households reside in the savanna zone. A sizeable percentage is also found in the forest zone. By combining zonal and household targeting, location-specific and household characteristics can be used in

identifying the poor from the non-poor for any poverty alleviation support that may be forthcoming.