Chapter 12

Effect of Climate Change on Crop Productivity and Prices in Benue State, Nigeria: Implications for Food Security

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ABSTRACT

The chapter is aimed at assessing the effect of climate change on crop productivity and prices in Benue State, Nigeria. Time series data on selected output of crops (maize, rice, sorghum, yam, millet, groundnut, beans, and cassava), area planted, price, and climate variables such as rainfall, temperature, and sea level were used. Due to differing periods in data availability, this study used the time period 1995-2009 for analysis, in order to maintain a common period for all the series. First, the trend of productivity, prices, and climate change was analyzed using visual plots and results indicate some level of variability in these series over time. Second, a three stage least square regression was used to simultaneously analyze the effect of climate change on productivity and prices. Results show that climate change had significant impact on the productivity of millet, sorghum, cassava, and groundnut while it had significant impact only on the price of maize. These findings have important implications for food security situation in Benue State, Nigeria.

INTRODUCTION

Despite technological advances, such as improved varieties, genetically modified organisms, and irrigation systems, the weather is still a key factor in agricultural productivity, as well as soil properties and natural communities. Rough estimates suggest that over the next 50 years or so, climate change may likely have a serious threat to meeting global food needs than other constraints on agricultural systems.

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(Intergovernmental Panel on Climate Change [IPCC], 2007; Building Nigeria’s Response to Climate Change [BNRCC], 2008). Specifically, population, income and economic growth could all affect these verities of climate change impacts in terms of food security, hunger, and nutritional adequacy. If climate change adversely affects agriculture, effects on human are likely to be more severe in a poorer world. Wolfe et al. (2005), Stige, Stave, and Chan (2006), and Orindi et al. (2006) were concerned that rising demand for food over the next century, due to population and real income growth, will lead to increasing global food scarcity, and a worsening of hunger and malnutrition problems particularly in developing countries. The Earth’s average surface temperature has increased by 1.5°F (0.83°C) since 1880 (Wikipedia, 2013). This chapter presents an empirical analysis of the relationship between climate change, crop productivity, and prices in Benue State Nigeria with the intention of drawing implications for food security and hence make policy recommendations.

The specific objectives of this chapter are to: first, describe the productivity and price trend of major crops in the study area; second, describe the trend of climate change in the study area; third, analyze the effect of climate change on crop productivity in the study area and fourth, analyze the effect of climate change on prices in the study area.

BACKGROUND

There is no doubt that the earth is warming thus resulting in climate change over the past century and future change is envisaged. This has been attributed to human activities such as the use of fossil fuels to produce energy, coupled with unsustainable agricultural and land use practices. Climate change is a major environmental challenge to the world today, with significant threats to ecosystems, food security, water resources and overall economic stability (CAB International [CABI], 2010). IPCC (2007) indicates that rising temperatures, drought, floods, desertification and weather extremes will severely affect agriculture, especially in the developing world. Thus, changes in climatic factors like temperature, precipitation, snowfall, wind, windstorm, flooding etc. have the potential to irreversibly damage the natural resource base on which agriculture depends, and in general adversely affect agricultural productivities, which may consequently threaten the food security of nations. The last couple of years has been a period of increased food prices, thus increasing the number of people going to bed hungry at night to over one billion (CABI, 2010). The underlying causes of increases in food prices are complex. However, this has been partly attributed to poor harvests due to an increasingly variable climate and the use of food crops for biofuels. In agriculture, both temperature and precipitation are dominant climatic factors that affect crop yield and prices, which vary widely throughout the year and over time (Alexandrov & Hoogenboom, 2000). In a study by Brockett, Wang, and Yang (2005), it was indicated that for all industries including agriculture, manufacturing, and services; the role of change in temperature alone contributes more than 90% amongst all climatic factors followed by rainfall as a second dominant factor.

Reported extreme weather events such as floods, droughts, tornadoes, and thunderstorms are increasing over time and increase in climatic variability has been observed as well. This climatic variability is responsible for more severe periods of drought coupled with water periods which could be inevitable consequences of climate change (Christensen et al., 2007). The climatic factors are more vulnerable to agriculture in developing countries where they do not have irrigation facility, and also lack the more precise prediction facilities (Downing, 1996). Together with the advancement of agricultural technologies, developed nations are being able to minimize losses suffered from a change in temperature and precipi-
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