

Price Fluctuation of Agricultural Products: Can the Theory of Complex Phenomena Explain It Better?

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Abstract

The food system and the growth of the agricultural sector are threatened by agricultural price fluctuations. This paper adopts Hayek's theory of complex phenomena to explore the simple and complex components of such fluctuations. It also identifies various underlying factors that need to be addressed to minimize the fluctuations and meet the food needs of a growing population.

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I. Introduction

Agriculture has been a major industry from time to time in the history of humankind. And it plays a vital role in the economic development of many countries. According to the World Bank (2018), agricultural activities accounted for 4 percent of global GDP in 2018. More than 25 percent of these activities occur in developing countries. There is no doubt that agriculture enhances food security and reduces poverty, especially among the rural poor in Africa, where agriculture provides a livelihood for at least 52 percent of the economically active population (Davis et al. 2017). The United Nations General Assembly identifies agriculture (more specifically, sustainable and inclusive food systems) as a critical means of attaining its Sustainable Development Goals (or 2030 Agenda), which were developed in 2015 and supplanted the Millennium Development Goals.

However, the food system and the growth of agriculture are threatened by price fluctuation, climate change, and many other factors in sub-Saharan Africa. Feeding the world population—projected by the United Nations' Food and Agriculture Organization to be about 9.7 billion people by 2050 (Bruinsma 2009), with nearly all of the population increase occurring in developing countries—in the future is becoming a mirage. The biggest factors that threaten the food system

and the agricultural value chain are agricultural price fluctuations, climate change, slow adoption of technology, and a shortage of labor. Promoting the welfare of the people, protecting the food system, and enhancing food security are serious challenges in sub-Saharan Africa because over 20 percent of the population there faces hunger and more than one-third is undernourished (Food and Agriculture Organization of the United Nations 2021; Fritts 2021).

Farmers around the world are facing a dramatic fluctuation in the price of agricultural products. According to Mchopa, Kazungu, and Benson (2012), agricultural price fluctuation is defined as frequent rises and falls in the prices of commodities. This fluctuation can be seasonal, short term, or long term. In seasonal price fluctuations, the prices of agricultural commodities change seasonally. Short-term fluctuations result from slight changes in demand and supply, while long-term fluctuations are caused by high inflation. The price of agricultural products is volatile because short-term production and consumption elasticities are low. Fluctuation in agricultural prices threatens food security and the livelihood of farmers.

Although several studies have been conducted on agricultural price fluctuation (for example, Mwebya 2018; Xie and Wang 2017), none can account for its complexity. As suggested by the Food and Agriculture Organization of the United Nations (2018), a paradigm shift is required to increase global food production by 70 percent by 2050. Against this background, this paper unpacks and rethinks the concept of agricultural price fluctuation in sub-Saharan countries using Friedrich Hayek's theory of complex phenomena.

II. What We Know about Agricultural Price Fluctuation

Price volatility in agriculture is larger than in other sectors such as manufacturing. Various factors cause price fluctuations. Some are short term, while others are long term and have longer-lasting effects. Short-term factors include changes in traders' markups, government policies, problems associated with law and order, civil unrest such as transporters' strikes, and unexpected changes in market prices. Ghanem et al. (2011) establishes that long-term factors include changes in government spending, in the extent of deficit financing, in credit and interest rate policies, in sales, excise, and other taxes, in policy regarding hoarding, black-marketing, and black money, and in pay scales, wage rates, and income taxes.

In West Africa, agricultural prices have been unstable for years, affecting both producers and consumers. Huka, Ruoja, and Mchopa

(2014), citing the Food and Agriculture Organization, reveals that the food price index has fluctuated widely in recent years because of the volatility of agricultural prices. The index rose from 122 in 2006 to 214 in June 2008 because (1) increases in petroleum prices raised costs along the agricultural value chain, (2) transportation costs increased, (3) weak exchange rates increased the cost of imported agricultural inputs, and (4) droughts occurred. Similarly, Nzuma and Kirui (2014) evaluate Kenya's food price crisis from 2002 to 2011 using a political-economy approach and find that Kenyan prices were high and volatile relative to world food prices. Further, they report that the impacts of the high food prices in Kenya are complicated by unstable macroeconomic conditions and regional factors such as persistent droughts and political conflicts.

Yonas and Mans (2012) find that in Ethiopia, food prices have been rising, presenting the most adverse economic shock to the economy. In Ethiopia and other developing countries, most people cannot afford basic foods because of price fluctuations; hence, they face food insecurity. Addressing the rapid price increase and high price volatility is at the top of the agenda in Ethiopia. Southern African countries, such as Zimbabwe, Mozambique, and Malawi, are in the same situation because of the impact of climate change-caused events such as floods and extreme drought. The situation has deteriorated to the point that food is not affordable to low-income households. In South Africa, household food security is threatened by many factors including agricultural price fluctuation.

III. Hayek's Simple and Complex Phenomena

This study explores Hayek's (1967) theory of simple and complex phenomena. A simple phenomenon is one whose effects can be predicted by an individual or a specialist. In a complex system, its components do not interact linearly and the character of their interaction is too complex to be comprehended by an individual or specialist. Pennington (2021) explains that "while non-linear systems can be scientifically modelled the relevant relationships may not typically be characterised with sufficient quantitative precision."

Hayek (1967) explains that what experts can do when faced with complex phenomena is to seek to understand the general principle without predicting an outcome. Many complex phenomena are biological or ecological. For example, Scheiner and Willig (2011) explain that an ecologist may discover the general principle that drives processes of environmental change; however, they might not

be able to know enough about the relationships between system components to predict successfully how ecosystems will evolve in response to exogenous or endogenous changes. Fiori (2009) notes that Hayek explains that a model of a complex phenomenon must incorporate interrelated factors that consist of many variables. For example, a large number of variables defines complexity in quantitative terms, while the existence of connection on the latter part provides a view in terms of a logical relationship.

Price fluctuation can be regarded as a socioeconomic issue. Pennington (2020) explains that socioeconomic issues are especially complex when uncertainty and change are present: “Knowledge of all the varied and changing economic and cultural conditions that confront multitudes of people may not be comprehended by any social scientist or group of such scientists.” Following this Hayekian insight, it is questionable to use statistical models of social interaction to predict human behavior, as contemporary neoclassical economists do. As Wagner (2020) notes, social interactions can be better understood in terms of processes.

To be sure, statistical modeling may be valuable, but its predictive value is limited. For example, Parker and Stacey (1994) insist that forecasting long-run outcomes with an econometric model may be of little value because the modeler needs knowledge of the variables that will affect future outcomes. As Kay and King (2020) explain, economists cannot successfully predict specific responses to specific events, as these responses hinge on the balance between forces.

IV. Fluctuation in Agricultural Prices as a Complex Problem

Hayek’s theory does not apply to socioeconomic problems only but can be adapted to study other problems. In studying price fluctuations in agriculture—in which many factors are at play, such as government intervention, environmental factors, behavioral changes, socioeconomic characteristics, cultural diversity, and technology adoption—Hayek’s theory is applicable. Price fluctuation is a complex and multilayered phenomenon (Huka, Ruoja, and Mchopa 2014) caused by various elements in the agricultural supply chain and some external factors. Paradoxically, good news for farmers may be bad news for the agricultural industry in the long run if prices fall and investors lose. For example, in Zimbabwe, complexity in agriculture is linked to the political and economic turmoil that the country has experienced for the last ten to fifteen years.

In Nigeria, agricultural price fluctuations have resulted from changing petroleum prices, transportation costs, crop yields, food stocks, exchange rates (especially in major exporting countries), trade policies, drought, and technology. The demand for food is inelastic, as small changes in supply can cause big changes in prices. Trostle (2008) cites a global market report published in 2007 that reported that agricultural commodity markets have experienced extreme price fluctuation more and more frequently, mainly because of supply and demand factors including population growth as well as weather conditions that affect output.

Thus, agricultural price fluctuation is complex in that many unobserved factors are intertwined. This makes it challenging to solve the problem. Agricultural prices are difficult to forecast, let alone to control.

V. Explanation of Principles

This section discusses a few of the components of agricultural price fluctuation that farmers, other stakeholders, policy makers, and others need to understand.

A. The COVID-19 Pandemic

Pandemics and higher food prices sharply increase agricultural price fluctuation and result in global hunger. Recently, the world experienced the spread of the novel coronavirus (SARS-Cov-2) and the COVID-19 disease, which increased the global food price index. The pandemic shocked global and national food systems. Changes in food supply and demand directly led to a rise in food prices. The Food and Agriculture Organization of the United Nations (2020) reported that global food prices rose for the third consecutive month in August 2020 because of firmer demand, fluctuating agricultural prices, and a weaker dollar. According to Zurayk (2020), the global price of a basket of food increased by 20 to 50 percent because of COVID-19-related disruptions, shortages, hoarding, and profiteering along the retail value chain.

Concurrently, farmers were unable to sell agricultural products during the pandemic lockdowns because of an increase in the food price index. Many farms' products were destroyed because of the breakdown in the value chain. Elleby et al. (2020) and the Food and Agriculture Organization of the United Nations (2020) proclaim that such breakdowns occurred across borders and within countries, which caused global price fluctuations and labor shortages in

countries reliant on seasonal migrant workers in the agricultural sector. The pandemic also impacted global agricultural commodity markets. As with the 2007–8 food price shock, the increase in agricultural commodity prices in international markets was transmitted to domestic markets, contributing to inflationary pressure, particularly in developing countries, which had to spend more to procure food.

The COVID-19 pandemic is a complex issue given the relationships among the different virus variants and the lockdown and other policies (Davies 2020; Atkinson et al. 2020; Pennington 2020).

B. Cooperatives and Access to Credit and Other Finance

Farmers' cooperatives and access to credit and other finance are significant elements that reduce agricultural price fluctuation. Awotide et al. (2015) explain that financing farmers would enable them to take charge and determine prices. The provision of agricultural inputs in the form of agricultural cooperatives also provides indirect benefits by affecting local prices.

C. Climate Change

Climate change is a long-term shift in temperature and weather patterns. It is influencing the price of agricultural products. The Food and Agriculture Organization of the United Nations (2020) reports that it represents about 20 percent of the challenges to food security. Mazhirov (2011) suggests that climate change may increase the price of corn (by 42 to 131 percent) and, by diminishing the yields of wheat and rice, increase their prices (by 11 to 78 percent and 17 to 67 percent, respectively). Climate change is a complex phenomenon because there are multiple interactions among its many components. The climate system is highly complex. The factors contributing to climate change are complex, and the more we know, the more complicated the situation seems. Climate change has a negative effect on agriculture. According to Pachauri and Reisinger (2007), the climate system's interrelated factors make it difficult to predict. Thus, its effect on agricultural price fluctuation is complex and cannot be predicted or modeled in a linear form.

VI. Why Does It Matter?

This complex pattern of agricultural price fluctuation makes the fluctuation issue paramount. Its importance is seen in the increase in

agricultural commodity prices. Trostle (2008) explains that agricultural price fluctuation is a complex issue with no easy answers. Similarly, according to the International Monetary Fund (2010), world market prices for agricultural commodities increased from the beginning of 2006 to July 2008 by 75 percent, and the problem continues. This has led to hunger and a global food crisis threatening food sovereignty and food security. Not only that, but the prices of raw materials and capital goods obtained from agriculture are high. Trostle (2008) adds that the rapid rise in prices of agricultural commodities cannot be attributed to a single factor but to several interrelated factors including long-term supply and demand trends.

VII. Conclusion

This paper focused on fluctuation of agricultural prices as a complex phenomenon. Following Hayek's theory, the paper concluded that factors influencing the fluctuation are not simple and linear but nonlinear, complex, and multifaceted. Hence, it would be inappropriate for researchers or stakeholders to look for the solution along just one dimension and to not involve farmers in a bottom-up approach to challenges such as the COVID-19 pandemic and climate change. Government policies and socioeconomic characteristics such as age, education, access to finance, credit facilities, cooperatives, agricultural inputs, marketing, and others should be considered as well.

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