Chapter 18
Rating of Cash Crop Insurance Contracts in Tanzania Using Nonparametric Methods

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ABSTRACT

This chapter used nonparametric methods to establish the parameters of cash crop insurance contracts based on zone yields. The secondary historical yields data obtained from the Food and Agriculture Organization of the United Nations, for the period of 1961 through 2018, for cotton and cashew nuts, were used both in estimating the kernel density function and forecasting the mean yield. The estimated kernel density and mean forecasts were used to tabulate, at a different level of coverage, the probability of loss, the expected yield shortfall (kilogram per hectare, denote kg/ha), and the actuarial-fair premium rates for each crop. The results showed that, at different levels of coverage (i.e., from 50% to 90%), the actuarial-fair premium rates range between 0% and 32% of the sum assured. However, the range for cashew nuts is narrow (0% to 8%) while that of cotton is 4% to 32%, a very wider range compared to cashew nuts. Further, the expected losses for cotton, in the same coverage intervals, ranges from 11.58kg/ha to 256.06kg/ha while that of cashew was 0.44kg/ha to 19.69kg/ha.

BACKGROUND OF THE PROBLEM

Agriculture is a key sector for development especially in Africa as most of the people are living in rural areas and households depend directly or indirectly on agriculture (Diao, Hazell, & Thurlow, 2010). For instance in Tanzania, the agriculture sector, among others, contributes around 30.1% of the Gross Domestic Product (GDP), employs around 66.3% of the population and accounts for 20% of export earnings (URT, 2018). The agriculture sector is vital in the economic development of a country because it provides food for manhood and raw material for industrialization. Farming of cash crops also known as commercial farming is of much interest compared to food crops. Cash crops focused on making a profit through selling of crops rather than personal use. The export of cash crops not only increases food security but generates foreign currency which contributes to the country's economy. Wage and employment to rural the economy are brought by cash crops (Achterbosch, Berkum, & Meijerink, 2014).

Given the importance of agriculture in the country, the government of Tanzania in collaboration with other stakeholders came up with several programmes to improve the sector. These were Kilimo Kwanza, Agricultural Sector Development Programme (ASDP) I & II, Agricultural Sector Development Strategy (ASDS), to mention a few. Moreover, the government has set aside strategic plans to improve some of the crops, the potential for the industrial economy and middle-income countries by 2025.

Despite all these efforts, farmers still face a number of risks, beyond their control, which affects production and overall investment in farming systems. The risks are climate change which results in droughts, insufficient rainfall, high temperatures and floods (Rondhi, Khasan, Mori, & Kondo, 2019), pests, diseases, price fluctuation in the world market, etc. All these risks affect agriculture production in one way or another. Achterbosch, Berkum, & Meijerink (2014) argued that for cash crops to be successful, economic and environmental risks have to be prevented or reduced. Because of unforeseen events, crop insurance is inevitable in order to reduce and/or cover the losses faced by farmers.

Basing on risks associated with agriculture, the government plays a vital role by providing substantial subsidies in premium, loss adjustment expenses, and reinsurance services (Smith & Glauber, 2012). As a remedy, the government of Tanzania through National Insurance Corporation (NIC), planned to launch crop insurance as an innovative solution to manage the risks faced by farmers and stabilize farmer's income. To ensure effective implementation of the same, all farmers in the country will be registered to establish the number of farmers and their location.

Agriculture insurance has been in existence for two centuries now. It started in Europe and then the United States, and spread to other countries around the world. Agriculture insurance contracts are available at two levels: farm and area. The contracts, at each level, cover losses caused by yield shortfalls and/or revenue losses (Barnett, Black, Hu, & Skees, 2005). In contributing to the government efforts of implementing the agriculture insurance policy, this chapter focus on establishing the framework to be used in rating an area-yield crop insurance, among other types of crop insurance available, using nonparametric methods. Two strategic cash crops namely; cotton and cashew nuts will be involved.

This chapter is comprised of five sections. Section one is the background of the problem which describe the problem and rationale, chapter two presents a review of statistical methods used in rating crop insurance contracts and theories of crop insurance. Section three describes the data, scope of the selected cash crops and the analysis plan. Results and discussion are presented in section four while conclusion is presented in section five.

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