ABSTRACT

Rice (*Oryza sativa*) production is growing rapidly not only as a major source of food and nutrition to the global populace but also as a strategic crop for poverty reduction among subsistence farmers in Uganda. Despite the socio-economic and nutritional importance of rice, average rice yield in Uganda is only half of the global yield average and barely quarter, potential yield average under good management practice. This situation is partly attributed to its high moisture demand which makes its cultivation in rainfed systems more vulnerable to climate variability. Although, literature has linked vulnerability of rainfed rice production to climate variability, there is limited empirical study in Uganda to quantitatively demonstrate impacts of climate variability on rice production (direction/magnitude) and how farmers cope. This study was motivated by the need to examine the relationships between climate variability, coping strategies and rainfed rice production in the Northern agroecology of Uganda. The aim of this study was to generate information which would enhance rice production for increased food and nutrition security and livelihood improvement of the rural population. The study objectives were to characterise rainfed rice production systems, determine effects of climate variability on rainfed rice production, and assess farmers' coping strategies in rainfed rice production to climate variability. The study used a four year farm-level data on rice production and climate (2013 - 2016). Descriptive statistics was used to determine the characteristics of the different rainfed rice production systems. The result showed a decline in rice yields from 2 t ha^{-1} during 2013 to only 1.6 t ha^{-1} during 2016 but there were significant yield difference between lowland and upland rainfed production systems. The result also showed significant differences in production practices between the two rainfed rice production systems as well as variations in mean rainfall and temperature. To determine the extent of rice production efficiency and whether climate variability affects production, the stochastic frontier model was estimated. The estimation indicated low efficiency level at only 41% while mean rainfall and variations in rainfall had adverse effects on rice production. Result from inefficiency model indicated that location of rice plot, plot size, crop diversification, and age of the farmer promotes inefficiency in rice production. Qualitative analysis was performed to determine farmers' views of climate variability and how they cope. The result showed that farmers experience variability in onset, distribution and amount of rainfall and temperature conditions. Subsequently, different coping strategies applied

included changing rice variety, shifting rice fields along the valley area, adjusting planting dates, transplanting, fertilizer use and regulating water. To ascertain which farmers' characteristics influence their choice of coping strategies, multinomial logistic regression was performed and the findings showed that gender of the farmer, access to extension services, age, credits, crop diversification and location of a farm influence choice of coping strategies. Finally, to determine contribution of coping strategies to yields, Ordinary Least Square (OLS) regression was performed and differential contribution of coping strategies to rice yield was observed. Comparatively major contributions to yields were made by moisture related strategies. The study therefore concludes as follows: (1) That there are differences between lowland and upland rainfed rice production systems in terms of yields, input utilisation and production practices. (2) Rice farmers are producing inefficiently and increased variability in rainfall negatively affects rice production. (3) Coping strategies substantially improve rice yield but the type of strategy adopted is influenced by farmers' characteristics. The study recommends promoting awareness about climate variability and potential response alternatives for rice production. Transformation of current temporary coping mechanisms for rice production into long-term sustainable adaptation measures in systems with high exposure and vulnerability. And further study be undertaken to explore farm-level production and climate data beyond four years.