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"Agricultural development within the rural-urban continuum"

Impacts of Climate Variation on Land Use Change in Major Fruit Production Area of Thailand

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Abstract

The study aimed at analysing impacts of land use change due to climate variability in Thailand's major fruit production area – Tha Mai district, Chan Tha Buri province. The study used the CropWat model to estimate impacts of weather variables on actual crop yield and comparative cost-benefit of crop production. The study calibrated the positive quadratic programming model to land use of the study area in 2010 which includes 11 major crops consisting of rubber, dragon fruit, pepper, salacca, rambutan, mangosteen, durian, *Lansium domesticum*, pineapple, rice and cassava. After that, the model with the changes on cost-benefit of crops was used to examine how land use change due to climate variability. The analysis used secondary data which consists of GIS land use data of 2010, climate data from 1951–2010, crop production data surveyed in 2010 from 292 farm samples by the Office of Agricultural Economics, and crop coefficients required for CropWat model from FAO and published literature. The results showed that climate variability, in terms of significant variables as *e.g.* rainfall, and temperature, varied significantly during so-called La Niña years and induced a reduction of the average net crop return of 160 US$ ha^{-1} and a reduction in cropped area of 524.38 ha as compared to the baseline. Also, pepper, *Lansium domesticum* and durian were the three crops with a sensitive response to climate variation. The results under El Niño climate variability showed that net crop return and crop area would be reduced by 190 US$ ha^{-1} and of 504.44 ha, respectively. However, *Lansium domesticum*, mangosteen and rubber crop area would have positive responses under El Niño climate variability. But pepper and durian were also under El Niño counted as the most sensitive crops to the climate variation. To alleviate crop yield change under La Niña conditions, adaptation of farmers would cost 1,697 US$ ha^{-1} which consists of 577 US$ ha^{-1} for input cost, 704 US$ ha^{-1} for labour cost and 544 US$ ha^{-1} for irigation cost. Aadaptation costs to alleviate the impacts on El Niño weather conditions were lower and consisted of 501 US$ ha^{-1} for irrigation. It can be recommended that policies to mitigate climate variability should be pursued in pepper and durian as first priority while further fund support will be needed when the climat variability tend to be more in the direction of La Niña weather conditions.

Keywords: Climate variation, land use change, positive quadratic programming

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