

Wallapa Changlek 2013: An Application of Mathematical Programming-Multi Agent Systems for Sustainable Farming Systems in Mae Sa Watershed. Master of Science (Agricultural Economics), Major Field: Agricultural Economics, Department of Agricultural and Resource Economics.  
Thesis Advisor: Mr. Chakrit Potchanasin, Ph.D. 174 pages.

This study aims at analyzing and assessing sustainability of farming system in Mae Sa watershed as well as conducting scenario analysis to enhance farming systems sustainability. The study applied Mathematical Programming-Multi Agent Systems model to analyze impacts of farming systems sustainability for 12 years during 2005 to 2016 through 7 indicators consisting of economic indicators (household income, net farm income, and savings), social indicators (employment and productivities of labor), and environment indicators (soil erosion and pesticide toxicity).

The results under baseline scenario indicated that farming systems in Mae Sa watershed was sustainable indicated by positive trend of Performance Index (PI) of 0.50% per year. In addition, by considering Sustainability Index (SI), it was found that the first three issues which needed to be improved were pesticide toxicity, employment and soil erosion issue. The results under scenario analysis revealed that, under the scenario of introducing Good Agriculture Practice (GAP) into the area, it impacted to cultivated areas and increasing of income while decrease sustainability level regarding to employment, productivities of labor, and soil erosion. In the case of wage increasing to 300 Baht per day scenario, the results showed impacts of declining of cultivated areas and income including decreasing of sustainability level of household income, soil erosion, and pesticide toxicity. For the scenario of introducing dried litchi selling which the farmers could sell litchi for 375.61 Baht per kg but they needed initial fund for 15,432.80 Baht, the scenario impacted only few to the change of sustainability level. For the scenario that introduction of doing terrace with crop cultivation which could reduce soil erosion by 95%, the results showed increasing of cultivated area on terrace while sustainability level of employment and pesticide toxicity were decreased. For the scenario of doing cultivation with mulching which could reduce land erosion by 91%, results showed that the cultivated area with mulching was increasing while sustainability level of pesticide toxicity was decreasing. Based on the study results, it could be concluded that the relevant government agencies in the area should develop policies by considering priority of the issues which needed to be improved especially educating the farmers about GAP on pesticide use and developing farm technology for labor saving.

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