SYSTEM DYNAMICS ANALYSIS OF LIBERALIZING THE RICE MILLING SECTOR IN MALAYSIA

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INTRODUCTION
Rice milling refers to a process of turning rough paddy into white rice. A rice miller plays an important role by purchasing rough paddy from paddy farmers and then producing white rice for consumers. However, the Malaysian government has paid less attention to the rice milling sector because of its tendency to give emphasis to paddy production and consumption sectors. The Malaysian government gives subsidies to paddy farmers to boost local production. The government is also keen on raising paddy farmers income and thus provides them a generous package of farm inputs and financial incentives. At the same time, the government desires to assure steady supply of rice at reasonable prices for consumers. By means of price fixation, the government imposes the guaranteed minimum price and ceiling price at farm and retail level, respectively. Price controls leave a little room for rice millers’ profitability. For this reason, the government dispenses a rice miller subsidy to a group of rice millers that supply Super Tempatan 15% of broken rice (ST15), an inferior grade of rice designated for low income households in Malaysia. The government also subsidizes energy such as petroleum products and electricity to support manufacturing activities of all sorts in the country. Rice milling is an energy intensive operation and heavily relies on electricity to run machinery and equipment. Its energy use has an explicit effect on the supply volume of good quality rice and production costs. Hence, improving the milling efficiency through better technology is essential for higher recovery ratios and cost reduction. However, rice millers are often reluctant to make capital investments because of low profitability. Furthermore, Malaysia is expected to comply with the WTO’s demand for market liberalization, which translates into the removal of price controls and the subsidies. Rice millers must go through structural changes in market. In short, the aim of this study is to examine the impacts of market liberalization on the rice milling sector in the context of whole rice industry in Malaysia. Specifically, the author develops a system dynamics model for the Malaysian rice industry, and examines the impacts of removing price controls and the subsidies on rice prices, production, consumption, import, capacity utilization, capital investments, the head rice recovery ratio and the rice self-sufficiency level. The author then proposes policy alternatives that can mitigate the impacts of market liberalization after understanding the market structure and behaviours of the rice milling sector in the context of whole rice industry in Malaysia.

MATERIALS AND METHODS
The authors seek to understand the structure of rice milling sector in the context of whole rice industry in Malaysia and describe how the interrelationships among the key variables give rise to certain behaviours. The authors use a system dynamics approach to conduct this research. System dynamics is an ideal methodology for studying and managing complex systems like the rice industry in Malaysia. System dynamics gives emphasis to feedback relationships or loops that generate system behaviours arising from an internal structure. In each feedback loop, stock (level) and flow (rate) determine system behaviours. The level accumulates as a result of actions, which depend on decision rules and information stemming from the level. The decision rules dictate the flow or rate of change, which in turn causes the level to change in an iterative cycle. Most importantly, system dynamics models must incorporate actual decision rules used by the real actors in the real world. The feedback loops represent causal relations based on information from not only quantitative data or statistical data.
correlations among variables observed in historical data, but also qualitative data that exert great influence on decision rules and system behaviours. System dynamics is a powerful tool for policy analysis because it enables one to simulate different patterns of system behaviours in a computer platform when there are changes in the internal structure or parameter values. Hence, system dynamics as a methodology fits well with the objectives of this study.

RESULTS AND DISCUSSION
The authors devised six scenarios in which the protectionist policies such as price controls, rice miller subsidy and electricity subsidy, are separately and collectively removed from the market. And then the authors examined the impacts of policy changes on the key variables such as rice prices, production, consumption, import, capacity utilization, capital investments, the head rice recovery ratio and the rice self-sufficiency level. The simulation results suggest that the removal of price controls has the most significant effects on the key variables. Unexpectedly, the removal of the rice miller subsidy has a little effect other than raising the market price of ST15. The removal of the electricity subsidy has virtually zero effect. Most of the policy effects are centered on the market prices of rice at different levels. The policy changes affect rice consumption and import far more than they affect paddy and rice production. There are modest effects on capital, whereas capacity utilization and the head rice recovery ratio show marginal increases.

After removing the protectionist policies in 2016, the author introduced three policy alternatives that can help stabilize rice prices. The policy proposals are entirely centered on the supply side, namely, paddy production, rice production and rice import. First, the Malaysian government makes possible the land conversion from non-granary areas to granary areas, particularly in East Malaysia. Second, the government permits importation of dried paddy to provide raw materials for rice millers. Third, the government terminates the import monopoly license granted to BERNAS and opens the trade market to private traders. The simulation results of policy alternatives suggest that Malaysian consumers benefit the most from IMBD (importing more rice), which appears to be the most effective means to lowering and stabilizing rice prices. It also raises rice consumption for extended periods. Rice millers and paddy farmers are adversely affected by losing their market share to foreign rice. Rice miller’s capacity utilization, capital and head rice recovery ratio also shrink slightly. Rice millers and paddy farmers gain the most from PPSLC (land conversion) and RPPIM (importing paddy) because they can increase the supply of local rice. Rice prices also fall and lead to higher rice consumption, although their effects are far weaker that those under IMBD. Paddy farmers gain more from PPSLC than from RPPIM because the land conversion increases their farm income. Paddy farmers may suffer from RPPIM because they lose their market share to imported paddy. In the long run, falling prices of local rice and paddy do not appear to be a great prospect for both rice millers and paddy farmers. However, the most competitive and large suppliers may fare well. Rice millers are slightly better off under RPPIM than they are under PPSLC because their capacity utilization, capital and head rice recovery ratio decline the least.

CONCLUSION
The simulation results of policy changes suggest that the removal of price controls has the most significant impacts on the key variables. The removal of the rice miller subsidy has a little impact other than raising the wholesale and retail prices of ST15. The removal of the electricity subsidy has virtually zero impact. The simulation results of policy alternatives suggest that Malaysian consumers would be better off when private traders are allowed to enter the trade market and import white rice. Local paddy farmers are better off if the granary areas are converted into the non-granary areas. Consumers can also benefit because rice prices fall and rice consumption rises. However, their effects are far weaker than those under
the scenario in which the monopoly license terminates. Paddy farmers may suffer from paddy importation because they are likely to lose their market share to foreign paddy. The falling prices of rice and paddy in the long run may not be a great prospect for rice millers and paddy farmers. However, highly competitive and large suppliers may fare well. Rice millers are slightly better off with the paddy importation than with the land conversion because capacity utilization, capital and the head rice recovery ratio are higher.

**BENEFIT(S) TO INDUSTRY**

The study provides insights into the impacts of market liberalization and suggests that rice millers should endeavour to increase their economies of scale if they are serious about remaining competitive and profitable in the rice milling sector. With regards to policy implications, the Malaysian government may opt to impose high tariffs on imported rice to safeguard the local industry. If the Malaysian government desires to import dried paddy from overseas, it must control the import volume of dried paddy and impose tariffs on imported paddy, whenever its value is lower than the traded value of local paddy.

**ACKNOWLEDGMENT**

This study is funded by the Long-term Research Grant Scheme (Min.of Education) (2011-2014) for a research project titled The Economic Efficiency and Sustainability of Paddy and Rice Industry in Malaysia, Vot. No. 5525016

**REFERENCES**


