UNIVERSITI PUTRA MALAYSIA

IMPACTS OF LIBERALIZING RICE MILLING SECTOR IN MALAYSIA USING SYSTEM DYNAMICS FRAMEWORK

BONHEE CHUNG

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By

BONHEE CHUNG

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Doctor of Philosophy

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By

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February 2015

Chair: Datin Paduka Prof., Fatimah Mohamed Arshad, PhD

Faculty: Institute of Agricultural and Food Policy Studies

The Malaysian government has regulated the rice industry through price controls, provision of various subsidies and monopoly on rice importation among other policies. The government’s main objectives are to achieve rice self-sufficiency, improve paddy farmers’ income and keep rice affordable for low income households in particular. By means of price fixation, the government imposes the guaranteed minimum price at farm level and ceiling price at retail level. As a consequence, the government has effectively restricted the profitability of rice millers who play an important role by purchasing rough paddy from farmers and then producing white rice for consumers. The government has also directly intervened in the rice milling sector by establishing public mills and provided them a rice miller subsidy as well as an electricity subsidy for producing affordable rice, known as ST15 in local market.

For many years, there have been concerns over market liberalization in many countries around the world. The Malaysian government is expected to comply with the WTO’s demand for market liberalization, which translates into removals of the protectionist policies. Some important questions arise over how the liberalized market would cope with structural changes and more importantly whether it can stabilize rice prices in Malaysia. The change in market structure are most likely to have sequential effects on key variables such as rice prices, production, consumption, import, rice millers’ capacity utilization and capital investments, milling efficiency represented by the head rice recovery ratio and the rice self-sufficiency level.
Using a system dynamics approach to modeling the rice industry in Malaysia, the author developed a system dynamics model in an attempt to illustrate the behavioral patterns of the rice milling sector in the context of whole rice industry in Malaysia. And then the author ran simulations of policy change such as removals of price controls and the subsidies, and examined their impacts on the key variables. The author also ran simulations of policy alternatives that can stabilize rice prices and again examined their impacts on the other key variables.

The simulation results of policy changes show that the removal of price controls has considerable impacts on the key variables, while the removal of rice miller and electricity subsidies has little impacts on the key variables. The simulation results of policy alternatives suggest that terminating the monopoly on rice importation is the most effective way to stabilize rice prices, even though Malaysia’s rice self-sufficiency stays at the minimum level. Malaysia is able to stabilize rice prices and achieve the 100% self-sufficiency goal through land conversion from non-granary areas to granary areas; however, there are financial, physical and technical constraints to initiate the land development. Malaysia can also stabilize rice prices and achieve the goal by permitting paddy importation into Malaysia at the expense of local paddy farmers.
Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

KESAN LIBERASASI SEKTOR PENGILANGAN BERAS DI MALAYSIA DENGAN MENGGUNAKAN RANGKA KERJA SISTEM DINAMIKS

Oleh

BONHEE CHUNG

Februari 2015

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Kerajaan Malaysia telah mengawal industry beras di Malaysia melalui harga kawalan, pemberian pelbagai subsidi dan monopoli mengenai pengimportan beras antara dasar-dasar lain. Matlamat utama kerajaan adalah untuk mencapai tahap bekalan beras yang mencukupi, meningkatkan pendapatan petani padi serta dapat memberikan harga beras yang berpatutan terutamanya bagi isi rumah berpendapatan rendah. Dengan cara penetapan harga, kerajaan mengenakan jaminan harga minimum di peringkat lading dan harga maksimum di peringkat runcit. Dengan itu, kerajaan berkesan menghadkan pengilang beras dalam pembelian padi mentah daripada mengambil keuntungan daripada petani dan kemudian menghasilkan beras putih kepada pengguna. Kerajaan terus campur tangan dalam sector pengilangan beras dengan menubuhkan kilang-kilang awam dan memperuntukkan mereka dengan subsidi pengilangan beras serta subsidi elektrik untuk menghasilkan beras dengan harga yang berpatutan yang dikenali sebagai beras ST15 di pasaran tempatan.

Selama bertahun-tahun, tidak ada kebimbangan terhadap liberalisasi pasaran di banyak Negara seluruh dunia. Kerajaan Malaysia dijangka akan mematuhi permintaan oleh WTO untuk liberalisasi pasaran, yang bermaksud menghapuskan dasar-dasar perlindungan yang ada. Beberapa soalan yang penting timbul ke atas bagaimana pasaran liberal akan menghadapi perubahan-perubahan struktur dan lebih penting sama ada ia boleh menstabilkan harga beras di Malaysia. Perubahan dalam struktur pasaran mungkin mempunyai kesan yang berturutan terutamanya
ke atas pembolehubah utama seperti harga beras, pengeluaran, penggunaan, import, pengilang beras, kapasiti pengeluaran pengilang dan pelaburan modal, kecekapan pengilangan yang diwakili oleh nisbah pemulihan beras dan tahap kecukupan beras itu sendiri.

Dengan menggunakan pendekatan sistem dinamik untuk pemodelan sector pengilangan beras dalam konteks industry beras di Malaysia, penulis membentuk model sistem dinamik dalam usaha untuk menggambarkan pola tingkahlaku bagi sektor pengilangan beras dalam konteks beras seluruh industri di Malaysia. Kemudian penulis melaksanakan simulasi dasar perubahan seperti menghapuskan kawalan harga dan subsidi serta meneliti kesannya pada pemboleh ubah utama. Penulis juga melaksanakan simulasi alternatif dasar yang boleh menstabilkan harga padi dan turut meneliti kesannya pada lain-lain pemboleh ubah utama.

Keputusan simulasi perubahan dasar menunjukkan bahawa harga kawalan mempunyai kesan yang besar kepada pemboleh ubah utama, manakala penarikan subsidi pengilang beras dan elektrik mempunyai kesan yang kecil ke atas pemboleh ubah utama. Keputusan simulasi polisi alternatif mencadangkan bahawa pemansuhan monopoli ke atas perdagangan beras adalah cara yang paling berkesan untuk menstabilkan harga pasaran dan bekalan beras di Malaysia, walaupun tahap kecukupan beras di Malaysia tetap pada tahap minimum. Malaysia mampu untuk menstabilkan harga padi dan mencapai matlamat kecukupan beras 100% melalui penukaran tanah dari kawasan bukan jelapang ke kawasan jelapang.Walau bagaimanapun, terdapat kekangan kewangan, fizikal dan teknikal untuk memulakan pembangunan tanah. Malaysia juga boleh menstabilkan harga padi dan mencapai matlamat dengan membenarkan pengimportan padi ke Malaysia yang akan mengecilkan sector padi tempatan.
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God has caused me to live the life of Joseph. It is my desire and honor to lead a life that is worthy of His calling. I will become a nation changer and a blessing to all people. Let my life be pleasing to His eyes and glorify Him above all names. His love endures forever. I will joyfully worship and praise Him until the last breath.
I certify that a Thesis Examination Committee has met on 4 February 2015 to conduct the final examination of Bonhee Chung on his thesis entitled “Impacts of Liberalizing Rice Milling Sector in Malaysia using System Dynamics Framework” in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

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LIST OF ABBREVIATIONS

ASEAN  Association of South East Asian Nations
BERNAS  Padiberas Nasional Berhad
ESW  Electricity Subsidy Withdrawal
FAOSTAT  Food and Agriculture Organization Corporate Statistics
GA  Granary Areas
GDP  Gross Domestic Product
GMP  Guaranteed Minimum Price
IBD  Inclined Batch Dryers
IMBD  Import Bernas Discontinue
IMF  International Monetary Fund
KADA  Kemubu Agricultural Development Authority
KTOE  Kilo Tonne of Oil Equivalent
MADA  Muda Agricultural Development Authority
MSE  Mean Square Error
NGA  Non Granary Areas
PCW  Price Controls Withdrawal
PPSLC  Paddy Production Sector Land Conversion
RMS  Root Mean Square
RMSPE  Root Mean Square Percent Error
RMSW  Rice Miller Subsidy Withdrawal
RPPIM  Rice Processing Paddy Import
RTP  Retail Price
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<tr>
<td>R&amp;D</td>
<td>Research and Development</td>
</tr>
<tr>
<td>SST5</td>
<td>Super Special 5%</td>
</tr>
<tr>
<td>SST10</td>
<td>Super Special 10%</td>
</tr>
<tr>
<td>ST15</td>
<td>Super Tempatan 15%</td>
</tr>
<tr>
<td>USA</td>
<td>United States of America</td>
</tr>
<tr>
<td>USD</td>
<td>United States Dollar</td>
</tr>
<tr>
<td>WHP</td>
<td>Wholesale Price</td>
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<td>WTO</td>
<td>World Trade Organization</td>
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CHAPTER 1

INTRODUCTION

1.1 Background

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 behaviors of the rice milling sector in the context of whole rice industry in Malaysia.
1.2 Problem Statement

Market liberalization has aroused public concerns over food security in many countries because it stands to compromise the role of governments in protecting their domestic market. Most governments in Asia have intervened in their rice markets through various policy instruments to ensure sufficient supply of rice at reasonable prices. The most effective means of controlling the market is perhaps price controls. The Malaysian government has fixed the guaranteed minimum price for local paddy at farm level to protect paddy farmers’ income and at the same time imposed ceiling price for rice at retail level to protect consumers. Hence, price controls have restricted rice millers’ profitability. Consequently, it has provided uncertainties and little incentives for rice millers as to making capital investments that are necessary to improve their milling efficiency. Price controls also have detrimental effects on market efficiency and competitiveness of the rice milling sector in general. In January 1993, the Malaysian government concerned with adverse effects of market distortions removed price controls on all rice grades, promptly increasing their wholesale and retail prices as shown in Figure 1.1 (Salman, 2010). See Appendix I for numerical data.

The profit margin of rice millers had been stable before 1993, but markedly improved when rice prices increased. Interestingly, rice millers raised the production of head rice since 2005 as shown in Figure 1.2, although the milled rice recovery ratio declined during the same period. In
In retrospect, the head rice recovery ratio is more important than simply the milled or white rice recovery ratio. The more head rice the millers recover, the higher profit margin the millers can obtain as head rice carries a higher commercial value than does broken rice. Figure 1.2 indicates that there were improvements in the head recovery ratio because of technical progress. After the removal of price controls in 1993, the profit margin had improved substantially and capital investments would have followed. Given inherent delays in capital investments and installment, rice millers appear to have reaped higher proportion of head rice since 2005.

By the end of 1998, the government imposed price controls again to reign on price increases at retail level, whereas the wholesale price remained floated. The retail price of rice was relatively stable until 2007, when the international food crisis hit the domestic market and caused price shocks. Paddy price also experienced rapid growth since 2005, sharply raising the costs of production as rice millers paid more for paddy. Hence, the profit margin has been falling again at an alarming rate because the ceiling price remains fixed. It is likely to discourage rice millers from making capital investments and inhibit further improvements in the head rice recovery ratio.

The Malaysian government gives the rice miller subsidy to a group of rice millers that produce ST15 to relieve their burden on the costs of production, given the poor recovery ratios and price controls. Rice is processed food from rough paddy, which cannot be consumed in its original form. Rice processing removes about 35% ~ 40% of rough paddy in terms of a gross weight. It is a large physical loss because rice millers are able to sell only 60% ~ 65% of what they paid for paddy. For example, ST15 has a fixed price at wholesale and retail level. Rice millers that produce ST15 sell it to wholesalers at RM 1350/MT, while the purchasing price is RM 1050/MT on average. Then, rice millers can sell only 0.60 MT ~ 0.65 MT of rice after processing. This translates into a net loss of RM 170/MT ~ RM 240/MT, exclusive of other production costs. This is why the Malaysian government compensates the rice millers and dispenses the rice miller subsidy of RM 750/MT.

In addition, rice millers must deal with poor quality of paddy. The high moisture content as well as the presence of damaged, immature and foreign matters have detrimental effects on the rice recovery ratios. The undesired contents that need to be deducted for payment are estimated at 24% ~ 27% in Malaysia, whereas the actual deduction for them is only 17% ~ 20% (Fredericks and Wells, 1983). Hence, rice millers are facing an extra 6% ~ 7% financial loss for every paddy purchased. Put differently, rice millers make payments for raw materials that cannot be essentially processed or recovered. Therefore, the rice miller subsidy has become an inalienable right if rice millers supply ST15.
Rice milling is energy intensive operation, making rice millers as vulnerable as all other industries to rising costs of energy. Malaysia has seen an unprecedented increase in energy prices because of the increasing demand for energy, particularly the crude oil and natural gas, from all sectors of economy (Energy Commission, 2011). Hence, the Malaysian government has subsidized energy such as fuel oil, natural gas and electricity to stimulate economic growth. The rice milling sector is one of the beneficiaries of the energy subsidy. Rice millers would be negatively affected by the energy subsidy withdrawal because it will increase their production costs. Particularly, rice millers heavily rely on electricity. There is a positive relationship between rice production and electricity cost shown in Figure 1.3. Hence, the rising cost of energy in addition to the energy subsidy withdrawal will reduce the profit margin of rice millers. Falling profit margins will slow down capital investments that are necessary for capital acquisition. Old capital has detrimental effects on energy efficiency. Rice millers are likely to spend more on energy despite the diminishing returns to capital.

In a nutshell, the Malaysian government provides subsidies for food and energy to enhance the well-being of its citizens and sustain industrial activities including rice milling. The energy and rice miller subsidies amounted to about RM 10 billion and RM 337 million, respectively, in 2010 (Mohd Salim, 2010). Hence, the rising demand for rice as well as the energy to produce rice makes the government subsidies seemingly an indispensable input. However, impending market liberalization adds pressure on Malaysia to remove these subsidies. Rice millers can no longer benefit from financial provisions that help them reduce the costs of production. At the same time, market liberalization requires the removal of
price controls. It is likely to trigger a proportional increase in rice prices as evidenced by historical data. Hence, rice millers will have to adjust to the changing market structure simultaneously as market liberalization unfolds. In short, it raises some important questions. How will the rice milling sector respond to policy or structural changes in the event of market liberalization in Malaysia? What will be their effects on the level of rice production, consumption, import and prices? Furthermore, how will those changes in the level of rice production, consumption, import and prices affect rice millers when they are making decisions on capacity utilization and capital investments? Furthermore, how will their decisions affect the head rice recovery ratio and the rice self-sufficiency level in Malaysia? The questions will be explored throughout the thesis.

Figure 1.3 Rice Production and Estimated Electricity Cost in Malaysia, 1980 – 2010
Source: Department of Statistics, 2011

1.3 Research Objectives

The focus of this research centers on the impacts of market liberalization on the rice milling sector as well as the rice industry as a whole. The Malaysian government has intervened in the rice industry by implementing protectionist policies such as imposition of price controls and provision of the subsidies. However, Malaysia must comply with the WTO's demand for market liberalization, which translates into the removal of price controls and the subsidies. It has become a central issue for open economies like Malaysia. Should Malaysia comply with the WTO and abandon the protectionist policies, whether the rice milling sector can withstand the shocks and raise its competitiveness is of vital importance to policy makers and industry stakeholders. Questions arise over the readiness of rice milling sector and the stability of market supply and price in Malaysia. The author conducts a research with the following objectives.
1.3.1 General Objective

To examine the impacts of removing price controls and the subsidies from the rice milling sector on the paddy and rice industry in Malaysia.

1.3.2 Specific Objectives

To develop a system dynamics model for the rice milling sector in the context of whole rice industry in Malaysia.

To simulate the removal of price controls and the subsidies, and examine their impacts on rice prices, production, consumption, import, capacity utilization, capital investments, the head rice recovery ratio and the rice self-sufficiency level in Malaysia.

To simulate policy alternatives that can stabilize rice prices after market liberalization in Malaysia and examine their impacts on production, consumption, import, capacity utilization, capital investments, the head rice recovery ratio and the rice self-sufficiency level.

1.4 Scope, Relevance and Limitations

The scope of the thesis confines to the business dynamics of Malaysian rice milling sector with relevance to rice production, consumption, price setting, costs of production and profitability. The rice milling sector is closely associated with the paddy production and rice consumption sectors in the context of whole rice industry in Malaysia. Hence, the author looks into structural relationships among different sectors of the rice industry, and then examines how they interact with one another so as to understand their causal or feedback relationships. In addition, the author examines how rice millers behave when they are making decisions on capital investments and capacity utilization in response to structural and policy changes in the event of market liberalization. Their decisions have successive effects on the head rice recovery ratio and the rice self-sufficiency level.

The author seeks 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 behaviors. The author uses 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 behaviors arising from an internal structure. In each feedback loop, stock (level) and flow (rate) determine system behaviors. 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 correlations among variables observed in historical data, but also qualitative data that exert great influence on decision rules and system behaviors. System dynamics is a powerful tool for policy analysis because it enables one to simulate different patterns of system behaviors 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.

The limitations include data availability and measurement errors. The quantitative data used for building a system dynamics model are highly aggregated, e.g. rice production, consumption, import and prices. Some important data are not readily available for comparisons between simulated and actual outputs. However, system dynamics models do not seek to provide precise parameter values. Generating plausible patterns of system behaviors may suffice the objective of the study, which is to illustrate feedback relationships and simulate policy changes and alternatives. Given the data availability, the model structure was built on the basis of 30 years from 1980 to 2010. The author runs simulations up to 2025 for a short term analysis and 2035 for a long term analysis of system behaviors. The author deems that the selected time bounds are appropriate for simulations in the case of Malaysian rice industry.
REFERENCES


