

THE COMPETITIVENESS STUDY ON KELANTAN PADDY INDUSTRY USING PORTER'S DIAMOND MODEL

Azmahani Binti Yaacob @ Othman^{1*}
Universiti Teknologi MARA Cawangan Kelantan

Prof Dr Zulkornain Bin Yusop²
Universiti Putra Malaysia, Serdang, Selangor

Syazwani A Malek @ Abdul Malek³
Universiti Teknologi MARA Cawangan Kelantan

Abstract: This study used the Porter's Diamond Model as the theoretical underpinning to examine the competitiveness of Kelantan paddy industry. The model examined six (6) factors that were factor conditions, demand conditions, farmers' strategies and supporting industries, chances and government's roles. A total of 344 farmers were involved in this study. The farmers were required to answer a set of questionnaires which were adopted and customized from previous study. Partial least Square (PLS) SmartPLS M2 Version 3.0 was used for data analysis. The result showed that only four variables were significant and able to explain the competitiveness of paddy industry in Kelantan. They were factor conditions, demand conditions supporting industries and chances.

Keywords: Competitiveness, Paddy Industry, Porter's Diamond Model

1. Introduction

Paddy production has always given special priority since rice is Malaysian staple food. Despite the paddy industry having a small contribution towards the nation's GDP, it has garnered much interest from policymakers given its complex relationship with food security, culture and socioeconomic factors. Anyhow, the government did their best and tried to achieve its current national plan, Eleventh Malaysia Plan (2016 – 2020) which emphasized on the high value-added of agriculture activities by accelerating adoption of farming technology and promoting a cluster-based approach through vertical integration of the supply chain for selected crops (MEA, 2018). However, the area harvested continued to decline due to economic reforms that reduced government requirements to grow rice and economic development that increased the opportunity cost of land (Ricepedia, 2019). There were also no new areas developed for paddy cultivation purposes (Yahya, 2001).

Table 1 compares the hectare of planted area and average yield by all seasons in Malaysia and granary areas from year 2008 to year 2017. In general, the average yield of paddy and the planted area in granary area showed an increasing trend even the paddy production shows some up and down.

Table 1: Hectare of Planted Area, Average Yield and Production of Paddy for All Season in Malaysia for the Year 2008 until 2017

Year	Malaysia		Granary area	
	Planted area (ha)	Average yield of paddy (kg/ha)	Planted area (ha)	Average yield of paddy (kg/ha)
2008	656,602	3,584	384,145	4,249
2009	674,928	3,720	391,625	4,646
2010	677,884	3,636	387,160	4,540
011	687,940	3,748	389,544	4,773

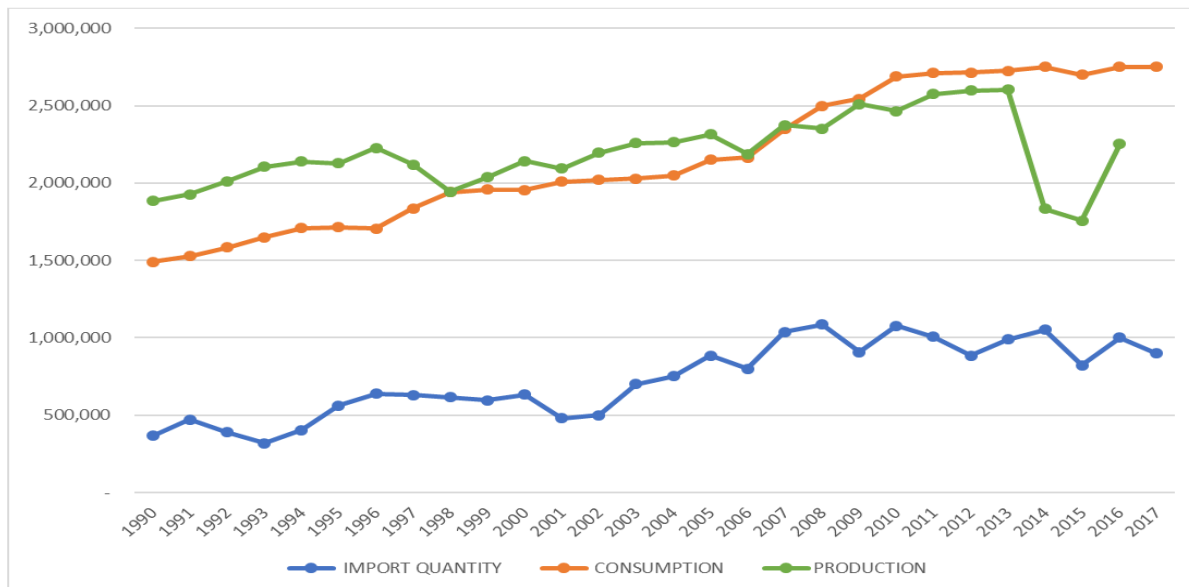
*Correspondence author: Azmahani Binti Yaacob @ Othman, Universiti Teknologi MARA Cawangan Kelantan, Kampus Kota Bharu, Lembah Sireh, 15050 Kota Bharu, Kelantan, Malaysia. Email: azma928@uitm.edu.my

2012	684,545	3,797	381,583	4,866
2013	671,679	3,876	369,273	5,002
2014	679,239	4,194	400,733	5,212
2015	681,559	4,022	406,048	4,864
2016	688,770	3,978	417,007	4,941
2017	688,959	3,728	426,249	4,491

Source: Department of Agriculture (2016)

Even the data shows that average yield in Malaysia increase, the facts is Malaysia rice consumption is higher than its production. Figure 1 presented the gap between rice consumption, production and imports from year 1990 to 2017. The higher the gap between production and consumption, shows the higher import bill for rice. The data also shows a slower rate of increasing in consumption, but it still far ahead from local production especially after year 2007. The production dropped in 2014 and 2015 because of flood in Kelantan and the El-Nino weather anomaly, which was associated with the dry season recorded throughout 2016 (Ghani, 2017). In fact, the OECD-FAO Agriculture Outlook also projected a widening gap between Malaysia’s production and consumption of rice (Omar, Shaharudin, & Tumin, 2019). Over-reliance on food imports could further weaken the ringgit. If the currency weakens, the import of food becomes expensive. By continuing to rely on imports to address food shortage, it will cause our currency to continue to fall and as a result, food becomes more expensive.

Figure 1: Rice Consumption, Production and Import Quantity from Year 1990 to 2017



Source: IRRI (2018)

Apart of that, paddy production also faces other constraints such as the escalating prices of agricultural inputs, low adoption of technology, high post-harvesting losses, importing of foreign rice, and uneconomic land holdings and that lead to fluctuating in paddy yield (Suntharalingam & Santiago, 2006). Malaysia also faces with shortages of irrigation water especially because the intrusion of coastal seawater into areas below sea level and climatic issues such as periodic drought, irregular rainfall, and seasonal monsoon floods. These lead to soil-related problem such as suspected nutrient imbalance and deficiency as well as low cat ion exchange capacity (Suntharalingam & Santiago, 2006).

Therefore, it is important to have a study that can help the government in determining the best policy to develop the country’ paddy industry and indirectly, help those who involved, especially farmers, in this industry to be more competitive.

2. Literature Review

Porter's diamond model can help firm in analysing which competitive factors that an industry can exploit to make sure that it able to compete with others, either locally or internationally. Industry also can use this model to analyse other's competitive factor if it would like to set up new branch in other country (Smit, 2010). The diamond model helped Porter to construct a national development model, the model used in this study to measure competitiveness in paddy industry in Kelantan. Global competitive advantage or Diamond Porter theory consists of interactions of four determinants. The first one is factor condition, second demand condition, third is related and supporting industries and last one is corporate strategy, business structure and competition as well as two supporting factors, opportunities and government roles.

2.1. Factor conditions and competitiveness

Traditional trade theories categorize factor conditions as land, labour and capital but Porter differentiate these categories to human resources, natural resources, knowledge resources, capital resources and infrastructure (Smit, 2010). Each country has its own set of factors of productions and it will develop its country by optimizing its factor conditions. This can explain why some countries are called low-cost countries, agricultural countries or start up culture countries. Porter argued that the quality of factor of productions is more important than the quantity (Porter, 1990). The finding by Biyi (2005) stated that Nigeria was not competitive in paddy farming at production level. They had problems in sourcing the labour to work on the farms since the youth had moved to the cities looking for white collar jobs which offered them with better income. The alternative for this manual labour is mechanization but it is very expensive and farmers cannot afford for it

Paddy production are also affected by sets of variable and environmental parameters, including genetic characteristics, soil, weather and cultivational management. This climate factor is uncontrollable. The changes in temperature, rainfall, soil moisture, flood, drought, pest attacks, plant diseases and any natural disaster are the example phenomenon related to changes in climate. Several studies suggested that climate change could affect the nation food security level, hence, indirectly affect the income of farmers. Farmers perceived that paddy farming is no longer profitable due to low productivity resulting from climate change. As for the farmers, even with heavy government subsidy still not enough and it requires increase in productivity to make paddy farming is viable and sustainable sector (Alam, Siwar, Talib, & Jaafar, 2013). The climate changes can be related to total yearly rainfall in which its variation from month to month is too high. The effect of up and down in rainfall can be controlled through a proper irrigation system. The main problem with this climate changes is during the end of crop cycle. It can lead to serious damage of crop hence affect the average yield of production (Ibrahim & Alam, 2016; Siwar, Idris, Yasar, & Morshed, 2014). Based upon these arguments, this study postulates that:

H1: Factor conditions will be positively related to competitiveness

2.2. Demand conditions and competitiveness

Demand conditions are the state of demand for goods and services by consumers in a country and indirectly can influence factor conditions. Consumers may put producers in pressure since they require higher quality product with reasonable price charge and demand for after sales service (Barragan, 2005). Firm can have competitive advantage if its product is demanded in large quantity locally than in foreign markets. Firm can be a trend-setter and thus will lead to global market. This is because the home demand will help local firms to act faster than foreign firms or their rivalry to become an establish firm (Bakan & Dogan, 2012). Sun (2017), in his research in China, found out that the more the consumption structure and consumption consciousness change, the more variety and diversity of demand on agriculture products. Hence will innovate them to develop new products, increase the quality of the products, improve the marketing strategies and indirectly will improve the competitiveness. So, the second hypothesis for this study is:

H2: Demand conditions will be positively related to competitiveness

2.3. *Farmers' strategies and competitiveness*

Farmers' strategy can be categorized as management structure and manner, working morale, relationship between work and management, hierarchic style and interactions between companies considered as non-economic factors (Oz, 1999). Since different country has different traditions and values so the strategy and structure of a firm in different country is vary from each other. Fujimoto (1976) in his study examined the role played by material inputs such as fertilizer, pesticide and new seeds in order to determine the factors of increasing farmers income. He concluded that farmers' ability and knowledge in farm management will increase the competitiveness in paddy farming activities. Based upon these arguments, this study postulates that:

H3: Farmers' strategies will be positively related to competitiveness

2.4. *Supporting industries and competitiveness*

Related and supporting industries, can be defined as "spatial proximity of upstream and downstream business activities, usually occurs at regional level and not national level, through exchanging information, idea, innovations, technology besides provide local skilled labour pool" (Oz, 1999, p. 52). However, the degree of relatedness is different between those operational activities which is influenced by cross-supplies. For example, the presence of a powerful trading, logistics, and financial institutions helps agriculture sector in general to obtain a better position in international markets, as in the case of Argentina (Eduardo, 2009). Eduardo (2009) found that competition between two different industries which are complement to each other can lead to improvement in productivity and push for innovations related to operative and risk management. Based upon these arguments, this study postulates that:

H4: Supporting industries will be positively related to competitiveness

2.5. *Chances and competitiveness*

Chances are usually related to improvements by outsiders and lie beyond the power of the firm or sector that indirectly can affect the firm's competitiveness. Examples of chances are new inventions, political decisions by foreign governments, war or radical technical changes such as biotechnology and microelectronic (Bakan & Dogan, 2012; Tensae, 2006). Chances are accidents happened because of changes in other factors in diamond model. The role of accidents cannot be seen independently. They happened simultaneously in different locations which can result in a competitive firm in that location. Nevertheless, chances can become unavoidable issues. The process of upgrading the industries and diversification of economic activity sometimes lead to market failure. In this case, the government is needed to overcome these externality issues. The failure of local market severely affected by low commodity prices, hence lead to fall in private investment and indirectly the market will be uncompetitive (Gore, 2010). Hence, the hypothesis developed would be:

H5: Chances will be positively related to competitiveness

2.6. *Government's role and competitiveness*

The Malaysian government regards the subsidy programs as a crucial and sensitive political issue to maintain support of the rural sector since poverty is relatively high among rice farmers who mostly are Malays (Arshad & Mohayidin, 1990). The current producer price is highly protected and regulated above the world price to encourage rice farmers to boost their output as domestic rice sector has not been able to compete in an open market (Mohamed, Terano, Shamsudin, & Latif, 2016). A research by Suleiman et al., (2014) showed that the elimination of producer price subsidies would negatively affect the local rice industry, on average decrease domestic production by 13%, decrease cultivated area by 13%, and reduce producer price by 20%, yet demonstrated no impacts on rice

consumption because imports are allowed to fill the gap. Therefore, the research hypothesis is defined as:

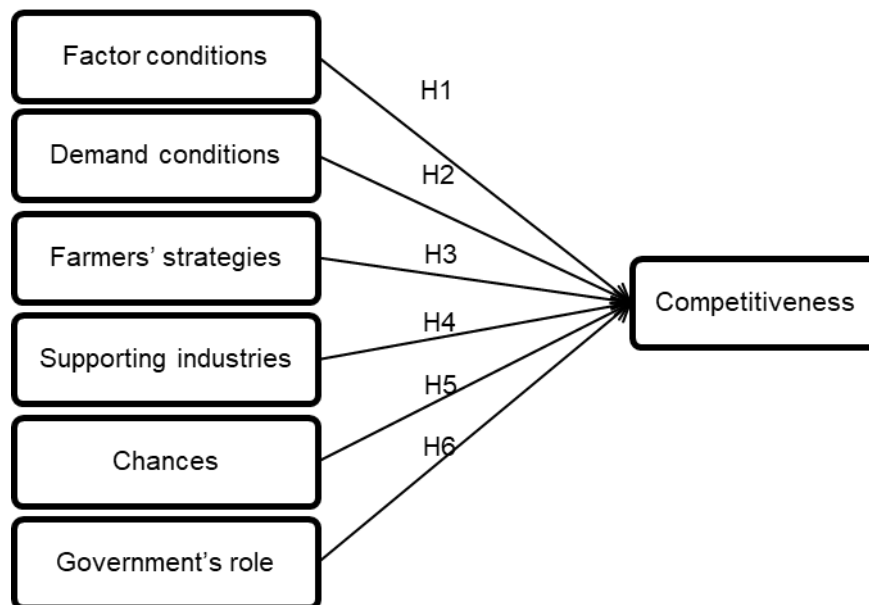
H6: Government's roles will be positively related to competitiveness

3. Conceptual Framework

This model consists of internal and external factors. The internal factors comprise of four determinants which are factor conditions, demand conditions, related and supporting industries and firm's strategy, structure and rivalry while the external factors are government and chance. Porter believed that all these factors are related to each other. All factors act individually and as a mutually reinforcing system. For instance, favourable demand conditions will not lead to competitive advantages unless competitors are sufficient to initiate firms to respond. It is possible if competitive advantages only based on one or two factors but usually it is cannot sustain in the long run because of competitive reaction (Porter, 1990).

Figure 2 below shows the competitiveness' diamond model as a basis of analysis.

Figure 2. Conceptual framework



4. Research Methodology

The measures used to operationalize the constructs included in the investigated models and the questionnaires were mainly adapted from previous studies, Bakan and Dogan (2012) and Nurul Asrin et al. (2012) with minor wording changes to tailor them to the competitiveness in paddy farming. All items were measured using a 10-point Likert-type scale with anchors on 1 = not important and 10 = very important.

Target subjects were farmers in Kelantan from different areas such as Kota Bharu Utara, Kota Bharu Selatan, Pasir Mas and Pasir Puteh. Out of 400 questionnaires distributed, only 344 were completely filled up. 56 of them did not answer two main sections which were demand conditions and the government's role and therefore discarded. Any missing value was treated using EM (expectation-maximization algorithm) while Mahalanobis distance was used to examine the potential of multivariate outliers in this research.

To analyze the research model, the Partial Least Squares (PLS) analysis using the SmartPLS 3.0 software was used (Ringle, Wende, & Becker, 2015). Following the recommended two-stage analytical procedures by Anderson and Gerbing (1988) the measurement model (validity and reliability of the measures) was tested followed by an examination of the structural model (testing the hypothesized relationship) (see Ramayah, Osman, Azizah, Malliga, & Jasmine, 2013 and Ramayah, Lo, Rouibah, & Oh, 2014). To test the significance of the path coefficients and the loadings, a bootstrapping method (5,000 resamples) was used (Hair, Hult, Ringle, & Sarstedt, 2017).

5. Data Analysis

5.1. Demographic Characteristics

All respondents were Malays and majority of them were males (86.6%) aged more than 60 years old (56.4%) with experience more than 20 years. Most of them (68.0%) planted paddy on less than 5 acres of land which is categorized by KADA as inefficient since the area planted is small.

5.2. Measurement Model

Convergent validity is the extent to which a measure correlates positively with alternatives measures of the same constructs (Hair et al., 2017). To evaluate convergent validity, researchers need to consider the outer loadings of indicators and the average variance extracted (AVE). As presented in Table 2, the Cronbach alpha (CA) and composite reliabilities (CR) were all higher than 0.7, and the AVE was also higher than 0.5 as suggested in the literature (Hair et al., 2017). Table 2 shed light on the fact that all the relevant requirements had been fulfilled. So convergent validity is confirmed.

Table 2: Measurement Model

Constructs	N	CA	CR	AVE
Competitiveness	5	0.849	0.925	0.764
Factor Conditions	8	0.923	0.937	0.653
Demand Conditions	4	0.862	0.901	0.696
Strategies	8	0.950	0.948	0.696
Supporting Industries	2	0.902	0.953	0.910
Chances	4	0.899	0.928	0.764
Government's Role	9	0.981	0.983	0.864

The discriminant validity of the measures (the degree to which items differentiate among constructs or measure distinct concepts) (Ramayah et al., 2013) was examined by comparing the correlations between constructs and the square root of the average variance extracted for that construct. As can be seen from Table 3, all the square root of the AVE was higher than the correlation values in the row and the column indicating adequate discriminant validity (Fornell & Larcker, 1981).

Table 3: Fornell & Larcker Criterion

	Chances	Competitiveness	Demand Conditions	Govt's roles	Factor Conditions	Strategies	Support Industries
Chances	0.874						
Competitiveness	0.509	0.791					
Demand Conditions	0.085	0.317	0.834				
Government's roles	0.457	-0.156	-0.014	0.929			
Factor Conditions	0.821	0.692	0.303	0.291	0.808		
Strategies	0.450	-0.230	-0.057	0.843	0.261	0.834	
Supporting Industries	0.398	0.375	0.143	0.297	0.459	0.190	0.954

5.3. Structural Model

A structural model shows the causal relationships among constructs in the model (path coefficients and the R^2 value). Together, the R^2 and the path coefficients (beta and significance) indicate how well the data support and hypothesized model (Hair et al., 2017).

Table 4 shows the results of the structural model from the PLS output. The government's role was negatively related to competitiveness and was not significantly related to competitiveness ($\beta = -0.139$, $p > 0.05$) while farmers' strategies was negatively related to competitiveness but significantly related to competitiveness ($\beta = -0.379$, $p < 0.05$). All other variables (supply conditions, demand conditions, supporting industries and chances,) were positively and significantly related to competitiveness. The R^2 value was 0.687 indicating that all the variables explained 68.7% of the variance in the competitiveness in paddy farming. The results supported H1, H2, H4 and H5 whereas H3 and H6 were not supported.

Table 4: Hypotheses Testing

Hypothesis Testing		Path Coef	Std Error	T value	Decision
H1	Factor Conditions → Competitive	0.564	0.076	7.429	Supported
H2	Demand Conditions → Competitive	0.085	0.035	2.462	Supported
H3	Farmers' Strategies → Competitive	-0.379	0.108	3.519	Not Supported
H4	Supporting Industries → Competitive	0.129	0.049	2.652	Supported
H5	Chances → Competitive	0.221	0.080	2.762	Supported
H6	Government's Role → Competitive	-0.139	0.099	1.400	Not Supported
$R^2 = 0.687$					

This result of this study is consistent with other studies. Various studies found that the competitiveness in paddy farming depend heavily on factor conditions such as technology, the use of higher quantities of fertilizer, improved paddy variety seeds (Siwar, Idris, Yasar, & Morshed, 2014), the role of education and the farm size (Johari, Cooke, & Lyndon, 2016), Technology also can help in improving the quality and transform the newly research and development into real productive forces (Sun, 2017). By improving the agricultural mechanization, the labour productivity will increase and hence can increase the level of competitiveness.

Demand conditions also found to be positive and statistically significant in this study. This is because rice is a staple food for about half of the world's population. The higher the population, the higher the demand for rice will be. Konsolas (1999) stated that consumers play a very important role in enhancing the competitive advantage. If the consumers are consumer-oriented industries, a clearer trend will emerge. The higher the spending pattern by consumers could lead to the success of the any industry include paddy.

Other than that, supporting industries also positively influence the competitiveness of paddy industry in Kelantan. Basically, the type of support program needed by farmers are training, advisory services, introduction to new technology, the process of grading of rice and financial support. According to Harun and Engku Ariff (2017) the success of this institutional support depends on the targeted group. So, the development program introduced must take into account the views and opinions of farmers.

Chances also found to be a significant factor. A research did by Eduardo (2009) in Argentine can confirm that chances is one of the important factor in determining competitiveness. Thus, all these four factors are very important in determining competitiveness in the paddy industry in Kelantan.

Farmers' strategies was found not to influence the competitiveness since the most important strategies did not come from the farmers but BERNAS since it owns the exclusive import right and has a profound impact on an array of economic, political, and societal stabilities (John & Alias, 2011). Its

import strategy has serious implications for national food security. Besides that, the sizes of land were relatively small and uneconomical which lead to low income earned level and high incidence of poverty. According to Suntharalingam and Santiago (2006) basically, they were family-owned and operated by small agrarian communities. For example, about 70% of the rice farmers in the country owned farms less than two hectares (five acres), contributing to farm income of about RM300 to RM350 per acre per month.

The government's roles also found not to influence the competitiveness. It might be related to the attitude of farmers which are too depends on the government's subsidies in reducing the cost of production (Nurul Asrin et al., 2012). Farmers need for the protectionism policy to survive since trade barriers able to protect the domestic producers (Deviga, Michael, & Gordon, 2011). Their research found that by implementing an income support policy after eliminating production-based subsidies could increase government revenue and at the same time could reduce the burden of taxpayers and hence improve farmers' livelihood.

6. Conclusion

In the paddy and rice industry, it is important to know the actual total area planted with paddy and the growth stage for each paddy plot. This helps to provide accurate measurement of yield, land use prediction, farm monitoring, and to predict the expected harvest. In addition, accurate and up-to-date paddy data are especially important during events such as natural disasters to allow the authorities to predict yield loss and end-of season harvest. Furthermore, it helps avoid leakages in the input subsidies; whereby *ghost* lands can be prevented. This, in turn, allows prompt and effective policy and management decisions as well as appropriate downstream market responses.

The establishment of KADA is an effort to ensure the self-sufficient country is assuring. Through the upgrade paddy production program, collaboration between organizations can be realized through the combination of expertise and the provision of subsidies and incentives to ease a burden of farmer's production costs are among the strategies in their effort to strengthen National Food Security as targeted under the Agro-Food Policy (2011-2020). However, the challenge in the global and domestic such as natural disasters and climate change factors are unavoidable. Furthermore, research and development in food security should be holistic and inclusive other noteworthy. The systematic farm management practices and right along the chain growth of crops must be emphasizing to ensure the food production is guarantee. Efforts to enhance food security at the national and household level are deserving of support from all sectors.

There are many possible reasons for not being competitive in paddy production. Some of them are lack of engagements and cooperation with research institution due to Kelantan geographical vicinity, environmental conditions, aging population, small size of land per farmers, experience-based activity and opportunity cost of development. The government should identify location-specific differences between district and state to allow for more effective and targeted improvements.

Since this study focused in Kelantan areas only, the researcher faced some limitations in terms of availability of the data provided by KADA, DoA, LPP and PPK. Therefore, it should only be used as guidance for future studies in other states by taking into consideration the cross cultures comparison, practices and values among different states. For instance, the results might not be similar for farmers in Kedah and Perak who are better in production of paddy. Nevertheless, similar results might be obtained in states that are in lower ranking in producing paddy.

Other than that, a more detailed industry analysis study should be done to determine the impact of related and supporting industries, such as inputs sector, production sector and product sector on paddy industry. This detailed analysis is needed in order to know where competitiveness can be easily achieved with given conditions especially the irrigation system and seed. Apart of that, it is also need to evaluate the strength and weaknesses of any service providers either from government agencies or private sector in term of delivering the required services by farmers.

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