

Linkages between Sector in Malaysia Agriculture Industry: An Application of Input-Output Analysis for Growth Promotion

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Abstract: The agriculture sector plays an important role in the economic and social development of Malaysia. Even though that the agricultural sector is marginalized in terms of the percentage contribution to the Gross Domestic Product (GDP) compared to other sectors, however the contribution of agriculture to GDP is increasing in value terms. Promoting the key sectors can activate and propel the economy to grow faster while economizing the use of resources. According to the Hirschman Unbalanced Growth, hypothesis can excite the rest of the economy to grow as well through the inter industry linkage relations. This study measures the strengths of the inter industry linkages using the input-output analysis and examines the contribution of agriculture subsector through its forward and backward linkages by using the Malaysian input-output data. The objective of this paper is to identify the linkages (backward and forward linkages) and identify the key and non-key sectors that contribute to the Malaysia Agricultural sector for growth promotion as it will pull the economy to a higher level of performance. From the analysis, there are three subsectors in agriculture diagnosed to have strong forward linkages and only five subsectors of agriculture can be considered as key sectors. The government should focus on the agricultural subsectors with strong linkages to the rest of the economy. For sectors with weak linkages, a proper and effective actions should be taken to further strengthen them to increase their contribution to the industry and to the whole Malaysian economy.

Key words: *Key Sectors, Input-Output Analysis, Malaysia, Agriculture*

BACKGROUND

Before the country's independence from the British colonisation in 1957, the agricultural sector provided the country with self-sufficiency in food and the sector was predominantly traditional with low productivity and output. However, the development of this sector such as the cultivation of crops like rice, vegetables, livestock and fishing activity has created job opportunities to local residents. The oil palm crop was introduced on a commercial scale in the early 1960s. At the beginning of the oil palm cultivation, progress was slow. However, after the establishment of the Oil Palm Research Institute (PORIM) in 1979, the technology of oil palm cultivation and processing was given greater emphasis and serve as a strategic crop to the economy of Malaysia [1]. To date,

Malaysia is the leading exporter of World Palm Oil and the second biggest producer of Palm Oil after Indonesia.

The agricultural sector is marginalized in terms of the percentage contribution to GDP compared to other sectors. The contribution fell from 28.8 per cent in 1970 to only 8.6 per cent four decades later. In 2010, the percentage contribution of the agricultural sector stood at 7.3 per cent. However, the contribution of agriculture to GDP is increasing in value terms. Despite this phenomenon, the agricultural sector especially the oil palm sub-sector had help dampen the economic problems faced by the country in 1998 and 2008. It continues to grow in value towards GDP contribution [2].

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Drawing the idea theorised by Hirschman [3] through his Unbalanced Growth Hypothesis indicate that growth can be achieved more cheaply and effectively if high interindustrial linkage sectors are promoted through more allocation of investment resources. For these sectors, an increase in the final demand of the sector would require output to be increased in order to satisfy the resulting rise in demand [4]. Through interindustrial linkage relations, the phenomenon stimulates the increase in industrial activities of other sectors linked to it as supplier of inputs as well as receiver of inputs [5]. The end result is an increase in the GDP of the country. High interindustrial linkage sectors are termed as Key Sectors.

The key sectors, through its backward and forward interindustrial linkages will promote the maximum increase in economic activity of closely linked sectors or industries. These sectors can be identified through the interindustrial linkage measure [6]. In this paper, our aim is to identify key and non-key sectors of the Malaysian Agricultural Sector. With the identification of the keys sectors, we will finally suggest that these sectors will promoted as it will pull the economy to a higher level of performance.

Objectives

The objectives of the paper is to identify the linkages (backward and forward linkages) in Malaysian Agricultural sector, identify the key and non key sectors of the Malaysian Agricultural sector and to suggest that the sectors to become the Malaysian sub sector for growth promotion as it will pull the economy to a higher level of performance.

RESEARCH METHODOLOGY

Introduction to Input-Output Analysis

A. Forward Linkage (FL)

If FL exists in a sector, it describes the linkages that exist between the columns in the economy. This relationship is shown by the correlation line sale of output by sector (*i*) to various sectors in different column (*j*). It's just like BL relationship which existed FL relationship also shows the output of the sale either directly nor indirectly [7]. In other words, economists stated that there is associated with supplier relationships in the industry. Index of the FL or BL on average higher than 1 is defined as the strong relationship that exists between the sectors. Index reflects the relative increases in the final demand of industrial products provided are spread throughout the industry as a whole system.

Power diffusion index is defined as:

$$FL_i = \frac{\frac{1}{n} \sum_j b_{ij}}{\frac{1}{n^2} \sum_j \sum_j b_{ij}}$$

B. Backward Linkage (BL)

If a sector has a BL relationship, it shows the diversity of inputs purchased from each line (*i*) in a column (*j*). This indicated the relationships purchase of inputs from various sectors in the same column directly and indirectly. Economists stated that this relationship can be described as a supplier relationship in the industry. Examples of BL relationship can be seen in the manufacturing industry where to make a soap, this sector should first seek input from other sectors such as palm oil.

Power diffusion index is defined as:

$$BL_i = \frac{\frac{1}{n} \sum_j b_{ij}}{\frac{1}{n^2} \sum_j \sum_j b_{ij}}$$

C. Key Sectors

The main purpose of the analysis of backwards and forwards linkage is to identify potential key sector in the economy. If a potential sector is identified, it is easy for the government to formulate a policy to growth economic by injection to these sectors [8]. A strong sector need to have both backwards and forwards relationship to identify potential sector and key sectors. It is shown by the sub-sectors that have both backward and forward link (above 1). The formula for calculating the main sectors are:

$$NBL = nBL_j / \sum BL_j$$

$$NFL = nFL_i / \sum FL_i$$

Where,

- NBL = { BL_j } – Vector value for backward linkage
- NFL = { FL_i } – Vector value for forward linkage
- n – Number of sectors in the table

According to the indication of all sizes in all sectors of the economy connector, it can be categorized into four types, if the value of both chain backwards and forwards sector is above average (normal value for both chains was higher than 1), then this sector is the key sectors.

The outcome of this input – output analysis shows that if the backwards chain above the mean (value 1), this sector in the strong backward relationship and if the forward chain larger than the average value, this sector is classified as having strong forward chain relationship. For the fourth type, it

refers to the category of weak ties. This is a case where the backward and forwards chain is less than the value of 1. The data used in this study is the Input-Output tables in 2005 issued by the Department of Statistics, Malaysia. The raw data consist of 120 sectors. This has been aggregated into only 39 industries of the agricultural sector and the remaining 90 sectors is aggregated.

FINDINGS

Forward and backward interindustry linkages for industries of the agricultural sector in 2005 are shown in Table 1. The result shows that subsector which has a strong backward linkages (BL) is subsector flower plants (7) with a coefficient value of 1.012, meat and meat production (13) with a coefficient value of 1.284, preservation of seafood (14) with a coefficient value of 1.131, preservation of fruits and vegetables (15) with a coefficient value of 1.091, dairy production (16) with a coefficient value of 1.081, bakery products (19) with a coefficient value of 1.181, other food processing (21) with a coefficient value of 1.134, tobacco products (24) with a coefficient value of 1.029, fertilizers (25) with a coefficient value of 1.110, soaps, perfumes, cleaning & toilet preparations (26) with a coefficient value of 1.086, tyres (27) with the coefficient of 1.082, rubber gloves (29) with a coefficient value of 1.459, rubber products (30) with a coefficient value of 1.035, financial institutions (36) with a coefficient value of 1.017, insurance (37) with the coefficient value of 1.042, other financial institutions (38) with a coefficient value of 1.056.

Subsector which has strong forward linkages (FL) are oil palm (6) with the coefficient value of 1.014, other livestock (10) with the coefficient value of 1.283, and the other sector (40) with a coefficient value of 8.297. Meanwhile, subsector which has a low linkages (LL) is paddy (1) with the coefficient value of 0.718, food crops (2) with the value of the coefficient of 0.733, vegetables (3) with the coefficient value of 0.559, fruits (4) with a coefficient value of 0.746, rubber (5) with the coefficient value of 0.618, other agriculture (8) with a coefficient value of 0.647, poultry farming (9) with a coefficient value of 0.961, forestry and logging (11) with a coefficient value of 0.566, fishing (12) with a coefficient value of 0.865, grain mills (18) with a coefficient value of 0.685, confectionery (20) with a coefficient value of 0.567, animal feeds (22) with a coefficient value of 0.940, wine and spirit (23) with a coefficient value of 0.660, waterworks (32) with a coefficient value of 0.626, communication (34) with a coefficient value of 0.928, and real estate (39) with a coefficient value of 0.833.

Finally, subsector that become a key sector (KS) is the oils and fats (17) with a coefficient value of 1.424, rubber processing (28) with a coefficient value of 1.391, electricity and gas (31) with a coefficient value of 1.057, transport (33) with a coefficient value of 1.521, and bank (35) with a coefficient value of 2.018. Sectors whose interindustry linkage numbers are greater than unity for both backward and forward interindustry linkages are Oils and Fats, Rubber Processing, Electricity and Gas, Transport sectors and Banks. These sectors are Key Sectors of the economy in the Agricultural sector.

Table 1: Forward Linkage (FL) and Backward Linkage (BL) for the Year 2005

No	Industry	BL	FL	Result
1	Paddy	0.722	0.718	LL
2	Food Crops	0.785	0.733	LL
3	Vegetables	0.735	0.559	LL
4	Fruits	0.856	0.746	LL
5	Rubber	0.738	0.618	LL
6	Oil Palm	0.802	1.014	FL
7	Flower Plants	1.012	0.797	BL
8	Other Agriculture	0.887	0.647	LL
9	Poultry Farming	0.97	0.961	LL
10	Other Livestock	0.927	1.283	FL
11	Forestry and Logging	0.651	0.566	LL
12	Fishing	0.868	0.865	LL
13	Meat and Meat Production	1.284	0.623	BL
14	Preservation of Seafood	1.131	0.526	BL

15	Preservation of Fruits and Vegetables	1.091	0.551	BL
16	Dairy Production	1.081	0.659	BL
17	Oils and Fats	1.424	1.123	KS
18	Grain Mills	0.961	0.685	LL
19	Bakery Products	1.181	0.596	BL
20	Confectionery	0.841	0.567	LL
21	Other Food Processing	1.134	0.888	BL
22	Animal Feeds	0.94	0.995	LL
23	Wine and Spirit	0.908	0.66	LL
24	Tobacco Products	1.029	0.623	BL
25	Fertilizers	1.11	0.78	BL
26	Soap, Perfumes, Cleaning & Toilet Preparations	1.086	0.585	BL
27	Tyres	1.082	0.612	BL
28	Rubber Processing	1.224	1.391	KS
29	Rubber Gloves	1.459	0.607	BL
30	Rubber Products	1.035	0.875	BL
31	Electricity & Gas	1.057	1.041	KS
32	Waterworks	0.895	0.626	LL
33	Transport	1.185	1.521	KS
34	Communication	0.963	0.928	LL
35	Banks	1.056	2.018	KS
36	Financial Institution	1.017	0.622	BL
37	Insurance	1.042	0.64	BL
38	Other Financial Institution	1.056	0.617	BL
39	Real Estate	0.852	0.833	LL
40	Other Sector	0.922	8.297	FL

Note: BL – Backward Linkage
 FL – Forward Linkage
 LL – Low Linkage
 KS – Key Sector

DISCUSSIONS

Present as one of the Key Sectors is the Oils and Fats sector, which is the downstream portion of the oil palm industry. The oil palm sector has relatively low backward linkage but strong forward linkage. The oil palm industry is considered as an input feed for the Oils and Fats sector. By boosting demand for oils and fats products, it would draw inputs from the oil palm sector thereby increasing its production. This is because the demand for crude palm oil produced by the Oil Palm sector is merely a derived demand for oils and fats products. Hence, it can be suggested that instead of promoting the Oil Palm sector as mentioned in the NEM, the government can effect greater economic growth by concentrating more on the Oils and Fats sector. Other sectors such as transportation, Electricity and Gas are required by the agricultural sector for power and commodity

movement. Rubber processing as a key sector in agriculture can be explained as the Oils and Fats sector. The sector requires crude rubber for processing into products while Electricity and Gas as well as transportation are required for similar reason.

RECOMMENDATIONS

In the analysis, we found that two producing sectors that can be considered as Key Sectors are Rubber Processing and Oils and Fats. Three sectors identified as Key Sectors are in the service industries namely Electricity and Gas, Transport and the banking sector. Hence in the broad agricultural sector, the two mentioned sectors, if promoted can bring greater impact on economic growth. These can be considered as the “economic sweet spots” of

Malaysia within the context of the broad agricultural sector.

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