



Deterministic Factors of Thai Cassava Prices: Multi-Uses of Cassava from Food, Feed, and Fuel Affecting on Thai Cassava Price Volatility

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Abstract

Cassava (Manihot esculenta Crantz) is one of the world important carbohydrate and calorie crops. The significance of cassava lies hidden in the uses of cassava products ranging from food to industrial sectors. In recent years, the Thai cassava price is markedly fluctuated and became a challenge for farmers, collectors, and manufacturers of cassava products to manage their production and processing. This paper examines factors considerably influencing the volatility of Thai cassava price. We further attempt in reporting the weighted importance of each factor including the pattern of their relationship with respect to cassava price. Research methodology will be conducted into two dimensions: from the perspective of only cassava price and from the combination of cassava price and its influencing factors. The result shows the seasonality nature of cassava price, while the fluctuation is caused by the several interrelated factors.

Keywords: Cassava, Price, Utilization, Thailand.

1. INTRODUCTION

Cassava (*Manihot esculenta* Crantz) or manioc or cassava is one of the world important carbohydrate and calorie crops. It is considered to be a staple food in Africa and common food in Latin America as being used as ingredients in various traditional dishes. The smaller part of cassava is being processed and used as animal feed and starch production. In Asia, on the contrary, very little of cassava is used as direct human consumption. The majority of cassava is being processed or transformed into chips, pellets, and starch. The role of cassava in Thai economy is quite significant. Thailand is the world second largest cassava producer after Nigeria but they are the world top exporter of cassava dried (referred to cassava chips and pellets) and cassava starch. In 2011, Thailand exported 3.74 million tons of cassava dried and 1.86 million tons of cassava starch. In money term, these are worth 978.59 and 922.29 million US dollars (or 3.13 and 2.95 billion Thai baht) respectively (FAOSTAT, 2014). With this export value, the cassava products are ranked as the third most Thai exported agricultural commodity (Thai Custom Department, 2011).

The significance of cassava lies hidden in the uses of cassava products. For instance, cassava chips and pellets are generally well-known as key ingredient in animal feed especially where corn is not suited for logistics or price reasons. More importantly, cassava starch is an intermediate product that has various applications. The variety of applications ranges from food to industrial sectors. In the food industry, it is being used as thickener, texture-building agent, and non-gluten starch in bakery products. Applications in industrial sectors include coating application in paper, finishing application in textiles, adhesive component, etc. (FAO, 2004). In recent years, the Thai cassava price is markedly fluctuated and makes it difficult for farmers, collectors, and manufacturers of cassava and its products to plan their production and processing. This paper examines the all the factors considerably influencing the volatility of Thai cassava price. We further attempt in reporting the weighted importance of each factors and to best describe their relationship with cassava price.

Many researchers have investigated potential factors influencing other crop commodities' prices. These crops include

corn, soybean, and sugar cane. Together with attentive and intensive science and technology that develop them to have even greater and more various uses, these crops have become world important economic crops. Nonetheless, much lesser attention is being brought to cassava and even much lesser studies look at cassava from the economic perspective. We expect that this paper will at least bring more attention to cassava and hopefully lead to the greater development of utilization in the future.

2. MATERIAL AND METHODS

Cassava as a commodity has played a significant role in Thai agriculture since 1970s. It became the chosen cash crop especially in the arid and non-irrigated area namely the northeastern part of Thailand at the time. The technology later permitted the transformation of simply agriculture to agro-industry through the processing of cassava to cassava starch. As a result, cassava gains popularity among many farmers as safe cash crop for production due to its minimal requirement and investment in comparison to other crops such as rice, sugarcane, or perennial fruits. At present, fresh cassava root can be processed into several more products and purposes. Utilization of processed cassava includes dried cassava pellets and chips, native starch, modified starch, biomass for bioethanol, etc.

2.1 Materials

Several data sources are investigated and used in this research. These sources include the Thai Office of Agricultural Economics (OAE), the Thai Tapioca Starch Association (TTSA), the Thai Tapioca Trade Association (TTTA), the Northeastern Tapioca Trade Association (NETTA), and Thai Tapioca Development Institute (TTDI). The datasets cover the wide range of information: production, planted area, yield, prices, export and import volumes and values of fresh and processed cassava products (i.e., fresh cassava root, chips, pellets, and starch). For each data of interest, the dataset from different sources will be compared for the validity. The time period of interest for this research is from 2005 to present (up to August 2015 where data is available from all sources), which is suited to study the profile and dynamic of changes in prices and production of Thai cassava.

2.2 Methods

With the fluctuation of cassava price, we see the need to start with identifying the pattern of seasonality, trending, and cyclical in the first stage. In the second stage, given multiple potential factors that could cause cassava price volatility, we use the approach in identifying the causes of the price volatility and price surge through demand and supply factors (*Heady and Fan, 2010* and *Gilbert and Morgan, 2010*). We will conduct an investigation on these factors in three parts. The first part focuses on factors commonly affecting cassava supply. Several factors can influence the supply of agricultural products. The common ones are, planted area, harvested area, yield, weather, production enhancing factors (e.g. technology, fertilizer and chemical uses), and agricultural practices. Other less common ones, yet potentially as impactful are quality of planted area (soil) and government policy. For example, government support program to partly paying for factors of production could make cassava farming becomes more attractive and resulting in an increase in harvested area and consequently in cassava supply.

Turning to the factors affecting cassava demand, an investigation on the structure of the industry is needed. Various uses of cassava and its products are the core the industry structure. Thus, categorization and reviews on the magnitude of uses are applied here. Lastly, all factors affecting cassava supply and demand are being investigated at the same time to determine which factors significantly impact the cassava price and causing all of these fluctuations. Other qualitative information such as cultivation and practices are collected from interviews with cassava farmers and government officials together with a review of several sources.

3. RESULT

The popularity of cassava as cash crop choice has now expanded to almost entire country, spreading from the north, northeast, and central with a high concentration in the original planted area, the northeast. Cassava can be cultivated all year round in Thailand. Nonetheless, the two most common times for cultivation is the beginning of rainy season from March to May; and the end of rainy season in November. The difference in quality

of cassava root exists from these various cultivation times. Those cultivated at the beginning of rainy season tend to give more outputs. Additionally, the roots can be harvested anytime from 8 up to 18 months after the cultivation. In contrast, those cultivated in November generally takes longer time to grow and to be ready for harvest as a result of dry condition during the growing period of cassava. Nonetheless, these November crops are less susceptible with weeds; thus, less care for weed control.

One of the primary reasons for cassava becoming cash crop choice for farmer is its minimal care. Thai cassava cultivation occurs mostly in rain fed area. Cassava can naturally be grown in dry area. Water is critical for cassava during the first two months of cultivation and during the dry season for those cultivated at the end of rainy season. Farmers also tend to choose the varieties suited for their area of production. Hence, the cost of watering is very minimal. Other aspects of cassava care include fertilization and pest control. Thai cassava is commonly grown in less productive highlands (fewer amounts of organic matters and soil nutrients). Thus, fertilization is needed in order to boost up the production. Weed control is considered to be revenue boosting practice, as weed control is vital for the growth of cassava roots.

With respect to the fluctuation of prices of fresh cassava root, it is found that the spread of prices indicate seasonality pattern. Figure 1 shows the trending pattern of fresh cassava root prices.

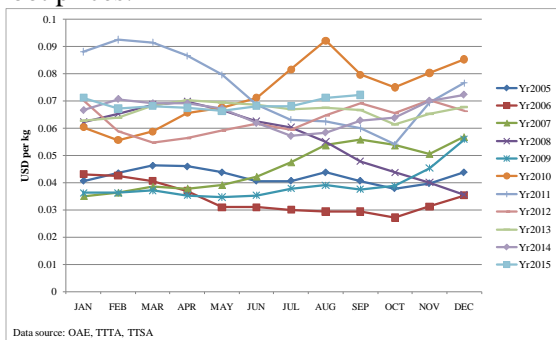


Figure 1. Thai fresh cassava root prices from 2005 to present

The prices of fresh cassava root often rises in November and December of every year. On the contrary, June and July are the months that cassava root faces the lowest price of the year. This highly corresponds to the harvesting time

of cassava root where October or November is the first month for cassava root to be available. Similar to other crops, the prices of the products are generally high at the beginning of the harvesting season due to the limited supply. The lowest prices in June and July can be explained in the similar way but opposite end; abundance of cassava roots drives the prices down. The incidence also reveals important culture of Thai cassava industry. Cassava farmers need to bring their harvest to the cassava collectors, where they are generally the ones who absorb the cost of transportation from farm to collecting fields. The price offered by the collector depends on the quality of cassava root, that is, starch content. Higher starch content would receive higher price than the lower one. Therefore, the price is somewhat controlled by the collectors. Each collector could offer various price levels; this leads to a common finding of farmers traveling in far distance to collectors who offered higher prices than those in their own areas.

By using 2005 cassava root price as base year, a simple plot of graph in figure 2 shows volatility of prices from 2006 to September 2015. A striking finding that stands out is the cassava root prices in 2010 where prices were much higher, more volatile and rose in the typical down months. Investigation reveals the cause of the incidence to be an outbreak of mealy bug. This outbreak, in turn, gives two effects at the time; lower production of cassava roots and concern for collector of inadequate material for their processing.

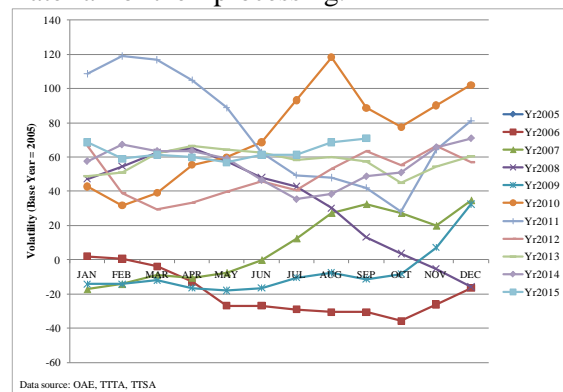


Figure 2. Thai cassava root price volatility from 2005 to present

As mentioned that agricultural supply can be influenced by multiple factors. In this research, we focus on the three factors: crop

area, yield, and last year average price of cassava root. We were confronted with problems of unavailability and incompleteness of several datasets for fertilizer and chemical uses for cassava

The equation is written as follows:

$$Cassava\ Supply = \beta_0 + \beta_1 Crop\ Area + \beta_2 Yield + \beta_3 Last\ Year\ Average\ Price \quad (1)$$

Table 1. Cassava supply regression result

Factor	Variable Type	Regression Coefficient
Cassava Supply	Dependent	
Crop Area	Independent	20.31
Yield	Independent	1,169,791.56
Last Year Average Price	Independent	-5,023.56

A simple linear regression captures the relationship of supply and their potential factors. The regression result in table 1 indicates a high correlation of cassava supply and crop area and yield. The R square value of 0.9979 can be described that crop area, yield, and last year average price can explain 99.79 percent of variation of cassava supply. Surprisingly, last year average price is negatively correlated with cassava supply. This leads to a closer look at the last year average price variable. In reality, last year crop price is a motive for choices on types and volume of crop cultivation. By simply regressing of crop area on last year average price, a high correlation is found. To combine this with the surprise regression result of cassava supply, this can be interpreted as last year average cassava price is a motive for farmers to expand existing or convert to cassava agriculture. Nonetheless, the most impactful factor in improving cassava supply is the improvement in yield. However, the expansion of crop area is the simplest approach to increase supply.

The cassava industry structure can be explained through the uses of cassava. The fresh cassava roots can be primary and secondary processed into three main uses: cassava chip and pellets for animal feeds and partly ethanol, and starch and modified starch. Majority of the cassava products are exported. Hence, we investigate on the correlation of various types of cassava export product values of current year and cassava supply (which is production) of the following year. Figure 3 demonstrates this; clearly, after the mealy bug outbreak in 2010, the production of cassava has been increasing. The rise in year of

cassava supply is inevitably correlated to the exports of cassava starch and chips. This is consistent with many reports of Cassava associations that exports purposes are accounted for more than 50 percent of all cassava production and uses of Thailand.

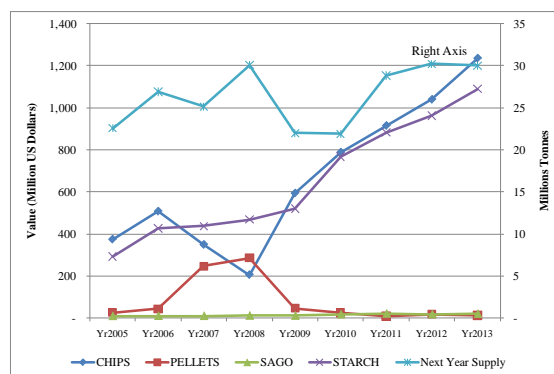


Figure 3. Relationship of export cassava products and domestic supply

4. CONCLUSION

Clearly, cassava is an important crop commodity of Thailand. It is not only an important material for domestic agribusiness, but it also brings in revenues for the country through various forms of products for the exports. The price of cassava, like other crops, fluctuates with domestic and foreign factors. Despite being dominated by the export influence of cassava starch and chips, the domestic production is still susceptible for unexpected domestic uncertainty such as pest outbreak. To understand better the situation of volatility of cassava price, one needs to understand the structure of the industry, the drivers of the supply and demand.

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