Role of Cassava in Thailand

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INTRODUCTION

Cassava plays a major role in Thailand's economy and agriculture since 1970s although it is not considered a staple food. It is recognized as the third most important crop of the country in terms of economic agricultural product. It is mainly grown as a cash crop through the whole country especially in the arid and non-irrigated areas of Thailand. It is because it can be grown with minimum input costs compared to rice, sugarcane or perennial fruits and also can be grown in virgin soils where other crops cannot be grown economically. Moreover, it can be cultivated the whole year round through the entire country. Therefore, it makes more profits for farmers (Treesilvattanakul, 2016).

In Asia, cassava is rare to be used directly for human consumption. It is mainly used as chips, pellets and starch by processing. It is used as a staple food in the forms of fresh roots or as dried cassava flour in Nigeria, Ghana and Brazil while it is used as an ingredient in various traditional dishes in Latin America. Only a few portion of cassava is being processed and used as animal feed and in starch production. In Thailand, it is used mainly for food, feed and fuel. All over the world, Thailand is ranked as the first exporter of cassava chips and pellets as well as the second largest producer after Nigeria (Treesilvattanakul, 2016).

In terms of total production of cassava roots, 78% is exported in the forms of cassava chips and pellets (39%) and cassava starch (39%). For domestic consumption (22%), 3% goes to cassava chips and pellets, 14% goes to cassava starch and 4% goes to ethanol, etc. (Newby, 2016). According to the data as shown in Table 1, Thailand was the second largest producer in cassava production throughout the world in 2013 and 2014.

Table 1. World Cassava Production in 2005-2014

Unit: 1,000M.T.

Year	Nigeria	Thailand	Vietnam	Indonesia	China	Brazil	World
2005	41,565,000	16,938,244	6,716,200	19,321,200	4,015,661	25,872,016	206,553,731
2006	45,721,000	22,584,402	7,782,500	19,986,640	4,313,333	26,639,012	223,368,631
2007	43,410,000	26,915,540	8,192,800	19,988,058	4,361,573	26,541,200	227,806,894
2008	44,582,000	25,155,796	9,309,900	21,593,052	4,409,014	26,703,040	231,306,414
2009	36,822,248	30,088,024	8,530,500	22,039,148	4,506,386	24,403,981	235,141,005
2010	42,533,180	22,005,740	8,595,600	23,918,118	4,565,318	24,967,052	240,820,938
2011	46,190,248	21,912,416	9,897,913	24,044,024	4,513,667	25,349,542	253,455,921
2012	50,950,292	29,848,491	9,735,723	24,177,372	4,574,109	23,044,557	257,375,372
2013	47,406,770	30,227,542	9,757,681	23,936,920	4,598,480	21,484,218	261,101,216
2014	54,831,600	30,022,052	10,209,882	23,436,384	4,659,481	23,253,514	268,277,743

Source: Food and Agriculture Organization of the United Nations, FAO, 2016.

Cassava chips and pellets are the major components in animal feeds. However, cassava starch are used in both food and industry sectors. In the food sector, it is being used as thickener, texture-building agent, and non-gluten starch in bakery products. In the industry sector, it is used for coating application in paper, finishing application in textiles, adhesive component, etc. (FAO, 2004). Nowadays, after processing fresh cassava root, it can be used

as dried cassava pellets, cassava chips, native starch, modified starch, biomass for bio-ethanol, etc (Treesilvattanakul, 2016).

In Thailand, the cassava industry has been developed a few years ago. It was produced commercially in the eastern provinces after World War II. There was a market demand for cassava chips and pellets in Europe. That caused the expansion of the total cultivated areas for more production across the country. In late 1993, the demand of Europe decreased due to the cereal feeds support policy (FAO, 2008). According to the report of Chaisinboon and Chontanawat (2011), production has decreased from 24 million tons in 1989 to 16 million tons in 2002. As well, the harvested area decreased from 1.6 million hectares in 1989 to 0.99 million hectares in 2002. However, the yield increased from about 15 tons per hectare in 1989 to 23 tons per hectare in 2009. Thailand found the new foreign markets for cassava chips and pellets in China and South Korea. In 2002, the amount of cassava chips exported to China increased.

According to the report of Jakrawatana *et al*. (2015), in 2012, the production of cassava was 26.6 million tons per year in Thailand. And then, the production increased in 2013-2015 and accounted for 30.2 million tons, 33.2 million tons and 32.9 million tons per year, respectively (Ministry of Agriculture and Cooperatives, 2015). Cassava roots and starch (native starch, modified starch and Sago obtained from cassava flour) are exported to other countries with the amount increasing yearly as shown in Table 2 (Monineath, 2016).

Table 2. Export of Cassava to the world markets in 2013-2015

Unit: 1,000 M.T.

Export products	2013	2014	2015
Cassava Starch	3,370	3,858	3,513
Cassava Roots	8,273	9,822	10,216
Total	11,643	13,680	13,729

Soruce: ceicdata.com

Starch production from cassava

Sriroth *et al.* (2000) stated that the production of cassava starch plays a major role in generating the income in many tropical countries like Thailand, Vietnam, Brazil and Cambodia. Cassava starch is used for organic acids fermentation products, ethanol and bio-plastics.

According to the findings of Piyachomkwan and Tanticharoen (2011), the modern starch manufacturing process has been developed in Thailand due to the increase in the demand for cassava starch significantly in the local market. There were 79 modern starch factories and those factories produced 15-17 million tons of cassava starch every year through operating with mechanized processes such as separation (e.g. dewatering centrifuge) and drying (e.g. flash dryer). About half of the total production was consumed for local markets while the other half are exported to the international markets with various forms of native, modified and hydrolyzed ones (e.g. sweeteners, sugar alcohols, amino acids, organic acids). As the industrial sector and starch markets develop across the world, the demand for cassava starch will increase in the export market (Piyachomkwan and Tanticharoen, 2011).

The various technologies for converting into the cassava starch from fresh roots have developed based on the availability of energy, the costs of energy, availability of freshwater and seasonal supply of cassava roots (Tran *et al*., 2015). Jakrawatana *et al.* (2015) stated that there are 99 cassava starch plants which produced the total capacity of 34,141 tons of starch per day. Each plant produced an average capacity of 350 tons of starch per day.

Ethanol production from cassava

Thailand has imported huge amount of crude oils. Therefore, the government has focused on the production of energy sources and supported for research and development on new renewable energy sources. As a result, ethanol became the alternative energy source (Wichitchan and Skolpap, 2014).

According to the analysis of Renewable Fuels Association. Thailand stands sixth in rank in ethanol production all over the world in 2016. Bio-fuel production was set as an important national agenda. According to the findings of Nguyen and Gheewala (2008), ethanol was manufactured by fermentation of molasses in Thailand. Nevertheless, the production of molasses was not sufficient to get the ethanol target of the government. Therefore, the government supported the research and development to conduct a pilot survey on the production of ethanol particularly in biochemical and chemical engineering. As the result of the studies, it was found that cassava has a high potential for ethanol production to address the fuel crisis with minimum costs of production compared to sugarcane. Moreover, FAO (2010), Sriroth *et al*. (2010) and Nguyen *et al*. (2007) stated that there are several favorable factors in using cassava as raw materials for ethanol production:

(1) drought resistant;
(2) minimum input requirements;
(3) available all-year round;
(4) easily processed into dried cassava chips;
(5) long lasting shelf life;
(6) easily transportable;
(7) higher average yield compared to the global average yield; and
(8) potential technology to increase yield later.

Wichitchan and Skolpap (2014) also stated that ethanol was manufactured by using various types of raw materials to produce fuel. Among them, cassava is one of the most suitable resources. Moreover, it can be used as a raw material for ethanol production because there are various forms of cassava products such as cassava chips, pellets and starch. Especially, cassava roots and chips are used as raw materials for local ethanol production. Based on the types of raw materials, there is a difference in the production costs. If cassava roots are used as raw materials, the production costs are lower than those from cassava chips. However, the yield of ethanol was higher in cassava chips compared to those in cassava roots.

The areas under cassava cultivation are expanded (FAO (2010), Sriroth *et al*. (2010) and Nguyen *et al*. (2007)). In the report of the Department of Alternative Energy Development and Efficiency (DEDE) (2014), the area under cassava cultivation was 1.2 million hectares in 2013. There are seven factories for ethanol production from raw materials of cassava (DEDE, 2015).

The use of renewable energy also increased. According to the Royal Thai Government's Alternative Energy Development plan (2012-2021), the target is to increase the use of renewable energy from 11 to 25% in 2021 (Suwanasri *et al*., 2015). The main objective of the development of ethanol production technology from cassava is to produce high yield of ethanol, to save energy and water. Moreover, the biomass residues are to be used efficiently with minimum costs of production as much as possible (Piyachomkwan and Tanticharoen, 2011).

CONCLUSION

In Thailand, cassava plays a major role in the economy of the country although it is not a staple food. Cassava is mainly used for food, feed and fuel. Thailand is the second largest in cassava production in 2013 and 2014 as well as the first exporter in 2005-2009. Cassava chips and pellets are exported to Europe, China and South Korea. Cassava starch are used in both food and industry sectors. There are demands for it in both domestic and export markets. For ethanol production, cassava is used as raw material due to the low input costs of production and different agronomic characteristics compared to sugarcane. As cassava is utilized in various forms, the demand also increases. Therefore, the areas for cassava production has been expanded. Cassava fresh roots and cassava chips are the major raw materials for ethanol manufacturing. Based on the types of raw materials, the yield of ethanol and production costs are different.

REFERENCES

Chaisinboon, O. and Chontanawat, J. (2011). Factors Determining the Competing Use of Thailand's Cassava for Food and Fuel. 9 Eco-Energy and Materials Science and Engineering Symposium. E nergy Procedia 9 (2 011); 2 16 – 229.

Department of Alternative Energy Development and Efficiency (DEDE). (2014). Curriculum Development Project on Renewable Energy (Ethanol and Biogas). Department of Alternative Energy Development and Efficiency, Ministry of Energy, Bangkok.

Department of Alternative Energy Development and Efficiency (DEDE). (2015). Ethanol List June 2015. Retrieved on September 26th, 2015 from http://www4.dede.go.th/dede/images/stories/bioethanol/ethanol_list-june_2015.pdf.

FAO. (2004). Global Cassava Market Study: Business Opportunity for the Use of Cassava. Food and Agriculture Organization of United Nations.

FAO. (2008). The Right to Food and the Impact of Liquid Biofuels (Agrofuels), Italy; 2008.

FAO. (2010). Bioenergy and Food Security: the BEFS Analysis for Thailand. Food and Agriculture Organization of the United Nation, Rome.

FAO. (2016). Cassava, Production Quantity (tons) – for All Countries. Retrieved on March 27, 2017 from http://www.factfish.com/statistic/cassava%2C%20production%20quantity

Jakrawatana, N., Pingmuangleka, P., Gheewala, S. H. (2015). Material flow management and cleaner production of cassava processing for future food, feed and fuel in Thailand. Journal of Cleaner Production 134 (2016); 633-641.

Ministry of Agriculture and Cooperatives. (2015). Trade . Retrieved on February 15th, 2016 from Ministry of Commerce : http://www2.ops3.moc.go.th/

Monineath, El. (2016). The Impact of Declining Export Price of Tapioca Starch on Thai Economic Output and Employment. Working Paper, February 2016.

Newby, J. (2016). Cassava in Asia: Exposing the drivers and trajectories of the hidden ingredient in global supply chains. World Congress on Roots and Tubers th nd18 – 22 January 2016, Nanning, China.

Nguyen, T.L., Gheewala, S.H., Garivait, S. (2007). Energy balance and GHG-abatement cost of cassava utilization for fuel ethanol in Thailand. Energy Policy 35, 4585-4596.

Nguyen, T.L.T., and Gheewala, S.H. (2008). Fossil Energy, Environmental and Cost of Ethanol in Thailand. Journal of Cleaner Production, 16, 1814-1821.

Papong, S., Malakul, P., Trungkavashirakun, R., Wenunun, P., Chom-in, T., Nithitanakul, M., Sarobol E. (2014). Comparative assessment of the environmental profile of PLA and PET drinking water bottles from a life cycle perspective. Journal of Cleaner Production 2014; 65:539–50.

Piyachomkwan, K. and Tanticharoen, M. (2011). Cassava Industry in Thailand: Prospects. Journal of the Royal Institute of Thailad. Vol 3, 2011.

Renewable Fuels Association. (2017). World fuel ethanol production. Statistics tables. Retrieved on February 27, 2017 from http://ethanolrfa.org/resources/industry/statistics/#1460745352774-cd978516-814c

Sriroth, K., Piyachomkwan, K., Wanlapatit, S. and Oates, C. (2000). Cassava starch technology: the Thai experience. Starch-Stärke; 52:439–49.

Sriroth, K., Piyachomkwan, K., Wanlapatit, S., Nivitchanyong, S. (2010). The promiseR of a technology revolution in cassava bioethanol: from Thai practice to the world practice. Fuel 89, 1333e1338.

Suwanasri, K., Trakulvichean, S., Grudloyma, U., Songkasiri, W., Commins, T., Chaiprasert, P. and Tanticharoen, M. (2015). Biogas – Key Success Factors for Promotion in Thailand. ournal of Sustainable Energy & Environment Special Issue (2015); 25-30.

Thai Tapioca Trade Associate. (2007). Annual Report Year 2007, Bangkok; 2007.

Tran, T., Da, G., Moreno-Santander, M. A., Vélez-Hernández, G. A., Giraldo-Toro, A., Piyachomkwan, K., Sriroth, K. and Dufour, D. (2015). A Comparison Of Energy Use, Water Use And Carbon Footprint of Cassava Starch Production in Thailand, Vietnam and Cambodia. Resources, Conservation and Recycling 100 (2015); 31-40.

Treesilvattanakul, K. (2016). Deterministic Factors of Thai Cassava Prices: Multi-Uses of Cassava from Food, Feed, and Fuel Affecting on Thai Cassava Price Volatility. Vol. 3 (2016) 12-16, ICoA Conference Proceedings, 7 – 9 November 2015.

Ubolsook, A. (2010). Sustainable Energy Crops: An Analysis of Ethanol Production from Cassava in Thailand. All Graduate Theses and Dissertations. Paper 794.

Wichitchan, C. and Skolpap, W. (2014). Optimum Cost for Ethanol Production from Cassava Roots and Cassava Chips. Energy Procedia 52 (2014); 190-203.

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