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

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


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 cause 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

<table>
<thead>
<tr>
<th>Export products</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cassava Starch</td>
<td>3,370</td>
<td>3,858</td>
<td>3,513</td>
</tr>
<tr>
<td>Cassava Roots</td>
<td>8,273</td>
<td>9,822</td>
<td>10,216</td>
</tr>
<tr>
<td>Total</td>
<td>11,643</td>
<td>13,680</td>
<td>13,729</td>
</tr>
</tbody>
</table>

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), Siroth 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), Siroth 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


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