

## Analysis of Thailand Biomass Resources and Biomass Pellet Market

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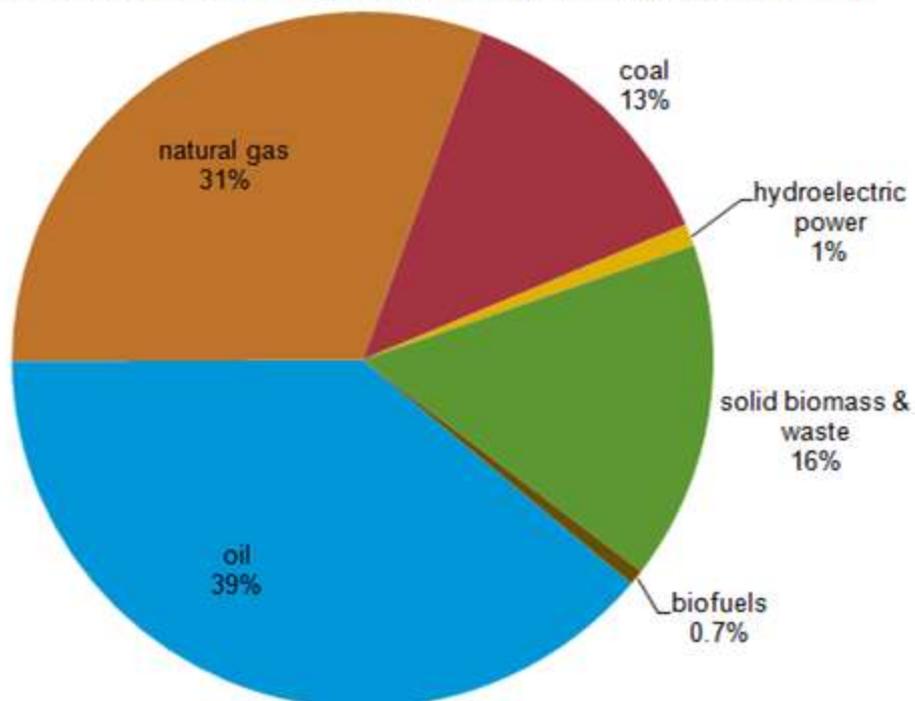
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### General Situation of Thailand Energy Sources

Thailand has abundant forest resources and crop resources, which is an advantage for Thailand to produce and use wood pellet as a kind of green energy, and makes it possible to develop Thailand as the biomass pellet trade center in ASEAN.

Total energy consumption in Thailand, by type (2010)

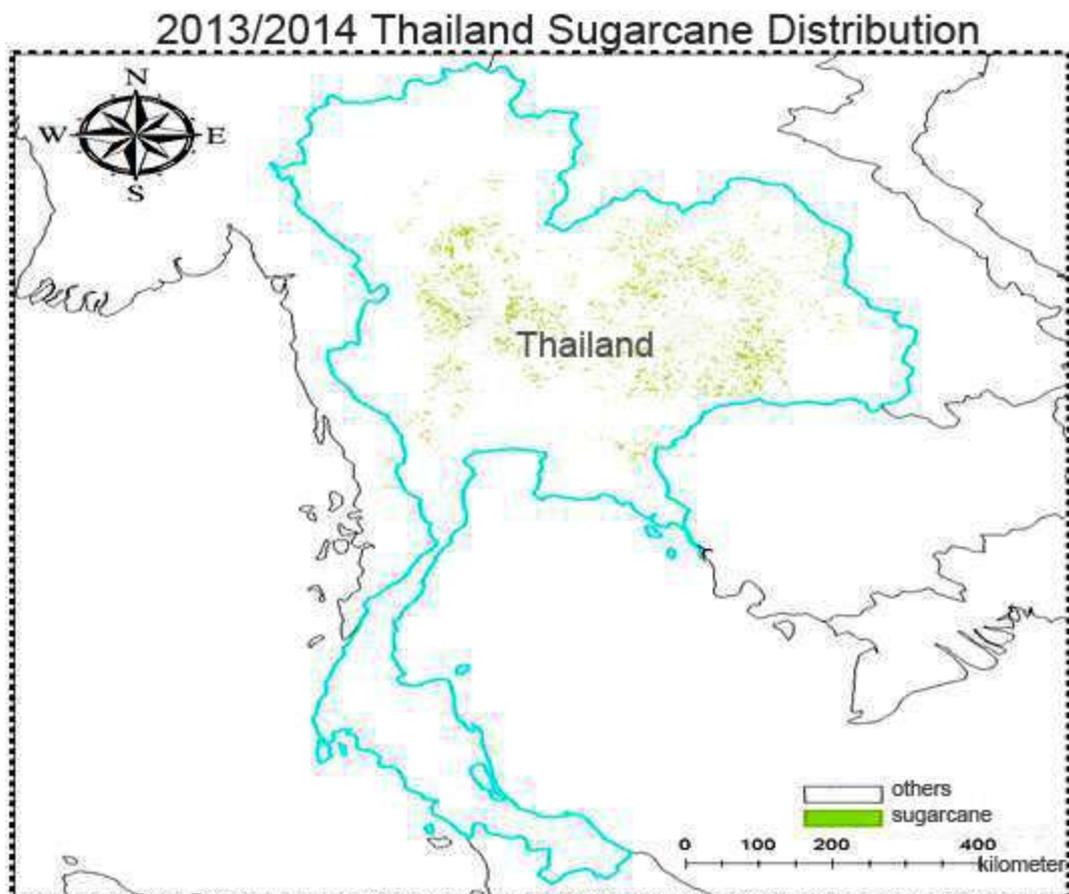


### Varieties of Thailand Biomass Resources

Thailand is a major country of agricultural products producing and exporting, and the government attaches great importance to bio-industry. By setting senior management institutions, presenting preferential policies, enacting development projects, Thailand has achieved good progress in bio-agriculture, bio-pharmaceutical, bio-energy, etc. The main raw materials for making bio-pellets in Thailand are sugarcane, cassava and rice. Thailand is cultivating the giant king grass as a new material for bio-energy. Abundant natural resources, cheap labor cost and wide domestic-foreign market, all these factors make it possible for developing pellet fuel.

### --Sugarcane

Thailand is the main sugarcane producer and cane-sugar exporter country in the world, locating in the moist tropical-region of Southeast Asia. In 2013, Thailand cane-sugar exports ranked 2nd in the world, following Brazil. Cane-sugar industry has a great contribution to Thailand economy as one of the main economic sectors in Thailand. During 2013-2014, the military and government has proposed a plan of expanding sugarcane plantation to increase the production of cane-sugar, which will promote a further development of the cane-sugar industry. And what comes with the cane-sugar industry is the cane wastes, of which the outstanding one is the bagasse.

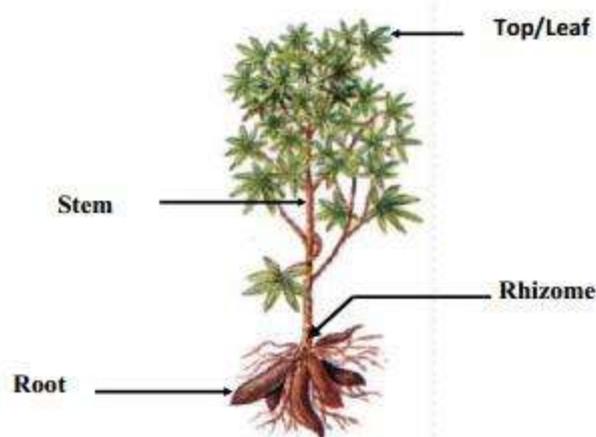


Thailand plantation of sugarcane are mainly distributed in the northeast, the middle, and the north areas where are the main distribution ranges of sugar refineries. The bagasse is the key material for making cane-sugar, and it is expected to have a production of 11 million tons in 2014; the predictable bagasse amount is 22.9 million tons. The huge amount of bagasse provides ample raw materials for growing bio-pellet fuel.

There is an obvious amount of bagasse in cane-sugar process (probably 1 ton sugarcane can produce 290kg bagasse). With the development of sugar industry, the bagasse amount is rising year by year.

### **Cassava**

Thailand is the third large producer country, the first large exporter country of cassava around the world. As one of the four dominating crops (the other three are rice, rubber and sugarcane), the cassava has a strong support from the government, wide planting areas and high productivity. In the 76 provinces of Thailand, there are 46 provinces are planting cassava now, and its main production are located in the northeast, the north, and the middle areas, including the east area.



Developing cassava waste has many advantages, and there are three reasons

Cassava is the crop that can be planted full-year, and this property is crucial under the situation of intense land competition.

The agriculture ministry sets the special nation project whose purpose is to increase the average production of fresh cassava root to 30 ton/ha. by cultivating the cassava of high production, improving irrigation system and fertilizing condition.

The investment and energy cost that the cassava planting and harvesting need is small.

Cassava has huge yield, producing a large number of biomass raw materials, and the cassava stem is the primary materials of making bio-pellet fuel, having a lot of research and development prospects.

Because of the cassava agriculture development, Thailand has a huge production cassava stems and wastes. Now, most thais just simply smash a small amount of root-stocks and return them to the farmland, and part of the wastes is taken as feed, as food fungus culture medium or as fuel of chipboard processing. However, most of the wastes is abandoned directly, which not only causes the waste of resources, but also pollutes the environment, so the exploitation for cassava stems has to step forward.

By the preliminary forecasting, it shows that cassava stems can have an output of 7.5t/hm<sup>2</sup>, yearly output of 4.27 million tons. As the one-third of the stem needs to be used for regrowth for next seas on, the actual amount for making biomass stuff is around 2.56 million tons, equaling every year generating capacity of 12098GW.H.

Most of the cassava earthnut is used for producing starch and alcohol, and the waste left after collecting starch and alcohol is rich of fiber, and it can be used to make biomass fuel after processing; it is a good resource for pelletizing and powdering. At present, the waste is widely used to make feed pellet, but it has a certain prospect as a kind of raw material for fuel pellet.

	Production (tonne)	Residue	Production (tonne)	Energy Content (MJ/kg)	Energy Potential (TJ)	(ktoe)
Cassava	30,088,025	stem	2,439,236.19	18.42	44,930.73	1,06
		rhizome	1,834,466.88	18.42	33,790.88	799

### **Cassava stem energy utilization and pelletization requirements**

Overall, cassava stem is a promising material for manufacturing pellet fuel. Although its average calorific value is a little lower than the cork fuel, it still has considerable combustion value. Cassava stem has high ash melting point and it means the stem has low risk of combustion and slagging, beneficial to further utilization. If the stacking time of the stem is prolonged, its combustion characteristic will be improved. The moisture content of the stem is an important parameter of pelletizing, so it has to control the moisture content properly, and generally if the moisture content is controlled at a level of 10% or 12% or 14%, the pellet produced has high durability and density-mass.

Under the basic situation of no changing the pellet equipment, cassava stem pelletizing needs lower energy cost than biomass pelletizing. If optimize the pellet machine, more energy will be saved. Developing the cassava stem pellet is of great goodness and great profits. Rich sources, good combustibility and high pelletizing quality make cassava stem and waste the excellent solid biomass fuel.

### **---Rise Husks and Straws**

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