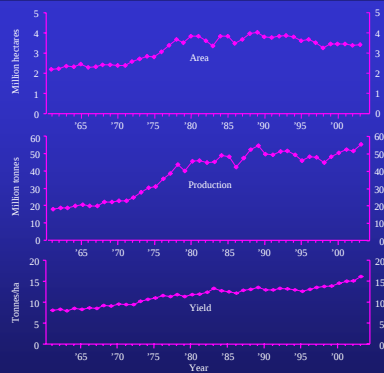


Production and utilization of cassava in Asia and its potential as a bio-fuel

Reinhardt Howeler



Cassava distribution in Asia. Each dot represents 10,000 ha of cassava



Total harvested area, production and yield of cassava in 12 cassava growing countries in Asia, 1961-2003.
Source: FAOSTAT, 2004.

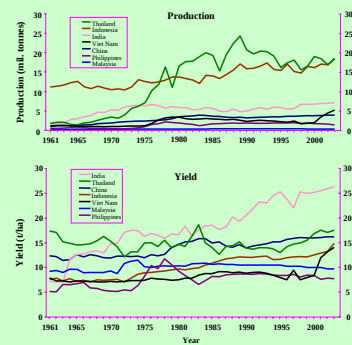


Figure 4. Cassava production and yield trends in Asia's principal cassava producing countries, 1961-2003
Source: FAOSTAT, July 2004.

Production Practices



In Thailand cassava is generally grown in monoculture on very light textured soils with gentle slopes



In Vietnam cassava is often grown on rather steep slopes





In Indonesia most cassava is intercropped with maize.....

....or rice and maize followed by short-duration grain legumes



Utilization

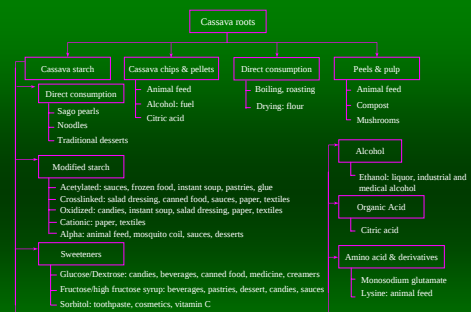


Figure 7. Cassava root processing into value-added products
Source: Adapted from TIFITA, 2000.

Human Food



In Laos boiled cassava roots are a staple food for many ethnic minority people



In Indonesia peeled and sun-dried cassava roots are called *gaplek*; this is sold in stores for use as human food and animal feed



Gaplek is pounded into flour which is used to make *tiwul*

Animal Feed



In north Vietnam, fresh cassava roots are chipped using a simple cutting board.....



Chips are sun dried in any available space



In Central Vietnam, cassava leaves are chopped for making silage



Feeding pigs with ensiled cassava roots and leaves



In Thailand cassava roots are chipped and sundried on large concrete drying floors

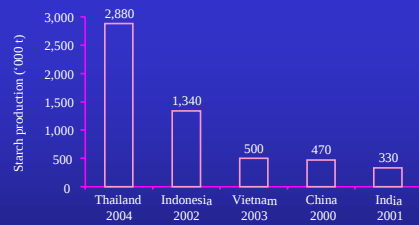


When regularly turned the chips will dry in 2-3 days of sunny weather



Dry chips and pellets are mostly produced for export as animal feed to China and Europe

Starch and Starch Derivatives



Annual cassava starch production in various countries in Asia in 2000-2004
Source: Compiled by R. Howeler from various sources in 2006.

In Dong Lieu village in north Vietnam about 300 households are involved in small-scale starch production



Presently there are about 50 new medium- and large-scale cassava factories in operation in Vietnam



....where cassava roots
are transformed into dry
starch in less than 30
minutes



In Thailand, cassava starch production is fully mechanized



....except for removal of stumps and impurities before grating
the fresh roots



The starch is packed in
either 50 kg bags or 1
tonne containers





Waste water from the cassava starch factory is converted into biogas to be used for drying the starch

New market potential

Summary of market potential¹⁾ for cassava by country in 2006.

	Food		Animal feed		Starch and starch-based products	Ethanol
	Fresh	Processed	Domestic	Export		
China	*		**		***	***
India -Kerala	*	**				
-Tamil Nadu					***	
Indonesia	*	**	**	*	**	
Malaysia		**	**		**	
Philippines	*	**	**		***	**
Thailand			***	*	***	***
Vietnam-North	*	**	**	*	***	
-South		**	**	*	***	

¹⁾ * = maintenance of existing consumption levels
 ** = growth in existing markets



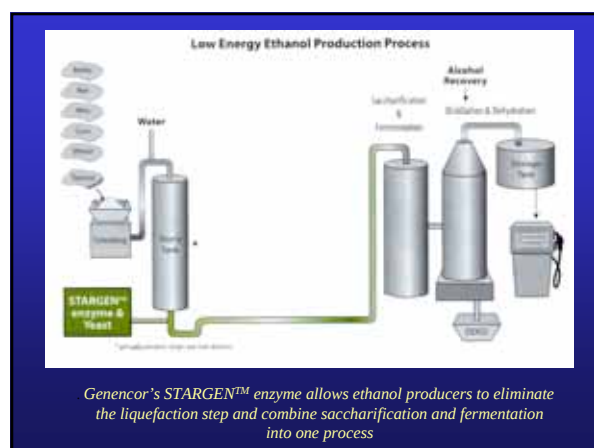
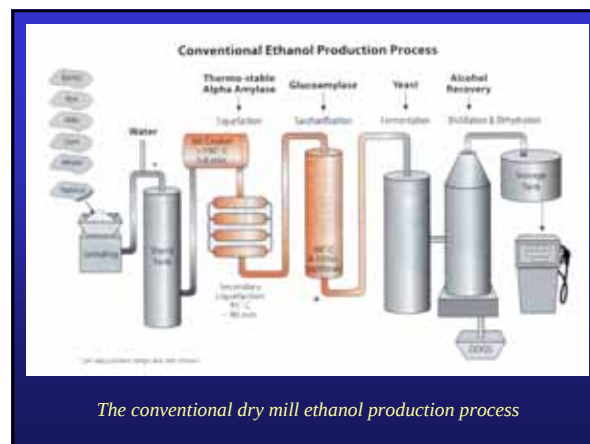
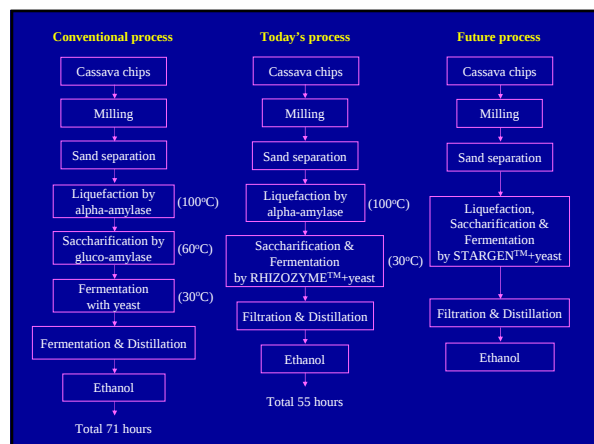


Table 8. Cost of production of ethanol using either dry maize grain or fresh cassava roots as the raw material for ethanol production under US and Thai conditions.

	USA		Thailand	
	Maize	Cassava	Maize	Cassava
Crop yield (t/ha)	11	35	3.5	20
Crop price (\$/tonne)	81	25	104	26
Ethanol yield (liters/t raw material)	379	180	379	180
Substrate cost (\$/liter ethanol)	0.21	0.14	0.27	0.14
By-product credit (\$/liter ethanol)	-0.063	-0.004	-0.063	-0.004
Processing costs (\$/liter ethanol)	0.16	0.21	0.16	0.21
Ethanol production cost (\$/liter)	0.31	0.35	0.37	0.35

Source: adapted from Shetty et al., 2006, by R. Howler

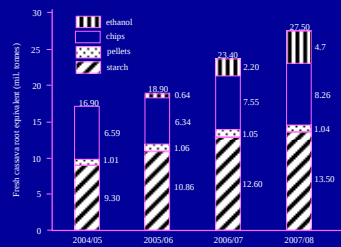


Figure 4. Current and expected future market demand for various products made from cassava in Thailand from 2004/05 to 2007/08.

