Starch Markets in Asia

Keith O. Fuglie and Christopher G. Oates[1]

The extraction and processing of starch from agricultural commodities is one of the most important agro-industries world wide. By the early 1990s, global production of starch probably exceeded 38 million metric tons (mmt) per year for a market value of at least $11 billion. In Asia, starch production was about 16 mmt and demand for starch by food and non-food industries was growing by 5-10 percent per year.

Starch is very versatile and has a wide variety of uses. Almost all major industries have found some uses for starch. In food industries, starch is used to impart "functional" properties to processed foods such as thickening, binding, filling, and taste. Starch is used in canned soups, instant desserts, ice creams, processed meats, sauces, and bakery products. Starch can also be converted into sugar. It is used to manufacture sweeteners and syrups and to feed enzymes for the manufacture of MSG, a popular taste enhancer. Uses of starch in non-food industries are just as numerous. Major users include the textile, paper, plywood, and adhesive industries. Starch is also used in the manufacture of pharmaceuticals.

Starch is not a uniform commodity, however. Starch extracted from different commodities has different properties. Many end users require specific kinds of starch for making their products, and therefore demand starch derived from specific commodities. If the kind of starch they require is not available, then starch may undergo further processing and modification. The demand for "modified" starch is increasing rapidly but is still far below that of "native" starch (also called "primary" starch) in developing countries. Further, starch quality may be affected by post-harvest practices. How a commodity is harvested and stored, how it is processed into primary starch, and how that primary starch is handled and stored, all affect the starch's functional properties. For starch producers to be competitive in markets for specialized starch they must be able to deliver to user industries a product of known and consistent quality. However, some end users are less concerned with starch quality. The sweetener industry, for example, is mainly interested in converting the starch into sugar, and typically uses the cheapest source of starch. End users who require specific properties in starch are often willing to pay a significant price premium for native or modified starch with such properties. Understanding the properties of starch from different agricultural commodities and matching these properties to specific end use markets is critical for the development of a successful starch industry.

In this paper we review recent trends in global starch markets. We also examine the prospects for future growth of starch demand in Asia. Third, we investigate the cost

[1] Keith Fuglie is an Agricultural Economist and Regional Representative for East, Southeast Asia and the Pacific at the International Potato Center (CIP), Bogor, Indonesia. Christopher Oates is a Food Technologist and Managing Director of Agro Food Resources (Thailand), Ltd., Bangkok, Thailand.

structure of starch processing in Asia and derive implications for industrial organization and scale in this important agro-industry.

Sources and Uses of Starch

Globally, the major commodities from which starch is derived are maize, cassava, sweetpotato, potato and wheat. In developing countries, root crops are relatively more important as sources of starch than cereal crops. Worldwide, the biggest user of starch is the sweetener industry. In developing countries, most starch is used to make processed food products. As a country's economy develops and incomes grow, non-food industries make up an increasing share of total starch consumption.

Commodity supply of starch

Statistics on starch production, prices, and demand are not widely available. Unlike for agricultural commodities, government agencies generally do not collect and publish reports on starch markets. However, statistics on international trade in starch are often reported. International trade in starch is mostly within regional markets. But with gradual reduction in trade barriers, global trade in starch is becoming more important.

In Table 1 we present some estimates of global annual starch production. These estimates are largely based on Ostertag (1993), with some revisions and updates for several Asian countries. The estimates indicate that Asia accounted for 40 percent of world starch production in the early 1990s. While nearly two thirds of world starch production was derived from maize, maize accounted for only 37 percent of starch production in Asia. Root crops accounted for 60 percent of Asian starch production, especially cassava (29 percent), sweetpotato (26 percent) and potato (5 percent).

Of all the figures on starch production shown in Table 1, perhaps the most uncertain estimate is the quantity of starch derived from sweetpotato in China. Official statistics, which only include production from large scale factories, report that about 1 mmt of sweetpotato starch are produced annually. But in China, most sweetpotato starch is produced by small and medium-sized processors (Tang et al. 1990). Ostertag (1993) estimated that at least 4 mmt of starch were produced from sweetpotato in China in 1992, which is equivalent to 27 mmt of fresh sweetpotato (or about 23 percent of total sweetpotato production in China). A similar figure is reported by Lin and Qiu (1995). Huang (1998) estimated that by the late 1990s, the share of sweetpotato used by industry had risen to 33 percent of total sweetpotato production. If all of this was used for starch production, it would imply an annual starch production of 5.7 mmt. In Table 1 we report 4 mmt of sweetpotato starch for China for the early 1990s, which is probably conservative.

The patterns of raw material use for starch extraction around the world can be explained largely by relative commodity prices in regional markets. In North America, maize is by far the cheapest source of starch and accounted for 98 percent of starch production in this region. Especially important in the U.S. and Canada is the use of corn starch to produce high-fructose syrup for soft drinks. In Europe, maize, wheat, and potato all contribute significant amounts of starch. In tropical countries, cassava is a cheap source of starch, and supplies nearly 98 percent of starch produced in Southeast Asia. Sweetpotato is an important source of starch in Northeast Asia (China, Japan, and South Korea), along with maize and potato.

The estimates shown in Table 1 imply that starch and starch-based products play a major, if not pivotal, role in the market for root and tuber crop commodities in many countries of Asia. In tropical Asia, where cassava is the most important source of starch, more than half of total cassava production is used for starch extraction, including 62 percent in Indonesia and 52 percent in Thailand, by far the two largest cassava producing countries in Asia. In temperate Asia (China, Japan, and Korea), sweetpotato follows closely behind maize in its overall contribution to starch production. Between 23-33 percent of sweetpotato production in this region is used for starch extraction, including 23-33 percent in China and as much as 67 percent in Japan. Sweetpotato is not yet widely used for starch extraction in tropical Asia because of the availability of cheap cassava starch.

Table 1. Global starch production in the early 1990s
(million metric tons of starch/year)

	Maize	Wheat	Sweet Potato	Cassava	Potato	Other	Total
WORLD	24.155	2.126	4.148	4.992	2.359	0.142	37.922
NORTH AMERICA	13.450	0.200			0.055	0.020	13.725
EUROPE	3.700	1.400			1.500		6.600
LATIN AMERICA	1.000			0.330			1.330
AFRICA				0.020			0.020
AUSTRALIA	0.050	0.300					0.350
ASIA	5.955	0.226	4.148	4.642	0.804	0.122	15.897
China	2.063	0.061	4.000	0.300	0.400		6.826
Japan	2.500	0.150	0.120		0.400		3.170
South Korea	1.072		0.013				1.089
Taiwan	0.045	0.015	0.015	0.015		0.030	0.120
Indonesia				2.000			2.000
Thailand				1.800			1.800
India	0.200			0.350			0.550
Malaysia				0.070		0.090	0.160
Philippines	0.075			0.017			0.092
Vietnam				0.090			0.090

Source: Ostertag (1993), updated for Asian countries from various industry sources.

Starch policy and trade

The global pattern of commodity prices and starch utilization has been significantly influenced by agricultural and trade policies. In the European Union, the Common Agricultural Policy (CAP) subsidizes the use of potatoes in starch production. In the CAP scheme, starch processors are provided a subsidy equivalent to any extra costs associated with using potatoes or wheat for starch instead of maize. Under the CAP scheme starch processors therefore face the same price of raw material whether using maize, potato, or wheat to extract starch. This policy is designed to provide additional marketing opportunities for potato and wheat, commodities which are in surplus in Europe, and to reduce imports of maize. In South Korea and Japan, a tariff-rate-quota (TRQ) system is in place for starch. Under the TRQ system, a small share of starch is allowed to be imported under a relative low tariff, but tariffs on imports above the quota are prohibitively high. In South Korea, the starch import quota is allocated to factories in proportion to the quantity of locally-produced starch they purchase. Again, this scheme is designed to support local farmers by increasing the demand for their commodities from local food and non-food starch industries.

Trade barriers have kept starch markets largely regional. Most trade in starch takes place within regional trading blocks, such as the European Union and among NAFTA countries. Europe exports about 350,000 tons of potato starch annually, mainly to Asia, North and South America. Recently, Thailand has emerged as a major exporter of cassava starch. Most of Thailand's starch exports are to countries within Asia, especially to Taiwan, Japan, and Indonesia. By the mid 1990s, Thailand exported about 1 mmt of cassava starch annually, or about half of its domestic production (Boonjit 1999). About 80 percent of Thailand's starch exports were in the form of native (primary) starch, and about 20 percent as modified starches.

Gradually, barriers to trade in food and food products are being reduced. This is increasing the level of global integration in agricultural and food markets. Trade liberalization and agricultural policy reform would likely have a significant effect on global trade in starch. It would likely increase exports of starch from countries with a strong comparative advantage in commodity production, such as USA and Thailand. On the other hand, exports of starch from the European Union would probably fall, and imports of starch by Japan and South Korea would likely rise.

Starch Demand

The quantity of starch consumed in food and non-food products in a country is closely associated with the level of economic development and income of that country. As per capita incomes rise, consumers demand a more varied set of food and manufactured products that use starch in their making. Thus, there is a close and positive relationship between income and quantity of starch demanded.

Engel function for starch demand in Asia

The statistical relationship between income and starch consumption can be formally estimated with the use of an Engel curve. The particular functional form used to represent the Engel curve is usually chosen on the basis of goodness-of-fit. We tested a variety of forms (linear, log, log-linear) and found that the quadratic form provided an excellent fit ($R^2 = 0.96$) for an Engel curve fitted to starch demand in a cross-section of ten Asian countries. The estimated function is:

$$(Kg\ of\ starch/capita) = -4.006 + 2.684\ (GNP/capita) - 0.0572\ (GNP/capita)^2$$

where GNP is given in purchasing-power-parity (PPP) US dollars. Per capita starch consumption is found by taking domestic production (from table 1) minus net starch trade (exports minus imports), and then dividing by population. The negative sign on the quadratic term implies that the rate of growth in per capita starch consumption declines as income rises.

The estimated Engel curve for starch demand in Asia is plotted in Figure 1 together with the actual data points for the 10 countries. This relationship implies high income elasticities of demand for starch in developing countries. For low income developing countries with per capita GNP of less than $2,000[2] (e.g., India and Vietnam), the income elasticity of starch demand is as high as 4.0, meaning that a 1% increase in per capita income will result in a 4% increase in starch consumption. For middle income developing countries with average per capita GNP of $3,000 to $4,000 (e.g., China and Indonesia), the income elasticity is between 1.5 and 2.0. For newly industrializing countries like Thailand and Malaysia with per capital income of $6,500 to $10,000, the income elasticity for starch ranges between 1.2 and 0.8. For developed countries with per capita incomes substantially above $10,000, the income elasticity of starch demand is less than 0.8 but still positive.

These income elasticities estimated for starch demand are substantially higher than income elasticities for most food commodities. For cereal crops such as wheat and rice, income elasticities are typically below 1.00 even in poor countries, reflecting the general tendency of consumers to spend a declining proportion of their income on food as income increases. Elasticities for less desirable crop commodities, such as root crops and coarse grains, may even be negative, as consumers switch to more preferred foods as incomes rise. The high income elasticity for starch reflects the fact that starch is used in the manufacture of food products bought mainly by consumes in the middle and upper income strata. That the income elasticity remains high even in middle income countries reflects the fact that starch is also used in the manufacture of many non-food products such as clothing, paper, and wood products, items with a relatively high income elasticity of demand.

[2] Per capita income is converted to US dollars at purchasing power parity (PPP) exchange rates to take into account differences in prices of consumer goods in the various countries.

Although we are not able to estimate income elasticities for different kinds of starch, the relationship between starch and per capita income appears to hold for native starches generally. In other words, starch derived from cassava, sweetpotato, maize, or other commodities are all likely to enjoy the same rapid growth in demand as incomes rise. For root crops and coarse grains, transforming the raw commodity into starch effectively transforms its demand from an inferior good to a superior good. A similar demand relationship probably holds for developing regions outside of Asia as well.

Elasticities of starch demand by type of product

Income elasticities can also be derived for starch according to different end uses. In Table 2, we show estimates of elasticities of starch demand by various food and nonfood industries and their products for Thailand. These estimates were developed using time series data between 1982 and 1993. In 1993, non-food industries consumed 28 percent of starch consumed in Thailand, a share that is likely to grow over time. For all starch, the income elasticity of demand was 1.01. But demand for starch from non-food industries grew by 1.51% for each 1% increase in income, compared with 0.85% for food uses. Within food products there was a wide range of elasticities, ranging from 0.21 for direct household use of starch to 1.9 for MSG and lysine.

Estimates of income elasticities of starch demand can be used to project future growth in starch demand. The annual growth rate in starch demand is given by the formula:

*Demand growth = Population growth + (Income growth) * (Income elast. of demand)*

Thus, for a developing country with a population growth rate of 2 percent, per capita income growth of 2 percent, and where the income elasticity of starch demand is 2.00, the annual rate of growth in starch demand would be 6 percent per year. In the 1980s and early 1990s, many economies in East and Southeast Asia were growing by more than 6 percent per year and starch demand was growing by more than 10 percent per year. Since the Asian financial crisis that began in 1997, economic growth in the region has slowed in most countries (China excepted), reducing the growth in starch demand. Nevertheless, the demand for starch in Asia continues to grow at probably around 5 percent per year or more.

Table 2. Starch demand in Thailand by industry

Industry	Market demand for starch in 1993 ('000 tons)	Income elasticity of demand	R^2
All Uses	604.0	1.010	0.992
All Food Industries	432.5	0.853	0.993
Direct household use	138.8	0.209	0.993
Other food industries	37.9	0.820	0.998
Sago pearl	36.6	0.843	0.977
Sweeteners	91.9	1.216	0.983
MSG & lysine	127.2	1.909	0.987
All Non-Food Industries	171.4	1.509	0.986
Other non-food industries	95.1	1.455	0.987
Textiles	16.2	1.474	0.918
Paper	60.1	1.611	0.986

Estimates are from log-log regression using annual data from 1982-1993.
Source of data: Starch use by industry from Kajonwan Itharattana. Income is measured as real GDP in 1985 international dollars from World Bank.

Economics of Starch Processing in Asia

The industrial organization and technology of starch processing is changing rapidly in Asia. Unlike in industrialized countries where starch is processed almost entirely by large-scale factories, much of Asia's starch processing is done by small and medium-sized firms, or even at the household level. For both large-scale and small-scale processors, the cost of raw material is by far the most significant cost item in starch processing.

Cost structure of starch processing

For both large-scale and small-scale processors, the cost of raw material is by far the most significant cost item in starch processing. Table 3 shows the cost of producing native starch for three large-sized starch mills in Asia. Raw material costs account for 70-80 percent of total production costs in each case after subtracting the value of waste by-products.[3] The Thai cassava starch mill is the least-cost producer of the three. It has lower costs than the Indonesian cassava starch mill because of more efficient use of capital and labor, and it has lower costs than the China sweetpotato starch mill due to the higher starch content of cassava relative to sweetpotato (which reduces raw material cost).

[3] Waste by-products from starch production can often be used as animal feed and other uses.

What the data in Table 3 indicate is that low raw material costs are essential in order to have a competitive starch industry. A ten percent reduction in raw material costs will have 4 to 5 times the impact on competitiveness as a ten percent reduction in capital and labor costs. Lowering raw material costs will require improvements in farm productivity, such as by developing higher starch-yielding crop varieties.

Table 3. Cost of starch production in large-scale factories in Asia

	Thailand cassava starch mill		Indonesia cassava starch mill		China sweetpotato starch mill	
Capacity:	5000 tons/year		8000 tons/year		5000 tons/year	
	US$/ton	%	US $/ton	%	US$/ton	%
Raw material price	35.0		40.0		35.0	
Raw material cost	175.0		200.0		233.0	
Value of waste products	(9.2)		(8.7)		(9.0)	
Raw material net cost	165.8	76%	191.3	70%	224.0	80%
Capital and labor cost	52.0	24%	82.0	30%	56.0	20%
Native starch cost	217.8	100%	273.3	100%	280.0	100%

Figures converted to 1998 US dollars.

Extraction rates

Cassava: 1 ton native starch from 5 tons fresh roots (20% starch extraction rate)

Sweetpotato: 1 ton native starch from 6.67 tons fresh roots (15% starch extraction rate)

Sources: Thailand (Boonjit 1994); Indonesia (Nelson 1984); China (authors' survey 1998).

Choice of technique in starch processing

Starch industries around the world have been undergoing rapid structure change. In industrialized countries, nearly all starch production now occurs in large-scale factories. In many developing countries, however, a significant share of starch production still takes place in small and medium-size mills. Further, it is not uncommon to see small and medium-size mills working together with large-scale mills to provide intermediate processing. An important question is whether there is a future for small and medium-scale processors, or is it only a matter of time before large-scale factories dominate starch production worldwide.

Increasing the size of a starch mill is largely a question of substituting capital for labor. With larger capacity machines, the large starch mill is able to produce much more starch with a given labor force than a small mill. Many operations done manually or that are only partially mechanized in the small mill are wholly automated in the large mill. Here, we use the terms “capital” and “labor” rather loosely. Capital includes not only buildings and machinery, but also the energy to run them and the recurring costs of keeping equipment maintained. Labor includes both skilled and unskilled labor. Other costs, such as insurance and taxes, are ignored for the moment.

The optimal combination of capital and labor, or the optimal choice of technique in starch milling, depends in large part on the relative cost of these inputs. In countries with abundant labor available at low wages, more labor-intensive techniques of production may be more profitable than capital-intensive techniques. As a country develops and labor costs increase, more mechanized methods of production may then become profitable.

The optimal combinations of capital and labor in production are illustrated in Figure 2. In the figure, the amount of labor used in production is given along the horizontal axis and the amount of capital along the vertical axis. The curved line O_1 represents an isoquant, or the combinations of capital and labor required to produce a given unit of output. The straight line AB is an isocost curve for a given set of input prices of capital and labor. AB is shown to be relatively flat, implying that labor wages are low relative to the cost of capital. The optimal combination of labor and capital is given by the tangency of the isoquant and isocost curves, or point X in Figure 2. Point X implies a relatively labor-intensive technique of production is best for this economic environment.

An increase in wages causes the isocost curve to become steeper, such as shown by line CD. Given these input costs, the labor-intensive method at point X is no longer optimal. Costs of producing the same level of output can be reduced by substituting capital for labor and adopting the technique of production indicated by point Y. It is often assumed that the adoption of more capital-intensive production methods will cause total employment in that industry to fall. This may happen, but there is also an output effect from adopting the capital-intensive technique: the reduction in unit costs causes total output of the industry to increase. In the Figure, output rises to the new isoquant O_2 and more capital and labor are employed. The net effect on employment could be positive or negative (it is shown to be slightly negative in the Figure). The main message of Figure 2 is that the larger-scale factory will only enjoy the lowest unit-production costs if labor costs are sufficiently high.

The choice of technique is not only driven by the cost considerations described above. More capital-intensive methods of production may also increase the quality and consistency of the final product. As consumer incomes rise, so does the demand for higher quality products. If small, labor-intensive mills cannot supply the quality of starch needed by users, then they may be replaced by larger mills that can control quality more effectively.

For some commodities, technical factors may favor large-scale starch milling. Maize starch, for example, is relatively difficult to extract and separate from proteins. For root crops like cassava, potato, and sweetpotato, starch extraction is more easily done and can be a suitable enterprise for a household or small-scale enterprise.

Another important factor is storage and transportation costs. For cereal grains like maize and wheat, storage and transportation costs are a relatively small part of total post-harvest costs, but for root crops these costs loom large. Since root crops consist of 60-80 percent water, transport costs of fresh roots from farms to factories are large relative to crop value. Further, the quality of starch in fresh roots may deteriorate rapidly after harvest if not properly conditioned and stored. For these reasons, it is more common in starch processing of root crops to find small starch mills located near farms. Freshly harvested roots are converted into "wet starch" (consisting of 30-40 percent water) in the small mills. Compared with fresh roots or dried chips, wet starch is easier to store in ambient conditions without suffering a deterioration in starch quality. Further, wet starch is cheaper to transport since it has only half the water content of fresh roots. The wet starch can later be dried and processed into native starch.

Industrial structure

The advantages of small mills located close to farms for starch production from root crops has led to forms of industrial organization that may favor the continued involvement of small and medium-sized starch mills until rather late in the development process. In China, it is common to find small and medium-size starch mills working in tandem with large mills. Since transportation and storage costs of fresh roots to the large mill are prohibitively high, the small and medium mills provide intermediate processing functions in order to reduce these costs. The intermediate product (wet starch) is then shipped to the large mill for final processing. During final processing, the starch is purified, dried, packaged and monitored for quality to assure that the needs of the end user are satisfied. The advantages of small and medium-size mills for intermediate processing would seem to be greater in regions where crop production is seasonal. In some tropical areas where year-round crop production is possible, large factories can secure a regular supply of fresh roots and extend the processing season.

The complementary between large and small starch mills can be illustrated by the system of sweetpotato starch production in Shandong Province, China. Shandong produces about 18 mmt of fresh sweetpotato annually, about 40 percent of which is used for starch (Huang 1998). The entire crop is harvested during September-November. In Sushi County, the Lu Xu Group runs a large starch mill with a annual capacity of 30,000 tons of starch, making it one of the largest starch mills in Asia. For 1-2 months following the sweetpotato harvest (October-December), the factory purchases fresh roots from within a radius of about 100 km from the factory for processing into starch and starch products. Afterwards fresh roots are no longer available. Farmers may chip and dry the roots in the field before storage, but the starch quality of dried chips is too low for most processing uses. Instead, the large mill purchases wet starch from small mills that processed fresh roots. These mills may be located several hundred km from the Lu Xu factory, too far to profitably transport fresh roots directly. In nearby Pinying County, the number of small and medium starch mills grew significantly in the 1990s to supply the growing demand for wet starch from the Lu Xu mill or household noodle-making enterprises. While the large factory also produced starch noodles, it targeted supermarkets in large urban centers and export markets. Local, household noodle makers typically sold their products in local markets or to small traders who marketed them in towns and villages.

With complementary functions between large and small-scale starch processors, it is possible that small mills can continue to exist even as labor costs rise relative to the cost of capital. Eventually, labor costs may rise high enough so that small mills lose their advantages. In Japan, the number of sweetpotato starch factories numbered over 1000 until the late 1960s (Komaki 1999). But by 1980, the number of starch producers fell to less than 50 as large mills took over the market. The rapid reduction in the number of mills reflected a point in the development process in which wages rose sufficiently high to offset the advantages of intermediate processing by small firms. Large, capital-intensive methods of transporting, storing, and processing fresh roots into starch became more profitable.

The point at which the sweetpotato starch milling industry in Japan began to undergo significant structural change was when real GDP per capita reached \$4000-\$5000 (measured in 1985 PPP US\$). This is about where Thailand was in the late 1980s and 1990s. Interestingly, the number of cassava starch mills in Thailand increased steadily until the 1980s but began to fall toward the end of the decade as large firms took over the market (Boonjit 1994).

If we extrapolate these trends to the rest of Asia we can draw some conclusions about the future of small and medium-size starch mills. Using the \$4000-\$5000 GDP/capita range as our indicator, we can predict that given current economic growth rates, coastal areas of China will reach this range within 5 to 10 years. At this point the small mills in Shandong Province may no longer be economical. However, interior provinces of China such as Sichuan are probably one or two decades from this level of economic development. In Southeast Asia, Thailand and Malaysia are already at or beyond this stage. Other countries in Southeast Asia are at least a decade or two away from reaching our indicator range. South Asia is probably several decades away. Thus it appears that small and medium scale starch processors of root and tuber crops may continue, and expand, for some time to come.

It should also be noted that the trends noted above for Japan and Thailand occurred in a policy environment that probably favored large mills. It is likely that large factories enjoyed advantages in obtaining financing, technical assistance, and other services. If policies could be designed to “level the playing field” between large and small producers, the latter may be able to remain competitive longer into the development process. One such policy would be an investment in providing technical innovations and advice targeted to the needs of small starch millers. Especially important for small producers is to improve quality and consistency to meet the demands of a wider range of end users.

Conclusions

The rapid expansion of starch utilization in Asia has breathed new life into market demand for tropical root and tuber crops, especially cassava and sweetpotato. While fresh consumption of starchy staples tends to decline as per capita incomes in Asian countries rise, consumption of products that use starch in their manufacture rapidly increases. Tropical root and tuber crops provide a versatile and low-cost raw material for meeting this new market demand from industry.

A comparison of Asian countries shows a close correlation between per capita income and consumption of food and non-food products that utilization starch. Our estimation of an Engle function for industrial demand for starch indicated high income elasticities for starch products. Demand for starch by food and non-food industries in Asia is likely to grow by 5-10 percent per year in low and middle income countries in the region. Over time, demand for starch by non-food industries will tend to grow faster than demand for starch by food industries.

For some products, starch quality is not very important and industries choose the source of raw material of starch based on cost considerations alone. For other products, such as noodles, starch quality is an important factor and starch from some crops (such as sweetpotato) is preferred over starch from other crops (such as corn and cassava). Sweetpotato starch utilization by the noodle industry has grown sharply in China over the past several years. In Southeast Asia, cassava currently provides the lowest cost source of starch in Southeast Asia. Exports of cassava starch to Northeast Asia from Southeast Asia are growing. Agricultural and trade policies also affect utilization and trade in starch.

Due to the bulkiness and perishability of root and tuber crops, initial starch extraction usually takes place at our near the farm in most Asian countries. Crude or wet starch is then sold by farms to small, medium, and large industries for further processing into fine starch and starch-based products. Thus, starch processing from cassava and sweetpotato has created new economic and employment activities for farm and rural households and adds value to these commodities. As incomes rise in the region, we can expect more capital intensive methods of processing to be gradual adopted in these countries.

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