# STATUS AND POTENTIALS OF THE PHILIPPINES CASSAVA INDUSTRY

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## ABSTRACT

Cassava is planted each year in about 120,000 hectares of agricultural land in the Philippines, producing about 1.8 million tonnes of cassava roots. Principal products of the processing industry are food, dried chips and starch. As a traded commodity, however, cassava contributes only about 2% to gross value-adding in agriculture.

The following factors favor the expansion of the industry: a) trends in associated commodities, b) dwindling prime agricultural land, c) expanding demand for cassava products, and d) availability of improved technologies.

As a food crop, demand for cassava is increasing and this trend is expected to continue with the increase in population and improvements in techniques for transforming cassava roots into more stable, convenient and attractive products.

Cassava has gained gradual acceptance as a high-energy component in commercial feed formulations. This is fueled by chronic shortages and the resulting high price of domestically produced maize. In specific locations, farmers now recognize that intercropping cassava with maize and given optimum care, this cropping system is economically comparable to two maize monocrops, and provides a more reliable income.

The outlook for the cassava starch industry in the Philippines is rather bleak. Trade liberalization and the absence of real government assistance in improving productivity and efficiency are threatening the survival of this sector. The agricultural modernization program, which is supposed to cushion the impact of trade liberalization, virtually has had no funding during the first two years from its passage, and until now has not produced anything of practical significance.

With the negative outlook for the Philippine sugar industry, cassava emerged as the most viable alternative source of raw material for production of alcohol for liquor. San Miguel Corporation has been investing heavily on plant construction and supply base development since 1995. The greatest challenge in the future will be to put in place a system that results in an adequate and stable year-round supply of cassava for the distillery.

Strengthening the cassava industry in the Philippines requires strengthening the linkage between production and markets accompanied by improved access to credit, supportive government policies and appropriate technical support.


## INTRODUCTION

The cassava industry in the Philippines is relatively small compared to that of Thailand, Indonesia and Vietnam. The industry is composed of three sectors representing the main uses of cassava in the Philippines, namely, food, dried chips for feed, and starch. Though most of the cassava in the Philippines is used for food, its use for starch processing appears to be the most important in the industry, as much of the commercial production and trading are associated with this sector. Dried cassava chips for the feed sector is new, small and more localized compared to the other sectors.

The insignificance of the cassava industry in the Philippines is not surprising, as the crop itself is accorded only minimal development support by the government. Agricultural programs in the Philippines have for decades been focused primarily on rice and maize. The development of the cassava industry has primarily been private sector-led. Even

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though the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD) has continually, for more than two decades, supported research on root crops, the support for technology transfer has been very limited. Many of the developed technologies have not yet reached their intended beneficiaries.

In spite of the lack of development support, cassava is among the top ten crops in terms of producing carbohydrate per unit area per unit time. Broad adaptability of the crop makes it an important component in cropping systems in newly opened forest areas and in farms with highly degraded soils.

The crop has a strong economic relationship with resource-constrained farmers situated in forest margins and marginal lands. Hence, any development in cassava will have an implication on food security, poverty alleviation, and on the protection and utilization of marginal lands in the Philippines that at present contribute very little to agriculture.

Some developments appear to favor the expansion of the cassava industry of the Philippines. These include:

1. Trends in associated commodities
    - Maize production has always lagged behind the growth of the livestock industry.
    - Maize production will be short of demand by at least 1 million tonnes each year.
    - The outlook of the domestic sugar industry is unstable.
    - Areas devoted to rice are decreasing and there is slow improvement in irrigation facilities.
2. Dwindling access to prime agricultural areas
    - Annually around 8,000 ha of agricultural land are converted to other uses.
    - Agriculture will increasingly be pushed to less favorable areas.
    - Crops tolerant to adverse agro-climatic conditions will become more important.
3. Expanding markets
    - Resistance to use of cassava as a replacement of maize has weakened.
    - Prospects for investments in other uses of cassava have improved.
4. Improved technologies
    - A pool of technologies and information for pushing cassava productivity higher is available.

## PRESENT STATUS

### Production

Cassava is the most widely grown of the root crops in the Philippines. The area planted to cassava expanded rapidly during the 1970s, but has remained fairly constant during the 1980s and 90s (**Figure 1)**. Production and yield reached a peak in 1978, after which both declined in the early 80s and stabilized in the 1990s. Presently, about 210,000 to 225,000 ha are planted to cassava annually (**Table 1**). The average volume of production during the past ten years is close to 2.0 million tonnes. Of this volume, it is estimated that 75% is utilized for food, 20% for starch processing and 5% for feed (estimates based on data about starch production and trade of dried chips).

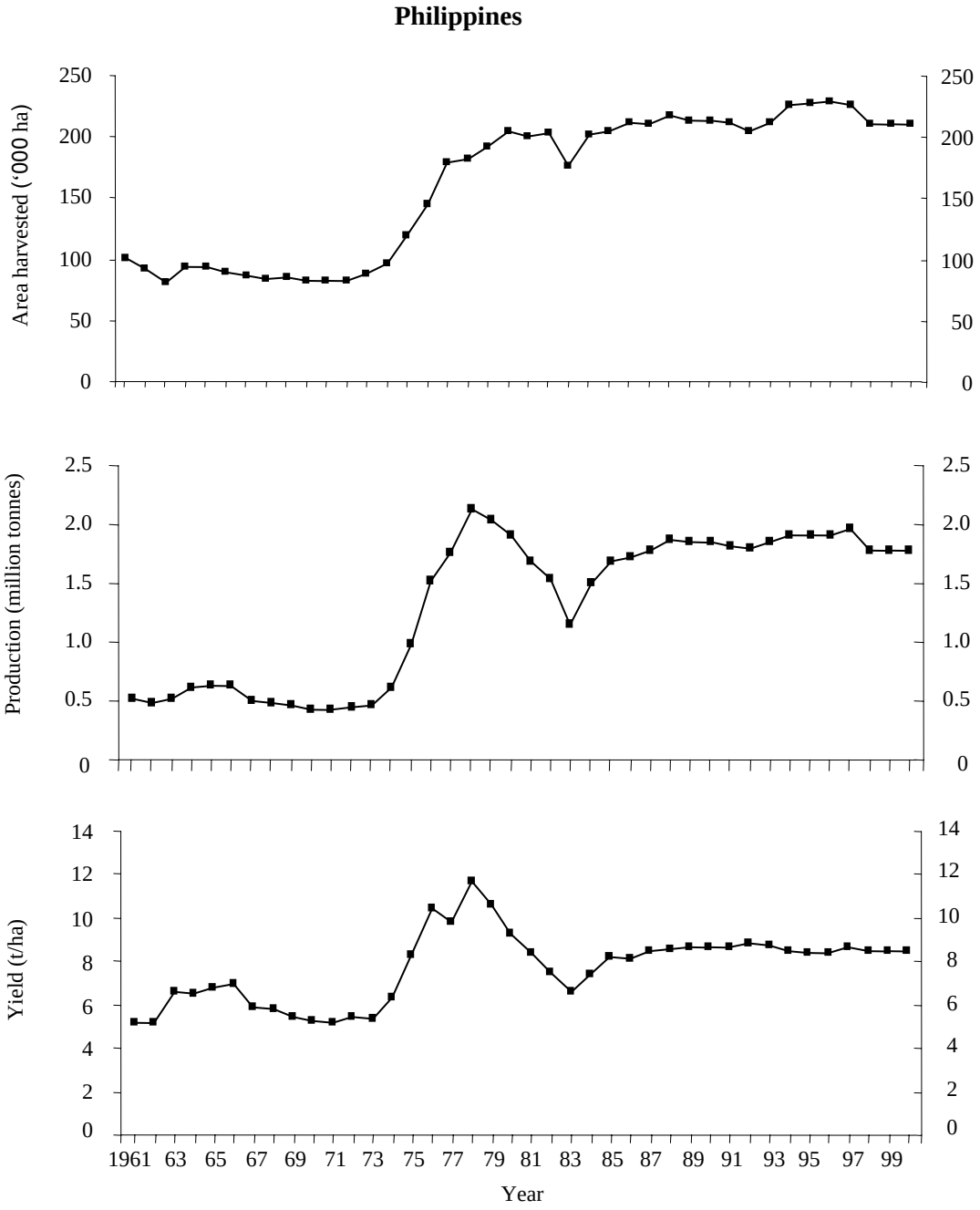


*Figure 1. Trend in cassava harvested area, production and yield in the Philippines from 1961 to 2000.*
***Source:*** *FAOSTAT, 2001*

**Table 1. Area and production of cassava in the Philippines (1990-1999).**

| Year | Area planted (ha) | Production ('000 t) | Yield (t/ha) |
|---|---|---|---|
| 1990 | 213,653 | 1,853 | 8.67 |
| 1991 | 210,908 | 1,815 | 8.61 |
| 1992 | 204,175 | 1,784 | 8.74 |
| 1993 | 211,263 | 1,843 | 8.37 |
| 1994 | 212,877 | 1,890 | 8.88 |
| 1995 | 225,751 | 1,906 | 8.44 |
| 1996 | 228,343 | 1,911 | 8.37 |
| 1997 | 230,522 | 1,958 | 8.49 |
| 1998 | 215,263 | 1,734 | 8.05 |
| 1999 | 221,618 | 1,794 | 8.09 |

***Source:*** *Bureau of Agric. Statistics (BAS), 2000.*

Although cassava is grown extensively in the Philippines, it is mostly grown in small patches for subsistence. There are, however, areas in the country where cassava is grown as a cash crop and on a commercial scale. These areas include Bukidnon, Lanao del Sur and Negros Occidental. **Table 2** shows that the principal cassava growing areas are located in Mindanao, which accounts for 59% of the area and 71% of production in the Philippines; of this, the Autonomous Region of Muslim Mindanao (ARMM), which comprises Lanao del Sur, Maguidanao, Sulu and Tawi-Tawi provinces, is by far the most important region. **Table 2** also shows that during the past ten years cassava production has shifted from Bicol and the Visayas towards the Mindanao region, especially to Western Mindanao and ARMM.

Cassava is generally grown with minimal inputs and care, and this is reflected in the low national average yield of about 8.0 t/ha – one of the lowest yields in southeast Asia. However, in areas where cassava is grown for starch and dried chips, the average yield is about 20 t/ha. The improvement in yield is mainly due to adoption of high-yielding varieties and slightly better cultural practices.

**Cassava for Food**

As in most Asian countries, rice is the principal and preferred food in the Philippines. In some islands in the Visayas and Mindanao, where narrow coastal plains provide little opportunity to grow cereals, people largely subsist on root crops including cassava. Cassava figures largely in the diet of the Muslim population in Lanao del Sur, Lanao del Norte and Cotabato. Highest per capita consumption of cassava in the Philippines is in the islands situated in the Sulu Archipelago (south of Mindanao) where cassava is the staple food.

**Table 2. Cassava area, production and yield in the various regions of the Philippines in 1990 and 1999.**

| Region | Area (ha) | | Production ('000 t) | | Yield (t/ha) | |
|---|---|---|---|---|---|---|
| | 1990 | 1999 | 1990 | 1999 | 1990 | 1999 |
| **Philippines** | **213,653** | **221,618** | **1,853.38** | **1,793.59** | **8.67** | **8.09** |
| 1. CAR | 276 | 134 | 2.36 | 1.92 | 8.56 | 14.33 |
| 2. Ilocos Region | 1,806 | 1,944 | 10.73 | 13.95 | 5.94 | 7.18 |
| 3. Cagayan Valley | 436 | 2,268 | 1.42 | 17.90 | 3.26 | 7.89 |
| 4. Central Luzon | 1,247 | 1,027 | 7.99 | 7.65 | 6.41 | 7.45 |
| 5. Southern Tagolog | 10,241 | 11,031 | 63.04 | 66.64 | 6.16 | 6.04 |
| 6. Bicol | 32,113 | 30,548 | 263.03 | 189.73 | 8.19 | 6.21 |
| 7. Western Visayas | 9,895 | 6,048 | 50.77 | 50.82 | 5.13 | 8.40 |
| 8. Central Visayas | 20,405 | 16,322 | 167.46 | 115.14 | 8.21 | 7.05 |
| 9. Eastern Visayas | 26,839 | 22,146 | 97.88 | 59.46 | 3.65 | 2.68 |
| 10. Western Mindanao | 22,308 | 24,339 | 218.80 | 235.98 | 9.81 | 9.69 |
| 11. Northern Mindanao | 9,499 | 8,053 | 92.20 | 81.68 | 9.71 | 10.14 |
| 12. Southern Mindanao | 3,874 | 2,292 | 33.17 | 15.71 | 8.56 | 6.85 |
| 13. Central Mindanao | 1,856 | 1,115 | 13.19 | 7.86 | 7.11 | 7.05 |
| 14. Caraga | 9,855 | 5,545 | 38.18 | 38.66 | 3.87 | 6.97 |
| 15 ARMM | 63,003 | 88,806 | 793.18 | 890.47 | 12.59 | 10.03 |

***Source:*** *Bureau of Agric. Statistics (BAS), 2000.*

In many rural communities, root crops are eaten or sold as boiled roots and processed products such as fried chips, cakes and sweet porridge. Shoots of cassava are also a favorite vegetable among Filipino Muslims.

Some new products from cassava, such as choco-roll, piloted by the Philippine Root Crops Research and Training Center (PhilRootcrops), are successfully getting into the markets. Increased demand and consumption of root crops in transformed forms have been demonstrated in these pilot projects. However, much has still to be learnt in pushing these products to the market. Noticeable increases in the use of cassava in both urban and rural areas have been processing into cassava cakes and *cutsinta*. Both are local preparations that have gained wide acceptance and a good market, and commercialization of these two products is evident in both rural and urban areas.

**Cassava for Animal Feed**

The dried cassava chips sector of the industry is relatively young and small. The sector is centered in the northern corridor of Mindanao. This includes the provinces of Misamis Occidental, part of Zamboanga del Norte, Misamis Oriental and Bukidnon.

The developments of cassava and maize in these areas are highly interrelated. Farmers' decision to grow maize or cassava is influenced by the relative prices of maize grain and cassava chips. When the buying price of maize is high, it is easier to sell cassava chips/meal to the feed miller, but it will be difficult to convince farmers to grow cassava instead of maize. Conversely, when the price of maize is low, it is difficult to trade cassava

chips/meal, but more farmers will shift from planting maize to planting cassava. Clearly, any discussion on the status and potential of cassava for feeds will invariably include a presentation on the status of maize in the Philippines.

***1. Status of maize in the Philippines***

Total maize utilization in the Philippines has been increasing from 1980 to 1996. Contributing mainly to the trend is the continuous increase in the volume of maize used for animal feeds, resulting from increased demand from the livestock sectors (**Figures 2** and **3**). The pig sector grew by about 2.5% and the broiler sector expanded by about 6% per year from 1990 to 1997. Such growth has not been matched by the domestic maize sector through area expansion and/or yield improvement. Ironically, the maize area in the Philippines has declined since 1991 by about 2.7 million hectares. Overall productivity of maize in the Philippines has improved and is still improving. Total maize production generally increased from 1980 to 1990 but declined slightly from 1991 to 1996. This decline is attributed mainly to the shifting of areas under maize to other crops.

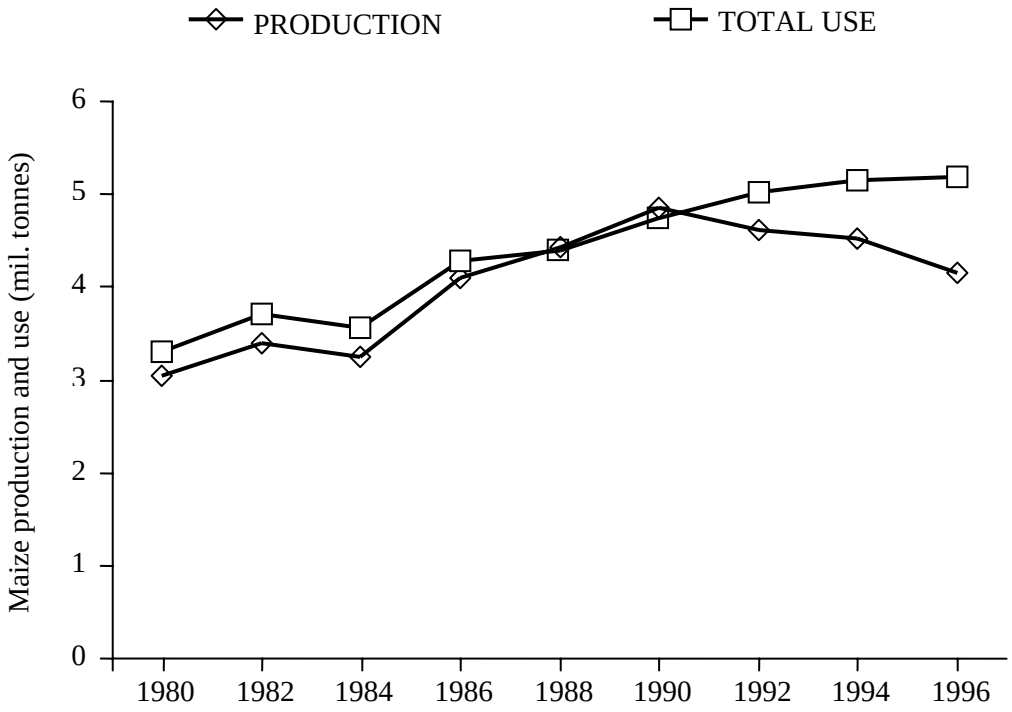


*Figure 2. Maize: production and use estimates in the Philippines, 1980-1996.*
***Source:*** *Bureau of Agric. Statistics (BAS), 1997.*

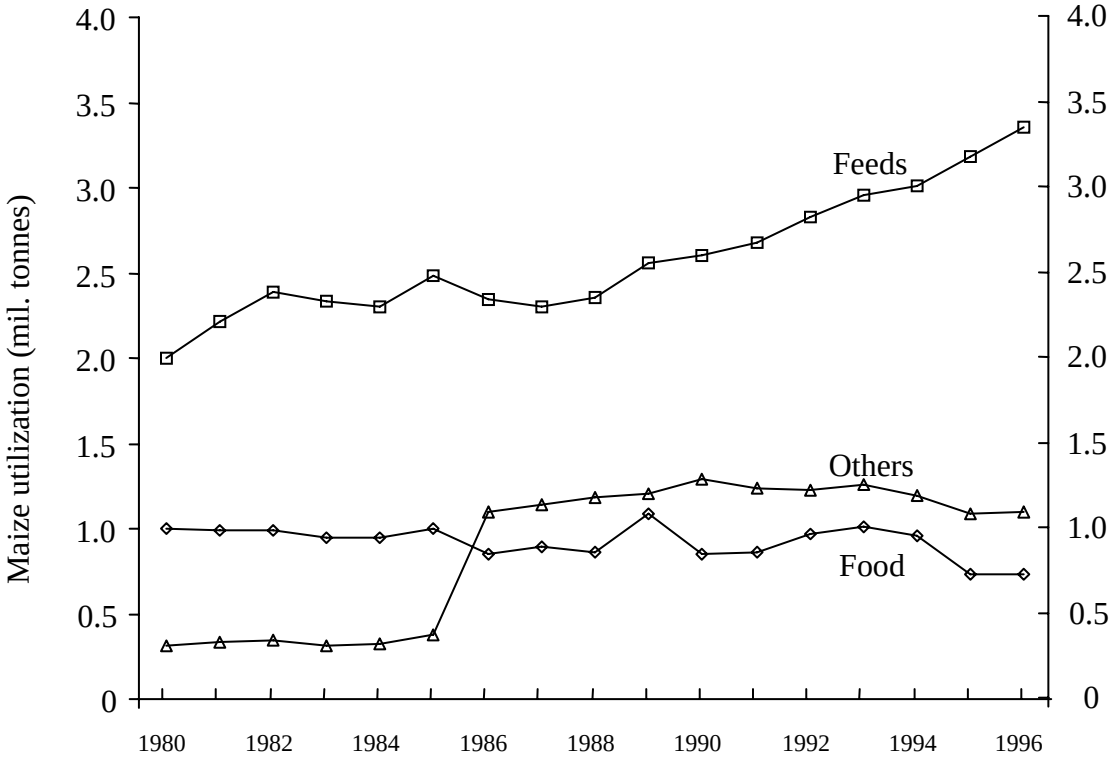


*Figure 3. Use estimates of maize in the Philippines, 1980-1996.*
***Source:** Bureau of Agric. Statistics (BAS), 1997.*

The volume of maize used for various feeds accounts for about 61% of total production, food for 30% and other uses 9% (**Figure 4**). The maize deficit has widened in 1996 to 1.03 million tonnes, and since then has not dropped below one million tonnes per year. This supply shortfall is further aggravated by climatic factors. In 1998, the production of maize decreased from 4.33 to 3.70 million tonnes, resulting in a shortfall of 1.70 million tonnes. These supply shortfalls for years have been solved largely through importation of maize, and to some extent through the use of other more available feed ingredients including dried cassava chips.

***2. Cassava dried chips production and trading***

Trading of dried cassava chips in the Philippines was non-existent in the 1980s even when dried cassava chips had become a major export commodity for Thailand and Indonesia. After a long drought at the end of the 1980s, and a favorable export price, together with an unfilled common quota of GATT member countries, three companies (Capicor, Guani Marketing and San Miguel Corporation) started campaigning for the massive planting of cassava in northern Mindanao, by buying and exporting dried cassava

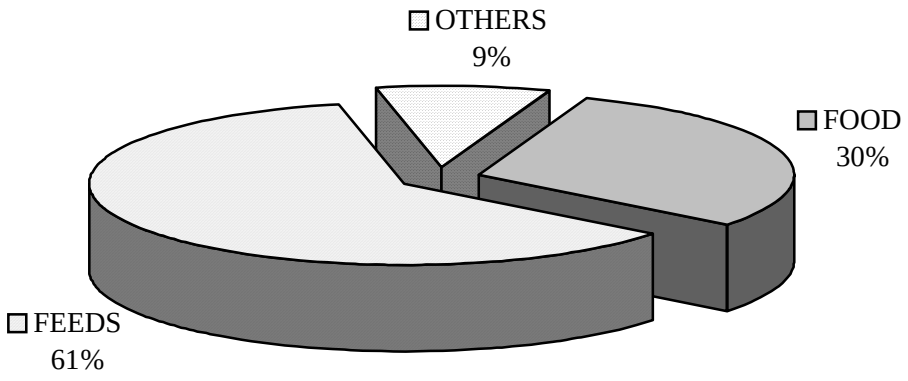


*Figure 4. Average relative shares of maize utilization in the Philippines, 1980-1996.*
***Source:*** *Bureau of Agric. Statistics (BAS), 1997.*

chips. A subsequent drop in export price caused widespread losses to growers, and the virtual death of a budding trade. Widespread cassava planting in the area was restored only recently in connection with a supply base development by San Miguel Corporation (SMC) and its subsidiary for feeds and alcohol.

In the 1980s, PhilRootcrops campaigned for the use of cassava meal in feed formulations, especially for pigs, as data from PhilRootcrops have indicated comparable weight gains of animals even with a complete shift from maize to cassava as the energy source. The effort gained lukewarm response. Problems in quality of chips and reliability of supply were raised by feed millers and were overemphasized. In the past three years, however, resistance to the use of cassava in feeds has gradually declined, and some major commercial feed brands in the country are now using cassava meal though at a lower proportion to maize than recommended. **Table 3** shows an increase in the volume of cassava dried chips traded in the Mindanao northern corridor area since 1990. The sharp increase in the volume of dried chips in 1992 and 1993 was due to a long drought in 1989 and 1990 as well as a favorable export market. The 1997-1999 surge in dried chips volume has more significant implication as these chips were utilized locally for feeds. This gradual acceptance of cassava in feed formulation can be explained by the widening deficit in yellow maize since 1991, as is shown in **Figure 2**. It is estimated that on the average 40,000 tonnes of dried cassava chips are traded annually for domestic feed formulations. This does not take into account cassava roots used as feed for on-farm livestock feeding. Although small compared to the traded volumes in the main cassava-producing countries in

Asia, the trend already represents a significant improvement over the situation in the 1980s in the Philippines.

**Table 3. Estimated area of cassava harvested for dried cassava chips in the northern Mindanao corridor in the Philippines, and the volume of cassava chips traded from 1990 to 1999.**

| Year | Area harvested ('000 ha) | Traded volume ('000 tonnes) |
|---|---|---|
| 1990 | 0.50 | 8.5 |
| 1991 | 0.80 | 17.5 |
| 1992 | 3.00 | 30.5 |
| 1993 | 8.00 | 60.8 |
| 1994 | 0.50 | 4.4 |
| 1995 | 0.40 | 3.0 |
| 1996 | 0.50 | 3.8 |
| 1997 | 3.00 | 16.0 |
| 1998 | 2.00 | 14.0 |
| 1999 | 3.00 | 25.0 |

***Source:*** *J.L. Bacusmo (unpublished data).*

The use of cassava in feeds has been a clearly growing sector of the cassava industry in the Philippines. In the absence of policies that overly favor the development of cereals, cassava has shown that it is competitive with domestic maize in terms of returns and reliability of harvest. One problem with cassava is its long cropping duration. Cash-strapped growers have difficulties in sustaining their families between planting and harvest of cassava. Maize and some other crops have the advantage of being short duration crops; hence, cash flow is better. One cropping system that addresses this and is now widely practiced in Bukidnon and Misamis Oriental is the intercropping of maize with cassava. Briefly, the system involves planting maize first and then planting cassava 20 to 30 days later between the rows of maize or between every other maize row. Maize is harvested four months later, while cassava is harvested 10-12 months after planting. This practice not only offers better cash flow and returns (over cassava monocrop) to farmer (**Table 4**), it also cuts down significantly the risk of failure in cropping maize (due to pests and diseases) in the second cropping season.

**Table 4. Comparative expenses and income per hectare of maize, cassava and maize-cassava intercropping**.

| | Cassava | Maize | Maize-cassava intercropping |
|---|---|---|---|
| Production costs (Philpesos/ha) | | | |
| Land preparation | 3,225 | 3,225 | 3,225 |
| Planting materials | 1,000 | 1,400 | 2,600 |
| Fertilizer/Chemicals | 2,150 | 4,000 | 5,100 |
| Labor | | | |
| -Planting | 750 | 400 | 900 |
| -Fert./chem. application | 200 | 700 | 700 |
| -Weeding | 1,500 | 1,500 | 3,000 |
| -Cultivation | 650 | 800 | 800 |
| -Harvesting | 3,000 | 1,800 | 4,500 |
| -Chipping | 2,500 | - | 2,225 |
| -Shelling and drying | - | 4,000 | 3,600 |
| -Drying (chips) | 2,000 | - | 1,780 |
| -Handling | 2,000 | 1,200 | 2,880 |
| -Sacks | 800 | 800 | 800 |
| Total | 19,775 | 19,825 | 32,110 |
| Production (tonnes) | | | |
| Maize grains | - | 4.5 | 4.0 |
| Cassava chips | 10.0 | - | 8.0 |
| Selling price (per tonne) | 2,500 | 6,000 | 6,000/2,500 |
| Gross income (P/ha) | 25,000 | 27,000 | 44,000 |
| Net Income (P/ha) | 5,225 | 7,175 x 2 =14,350 | 11,890 |

***Source:*** *Bacusmo, 1999.*

### *3. Problems*

*3.1 Lack of efficient mechanical dryers for cassava chips*

This is the most important constraint in the expansion and quality improvement of dried cassava chips in the Philippines. Drying is critical as this has implications on quality and stability of the product. Fresh cassava roots contain roughly 65% water. Removing this will require a high amount of energy and time as drying at high temperatures causes gelatinization and subsequent "locking" of moisture in the chips. The problem therefore

goes beyond simple drying, but encompasses drying the chips at an acceptable cost. The San Miguel Corporation has commissioned a number of dryer fabricators and engineers to provide mechanical dryers that can dry cassava at a drying cost of US $ 8/tonne of fresh chips. The average cost attained from various dryer designs was US $ 3/tonne of fresh chips. The lowest drying cost attained from various drying designs was US $ 20/tonne – roughly twice the acceptable drying cost.

*3.2 Maize importation*

The propensity to import maize as the immediate solution, instead of encouraging use of other domestic feed ingredients, contributes to difficulties in promoting a locally produced alternative to maize as a feed ingredient. Ironically, from 1996 to 1998, the Philippines imported not only maize but also 20,000 to 30,000 tonnes of cassava chips. Minimum Access Volume for maize (import volume slapped with a lower tariff) is determined without considering other locally available feed ingredients such as cassava chips. This does not bode well in developing domestic self-sufficiency in feed ingredients for the growing livestock industry.

*3.3 Limited access to credit and rampant "pole-vaulting"*

Many growers complain that they cannot grow cassava profitably because they do not have cash reserves (that can be tied up for 8-10 months) for the purchase of necessary inputs for the adoption of recommended agronomic practices for cassava. This makes the constraint to higher productivity a socio-economic rather than a technical problem. Credit or production support for cassava would enable farmers to improve their management practices in growing cassava and hence increase production per unit area. However, cassava is not usually included in the list of crops that banks are willing to support. Among the reasons for this is a track record of irresponsible application of production loans and the rampant practice of "pole-vaulting" by cassava growers. "Pole-vaulting" refers to the practice of evading payment of production loans by selling the cassava produce to buyers other than the one agreed upon by both growers and the bank. The buyer appointed by the bank is supposed to collect payments for production loans from the proceeds of sales of the delivered produce.

**Cassava for Starch**

Cassava is the primary raw material for the manufacture of starch in the Philippines. Due to its higher availability, most food manufacturers favor the use of maize starch; hence, about 70% of starch consumption in the Philippines is that of maize starch.

In 1997, there were ten cassava starch mills operating in the country (**Figure 5**) with a combined annual capacity of 200,000 tonnes of starch. Except for two mills in the Visayas, cassava starch mills are concentrated in Mindanao. Demand for starch tends to follow the trend of the country's economy. The economic upturn in the middle of the 1990s increased the use of starch for food, plywood, packaging products and textiles. Use of root crops in the manufacture of starch is projected to remain fairly high with improvement in the economy.

CASSAVA STARCH MILLS IN THE PHILIPPINES

1. Universal Starch Industrial Corporation, Kabankalan, Negros Occidental
2. Philippine Starch Industrial Corporation, Carmen, Bohol
3. Phil-Agro Industrial Corporation, Baungon, Bukidnon
4. Aznar Agro Industrial Corporation, Baungon, Bukidnon
5. Matling Industrial and Commercial Corporation, Malabang, Lanao del Sur
6. Lobregat Family Milling Corporation, Balabagan, Lanao del Sur
7. Purakan Plantation, Inc., Malabang, Lanao del Sur
8. ITIL Plantation Inc., Balabagan, Lanao del Sur
9. Philippine Trade Center, Cotabato City
10. Pacific Starch Corporation, Midsayap, North Cotabato

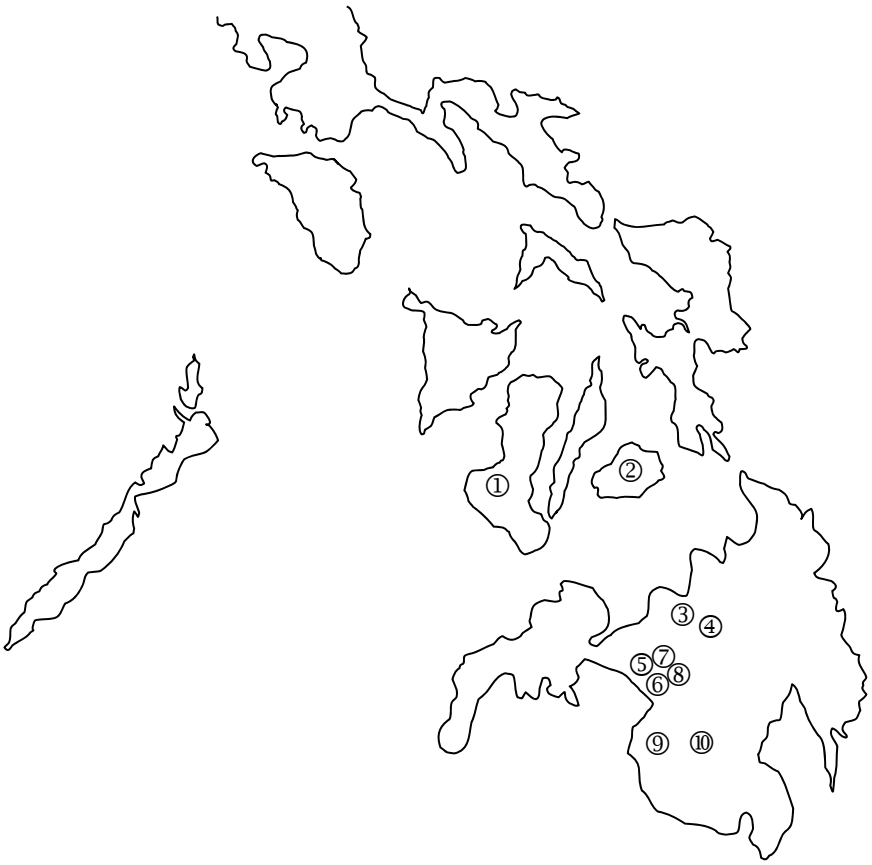


*Figure 5. Distribution of cassava starch factories in the Philippines in 1997.*

***1. Problems***

Starch manufacturing in the country is beset with structural, infrastructure and socio-economic problems that include:

*1.1 Trade Liberalization and Philippine cassava starch milling*

The biggest problem faced now by cassava starch mills in the Philippines is the accelerated reduction of import duties for cassava starch. Philippines being a member of the ASEAN and committed to AFTA is reducing tariffs for cassava products at an average rate of 5% per year. This situation has caused a deluge of imported cassava starch in recent years, and has led to the closure of two starch mills. **Table 5** shows the tariff rate, domestic production and import volume of cassava since 1993. Clearly, the volume of cassava imports increased significantly when the tariff went below the 30% level. Most of these imports come from Thailand, Indonesia and Vietnam, and are declared under Tariff Heading No. 3809.91.00; hence, they fall under the classification of Industrial Starch with only 3% duty.

**Table 5. Tariff rates, import volume and production of cassava starch in the Philippines (1993-2000).**

| Year | Rate of duty (%) | Import volume (in 50-kg bags) | Domestic production (in 50-kg bags) |
|---|---|---|---|
| 1993 | 40 | 2,470 | 978,802 |
| 1994 | 35 | 370 | 916,445 |
| 1995 | 30 | 15,102 | 606,950 |
| 1996 | 25 | 16,834 | 574,292 |
| 1997 | 20 | not available | 437,500 |
| 1998 | 20 | not available | 409,868 |
| 1999 | 15 | 520,000 | 1,232,500 |
| 2000 | 10 | not available | not available |

***Source:*** *Cassava Growers and Millers Association, 1999. (personal communication)*

*1.2 Old and inefficient machinery*

Most of the mills have not kept up with technological change. A few plants are hardly fit for operation, having pre-war components resulting in low processing capacity and high production costs.

*1.3 Security problem*

Most of the mills are situated in the Lanao del Sur area where insecurity is a serious problem. To ensure continuity of operation, mills in this area commit high expenses to security.

## THE FUTURE

### Cassava for Food, Feed and Starch

Cassava will play a more important role in the diet of more Filipinos in the future in the light of an increasing population and the dwindling availability of agricultural land. Although a large proportion of the daily caloric requirement of the Filipinos still comes from rice, it is doubtful whether the existing rice fields in the Philippines can provide the necessary production. In spite of this clear gap between demand and production, it is unlikely that there will be a significant shift in the choice of the food staple. Rice will still be the preferred staple and future deficits will be addressed through inter-regional trade. In terms of proportion to total production, the use of cassava for food by Filipinos may decline with increased access to a variety of foods in more convenient forms – easy to prepare and to preserve. Increased attention should therefore be given towards transforming cassava into more elaborate and convenient forms, and to extend the shelf life of fresh roots in order for cassava to remain a major food source in a growing economy characterized by rapid urbanization.

Starch use will continue to increase. Innovations on properties and uses of starch should increase future demand. Potential use of starch for the production of high fructose sugar and other sweeteners is not too far-fetched, considering the unstable outlook of the sugar industry in the Philippines. This, however, is by no means a guarantee to the survival of the domestic cassava starch sector. Most of the starch requirements in the country can be filled by use of other starches. Zero tariffs coupled with high transport cost from the south to Manila, not to mention other problems that beset the cassava starch sector, is enough to confer better competitiveness of imported starch over that of locally produced cassava starch. Will this domestic starch-manufacturing sector be able to attain competitiveness before it totally collapses?

Use of dried cassava chips is expected to continue growing. Maize production is not expected to improve significantly in the next five years. The irrigation program of the government is at a virtual standstill, and farmers are abandoning the growing of maize. Crop failure due to pests and diseases coupled with large losses due to inadequate postharvest facilities are simply too much for the maize growers. Moreover, after long periods of drought, many farmers shift to growing cassava as money intended for growing maize may have been spent to tide the family over the long drought. Drought followed by heavy rains (La Niña) also means higher pest and disease pressure for maize, thus pushing the farmers to grow other crops such as cassava.

### Cassava for Alcohol

Fervent expectations for growth in the cassava industry of the Philippines are anchored on the successful development of cassava as an alternative raw material of liquor alcohol production. With the unstable production of sugar in the Philippines, SMC has turned to cassava as an alternative raw material for alcohol. The company decided to install an additional distillation column that can take cassava or molasses as raw materials. The objective is to supply 25% of the total alcohol requirement of its subsidiary La Tondeña Distillers Inc. from cassava. Annual requirements of this plant are 180,000 tonnes of dried cassava chips, which would roughly need 25,000 ha of cassava to produce. This entails big investment for infrastructure and supply base development, but will partly shield and

prepare the company from the negative impact that may develop from the unstable sugar industry, hence unstable molasses supply.

***1. Status of Philippine Sugar/Molasses***

The Philippines used to be one of the biggest sugar-producing countries and the top exporter of sugar in Asia in the 1950s and 1960s. Though still considered among the main Asian sugar producers, the Philippines has become a net importer of sugar (**Table 6**). Recent data indicate that the Philippine production is already below domestic consumption, and the years of high levels of protection, control and encouraging sugarcane growing under unsuitable agro-climatic conditions have made the industry inefficient. The industry is surviving mainly from a "distorted" domestic price and access to the U.S. market as a tariff-free export. Under freer trade, however, it is unlikely that the Philippines will be able to compete with Thailand, India and Australia, nor the low-cost cane sugar industries in Latin America and Africa.

It is most likely that benefits from high domestic price and preferential access to the U.S. for sugar accrue largely to traders while benefits to producers are limited. Many growers in the Philippines suffered losses, and many have given up growing sugarcane in the latter part of the 1990s.

**Table 6. Asian sugar economy balances (tonnes raw sugar) in 1999.**

| | Production | Imports | Exports | Consumption |
|---|---|---|---|---|
| Net exporters | | | | |
| India | 15.8 | 0.3 | 0.5 | 15.7 |
| Thailand | 5.5 | 0.0 | 3.7 | 1.6 |
| Net importers | | | | |
| China | 7.7 | 1.1 | 0.6 | 8.4 |
| Pakistan | 3.0 | 0.3 | 0.2 | 3.1 |
| Indonesia | 2.1 | 1.0 | 0.0 | 3.1 |
| Japan | 0.8 | 1.6 | 0.0 | 2.4 |
| ***Philippines*** | ***1.8*** | ***0.4*** | ***0.2*** | ***1.9*** |
| Malaysia | 0.1 | 1.2 | 0.1 | 1.1 |
| South Korea | 0.0 | 1.4 | 0.3 | 0.9 |

***Source:*** *USDA, May 1999 Sugar Market Report (cited in Young et al., 1999).*

***2. Why cassava as an alternative to molasses?***

Any sugar or starch-containing crop can be processed into alcohol. Hence, in the case of an inadequate supply of molasses, many crops can be used as alternative raw materials for alcohol. The decision of SMC in the Philippines to develop cassava as the alternative raw material for alcohol production has several considerations. Cassava is cheap and available locally. There are reasons to believe that the productivity of cassava

can still be improved significantly. Moreover, the supply of cassava complements well the annual supply trend of molasses in the Philippines.

In terms of alcohol yield, a tonne of dried cassava chips can give 420-460 liters of alcohol. This compares well with local molasses that produce 280-295 liters of alcohol per tonne (**Table 7**), and especially with imported molasses, which have less sugar content due to improved efficiencies in sugar extraction by sugar mills in other countries. Cassava, however, requires additional steps in processing, and has to be converted into a stable form (dried chips) to attain flexibility in scheduling of use.

**Table 7. Parity price of molasses and dried cassava chips at various levels of alcohol cost.**

| Price of molasses (in pesos/tonne) | Equivalent alcohol cost (in pesos/liter) | Dried cassava chip buying price (in pesos/tonne) |
|---|---|---|
| 1,475 | 5.00 | 1,365 |
| 1,549 | 5.25 | 1,470 |
| 1,622 | 5.50 | 1,575 |
| 1,696 | 5.75 | 1,680 |
| 1,770 | 6.00 | 1,785 |
| 1,844 | 6.25 | 1,890 |
| 1,918 | 6.50 | 1,995 |
| 1,991 | 6.75 | 2,100 |
| 2,065 | 7.00 | 2,205 |
| 2,139 | 7.25 | 2,310 |
| 2,212 | 7.50 | 2,415 |
| 2,286 | 7.75 | 2,520 |
| 2,360 | 8.00 | 2,625 |

*Assumptions:*

| | |
|---|---|
| Alcohol yield from molasses | 295 l/t |
| Alcohol yield from dried cassava chips | 420 l/t |
| Additional processing costs using chips | 1.75 pesos/l |

***Source:*** *J.L. Bacusmo (based on SMC estimates).*

***3. Development of a supply base***

Developing cassava for alcohol production requires the development of a supply base. It was determined that the most flexible format of using cassava as a raw material is in the form of dried chips. The distillery is understandably strategically located near sugarcane farms and mills, but far from the cassava production base. Drying cassava chips will stabilize the produce and allow warehousing, thus gaining flexibility in schedule of use.

In 1996, supply base development for this purpose was initiated in Mindanao. About 5,000 ha of new cassava plantings were developed through a contract growing scheme. By 1997, however, the construction of the new distillation column that can take cassava chips as raw material was not completed. Production from these plantings went to produce animal feeds in 1997 and 1998. Subsequently, the price went down to as low as 1.50 pesos/kg (US $ 0.04/kg).

A number of problems and restrictions surfaced from the experience. Variety choice for example was limited to varieties with low HCN content. Technically, it does not matter since HCN can be removed during processing, but in the beverage business market perception is important and must be protected. On the production side, inadequate supply and the slow multiplication rate of planting materials hindered area expansion, while, on the primary processing side, drying remains the main problem.

***4. System development: the main challenge***

Developing a functional system of providing the distillery with cassava at a competitive price of an acceptable quality and reliably at the time when needed is the component that should firmly establish cassava as a viable alternative to molasses in the Philippines. Product format (dried chips) and the constraint in drying make cassava supply highly seasonal, hence, threatening reliability and requiring high warehousing and inventory costs. Supply-base sites and product format are being reconsidered to attain the basic features the system must have. Among the considerations is the culture of prospective growers. Sugarcane growers, for example, are not burdened with the processing of sugarcane. They simply deliver their sugarcane to the mill and the rest is a well-established system of sugar extraction, warehousing, trading and payment without the growers' participation. If the objective is to convince these growers (sugarcane growers in less favorable farms) to shift from sugarcane to cassava, decentralized chipping may be a bad approach.

**Cassava Research Challenges**

To exploit the full potential of cassava, the development framework should include moving cassava to more favorable environments. However, pressure for land will eventually push cassava and other crops into the more fragile ecosystems. In the Philippines, the area covered with natural grasslands (usually highly acidic uplands) is now estimated to be around 10.0 million ha, or equivalent to a third of the agricultural land in the country. This is the most likely area where cassava will be growing in the future. The challenge of research in the next decade is to develop cassava varieties that are adapted/tolerant to highly acidic and infertile uplands, and to develop a package of recommended practices for cassava in this fragile ecosystem that results in high productivity while maintaining soil productivity.

Another important challenge is the development of efficient mechanical dryers for cassava. Research towards developing new products from starch is also important as this will open up new markets.

## CONCLUSIONS

1. Improving the cassava industry of the Philippines requires expansion of market opportunities, efficiency in production and processing, adequate support services and favorable government policies.
2. The cassava industry of the Philippines is at a crucial point. The starch sector of the industry is adversely affected by trade liberalization and could totally collapse in the absence of supportive government policies and programs directed towards enhancing efficiency and solving social and structural problems that beset the sector.
3. Increased use of cassava for feeds is expected to continue. Strong advocacy specifically on tariff rates and importation procedures for maize and other feedstuffs is necessary to sustain and enhance the increased acceptance and use of cassava for feeds.
4. The Philippine cassava industry can grow significantly if the attempt by SMC to use cassava as an alternative raw material for liquor alcohol production proves viable. This hinges on putting in place a system that will sufficiently meet the requirements of price, quality and reliability of supply of the raw material.
5. Pressure on land will increasingly push cassava into more fragile ecosystems. Attaining high productivity from cassava under such an environment is difficult considering that resources to support yield increases are limited. The most important challenge for cassava research in the Philippines, therefore, are the development of cassava varieties adapted to the grasslands/acidic and infertile areas, as well as the development of recommended cultural practices for cassava in these areas that addresses productivity and soil conservation.

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