# CASSAVA

# Processing and Storage

Proceedings of an Interdisciplinary Workshop, Pattaya, Thailand, 17-19 April 1974

Editors: E.V. Araullo
Barry Nestel
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# World Market Prospects for Cassava and Its Products

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**Abstract** There are many intangibles associated with the projection of future demand for cassava. By definition, these are unquantifiable. Nevertheless, the overriding impression is that cassava and cassava products will be used in larger quantities in nonproducing countries. General, livestock, and industrial production trends suggest that there could be an increasing need for cassava products. Furthermore, the expected growth in demand in nonproducing countries suggests that cassava will also be used more in the industrial starch and animal feed industries of the producing countries.

Both the industrial starch and animal feed markets require processed cassava. However, to date, research on cassava processing is very fragmented. Therefore, it is very fitting that this workshop should deal with cassava processing at a time when the demand for processed cassava appears to be promising.

**Résumé** Les perspectives relatives à la demande future en manioc comportent de nombreux impondérables qui, par définition, ne sont pas quantifiables. On a cependant l'impression très nette que le manioc et ses dérivés vont faire l'objet d'une utilisation croissante dans les pays non producteurs. Les tendances de la production générale, de celle du bétail et de l'industrie laissent à penser qu'il pourrait bien y avoir une augmentation des besoins en dérivés du manioc. De plus, l'augmentation de la demande qui interviendrait dans les pays non producteurs pourrait se traduire par une augmentation de l'utilisation du manioc dans les pays producteurs pour la production industrielle de fécule et d'aliments du bétail.

Les marchés de la fécule industrielle et des aliments du bétail intéressent le manioc transformé mais, à ce jour, les recherches sur cette transformation du manioc restent très fragmentaires. Il est par conséquent fort heureux que le présent colloque traite de la transformation du manioc à un moment où il semble que la demande en manioc transformé est prometteuse.

THERE are three distinctly identifiable markets for cassava: the human food market; the industrial starch market; and the animal feed market. Geographically, these markets are located in both producing and nonproducing regions. However, the human market is centred in producing regions whereas the industrial starch and animal feed markets are

centred in North America and Western Europe, respectively. This paper[1] deals with the latter two markets.

## Industrial Starch Market

Starches[2] are derived from numerous plant sources, the most important commercial starches today being maize, cassava, potato, sago, waxy maize, wheat, sorghum, rice, and arrowroot. Starches, in most instances, are inter-substitutable and have numerous applications in the manufacture of foodstuffs, adhesives, textiles, paper, gelling and thickening agents, fillers, munitions, and drilling "mud." Not surprisingly, the relative importance of different types of starches varies between countries, with maize starch being most important in the United States and Canada; potato starch in Europe; sweet potato and rice starch in Japan and the Far East; and domestically produced starches of various types in less developed countries (LDCs). The major markets for cassava starch are Japan, the United States, and Canada, but even in these markets cassava accounts for less than 10% of total starch utilization.

The failure of cassava starch (the primary starch exported by LDCs) to account for a larger proportion of the international starch market may be partially accounted for by: (*a*) the inability of LDCs to provide a steady supply of starch of a desired quality; (*b*) a tendency of developed countries to trade with other developed and neighbouring countries; (*c*) noncompetitiveness of LDC prices; and (*d*) the high degree of substitution between starches from other sources.

Of these factors, only the first and perhaps third can be directly influenced by LDCs. Even so, the ability to supply quality starch does not necessarily assure a place in the market, whereas the inability to do so may result in loss of buyers. Moreover, the ability of LDCs to be price-competitive is limited, for although labour costs are less than in developed countries, LDC starch production normally does not realize the same economies of scale. In brief, although the combined effects of labour cost and scale of production are insufficient to ensure that either developed or LDCs can manufacture starch more cheaply, it does appear that the latter cannot necessarily produce starch at substantially lower costs than the former and, thus, cannot expect substantial price-induced growth in the demand for their product. Furthermore, the advent of starch derivatives in the past two decades could mean that these specifically designed starches could replace the normally unmodified LDC starches.

The demand for cassava starch, although greater in the United States than in Canada, has been more variable in the former than in the latter (Fig. 1). The demand for starch in general, and cassava starch in particular, is influenced by population, per capita income, production of starch-utilizing goods, produc-

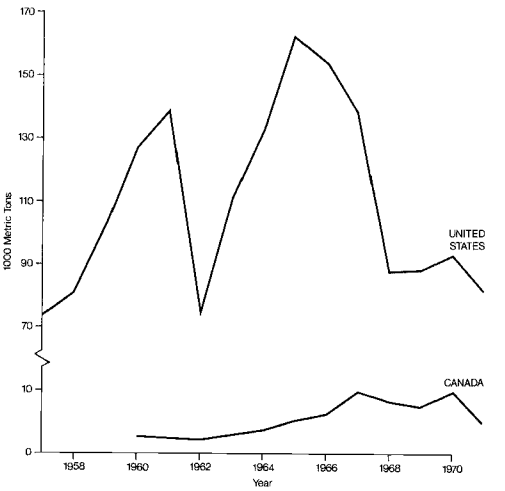


FIG. 1. US and Canadian imports of cassava starch.

[1]Much of the material of this paper is drawn from Phillips (1974), which benefited from an International Development Research Centre grant. The IDRC assistance is gratefully acknowledged.

[2]The physical properties of individual starches are primarily determined by the structure, size, and shape of grains. In general, the grains of starch, when heated in water, swell and burst at approximately 70°C to form a paste. Starches have a narrow density range of 1.50–1.53 and are insoluble in water.

tion of domestic starch, physical property of starches, and prices of competing starches.

Incorporating these factors into demand models provides the basis upon which future demand for cassava starch can be estimated. For the United States the most important factors are gross national product (GNP), production of newsprint, production of maize starch, and price of cassava starch. For Canada the most important factors are GNP, and prices of rice, potato, and cassava starch. Given different assumptions regarding the future of these crucial factors enabled calculations of potential 1980 demand for cassava starch to be made (Table 1).

The Japanese market differs substantially from the North American market because Japan is not a major producer of starch and imports a high proportion of starch from LDCs in the Far East. Political considerations,[3] in the form of specific agricultural support policies, have enabled potato and sweet potato starch rather than rice starch to predominate in Japan. Moreover, although the prices of both cassava and maize starch are competitive with potato starch ($90/metric ton (t), $120 /t and $230/t, respectively, in 1972–73), Japanese policy restrictions on the former[4] encourage use of the latter. The Japanese 1972–73 quota on cassava starch is fixed at 50,000 t, thereby precluding greater use of this cheaper starch, and quotas and licensing policies on maize starch are such that use of domestic potato starch is promoted — I was informed that maize starch import licenses are generally linked with use of potato starch on approximately a one-to-one basis. Thus, the manufacturer requiring maize starch or larger quantities of starch than are domestically available must still utilize potato starch to obtain an import license.

The substantial political component in starch policy suggests that future developments of Japanese demand for starch are very hard to predict, but it is probable that the potential for cassava starch imports are limited. However, the high degree to which Japanese trade policy in general is determined by bilateral trade arrangements could well entail increased Japanese purchase of cassava starch from Far East producers in return for access to particular markets. The only sound conclusion to be drawn with respect to Japan, therefore, is that with its impressive industrial growth, Japan will increase starch consumption. It is impossible at this juncture to suggest the future relative importance of various starches.

Similarities between starches, as well as the ability of chemists to tailor starches to suit specific uses, means that the market for a given starch can be drastically altered in a short time. In this context, the future of cassava starch is less definite than that of domestically produced starches in the United States, Canada, and Japan. The latter starches are partially protected from competition by the oligopolistic nature of domestic starch industries, and in the case of Japan, agricultural price support policies. Additionally, the proximity of starch supply and demand in North America results in suppliers of starch being aware of emerging markets for starch before most exporters. It is possible that North American starch manufacturers can coordinate the development and marketing of new starch products with emerging demand, thereby virtually excluding other suppliers from the market.

There are several applications for which cassava starch is preferred — newsprint and cardboard production, glues for stamps and envelopes, and food preparation — but even

TABLE 1. Projected 1980 demand for cassava starch (*metric tons*).

| | Low estimate | High estimate |
|---|---|---|
| United States | 41,000 | 340,000 |
| Canada | 20,000 | 21,000 |
| Japan | 50,000 | 50,000 |
| Total | 111,000 | 411,000 |

[3]Many of the contentions of this section are derived from interviews with individuals in the Japanese Ministry of Agriculture, and Mitsubishi and Kanematsu-Gosho companies.

[4]The 1969 International Trade Centre Report does not mention licensing of imports, but I was told in January 1973 that licensing of maize starch now exists. The full extent of this licensing could not be determined.

in these areas alternative starch products are appearing. Thus, the uncertainty of the starch market should be borne in mind when examining the projected 1980 demand for cassava starch (Table 1).

The total projected 1980 demand for cassava starch is 20–447% greater than 1970 levels. These figures suggest that the collective demand for cassava starch in the 1970's will grow at a compound annual rate of 2–16%. Furthermore, the range of the projections indicate the uncertainty of the future of international starch markets.

## Animal Feed Markets

The animal feed market is defined in this paper as the European Economic Community (EEC).[5] The growth of this market coincides with the development of the EEC Common Agricultural Policy (CAP), which altered the relativity of livestock feed energy and protein prices, making it attractive to use large quantities of relatively cheap protein and energy sources (viz., soybean meal and cassava, respectively) rather than cereals in the production of compound feed — in short "fabricating" from an appropriate mix of soybean and cassava a product superior in quality to maize. The increased demand for cassava (Table 2) has benefited from increased demand for livestock products, which has led to increased production of compound feeds, increased dependence on mixed feeds in livestock rearing, and increased livestock production. In 1958 Germany was the first European country to import cassava as an animal feed ingredient. The demand for cassava spread to other countries only after the CAP was implemented, but since that time it has become a feed ingredient in all the original EEC countries.

Prior to 1969, the bulk of cassava exports was in the form of meal and chips, but within a matter of 2 years cassava pellets captured 90% of the market. The bulk of cassava imported into Europe comes from Thailand, which increased exports from 280,000 t in 1962 to approximately 1.48 million t in 1973 (Bangkok Bank Review). Obviously, other exporting countries have not experienced such large absolute increases, but their potential to increase exports has evidently always existed.

As in the past, future demand for cassava in the EEC is a function of demand for livestock products, the total demand for concentrate feeds, and price. Recent studies (Esselman 1972; Ferris et al. 1971) predict that demand for livestock products will increase and that higher percentages of compound feeds will be used in livestock production. The two studies cited indicate that higher incomes, greater demand for livestock products, and increased dependency on compound feeds will lead to a substantial increase in the demand for compound feeds. Largest expansion in the use of concentrate feeds is expected to occur in France and Italy, since both of these countries use relatively low levels of compound feeds at present.

Projections of the share of this expanded compound feed market, which will be captured by cassava imports, have been estimated by the evaluation of least-cost feed rations. This analysis entailed collecting data on feed ingredient prices and compound feed specifications (i.e., starch equivalent, metabolizable energy, crude protein, lysine, methionine, etc., requirements for various categories of feed) in EEC countries. The least-cost feed rations were estimated by means of linear programming. From these formulations it was possible to determine the percentage of cassava in each ration, given various price relativities. For simple projection purposes, it is possible to multiply cassava percentages by the appropriate demand level for compound feed, and then to sum the results to arrive at an estimate of the total demand for cassava in 1980. Symbolically the calculation is as follows:

$$D_{c,80} = \sum_{i=1}^{9} \sum_{j=1}^{n} X_{i,j} c_{i,j} \qquad \ldots (1)$$

[5]Presently this is the only important export market on which information is available. However, little is known about the use of cassava as animal feed in producing countries. For example, it is claimed that as much as 4.8 million t of cassava roots are fed annually to animals in Northeast Brazil (Franco et al. 1972). If these figures are correct, more cassava is used as an animal feed in Northeast Brazil than in the EEC!

TABLE 2. Imports of cassava products into the European Economic Community (1962–73) (*'000 metric tons*).[a]

| | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| W. Germany | 366 | 387 | 462 | 520 | 702 | 533 | 481 | 548 | 591 | 479 | 387 | 420 |
| France | 23 | 20 | 18 | 17 | 16 | na | na | na | 35 | 79 | na | na |
| Italy | 0 | 0 | 0 | 1 | 0 | na | na | na | 14 | na | na | na |
| Netherlands | 1 | 5 | 17 | 76 | 96 | 159 | 237 | 444 | 502 | 599 | 650 | 700 |
| Belgium | 23 | 72 | 105 | 100 | 70 | 113 | 127 | 212 | 268 | 278 | na | na |
| Total | 413 | 484 | 602 | 714 | 884 | 805 | 845 | 1204 | 1410 | 1750 | 1850 | 1900 |

[a]Source: 1962–66, *The Markets for Manioc as a Raw Material for Compound Animal Feedingstuffs*, International Trade Centre, UNCTAD/GATT, Geneva, 1968; 1967–70, *The EEC Tapioca Market — Possibilities and Limits*, Food and Agricultural Organization of the United Nations (unpublished), 1972; 1971–73, Unpublished Country and EEC estimates.

where $D_{c,80}$ = demand for cassava in 1980; X = demand for compound feed; $c$ = percentage of cassava in ration; $i$ = the $i$th country in the EEC; and $j$ = the $j$th type of feed.

However, for the projections presented in this paper, equation 1 was modified to comply with the following country-specific constraints: (1) only feed compounded in the northern part of Germany will use cassava (approximately 60% of total compound production); (2) Belgium and Luxembourg are assumed to behave similarly and thus are treated as one country; (3) only very small quantities of cassava will be used in Ireland; therefore this demand has not been included in the final estimations.

These constraints, applied to equation 1, produced the projection of the demand for cassava in 1980 contained in Table 3. The demand projections for Germany, Belgium-Luxembourg, and Holland appear to be a continuation of trends begun in 1963, whereas the French, Italian, Danish, and British demands reflect a break with past trends. The latter two countries will probably not use cassava before 1974–75 when the implementation of CAP becomes effective. Hitherto Italy has used only small quantities of cassava, primarily because of a concessionary levy on maize that made it more attractive to use maize than cassava or other energy sources in feed compounding. This concession is presently being dismantled. France was not an earlier user of cassava because of the relatively low price of domestic grains. However, in 1972, several large French compounders began using cassava in their rations at about the 15% level. For projection purposes it has been assumed that this trend will not be reversed.

TABLE 3. Projected EEC demand for cassava: 1980 (*'000 metric tons*).[a]

| Country | Low | High |
|---|---|---|
| Netherlands | 1,020 | 2,380 |
| France | 157 | 1,950 |
| Denmark | 558 | 1,227 |
| Germany | 667 | 1,161 |
| United Kingdom | 472 | 947 |
| Belgium | 472 | 725 |
| Italy | 117 | 577 |
| Total | 3,473 | 8,967 |

[a]Source: Phillips (1974).

Figure 2 indicates the sensitivity of EEC demand to different prices of cassava. As expected, the demand for cassava is smaller and more sensitive to price changes at higher prices than at lower prices. The general indication is that the prospect of this market is promising for the remainder of the decade.[6] The post-1980 demand for cassava is less definite. Quite possibly the CAP of the 1980's will differ substantially from the present CAP, but

[6]This conclusion appears valid even in light of the current high prices for protein-rich ingredients (Phillips 1974).

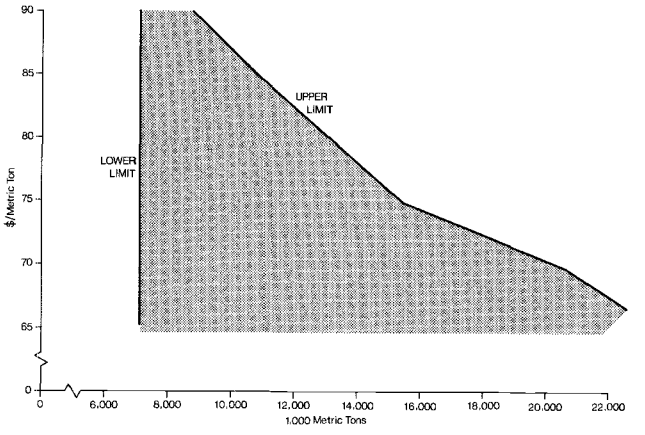


FIG. 2. Projected EEC demand for cassava: 1980.

the nature of these differences is impossible to predict at this time.

The accuracy of these projections depends on the reliability of (1) projected 1980 consumption of compound feeds[7]; (2) percentage of compound feeds utilizing cassava; (3) price relativities among ingredients; and (4) least-cost feed rations as a reflection of the types of feed formulae that will be consumed.

## The Unquantifiable Markets

Persistence of currently high prices for feed grains and feed protein sources may cause feed compounders in all parts of the world to reconsider their basic feed formulations. For the cassava exporter this implies that new markets for cassava may develop. Given current prices, it would appear that Japanese feed compounders would find it economic to use cassava as a feed ingredient. Presently there are barriers to the importation of cassava; however, if these barriers are removed the Japanese may import more than 1 million t of pellets.[8] Sudden development of this market could seriously disrupt current trade patterns.

Other regions to which cassava may be imported are western and eastern Canada and the adjacent regions of the United States. Recently completed feeding experiments in British Columbia have indicated that, economically and qualitatively, cassava is an attractive ingredient for compounded dairy feed. The success of this experiment has led individuals in the feed import industry to estimate that as much as 60,000 t of cassava could be imported into British Columbia in the near future. If this prediction is correct, one expects that other livestock-rearing regions of North America with good port facilities and distant from domestic feed grain-producing regions may also find cassava attractive.

A third region of the world in which a demand for cassava may develop is Eastern Europe. This is a region that is deficient in feed grains, hence current emphasis on livestock rearing will require additional animal feed. Indications are that this feed will have to be imported — hence the East Europeans may find it desirable to import some of their feed requirements in the form of cassava.

Presently only time will tell if these unquantifiable markets will evolve. But would-be exporters are recommended to monitor the development of these markets closely in the next several years.

[7]These projections depend in turn on 1980 projections of demand for livestock products, production of livestock, and feeding rates of compound feeds.

[8] This figure was suggested to me by Agricultural Ministry personnel and officials of feed-importing companies as the potential Japanese demand level.

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