

FEATURES

A STUDY OF THE ECONOMIC POTENTIAL OF USING CASSAVA (MANIOC) AS AN INDUSTRIAL RAW MATERIAL IN SRI LANKA

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In Sri Lanka, there is much industrial potential in cassava or manioc, through the most currently relevant products are starch, tapioca pearls and animal feed. The economic potential of this widely grown tuber is discussed in this paper by P.A.Samaratunga, Agricultural Economist at the Central Agricultural Research Institute, Gannoruwa.

INTRODUCTION

Root and tuber crop production at present is an integral part of Sri Lankan agriculture. Based on the potential uses, these crops (excluding potatoes) could be divided into two groups. The first comprises sweet potatoes and all other yams. They do not possess any significant value other than as a direct human food. Only cassava belongs to the second category which can be either directly consumed or used as an input for agro-based industries (Nweke, 1980).

Although there is evidence that significant quantities of cassava have been used in industries, especially before 1978, the food balance sheets (Department of Census and Statistics, 1960-1984), indicated no utilization of cassava, or any other root crop, in any industry during the last two decades. No external trade of any of these crops were recorded either. Hence the total production less the post harvest losses constituted the total availability which was assumed to have been directly consumed as human food. Apparently, though substantial in absolute quantity, with respect to the total production only a small fraction was channelled into industries and hence a fair approximation of such quantities had not been possible in the estimation process. No other reliable source of data on this aspect could be traced, despite the evidence that cassava is still being used in some small scale industries (Jayawardena, 1984).

In Sri Lanka, the industrial potential of cassava is thoroughly under-exploited. Cassava has been identified as a potential base for manufacturing industrial starch, glucose, adhesives

and paints. Also, dried chips and pellets of cassava for animal feed and tapioca pearls (as a substitute for sago) for confectionery are two other promising potential uses (Jayawardena, 1984). Small scale plants were producing these commodities at commercial level before they were adversely affected by higher quality substitutes imported after 1977. The textile industry which was the major purchaser of starch, presently relies for its requirements mainly on imports. Inability of the local producers to maintain the quality and the price of cassava starch at levels competitive with the imported starch appears to be a major cause of this situation. Animal feed producers too have given up the use of cassava chips in the face of a similar competition from less expensive maize.

In this context, this study attempts to evaluate the economic constraints to the use of cassava as an industrial raw material and the ways and means of alleviating them. This analysis con-

TABLE 1

Estimated requirements of Cassava and Land for achievable industrial utilization in Sri Lanka

Method of utilization	Net Additional requirement of fresh cassava roots * (met.tons)	Gross additional requirement of fresh cassava roots ** (met.tons)	Additional land required *** (ha)
Animal feed	40500	50625	5062.5
Starch for textile industry	7700	9625	962.5
Import Substitutions			
Maize and corn flour	2232	2790	279.0
Other cereal flour	403	504	50.4
Starch/Inulin	1469	1836	18.4
Sago	136	170	17.0
Tapioca and Sago	4306	5383	538.3
Total requirement	56746	70933	7093.3

* Refer text for details

** Taking into account 20 percent of post harvest losses too.

*** Assuming on average yield of 10 metric tons/ha.

concentrates only on the starch and animal feed industries because in Sri Lanka, they have been the most widespread methods of cassava utilization, outside direct human consumption.

METHODOLOGY

The analysis was conducted mainly with the use of cross sectional secondary data. Time series data were also used to a limited extent to supplement the analysis, while primary data were also gathered from local tapioca starch and pearl producers on the cost and returns of their industries. Tabular comparison was the analytical tool employed throughout the study.

RESULTS AND DISCUSSION

Cassava requirements for industrial use

With the conservative estimate of 15 percent dried chips of cassava in animal feed and a conversion ratio of 3:1 from fresh roots to dried chips, present production of approximately 90,000 metric tons of feed per year (Jayawardena, 1984) would need

40,500 metric tons of fresh cassava roots per annum (Table 1). Jayawardena (1984) also reported that the current requirement of starch for the textile industry is 2 million kg. per year and about 55 percent of this can be replaced with cassava starch. This leads to a requirement of 1,100 metric tons of cassava starch which is equivalent to, (under the local small scale ex-

traction conditions) 7,700 metric tons of fresh roots (Table 1). Hence, the current net requirement of fresh roots is 48,200 metric tons per year. With 20 percent post harvest losses, and at an average yield of 10 metric tons per hectare, the additional annual production and area requirements are estimated at 70,933 metric tons and 7,093.3 Ha, respectively. Over the

average annual production for the last 5 years, that is 600,588 metric tons, (Table 2) this is only a 8.0 percent increase.

Thus, it is evident that the impact of operating the above two industries, even at full strength, would be marginal over the present total cassava production and utilization. Moreover, even if the imports of various related commodities in Table 3 were fully substituted with cassava starch, it will add only around 10,000 metric tons of fresh cassava, which again is a comparatively very small quantity.²

1. It was assumed that the substitution would be carried out on one to one basis since no coefficients of substitution were available.
2. As the imported starch is used mainly in the textile industry this computation involves a double counting with the earlier estimate of 7,700 metric tons. If the quantities were netted out, the actual additional requirement of cassava becomes even smaller. That does not contradict the discussion in the text.

Market forces and prices

The findings of the above section have important implications connected to the inter-relationships among production, human consumption and industrial utilization of cassava. Direct human consumption has been maintained at a level of at least over 90 percent a share of the cassava annually

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TABLE 2 Annual Production and Extent of Cassava in Sri Lanka 1975 - 1984

	Production (000 met. tons)	Area (000 Ha)	Yield (kg/Ha)
1975	996.87	164.842	6047.43
1976	747.60	110.759	6749.79
1977	556.65	95.801	5810.48
1978	585.84	74.355	7878.96
1979	534.54	53.591	9974.44
1980	499.49	51.048	9784.71
1981	526.01	56.116	9373.82
1982	572.85	59.179	9679.95
1983	722.11	55.373	13040.83
1984	682.48	56.773	12021.21

Source: Department of Census and Statistics

TABLE 3 Imports of Cassava products and some other related products to Sri Lanka

ITEM	1980		1981		1982		1983	
	Quantity '000 Kg	Value '000 Rs.	Quantity '000 kg	Value '000 Rs.	Quantity '000 Kg	Value '000 Rs.	Quantity '000 Kg	Value '000 Rs.
Maize and corn flour	318.51	1887.90	282.73	1963.82	355.50	2593.93	N.A	N.A
Other cereal flour	2.33	64.23	75.15	1398.22	95.35	991.15	52.98	849.32
Starch/Inulin	300.10	1861.75	126.52	1008.72	203.12	1957.40	198.13	1745.47
Sago	15.00	86.22	5.00	32.23	38.60	669.41	129.22	889.12
Tapioca and sago	690.13	3452.51	540.35	2990.36	a	a	a	a

a. Data were inconsistent.

Source: External Trade Statistics, 1980 thro 1983

Sri Lanka customs.

utilized. Consequently, the food commodity market is the price determinant for cassava. The other industries are price takers which adjust their derived demand for fresh cassava as well as the supply of their products, accordingly. If such industries are to survive, they should pay a price high enough to distract the farmers from the well established food commodity market.

On the other hand in marketing the product, the starch industry has to compete with imported starch, particularly the Indian product supplied at low prices. Average CIF prices of imported tapioca and starch/inulin for the period 1980-1983 were Rs.5.27 and Rs. 9.24 per kg., respectively (Table 4). The prices have increased recently and the current retail price of imported tapioca pearls is Rs.13.00 per kg. The wholesale price offered to local tapioca pearl producers is Rs.13.00 per kg. This shows that the prices received by the local producers are closely related to the imported prices, for tapioca. As a matter

of fact, the prices of the local products are generally determined by the prices of the imported product as they are preferred due to their higher quality.

Currently, cassava fetches an attractive farm price of around Rs. 1.86 per kg. At this price, a hypothetical situation of zero processing cost provided the minimum conceivable prices the chip and tapioca pearl producers should receive for their products. Such minimum prices for chips and starch were Rs. 6.70 and Rs. 15.62 per kg (Table 5). But maize, a superior starch ingredient in animal feed is being supplied in adequate quantities at the current price of Rs.3.00 per kg. Therefore cassava chips cannot succeed in the competition as an input to the animal feed industry. On the other hand, the conceivable minimum price of tapioca pearls is Rs.15.62 per kg (Table 5) and higher than the wholesalers' offer of Rs.13.00 per kg. Nevertheless in reality there exists a substantial cost of processing with the cost of production of starch rises well above Rs.13.00 upto Rs.20.18 per kg. (Table 5).

The cassava based industries are thus affected adversely by the price leadership of the food commodity market at the inputs end and the competition from cheap imported substitutes at the output end. Consequently the prospects for promoting the production of cassava dried chips and starch are setting.

The expansion of the demand for animal feed through encouraging livestock, especially cattle and swine, producers to use more concentrates is one promising avenue of promising the utilization of cassava. Introduction of low cost and high return industrial uses for root crops through research is another obvious improvement. Nevertheless, both these involve intensive research and extension efforts and therefore would be possible only in the long run. Also, for them to be effective; encouraging price and trade conditions are essential. Thus the only solution valid in the short run, and in the long run as well, is changing the existing disadvantageous terms of trade. At the first sight, it looks as if the current adverse situation is not likely to change unless the free trade policy and the incentives for completing crops are changed. Nevertheless, if trade restrictions are imposed in order to protect local industries, it will result in an increase in the price of root and tubers which in turn reduce the calorie consumption in the low income classes. On the other hand, removal of the price supports for the other crops will lead to a general decline in agricultural prices and hence, farm income. Answers to these questions can be found only in the supply side of the picture.

Production and the supply of Cassava

It was pointed out before that roots and tubers have been mainly a cheap source of calories in low income classes, with limited alternative uses. Therefore the elasticity of demand can be close to zero. But the supply of the same could be assumed more elastic though empirical evidences are extremely rare. The only estimate available showed that both short and long run elasticities were equal to 1.09 for cassava in Thailand (Askari and Cum-

TABLE 4 CIF Prices of some imported cassava products and close substitutes, 1980 to 1983

	CIF Prices Rs/Kg			
	1980	1981	1982	1983
Maize and Corn flour	5.93	6.95	7.30	N.A
Other cereal flour	27.57	18.61	10.39	16.03
Starch/Inulin	6.20	7.97	6.64	16.14
Sago	5.75	6.45	17.34	6.88
Tapioca and sago	5.00	5.53	a	a

a. Data were inconsistent

Source: External Trade Statistics, 1980 thro 1983

Sri Lanka customs.

TABLE 5 Costs related to Cassava chips and tapioca
pearl production

Industry	Input	Quantity per Kg of the product	At Zero processing cost (Rs)	At actual processing cost (Rs.)
Cassava chips	Fresh Cassava roots	3 Kg	5.58	5.58
	Materials	n.a.	0.00	n.a.
	Labour	n.a.	0.00	n.a.
	Profit	20%	1.12	n.a.
	Total		6.70	
	<hr/>			
Cassava Starch	Fresh roots	7 Kg	13.02	13.02
	Labour	0.22 n.days	0.0	3.30
	Materials	-	0.0	0.50
	Profit	20%	2.60	3.36
	Total		15.62	10.18

mings, 1977). The comparatively high supply elasticity, particularly in the short run, is attributed to the non-seasonality of the planting and harvesting of cassava and its commercial orientation in Thailand. However, in Sri Lanka cassava is mainly grown as a subsistence crop with very low levels of inputs and hence at an extremely low cost (Table 6) which implies that the total production of cassava should be inelastic in Sri Lanka.

Low costs of production along with very high returns to land and labour imply that cassava production is done in a non-intensive manner (Table 6). Also, under the widespread present

practice, no liquid capital is required to produce these crops. In Table 7 costs and returns related to the production of cassava is compared with some alternative crops. This reveals that the net returns per hectare of cassava exceeded those of cowpea, green gram and maize and reached the levels pertaining to chillies, which is a main cash crop. On the other hand, the costs of production of cassava was much lower than the costs incurred on the other crops (Table 7). It is important to note that even this low cost is only the imputed cost of family labour but not an actual monetary cost. As a result return to capital became inapplicable to the root crops while the returns they yielded to land and labour

were outstandingly high. If cassava was grown at recommended input levels, they could produce returns to working capital as well as to land and labour, higher than those of the other crops (Table 6 and 7).

Despite this potential and the rising price (Table 8) adoption of cassava cultivation is limited in Sri Lanka. This situation is the combined effect of several factors. In the first place, Table 8 shows that the prices of many agricultural products increased during the past several years. Hence, even though there has been an increase in the monetary price of cassava, its relative prices at the farm level has not changed significantly.

Secondly, most of the roots and tuber crops are cultivated in small plots with family labour as the only variable input. Unavailability of capital would be an extremely limiting factor to these small scale operators, if they attempt to expand their production. Moreover, the scale of production could not be increased remaining in the same production process. After a point it would need hired labour and become competitive rather than supplementary to the other activities in the farm business. Cassava would not be as much profitable as the levels found in Tables 6 and 7.

Thirdly, roots and tubers are grown as subsistence crops and as was explained earlier, are only slightly responsive to price. It is also important to note that the strength of the root and tuber crops in peasant agriculture stems out of their adaptability as a low cost-low risk crop but not as a cash crop (Nestel, 1972; Jayawardena, 1984). Therefore, it seems that the majority of the farmers view cassava as an insurance, looking after the subsistence requirements in case of emergencies, but not as a commercial crop.

Consequently, in determining the level of production of cassava, the role of supply shifters like technological improvements and on-farm consumption shifters such as changes in grain

prices and availability, growth of family income, are more important than the own prices. To counter the price increases resulting from demand expansion, these supply shifters, primarily the technological improvements, will have to be employed, to expand the supply as well. Here again substantial amounts of research and extension efforts are required at the cost of public funds and hence they should be considered as a part of the national agricultural policy. Moreover investment on such programmes yield higher returns to the resources utilized and better income to the farmers without a price increase that reduces consumer welfare.

SUMMARY AND CONCLUSION

In Sri Lanka, numerous industrial potentials are open only to cassava

such as producing industrial starch, tapioca pearls, adhesives and animal feed. However, only starch, tapioca pearls and animal feed are the products currently relevant.

It is interesting to note that the production of cassava has to be increased by a mere 8 percent even if the country's entire requirement of these commodities are to be produced locally. Therefore the presence or the absence of industrial outlets is not likely to create a marked difference in the production of cassava, which is primarily a subsistence crop. Nevertheless the price and the market supply of the same would rise as a result of the expansion of demand. Meanwhile, more than 90 percent of the total cassava production has been consumed as human food, in the past. Consequently, the food commodity market has been

the price setter and the industries, which utilized only relatively small quantities, have been the followers. The local cassava based industries had to operate with this given price at the input end and the prices of the competing imported products at the output end. With such prices and the available technology, the local industries have failed to operate within profitable levels and hence been driven out of business to a large degree.

Own price elasticity of the demand for cassava is expected to be less than unity, on a priori grounds. As a result the scope of controlling the total quantity demanded by means of price intervention is restricted. The supply of roots and tubers is inelastic too, due to the low input - low risk production process presently practiced by the farmers who are basically subsistence oriented. Even though the total supply and total demand are both price inelastic, the market demand and the market supply are relatively more elastic. Hence, the role of own prices, though limited on deciding the production and consumption, is substantial in determining the quantities traded. Therefore, imposition of trade restrictions on imports so that a higher price could be offered for local cassava products would transfer a part of human consumption to industrial use. The short and medium run effects of expanding the demand of industries viz., increasing the uses of concentrated livestock feed and the introduction of new industrial potentials, would be the same, which eventually results in a further decline of the calorie consumption in low income classes. Obviously the solution to this problem is technological improvements leading to higher productivity and effective dissemination of the same among the farmers, which are only long run possibilities.

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TABLE 6 Costs and returns relating to cassava cultivation at farmers' and recommended management practices (per Ha.)

Item	Farm ^a		Recommended ^b	
	Amount	Cost (Rs.)	Amount	Cost (Rs.)
Land Preparation	43.9 (m.days)	1097.50	(by tractors)	1117.50
Planting	2.5 (")	62.50	10.0	250.00
Fertilizer application	-	0.00	269 kg	733.68
Earthing up	-	0.00	10.0 (m.days)	250.00
Weeding	-	0.00	20.0 (")	500.00
Harvesting	8.9 (")	222.50	20.0 (")	500.00
Total cost (Rs/ha)		1680.00 ^c		3351.18
Yield (Kg/Ha)		7604.00		20000.00
Farm Price (Rs/kg)		1.50		1.50
Gross Return (Rs/Ha)		11406.00		30000.00
Net Return (Rs/Ha)		9726.00		26648.82
Return per man day (Rs.)		169.73		469.15
Return per Rupee of working capital (Rs.)		d		15.40

a. Source: Department of Agriculture, Division of Agricultural Economics (1980)

b. Source: Department of Agriculture, Botany Division (1984)

c. Only the imputed value of family labour

d. Not applicable as no capital cost was incurred. The only input was family labour.

TABLE 7 Profitability comparison between root and tuber crops and some selected subsidiary food crops in major Cassava growing areas.

Crop ^a	Cost of Cultivation (Rs/ha)	Net return (Rs/ha)	Return to Labour (Rs/m.day)	Return to working capital (Rs/Rupee of capital)
Cassava	1680.00	9726.00	169.73	b
Cowpea ¹⁾	3439.86	846.05	27.49	1.87
Green gram ¹⁾	4129.67	182.34	29.64	1.06
Maize ¹⁾	2830.47	16.04	22.84	0.71
Chillies ¹⁾	7995.96	12292.42	74.27	15.03

a. Under rainfed conditions.

b. Not applicable

Source: Adopted from Department of Agriculture, Division of Ag. Economics (1983).

TABLE 8 Annual all island averages of producers' Prices of Cassava and some selected competing crops

Crop	Prices					
	1979	1980	1981	1982	1983	1984
Cassava (Rs/lb)	0.35	0.56	0.63	0.64	0.84	1.04
Paddy (Rs/Bu)	41.83	51.92	68.75	72.65	73.90	75.08
Green Gram (")	3.23	4.15	4.19	4.02	230.79	280.61
Cowpea - MI 35 (")	2.18	2.96	2.91	3.80	187.07	192.68
Kurakkan (")	35.21	57.73	78.98	69.93	96.16	99.58
Maize (")	34.41	45.91	62.01	60.67	71.51	74.52
Dried Chillies (Rs/lb)	9.10	10.66	9.35	10.78	13.55	N.A.

Source: Central Bank of Ceylong (1979 to 1984)

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