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CASSAVA CONSUMPTION IN EVOLUTION IN LATIN AMERICA
STAPLE OR VEGETABLE?

by

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Cassava Consumption in Evolution Staple or Vegetable

Unlike other parts of the developing world Latin America does not depend on a single carbohydrate staple as the backbone of its diet Thus while rice is the basic staple in tropical Asia wheat in temperate Asia and the Near East maize in East Africa and cassava in Central Africa all these starchy staples including potato are important in Latin America yet none dominate over the whole region The reasons for this are many but two stand out First a staple achieves a dominant role in the diet because of its low relative cost especially as an energy source In rural areas cost advantage is usually determined principally by yield advantage and thus agro-climatic conditions tend to be a principal determinant of food subsistence patterns Because agro-climatic conditions are quite variable in Latin America and because at least three major starchy staples (cassava maize and potato) were domesticated in the region each starchy staple achieved its own niche in the diet and cuisine of rural societies in Latin America

The other distinguishing characteristic of Latin America when compared to Africa or Asia is that the population of the former is predominately urban The urbanization process has a distinct impact on food consumption patterns First relative prices of food staples change between rural and urban areas Second convenience in food purchase and preparation becomes a principal concern in urban family time allocation Third income growth in an urban setting while leading to some increase in quantity consumed principally is reflected in an augmented diversity in the diet Finally urban areas at least in South American countries draw

migrants from rural areas where different staples dominate Although buffered by the other influences food habits are transferred to an urban setting The result is significant diversity in consumption patterns both within and across major urban areas

The food staple exists but it is not defined at the level of the continent nor but rarely at the level of a country Thus only in Mexico Honduras Guatemala and El Salvador does a single commodity maize make up more than 35% of average national calorie consumption Rather the food staple in a Latin America context is defined at the level of region rural residence and income strata It is at this level that the current role of cassava as a food staple will be discussed Moreover this analysis will provide the setting for a discussion in future chapters of the role cassava can play in the agricultural economy in the context of diversification of the diet and the declining role of the staple in Latin American food consumption patterns

Highly Protean Cassava The Diversity of Consumption Forms

Cassava is consumed in Latin America in three principal forms as the fresh root which is either boiled or fried as a roasted flour farinha de *mandioca* and as a type of unleavened bread casabe Consumption of the processed forms is culturally defined Casabe is only consumed in the Caribbean Basin particularly the island countries of Haiti the Dominican Republic and Jamaica (where it is known as bammies) and on the continent from eastern Venezuela through Guyana and Surinam Consumption of farinha de mandioca is almost soley confined to Brazil although it is also found to a limited extent on the border areas in Paraguay and northern Argentina

and among the indigenous Indian population in the Amazon basin areas of Venezuela Colombia Ecuador and Peru Although all are identified as cassava their consumption form makes them distinctly different foods Analogues for other starchy staples are bread and pasta in the case of wheat and choclo and tortillas in the case of maize

Consumption form is a dominant factor in the role cassava currently plays in the diet and its future prospects especially in urban food consumption Form influences preferences marketing costs consumer convenience and utilization within the meal The functional role of form in production marketing and consumption of cassava is best analyzed if the fresh root is distinguished from the processed products

Fresh cassava has all the salient characteristics of the root and tuber crops The cassava root is about two-thirds water although this still results in a starch content significantly higher than all the other major root and tuber crops In its cooked form cassava has as high or higher an energy density as polished rice The disadvantage of high water content comes in the higher marketing and storage costs for this bulky low value product These costs are exacerbated by the very short shelf-life for cassava roots When exposed to oxygen usually as a result of wounding during harvest the roots develop a blue-black pigmentation in the vascular tissue accompanied by the dessication of the starch containing cells (Janssen and Wheatley 1985) From 24 to 72 hours after harvest this process makes the fresh root unacceptable for human consumption Costs thus increase dramatically the further the consumption point is from the production point Although consumption of fresh roots is found throughout

tropical latin America consumption is high only in rural areas where cassava production is widely diffused

Processing eliminates the water stabilizes the product and vastly improves its marketing characteristics Consumption of processed products is thus more diffused through the food economy although still limited by its cultural boundaries Processing also reduces the cyanide content of the roots a necessity where varieties are bitter i e have cyanide levels in the parenchyma exceeding 100 mg/kg (on a dry weight basis) The production of casabe and farinha de mandioca are to a very large extent based on bitter varieties Both casabe and farinha de mandioca are of ancient origin as archaecological finds in Venezuela of clay griddles for making casabe have been dated to between 3000 and 7000 BP (Renvoize 1972) A reasonable hypothesis would be that processing to eliminate the HCN was necessary for the domestication of the crop However lathrap (1973) and Spath (1973) both argue that the genesis of cassava processing was not to remove the HCN per se but rather to support trade networks in the Amazon and Orinoco basis

From the earliest times the raison d etre for processing has principally been to improve cassava's marketing characteristics and not necessarily to improve its consumption characteristics A reverse pattern is found in grains Processing of grains takes place nearer to the consumption point than the production point and the reason is principally to transform the grain to a form utilizable by the consumer Rice milling the production of wheat flour or the grinding of maize meal or dough (Nixtamal in Mexico) are prime examples of forward linkages between grain

staple production and industrial development In cassava those linkages are forged at the production point Unlike the grains production and processing of cassava has developed as an integrated system The marketing system that results is thus specific to the cassava product that is produced

Form is essential to understanding the role of cassava in the agricultural economy It is also essential to understanding cassava consumption Although fresh roots farinha de mandioca and casabe are the principal forms in which cassava is marketed and consumed a large number of other forms also exist Tapioca pearl is produced in Brazil and is used to make a large wafer called beiju In Para state in Brazil farinha de tapioca is produced This is a puffed tapioca pearl and moves to the larger cities of the Amazon Basin Artisanal production of starch also occurs in many areas of Latin America In Colombia the starch is fermented and together with cheese used to make a bread called pandebono In Paraguay the unfermented cassava starch forms the basis of a bread form called chipa As reviews by Schwerin (1971) and Lancaster et al (1982) will attest the forms in which cassava is consumed are multifarous and all follow from variations in the form of processing

The antiquity and multiplicity of consumption forms and the relatively well defined boundaries on the consumption of each raise the issue of what has constrained their diffusion throughout the whole of Latin America and conversely whether there is potential for the consumption of these products in areas where they are not currently eaten There are no certain answers to these questions and only hypotheses will fill the breach Since cassava

is grown throughout tropical Latin America the reason does not derive from lack of knowledge concerning production of the crop The processing technology is simple and easily transferable and certainly a sufficient amount of intercourse between regions to facilitate the transfer of knowledge would be a reasonable supposition The answer seems to derive most logically from a certain rigidity in preferences for the basic carbohydrate staple The indigenous cuisine evolved in the rural areas and was developed around the caloric staple Differences in food preparation methods complementary foods and the structure of the meal reflect in large part the particular characteristics of the staple The difference between Mexican cuisine based on the tortilla and the food habits of the Northeast of Brazil where the base is farinha de mandioca are illustrative of first the central role of the staple and second the difficulty in substituting another staple How rice and wheat have come to play a larger role in urban diets is left to later but the conclusion here is that traditional cassava products that is casabe and farinha de mandioca will not be consumed outside their current areas of influence

Current Patterns of Cassava Consumption

Identifying where cassava is consumed will define both its current role in the diet and present constraints on increased consumption By 1980 (Table 1) cassava was a dominant caloric staple on a national basis in only one country Paraguay In that country it was second only to maize as a calorie source and contributed 13% of total food energy supplies In Brazil and Colombia cassava is an important but not dominant carboydrate source in the national diet contributing over 5% of national calorie requirements Cassava is of minor importance in the maize-based diets of

TABLE 1 Latin America Daily Calorie Consumption Derived from Principal Starchy Staples 1979-81

Country	Total Calories	Cereals			Roots and Tubers	
		Wheat	Rice	Maize	Cassava	Potato
Mexico	2890	323	56	1061	22	2
Costa Rica	2653	303	371	208	3	20
Honduras	2135	130	75	878	5	5
Guatemala	2138	205	36	977	2	9
Panama	2338	201	480	207	36	10
Cuba	2796	565	481	-	56	42
Dominican Rep	2130	194	442	47	37	3
Haiti	1905	218	145	258	66	3
Jamaica	2544	556	204	101	23	7
Brazil	2578	350	418	207	183	24
Colombia	2494	140	387	289	118	108
Ecuador	2114	199	255	176	41	60
Peru	2195	386	297	219	42	140
Bolivia	2082	463	108	277	69	159
Venezuela	2646	351	251	339	28	24
Paraguay	2839	277	128	445	372	5

Source FAO 1984

Mexico and Central America In all the rest cassava adds a significant component to the diversity of the national diet but does not reach the importance of the three principal grains maize rice and wheat

Disaggregating consumption gives a clearer picture of the distribution of cassava consumption The pattern that emerges in Table 2 is of very distinct differences in consumption levels depending on agro-climatic conditions and on rural-urban residence For fresh cassava the highest consumption levels are consistently found in the rural areas High rates of consumption are found in the jungle areas of Ecuador and Peru extending into the Santa Cruz area of Bolivia The highly populated eastern part of Paraguay has possibly the highest per capita consumption of fresh cassava in Latin America and this belt of fresh cassava consumption extends across northern Argentina and also into southern Brazil and Mata Grosso do Sul although consumption declines from those levels existent in Paraguay The third belt of fresh root consumption extends across the Atlantic coast of Colombia into the western part of Venezuela and in Colombia extends from the coastal region up the Magdalena river valley into the Santanderes

In all these areas fresh root consumption declines dramatically moving from rural areas to towns and finally to large metropolitan areas An in depth study on the Atlantic coast of Colombia (Janssen 1986) found that this relationship characterized the root crops in general (Table 3) but was especially marked in cassava The cost of moving a bulky perishable product significantly increases retail prices causing consumption levels to be lower

TABLE 2 Latin America Annual Per Capita Consumption of Cassava by Region and Rural-Urban Status

Country and Region	Rural (kg)	Urban		Average (kg)
		Town (kg)	City (kg)	
Colombia (1981)				
Atlantic Coast	72 7		42 3	54
Eastern Region	39 0		23 5	31
Bogota	-		7 2	7
Central Region	35 4		12 5	20
Pacific	17 3		8 3	12
Peru (1971-72)				
North Coast	11 0	10 6	9 7	11
North Sierra	18 0	7 5	-	17
Central Coast	n a	n a	n a	4
Central Sierra	n a	n a	n a	2
South Coast	n a	n a	n a	5
South Sierra	n a	n a	n a	1
High Jungle	82 2	14 2	-	71
Low Jungle	101 8	78 6	15 5	65
Metro Lima	-	-	4	4
Brazil (1975)				
Fresh Cassava				
North	n a	1 8	0 4	2
Northeast	5 2	3 4	1 9	4
Southeast	4 7	2 8	1 7	3
South	23 2	7 0	5 7	16
Center-West	n a	8 2	2 6	16
Farinha				
North	n a	49 0	45 5	54
Northeast	55 0	31 9	21 4	44
Southeast	10 5	3 3	2 2	5
South	4 4	3 2	0 5	4
Center-West	n a	3 7	2 2	4

Source Sanint et al 1985 Casas Moya 1977 IBGE 1977

TABLE 3 Colombia Annual Per Capita Consumption of Root Crops by Residence on the Atlantic Coast 1983

Residence	Consumption		Cassava Price (US$/kg)
	Yam (kg)	Cassava (kg)	
Cassava Producer	85 7	170 4	0 10
Rural Village	41 9	82 9	0 21
Intermediate Town	30 8	53 5	0 27
Metropolitan Area	30 5	30 5	0 44

Source Janssen 1986

Consumption patterns of farinha de mandioca are more influenced by regional preferences in Brazil than by rural-urban residence Thus farinha consumption declines dramatically moving from north to south and rather more moderately moving from rural to urban areas Farinha is the major calorie source in the North and Northeast of Brazil and makes up about a quarter of average daily calorie intake Even in urban areas in the North and Northeast farinha is a major calorie source contributing 25% of average daily calorie intake in Belem Para and 16% in Salvador Bahia Thus in the poorer regions of Brazil cassava has become a dominant staple essentially by linking cassava s high productivity under marginal conditions with processing at production points

The Ravages of Time Trends in Cassava Consumption

Per capita consumption of cassava as a direct food source has declined in Latin America over the past two and a half decades Cassava is not alone in this regard Consumption of beans and of maize for direct human consumption has also declined Historical analyses of consumption trends of caloric staples in countries such as the United States and Japan suggest that this is a natural tendency in the process of development Rising incomes and the urbanization process lead naturally to a greater demand for diversity in the diet Almost by definition the food that declines as a percentage in the diet is the principal carbohydrate source

Charting the size of the changes in cassava consumption is difficult given the unreliability and scarcity of data on cassava The weakest source is food balance sheets essentially because they depend on accurate production estimates as a starting point and for cassava these are known to

be highly unreliable However these estimates probably do represent basic trends and comparing 1960 to 1980 figures (Table 4) the tendency over the period is consistently a decline in cassava consumption These rather crude approximations nevertheless are supported by those few cases where food budget surveys can be compared over time (Table 5) In Peru per capita consumption between 1965 and 1972 declined moderately in every sector except the urban areas of the eastern rainforest There as road infrastructure improved cassava was obviously developing as a major food source suppling the expanding cities in the region In Colombia on the other hand cassava consumption in all the principal metropolitan areas declined between the late 1960 s and early 1980 s Finally in Brazil between the early 1960 s and 1975 except for fresh cassava in urban areas in the south consumption of both farinha and fresh cassava have declined especially farinha in the south and southeast of the country

At issue then is not the fact that cassava consumption has been declining in latin America but rather the reasons behind these trends From an understanding of causes a prognosis can be made about the future of cassava as a food source in the Latin American diet Cassava has long been painted as an inferior food and a food of the poor but there has been little rigorous analysis to test this hypothesis Moreover income effects on consumption in many cases may be dominated by other factors especially substitution due to changes in relative prices and the effects of urbanization The discussion thus turns to an analysis of these issues

TABLE 4 Latin America Trends in the Per Capita Consumption of Cassava Derived from Food Balance Sheet Estimates

Country	1964-66 (kg)	1979-81 (kg)
Costa Rica	6 2	1 3
Cuba	21 8	19 0
Dominican Republic	27 4	13 5
Brazil	107 4	79 9
Colombia	25 8	49 4
Peru	29 6	17 0
Bolivia	24 7	27 8
Venezuela	25 1	11 5
Paraguay	180 8	156 6

Source FAO 1969 FAO 1984

TABLE 5 Latin America Changes in Consumption of Cassava as Portrayed in Food Budget Surveys

Country and Region	Annual Per Capita Consumption 1960 s (Kg)	1970's (Kg)
Colombia (1968 and 1981)		
Bogota	10 4	7 2
Medellin	13 4	9 8
Cali	18 2	7 3
Barranquilla	29 4	27 2
Peru (1964 and 1971)		
Coast		
Rural	11 5	8 4
Urban	7 3	5 5
Sierra		
Rural	n a	6 2
Urban	2 8	1 5
Selva		
Rural	111 6	89 2
Urban	10 9	20 4
Brazil (1960 and 1975)		
Fresh Cassava		
North		
Cities	0 04	0 4
Northeast		
Rural	10 3	5 2
Towns	n a	3 4
Cities	1 1	1 9
Southeast		
Rural	15 8	4 7
Towns	3 6	2 8
Cities	3 7	1 7
South		
Rural	68 7	23 2
Towns	4 1	7 0
Cities	1 6	5 7
Farinha		
North		
Cities	58 9	45 5
Northeast		
Rural	69 6	55 0
Towns	n a	31 9
Cities	26 2	21 4
Southeast		
Rural	19 1	10 5
Towns	4 9	3 3
Cities	4 3	2 2
South		
Rural	16 2	4 4
Town	5 6	3 2
Cities	3 0	0 5

Source National food budget surveys

The Inferior Good Debate In Search of an Elasticity

The most direct means of estimating price and income elasticities is through the use of time-series data In cassava this is restricted by the quality of the national supply and utilization estimates Nevertheless though absolute values may be unreliable relative change from year to year is probably more accurately captured within the series Estimates of demand functions (Table 6) for cassava using national time-series data were attempted for a number of countries (Sanint 1986) Besides income own price and the price of substitutes an urbanization variable was also included Urbanization in those countries where cassava is consumed in the fresh form is expected to have a particularly strong impact on national demand for cassava essentially because of the difference in relative price of cassava and caloric substitutes in rural versus urban settings

The results of these estimates are remarkably good since all the elasticities are of a theorectically correct sign and the majority are statistically significant Not too much stock should be put in the absolute value of these estimates but the overall picture that arises is correct (to be supported later by additional analysis) The first conclusion that can be drawn is that cassava in these countries is not in general an inferior good Only in Paraguay where consumption levels virtually approach a biological limit is the income elasticity negative In Ecuador and Colombia the data would suggest that cassava is even income elastic This result follows essentially because demand has been corrected for the effects of urbanization which are all negative and except in Colombia highly significant Unlike grains urbanization completely

TABLE 6 Latin America Time Series Estimates of Demand Elasticities for Fresh Cassava in the Period 1965-84

	Colombia	Ecuador	Paraguay	Peru
Own Price	- 0 30	- 2 08	- 0 10	- 0 20
Income	1 60	1 38	- 0 13	0 03
Urbanization	- 0 16	- 0 99	- 0 13	- 1 03
Wheat Price	n s	0 45	0 07	0 11
Rice Price	n s	2 42	-	0 64

Source CIAT estimates

changes the structural nature of the cassava market Most of these elasticities are high In Paraguay urban consumption levels are high because of a well developed marketing system for cassava and here the effects of urbanization are not as pronounced

The own price elasticity for cassava is generally low but highly significant However even more than the own-price response cassava demand responds significantly to changes in the price of other caloric substitutes Any decline in the price of grain substitutes for example due to technical change or to policy intervention as well has a significant impact on consumption of cassava In summary then the declining consumption of cassava is not due to the fact that the commodity is an inferior good but rather to more fundamental changes in the overall economy and the structure of food demand which in turn has influenced the pricing of competing grain staples

A more reliable data base on which to base elasticity estimates is consumer budget surveys Unfortunately those with national coverage that include both expenditure and quantity or price data are rare Colombia has most recently carried out such a survey Elasticity estimates for cassava based on this survey (Sanint et al 1985) support the cross section estimates (Table 7) that is cassava is not an inferior good and in general demand is relatively price responsive The income elasticity (also corrected with dummy variables for rural-urban residence) is somewhat lower and the price elasticity significantly higher in absolute value when compared to the time series estimates for Colombia Though these estimates give a truer picture of the value of the elasticities they nevertheless support the conclusions drawn from the time series estimates

TABLE 7 Colombia Cross-Section Estimates of Demand Elasticities for Fresh Cassava by Income Strata 1981

Income Quintile	Fresh Cassava	
	Price	Income
1	- 0 84	1 47
2	- 0 92	1 23
3	- 0 93	0 27
4	- 0 92	0 64
5	- 0 83	- 0 04

Source Sanint et al 1985

Moreover the cross sectional data allow estimates by income strata as expected the income elasticity varies significantly between income strata Cassava is very income elastic in the two lowest income quintils and only in the highest income stratum does the income elasticity become slightly negative (although this coefficient is not significantly different from zero) Thus all but the most wealthy will increase cassava consumption with rises in income The poor who still have calorie consumption levels below minimum standards (Sanint et al) are especially responsive to changes in income and will increase their consumption of cassava at a greater rate than the rate of increase in income

The responsiveness of cassava consumption of the poor to changes in price and income is supported by results from the Dominican Republic (Musgrove 1985) Per capita cassava consumption on average is higher in this country than Colombia and here the poor are much more responsive to cassava price changes than income changes though the response to income is still significantly positive The Colombian and Dominican Republic results are suggestive of a general tendency for cassava consumption to be more responsive to income rather than price changes the lower is the existing level of per capita consumption Also although the data are limited at higher general levels of consumption consumers are more responsive to price suggesting a marked tendency to substitute for other caloric staples This result is particularly characteristic of the greater diversity in the latin American diet since for example in Asia this degree of substitution does not occur in rice the dominant staple even at high consumption levels

Purchase and consumption of different foods is contingent on those commodities meeting more basic consumer needs such as taste nutrient needs minimal preparation time or diversity in the diet This fact gives rise both to differences in preferences between commodities and to perceived differences in quality for most food commodities for which there are in turn price differentials Thus the consumers' perception of cassava in many countries is not in terms of a single generalized commodity with quality gradations as is the case for rice Rather farinha or casabe is a distinctly different food commodity from the fresh root In any analysis of demand for cassava where different products are consumed it is critical that the different products be analyzed independently before making an assessment of future demand for cassava as a whole

The need to discriminate between cassava products is particularly important in Brazil where both the fresh root and the processed product farinha de mandioca are major items in the diet In Brazil the distinction between products is maintained from production to consumption Farmers distinguish between the low-cyanide or sweet varieties called aipim and the high-cyanide or bitter varieties called mandioca They are kept separate virtually as distinct crops from production through marketing and consumption Farinha is the major consumption item essentially because of its storability and lower marketing margins and is the principal source of calories in the Northeast

Farinha behaves as the classic staple Because it is significantly cheaper than any other carbohydrate source consumption levels are high among the poor However as incomes increase consumers diversify their

source of calories Farinha in Brazil does have a negative income elasticity (Table 8) Yet in the lower income strata consumers will still eat more farinha with increases in income In Brazil particularly in the Northeast incomes levels among the poor are not sufficient to maintain adequate levels of calorie consumption Thus with increasing income the poor will still consume higher levels of farinha However these same consumers are very responsive to changes in farinha prices again indicating a desire to diversify when the opportunity arises The substitution process is further supported by the significant cross price elasticity between farinha and wheat flour A particular issue in the Brazilian case in evaluating commodity substitution is to separate substitution due to short-term swings in relative prices of caloric staples from the impact of a long-term change The introduction of the subsidy on wheat in the early 1970 s resulted in a long-term shift in the relative price of calories between farinha and wheat products The impact has been to speed up the substitution process and through more basic structural changes in tastes and the diet to limit potentially the degree of reverse substitution should the subsidy be lifted

Demand parameters for fresh cassava in Brazil however follow a similar pattern to that presented for other countries That is fresh root consumption responds positively to increasing income with the lower income strata being particularly responsive Moreover consumers are very responsive to price changes in fresh cassava as exhibited in the estimated price elasticity of -1 9 Thus in Brazil a duality of sorts exists in the demand for cassava farinha exhibiting the characteristics of an inferior good and fresh cassava the characteristics of a normal good Since farinha

TABLE 8 Brazil Income and Price Elasticities [1/] for Farinha by Income Strata

Elasticity	South		Southeast		Northeast		North
	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Income							
Lowest Income Group [2/]	-0 2703	0 3236	-0 8612	0 3236	0 0026	-0 0254	0 3670
Second Income Group	-0 3441	0 0037	-0 7111	0 0037	-0 1813	-0 1893	0 0976
Third Income Group	-0 4180	-0 3163	-0 5610	-0 3163	-0 3651	-0 3532	-0 1719
Fourth Income Group	-0 5156	-0 7393	-0 3627	-0 7393	-0 6081	-0 5699	-0 5280
Highest Income Group	-0 5656	-0 9562	-0 2609	-0 9562	-0 7327	-0 6811	-0 7107
Own Price							
Lowest Income Group	-1 3984	-2 1398	-0 3085	-2 1398	-0 6734	-0 5306	-0 0037
Second Income Group	-1 1371	-1 1451	-0 2480	-1 1451	-0 6451	-0 4897	-0 1679
Third Income Group	-0 8758	-0 1503	-0 1875	-0 1503	-0 6169	-0 4488	-0 3321
Fourth Income Group	-0 5304	0 0000	-0 1075	0 0000	-0 5796	-0 3947	-0 5492
Highest Income Group	-0 3533	0 0000	-0 0664	0 0000	-0 5604	-0 3670	-0 6606
Price of Rice							
Lowest Income Group	1 1079	0 8977	2 5697	0 8977	0 6524	0 3622	1 3133
Second Income Group	0 9213	-0 3869	2 2233	-0 3869	0 1959	0 2762	1 0589
Third Income Group	0 7347	-1 6715	1 8770	-1 6715	-0 2606	0 1901	0 8045
Fourth Income Group	0 4881	-3 3696	1 4191	-3 3696	-0 8641	0 0764	0 4683
Highest Income Group	0 3616	-4 2407	1 1842	-4 2407	-1 1736	0 0181	0 2958
Price of Wheat							
Lowest Income Group	1 5431	2 0210	1 5332	2 0210	0000	-0 5599	0 7813
Second Income Group	0 9480	1 3265	1 1311	1 3265	0 0550	-0 1411	0 1220
Third Income Group	0 3530	0 6321	0 7291	0 6321	0 5006	0 2777	-0 5373
Fourth Income Group	-0 4336	-0 2860	0 1976	-0 2860	1 0896	0 8313	-1 4089
Highest Income Group	-0 8371	-0 7569	-0 0750	-0 7569	1 3917	1 1153	-1 8560

[1/] Elasticities were estimated using cross-sectional data and employed a translog functional form

[2/] Elasticities were evaluated at the following income levels Lowest = ½ minimum salary second = 1 minimum salary third = 2 minimum salaries forth = 5 minimum salaries and highest = 8 minimum salaries

makes up about 90% of human consumption of cassava farinha dominates in the overall food demand for cassava in Brazil

Is cassava then an inferior good in latin America ? In a very narrow sense the answer is yes Farinha de mandioca in Brazil does have a negative income elasticity and since farinha makes up 90% of cassava consumption as a food source in Brazil and Brazil in turn makes up about 75% of food consumption of cassava in latin America then a weighted income elasticity for cassava as a food source in latin America would likely be slightly negative This conclusion however extends a result based essentially on the extreme importance of farinha in the north and northeast of Brazil (these two areas account for 86% of Brazilian consumption of farinha) to cassava in latin America as a whole Outside this limited area the conclusion does not hold that cassava is an inferior good and it does not hold because cassava is consumed principally in a fresh form The available evidence suggests that there is significant elasticity in the demand for fresh cassava Thus to explain the decline in the consumption of fresh cassava requires a more in depth analysis of the effects of urbanization and of changes in relative prices

The Urbanization of Cassava Consumption The Price Paid to Marketing

The most striking feature about consumption patterns of fresh cassava is the very large differences in consumption levels between rural and urban areas Not only is the pattern universally consistent but the differences in per capita consumption levels are indeed large (Table 9) The pattern is most clear at the level of a particular region especially where cassava can be compared with other starchy staples Such data exist for the

TABLE 9 Latin America Estimates of Average Per Capita Rural and Urban Consumption of Fresh Cassava

Country	Consumption	
	Rural (kg)	Urban (kg)
Brazil (1975)	10 6	3 1
Colombia (1981)	41 1	17 2
Peru (1972)	18 3	5 6
Paraguay (1986)	340	120
Venezuela (1975)	27 4	5 0
Dominican Republic (1975)	42 3	20 0

Source Lynam and Pachico 1982

Atlantic Coast of Colombia (Table 3) In this region cassava consumption declines precipitously from the point of production so that consumption in the large cities is less than 20% of that of cassava producers Neither plantain or rice show such differences and potato an imported commodity in the region exhibits the opposite pattern These differences in cassava consumption based on residence are not due to any significant difference in the manner of utilization in the home (Table 10) Cassava is eaten virtually in the same meals and prepared in the same manner The differences arise from the number of meals per week at which cassava is served and the size of the portion per serving The primary factor resulting in these differences in consumption of cassava are price and convenience Cassava is more than five times more expensive in metropolitan areas than the opportunity cost to cassava producers Moreover implicit costs in buying cassava daily in urban areas makes cassava a far less convenient food than say rice

The price difference between cassava producer and metropolitan consumer reflects the very significant marketing margin for the crop These margins derive from a marketing structure which must move a bulky and perishable crop from many small-scale producers to consumers who buy their cassava in small lots at convenient locations A comparison of implicit marketing margins for cassava versus rice in major latin America cities (Table 11) shows that the price that cassava consumers must pay for marketing services are in general higher than that for rice on an absolute basis Considering that the marketing margin for rice also includes a milling component the costs of cassava marketing are high indeed On a relative basis (i e as a percent of the retail price) the cost of

TABLE 10 Atlantic Coast Colombia Distribution of cassava consumption over the different meals by rural-urban residence 1983

	Metropolitan Urban Areas	Intermediate Urban Areas	Rural Areas	Producers
% of cassava consumed at breakfast	30 0	53 5	50 2	42 3
Most important form of preparation	boiled	boiled	boiled	boiled
% of cassava consumed at lunch	69 0	43 6	39 7	49 1
Most important form of preparation	in soup	in soup	in soup	in soup
% of cassava consumed at dinner	1 0	3 0	10 0	8 6
Most important form of preparation	boiled/ fried	boiled/ fried	boiled/ fried	boiled/ fried
Number of meals per week with cassava	4 9	6 3	8 3	11 0
Average portion of cassava served per person (grams)	118	158	191	313
Price (US$/kg)	0 45	0 27	0 26	0 08
Number of observations	80	80	160	160

Source Janssen 1986

TABLE 11 Latin America Marketing Margins[1] for Fresh Cassava and Rice in Principal Countries

Country and Region	Fresh Cassava			Rice		
	Retail Price (currency/kg)	Marketing[1] Margin (currency/kg)	Margin as % Retail Price (%)	Retail Price (currency/kg)	Marketing[1] Margin (currency/kg)	Margin as % Retail Price (%)
Brazil (1983)						
Pernambuco	125 2	110 9	89	326 5	146 5	45
Rio de Janeiro	163 2	143 4	88	353 7	176 7	50
Sao Paulo	175 0	161 3	92	319 5	131 5	41
Rio Grande do Sul	112 7	89 1	79	320 2	167 2	52
Paraguay (1983)						
Country average	28 0	18 0	64	143 0	60 0	42
Venezuela (1983)						
Caracas	3 6	2 1	59	5 0	2 6	51
Panama (1983)						
Country average	0 31	0 23	75	0 71	0 35	50
Dominican Republic (1984)						
Country average	0 50	0 30	61	0 91	0 24	27
Jamaica (1986)						
Country average	1 89	0 93	49	2 84[2]	0 88	31
Colombia (1981)						
Bogota	24 9	19 2	77	40 2	18 8	47

[1] Marketing margin is the difference between the farm-level and retail price
[2] Maize instead of rice

Source CIAT data files

marketing services is significantly higher for cassava From 50 to 90% of the eventual consumer price for fresh cassava is allocated to marketing services These margins essentially reverse the relative price of cassava and competing starchy staples between rural and urban markets In rural production zones cassava is normally the most inexpensive source of calories especially compared to grain crops In urban areas on the other hand fresh cassava is significantly more expensive on a per calorie basis than competing grains Clearly consumption levels adjust to this market change in relative prices

The implication of the high price for urban cassava on trends in aggregate consumption have been markedly negative in the rapidly changing economic environment that has existed in Latin America over the post-war period In that time Latin America shifted from being principally a rural based economy to being an urban-based economy Very high rates of rural-urban migration have shifted the population distribution in Latin America from almost 60% in the rural sector in 1950 to 30% rural in 1985 The urbanization process has completely changed the structure of starchy staple consumption in Latin America with the locus shifting from staples such as cassava maize plantains and potatoes to distinctly urban staples such as rice and wheat With rural population barely growing in most countries and urban population growth at very high rates aggregate per capita consumption of cassava has declined over time

The negative effect of the urbanization variable in the time-series demand estimates is thus clearly supported by a fuller understanding of cassava in rural versus urban environments Nevertheless total demand for

cassava should continue to increase although at a rate lower than that suggested solely by growth in population and income Disaggregating the growth components in total demand as is done for Colombia in Table 12 clearly shows the importance of the consumption weights on growth in total demand More importantly however though total demand may be growing at a modest rate the data would suggest that demand for marketable surpluses is growing at a very rapid rate indeed As cassava consumption shifts from principally a subsistence orientation to one based on purchased roots the implication is that market demand as reflected in the growth in urban demand is growing very rapidly indeed Thus aggregate trends in cassava consumption can significantly mask the dynamics of actual cassava markets However because of the nature of the crop there is little available data on marketed surpluses and therefore little scope for rigorous price analysis in fresh cassava markets

The consumption of fresh cassava in Latin America is in transition Because of rapid urbanization the locus of consumption is shifting from rural areas where per capita consumption levels are high to urban areas were per capita consumption is relatively low Cassava in most Latin American countries is thus shifting from being a starchy staple to being more of a vegetable crop that is with significant elasticity in demand Thus while aggregate trends are downward in fact markets for fresh cassava tend to be quite dynamic However this conclusion is seemingly contradicted by the decline in urban per capita consumption levels that have apparently occurred in Colombia in Southeastern Brazil and in coastal Peru To evaluate this the discussion turns to the last factor influencing cassava demand the price of substitutes

TABLE 12 Colombia Disaggregation of Demand Parameters for Fresh Cassava in Rural and Urban Areas 1981

Parameters	Rural		Urban		
Population Growth	- 0 1		3 7		
Income Elasticity	0 28		0 38		
Per Capita Income Growth	2 5		1 4		
Demand Growth	0 6		4 2		
Weighted Average [1]	0 51 (0 6)	+	49 (4 2)	=	2 4

[1] Weights are distribution of total consumption between rural and urban areas in 1981

Cassava and the Political Economy of the Urban Staple

Urban food prices entered the Latin American political arena during the rapid urbanization and industrialization process of the post-war period Urban poverty and malnutrition the felt need to control upward pressure on urban wages and the politics of managing inflation all induced most Latin American governments to implement controls on prices of major urban staples These controls focused on grains especially those where imports could be used as a means of either controlling prices or reducing subsidy costs that is where domestic production was also supported Maize in Mexico and wheat and rice in other Latin American countries were the principal markets in which governments intervened In general mechanisms were developed to support domestic producers of these grains Policies however were not implemented for domestic producers of carbohydrate substitutes especially cassava

Because of the significant cross-price elasticities between cassava and prices of major grains the interventions in grain markets can have a significant impact on cassava consumption Retail price trends in Latin American countries bare out this scenario In virtually all Latin American countries over the past decade and a half the real price of fresh cassava at the retail level has been rising (Table 13) This rising trend at least partially supports the relatively dynamic nature of cassava markets resulting in some upward pressure on cassava prices On the other hand prices of competing grains have been falling In some cases for rice such as in Colombia this has been due to the introduction of new technology However in the majority of cases the principal cause has been price policy aided in the case of wheat by a falling international price and a

TABLE 13 Latin America Annual Percentage Change in Retail Prices of Fresh Cassava Wheat Flour and Rice (in Constant Prices)

Country	Fresh Cassava (%)	Wheat Flour (%)	Rice (%)
Colombia (1960-84)	1 7	- 3 0	- 3 4
Venezuela (1965-84)	3 8	3 0	- 0 5
Peru (1966-83)	0 2	- 0 8	- 1 5
Paraguay (1968-83)	1 4	- 2 1	- 1 2
Ecuador (1970-84)	2 5	- 0 4	- 0 2
Brazil (1969-85)	- 0 2	- 1 6	- 0 1

Source CIAT data files

tendency to overvalue exchange rates However because governments intervene in wheat markets and because subsidies are utilized in wheat in a large number of countries declining international prices aided governments in effecting policies but were not the principal cause of declining domestic prices

Price of cassava and price of substitutes have played a dominant role in consumption trends in cassava This is clearly shown in both the time-series and cross-sectional demand estimates Moreover the effect of prices is clearly portrayed when consumption estimates over time are matched with changes in relative prices In the case of Cali Colombia (Table 14) per capita consumption has declined as a result of changing relative prices of cassava and rice The most dramatic case however is that of farinha in Brazil (Table 15) Not surprisingly farinha consumption has declined as relative prices with wheat flour went from 0 6 to 3 0 While farinha consumption halved wheat consumption doubled principally motivated by a massive subsidy on wheat consumption

Cassava is virtually invisible to policy-makers little data or market analyses exist for the crop Cassava is outside the control of government marketing agencies and cassava producers can master no political voice to defend their interests If no one yells nothing must be wrong Either cassava must be brought into the political arena or the crop will slowly disappear from the food basket in tropical Latin America This conclusion however is not a plea for subsidies or an admission that cassava cannot compete in rapidly expanding markets for carbohydrates The irony is that the decline in cassava is being attributed to a lack of effective demand

TABLE 14 Colombia Changes in Real Retail Price and Average per Capita Consumption in Cali 1970-1982

	Change in Price 1970-82 (%)	Change in Consumption 1970-82 (%)
Chicken	- 12	267
Wheat	- 10	109
Potato	3	104
Beans	25	16
Rice	36	13
Beef	54	0
Pork	93	- 51
Maize	162	- 61
Cassava	191	- 53

Source Pachico et al 1983

TABLE 15 Brazil Relationship between farinha de mandioca and wheat flour prices and consumption 1960-80

	1960	1970	1980
Farinha Consumption (kg/capita)	26 3	23 5	12 0
Wheat Consumption (kg/capita)	26 2	25 2	45 5
Farinha/Wheat Consumption	1 00	0 93	0 26
Farinha/Wheat Prices	0 61	0 64	2 95

when that lack is due to discriminatory policies rather than consumer choice There is rather a need for consistency in the setting of price policies which implies that cassava should be brought into the agricultural political economy of Latin America

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