CHARACTERISTICS OF THE WORLD'S CASSAVA PRODUCTION WITH EMPHASIS ON LATIN AMERICA*

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Prologue

This report analyzes in brief form the relative importance of cassava production in relation to other agricultural products in cassava producing countries (CPC) and particularly as related to those products with which CIAT is presently working.

On the basis of historical series, the production, area, and yield of cassava are analyzed, especially for the Latin American countries, with the object of evaluating their impact on the price of the product and on the income of the producers in cases where new technology being developed generates increases in crop yield.

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Introduction

The cassava producing countries of the world (1) are also responsible for 93% of the world's production of coffee and bananas and for about 80% and 70% of the world's production of sugar cane and beans, respectively (Table 1). These same countries' production of wheat is inferior to Russia's production (83.9 million tons) and superior to the production of the United States and Canada (62 million tons).

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(1) In Africa the following countries: Burundi, Central African Republic, Republic of Congo, Togo, Comoro Islands, Gabon, Ghana, Angola, Madagascar, Cameroons, Liberia, Equatorial Guinea, Ivory Coast, Nigeria, Uganda, Guinea, Ruanda-Urundi, Kenya, Niger, Senegal, Sierra Leone, Zambia, Malawi, Mali, Gambia, Chad, Somalia, Upper Volta, Benin (Nigeria) Zaire, and Sudan.

Asia includes: Thailand, Indonesia, Malaysia Sabah (No. Borneo), North Vietnam, Timor Islands, West Malaysia, South Vietnam, The Philippines, India, Laos Burma, Cambodia, China, Sarawak, Sri Lanka.

Oceania includes: Tonga, Figi, Trust Territory of the Pacific Islands, New Caldonia, Papua, and New Guinea.

Latin America includes: Brazil, Colombia, Paraguay, Ecuador, Venezuela, Cuba, Haiti, Perú, Argentina, Dominican Republic, Bolivia, Honduras, Jamaica, Panama, Nicaragua, Guatemala, Costa Rica, El Salvador, Puerto Rico and French Guiana.

* Internal Document of the Cassava Program, May 1977. Preliminary.

The production of maize in the cassava producing countries is very inferior to that of the United States (118.5 million tons) and the production of potatoes is very similar to that of Poland (48.5 million tons).

In production of sorghum, the cassava producing countries do not reach twice the production of the United States, the main world supplier (16 million tons), but in soybean the production of the cassava growing countries is very inferior to that of the United States, 33.1 million (56% of the world's production). In relation to meat, the United States produces 10.7 million tons while the cassava producing countries only 9 million tons.

It can be concluded that the main source of animal and vegetable protein are not produced by the cassava producing countries, but rather in developed countries. Furthermore, cassava and rice, with the exception of sugar cane, are the main sources of energy in all these countries.

In relation to CIAT's commodities, (cassava, beans, maize, rice) the area planted to cassava in 1974, was equivalent to only 2% of the plowable agricultural surface of all the cassava producing countries; for beans it was 3%, maize 8%, and rice 18% (FAO 1975).

In the cassava producing countries in Latin America, the area planted to cassava is equivalent to 2.4% of the total plowable agricultural surface, to beans 5%, maize 18% and rice 6%.

Comparing the world's production of these crops, in 1974 (Table 1) in terms of dry matter volumes (2), the following yields were attained: 286 million tons of rice, 246 million tons of maize, 36 million tons of cassava, and finally, 11 million tons of beans (3). In spite of the fact that cassava has a high composition of water, the total dry matter volume produced was three times superior to the dry matter volume of beans produced in the world.

AREA AND PRODUCTION

World production of cassava in 1974 was estimated at 103 million metric tons. During the period from 1964 to 1974, production increased 2.9 percent annually (Table 3). Area planted in 1974 was 11 million has, representing an annual increase of 2.14 percent from 1964 (Table 4). Average yield per hectare was 9.3 tons in 1974 and the rate of yield increase from 1964 was of 0.8 percent (Table 5). An increase in both production and area planted is evident, as is a slight increase in yield.

Asia and Latin America accounted for 29% each of the world production of cassava, and Africa produced 42% (Table 3). Area harvested was as follows: Africa 51%, Asia 26%, Latin America 23% (Table 4).

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(2) Based on the following humidity indexes for each product: cassava 65%, beans and maize 13% and rice 11%.

(3) Estimated rom Table 1.

FIGURE 1. Production zones and area planted to cassava (1,000 hectares) in Latin American producing countries, 1974.

Sources: Production zones: personal communication from scientists in CIAT's Cassava Program.

Planted area: FAO, 1975. Anuario de Producción, Vol. 29.

This reflects a very low average yield for Africa, 7.6 ton/ha in comparison with 10.4 ton/ha for Asia and 11.7 ton/ha for Latin America (Table 5) (4).

The average yield in Asia, Oceania and Lain America is above the average world yield, while that of Africa is slightly below.

Compared with the rest of the producing continents of the world, few problems arise in Africa caused by the presence of insects or diseases (Lozano and Booth 1974), in spite of the fact that mosaic, a viral disease has been reported to be exclusive to Africa (Terry 1974). Thus, the main cause for low yields in Africa are due to the lack of adequate cultural practices for cassava farming.

Brazil attained one fourth of the world production of cassava, followed in importance by Indonesia, Nigeria and Zaire with one tenth each. In latin America only two more countries, Colombia and Paraguay, produced at least 1% of the total cassava harvested (Table 6).

Latin America produced 30 million tons, with an annual growth rate for the last 10 years of 1.1 percent. The distribution of this production was Brazil 83%, Colombia and Paraguay 4% each, and Ecuador and Peru 1% each (Table 3).

A slightly decreasing rate in cassava production is evident in countries such as French Guyana, Paraguay, Panama, Venezuela, Puerto Rico and Argentina (Table 3). There is no information available to explain this trend.

Cassava is grown under traditional systems, primarily in farms no larger than 1 ha, associated or mixed mainly with maize (Table 7). In some countries of Asia and Africa it has been cultivated as a secondary crop, in the shade of coconut or african palm plantations. This practice has decreased in the last years. In Latin America it is common to intercrop cassava with semestral crops.

In the majority of the Latin American countries (Figure 1) such as Ecuador (Varón 1975), Venezuela (Arias 1975), Paraguay (Belloti 1977) and Guatemala (Fumagalli 1975), cassava is planted in small plots along with other crops of short vegetative period. In Perú (Rosas 1975) cassava is planted alone in family farms on small plots or occasionally intercroped with maize or plantain.

The following conclusions can be stated in relation to area planted and world production of cassava: (1) the largest area planted is found in Africa with slightly low yields resulting from traditional and rudimentary production techniques, and (2) the majority of cassava production is done in plots no larger than 1 ha, established mixed or intercroped with other semestral crops, primarily maize.

(4) Yields estimated based on the relation between production (tons) and area (has).

producing countries, the apparent per capita availability of calories in cassava was 153, inferior to that of rice and maize (1121 and 366) and superior to that of beans, barley, sorghum and banana (33, 90, 110 and 40).

Cassava participated only with 5% of the digestible caloric requirements in the cassava producing countries. In Africa, Oceania and Latin America the caloric requirements supplied by cassava are close to 16% and in Asia it is very low, only 2% (Table 13). In only three Latin American countries did cassava participate above 8% of the digestible caloric daily requirement per person; Paraguay 55%, Brazil 30%, and Ecuador 8%.

At the continental level it has been observed that Africa presented the largest per capita production of cassava and the lowest per capita production of meat and rice. This inverse relation has not been very marked in Latin American countries (Table 14). As the participation of cassava as a source of calories increases in these countries, the availability of animal or vegetable protein sources does not present any tendency.

Animal Feed

Available information indicates that cassava for animal feed is concentrated in the European Common Market (Phillips 1974). If cassava prices, as compared to other grains, are favorable, good perspectives exist for the future, especially in those countries with deficiency of energy sources.

Presently more than 90% of Thailand's production of cassava is consummed in Europe, practically monopolizing the European Common Market demand (Boonsue and Sinthuprama 1975). Thailand first exported its cassava in chips (6); lately they are exporting it in pellets.

Indonesia, another large producer of tuberous in the world, has not been able to cope the world demand for cassava, and cassava products primarily because of the fluctuations in the domestic consumption levels of this product. In Malaysia, another asiatic country, high production costs have difficulted the exporting of cassava derivatives, but the internal demand for animal feed has shown a fast growth rate (Firman Manurung 1974). In Latin America only Brazil has exported 2% of its cassava production in the form of flower, starch "tapioca", and chips (Phillips 1974).

Nestel (1974) indicates that the actual potential of cassava in the animal feed industry seems to lie in these same producing countries, especially in those where the pressure of the demand creates an increase in the price of those products used in the manufacture of concentrates, and where a market for meat quality is being developed.

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(6) Denominated "raspas" in Portuguese and "tajadas" in Spanish.

Annual Production per Capita

Per capita production of cassava in cassava producing countries was ten times larger than the per capita production of beans, slightly superior to that of maize and a little less than half that of rice (Table 8).

Compared with other agricultural crops grown in the cassava producing countries, cassava per capita production was slightly superior to that of wheat and potatoes and close to four times larger if compared with sorghum and soybean.

The African continent had the highest per capita production of cassava, but, along with Asia and Oceania, the smallest per capita production of meat (Table 8). Asia was estimated to have the highest per capita production of rice - 138 kgr person/year. This comparison is relevant in that it points out Asia as having an advantageous position in relation to the availability of protein sources - rice has 8% digestible protein and cassava only 1% (Gutierrez and Buitrago 1974).

The production of cassava decreased in the last ten years at a rate slightly inferior to the rate of population growth in the cassava producing countries (1.5% vs. 2.3%), resulting in a decreasing annual growth of production per capita (Tables 9 and 10).

In comparing the cassava producing countries (Table 11), Burundi, the Central African Republic and Congo show the largest per capita production of cassava, followed by Paraguay. Important in Latin America were also Brazil, Ecuador, French Guyana and Colombia (5).

The situation with cassava is similar to that of all agricultural crops produced in the tropics, where the population grows at a slightly higher rate than the production of any of these crops.

AVAILABILITY

Apparent Availability of Calories

Presently the most important use for cassava is human consumption. It has been estimated that 56% of the world's production is destinated to human consumption (Nestel 1974).

Given its low level of protein content, cassava is only used as a source of energy either for human consumption or for the elaboration of concentrates.

Compared with wheat, maize and rice (Table 12), cassava presents the least apparent availability of digestible calories. In the cassava

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(5) These figure were computed dividing the production figures in Table 1 by the population data in Table 6.

Nestel's theory coincides with the situation presented by some Latin American countries such as Panama, Costa Rica, Colombia, and Venezuela, where dehydrating plants have been installed for producing flower from cassava pellets. In the State of Monagas, Venezuela, a recently established 360 ton/day plant for the production of cassava pellets is dedicated primarily to supplying the local market with raw materials for the animal industry (Agroindustrial 1977).

The goals of the recent cassava flower industry in Latin America coincide with the doubts raised by various experts in animal nutrition (Buitrago et al 1975) in relation to the potential in cassava and its derivatives as a source of energy for animal feed. The demand for grains, seeds, oleaginous, and other energy and protein sources for the preparation of concentrate feed in Latin America will increase notoriously. Thus, the competition for products for animal feed is becoming more critical.

The potential of cassava as a source of energy is being recognized in some Latin American countries. Rosas (1975) shows that in Peru the demand for fresh cassava has undergone a slight increase in the last years; to the point that every significant increase of the area cultivated is subject to the establishment of flower or starch producing industries. In Guatemala (Fumagalli 1975) there are potential areas for increasing the production of cassava but not for industrial purposes as in this country currect production satisfies the domestic demand for human consumption and the needs of the small industry.

Starch Industry

The relative importance of the different kinds of starch varies from region to region (Phillips 1974). Starch from maize is more important in the United States and Canada, from potatoes in Europe, from sweet potatoes and rice in Japan and the Far East. The best markets for cassava starch are found in Japan, the United States and Canada, but in these countries cassava has contributed less than 10% of the total starch used.

Cassava starch is preferred as raw material for numerous products, e.g. for sizing in the linen and glue industries. Starch can be obtained from maize, potatoes, sweet potatoes, rice, sorghum, waxi maize, West-Indian sago, and cassava. Sago cannot be grown in the tropics as it has a long vegetative period, 8 to 10 years. Potatoes grow in temperate zones and along with rice, are a basic element in the diet. Another basic element in the diet of tropical countries is maize, which is presently processed economically to produce starch.

The feasibility of commercially producing starch from cassava is uncertain, nevertheless, it is important to bear in mind projections estimated by Phillips for the total cassava starch demand until 1970 and the decade following, showing an annual growth rate fluctuating from 2 to 16%.

In Latin America only Brazil on a big scale and Colombia on a small scale produce cassava starch with low impurity content. In this continent the production of starch from cassava has been in the hands of small industries with rudimentary technology.

IMPLICATIONS

As of today, three different markets have been identified for the farming of cassava, according to the investigations carried out by Phillips (1974): starch and animal feed industries, discussed in general in this report, and human consumption where the situation is slightly different.

Taking Colombia as an example, where 95% of the cassava produced is used for human consumption and the rest goes to the industrial sector, primarily for starch (Diaz and Pinstrup-Andersen 1977), the following has been observed: The area planted to cassava has varied year after year (Table 15), with an increasing tendency during the last 20 years (7) (Figure 2). The average annual increase in production was estimated to be 28,080 tons (8); however, yield has been almost constant with a slight annual increase of only 60 Kg/ha (9). That is to say, the gradual increases presented in cassava production are primarily due to growths in cultivated area.

In relation to prices (Table 16), for the last 18 years, the currect price has increased annualy by $70.34 per ton (10) and, at constant prices, the annual increase has been approximately $1 per ton (12). No creditable data is available on cassava prices in more recent years but it is known that they have risen at a very high rate, primarily due to adverse climatic conditions present in the latter years in all agricultural areas in Colombia.

Since (1) the increase in cassava production is a result primarily of an increase in area planted, (2) actual prices have been practically constant throughout the period (Figure 3), and (3) the majority of cassava produced is used directly for human consumption, it can be assumed that both supply from the farmers and demand for human consumption has increased proportionally with population growth. But besides population growth, increase in income per capita has also influenced cassava consumers demand (13).

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(7) Area equation (Y) = 95.47 + 2.99x, R= 0.83
(8) Production equation (Y) = 560.75 +23.03x, R = 0.76
(9) Yield equation (Y) = 5.98 + 0.06x, R = 0.46
(10) Current price equation (Y) = -60.65 70.34x, R= 0.94
(11) Prices deflated by the price index of the Central Bank.
(12) Constant price equation (Y) = 67.15 + 1.37x, R= 0.60
(13) Total demand growth rate is equal to the population growth rate, plus the elasticity in demand for the product multiplied by the growth rate of income per capita.

According to empirical estimates available (Pinstrup Andersen, Per et al 1976), the increase in consumer's income should not have a major impact on demand for cassava since it is primarily consumed by persons of low income (14). In other words, people consume more cassava as their income increases, but only to a certain point. From then on this product behaves as an "inferior good".

Assuming that the population in Latin America will increase at a rate of 2.5% in the next decade and that the per-capita income will increase at a rate of 2% (Sanders and Alvarez 1977), cassava production can increase at a rate of 2.7% without affecting prices. The annual cassava production rate of growth for Latin America in the last decade was 1.23%.

An increase in the production of cassava above 3% would be sufficient to cause a decrease in prices occasioning a reduction in net profits of the producing sector thus diminishing the stimulus to future production.

A solution would be to reduce cassava prices to levels competitive with those of other products, primarily of the starch and flower markets. Thus, a competitive price level would be attained, maintaining acceptable profits for the producers if cassava yields could be increased through simple and inexpensive technology. For the case of Mexico where cassava shows a very low popular consumption, the solution suggested has been to increase the area planted to cassava for industrial purpose, especially for concentrates.

Besides being an energetic supplement in animal concentrates, cassava may be a potential substrate in the production of protein from a fungus (Nestel 1974). By means of this bilogical process the level of protein in cassava could be increased up to 35% (15).

The economic feasibility of producing alcohol from cassava is being studied in Brazil. This is a very important aspect in terms of the present worldwide energetic crisis.

Recent studies show that bread or bread-type products can be elaborated with formulas containing cassava flower or starch as the basic ingredient, replacing wheat flower (Knight 1974). In countries such as Paraguay and Brazil there are laws obliging bread producers

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(14) The elasticity income for cassava demand in Cali, Colombia has been estimated at 0.1185 (Pinstrup Andersen, P.N. de Londoño and E. Hoover 1976). The impact of increasing food supply on human nutrition. Implication for commodities priorities in agricultural research and policy. American Journal of Agricultural Economics, 58(2), May 1976, p. 131-142.

(15) See Gomez, G.G. for more detailed information on this process.

to use a percentage of cassava flower in making bread. In Colombia there are advanced studies on the use of cassava flower in the elaboration of bread and noodles; however the problem here is the scarcity of the product with consequent favorable prices for the fresh root.

CONCLUSIONS

According to information available it seems that the best perspective for developing the industry of concentrates is the use of cassava as an energy source for the domestic market. This implies (1) producing countries must think more in satisfying the domestic market than in exporting concentrates, given good comparative prices, and (2) reduce cassava prices to levels competitive with the prices of other substitute products.

Finally, and in spite of the fact that the market for exported starch is very uncertain, this line is very interesting and must be studied closely in producing countries as the sub-products of this process are very useful in the concentrate industry.

Table 1. Annual production of some important agricultural crops in the cassava producing countries. (Millions of tons) 1974.

Region	Wheat	Barley	Dry Beans	Maize	Rice	Sugar Cane	Potatoes	Cassava	Cotton (Fiber)	Sorghum	Soy	Coffee	Bananas	Meat
A.L. a/	9.2	0.9	2.9	31.9	10.8	250.0	8.5	29.7	4.0	7.6	8.7	2.9	18.7	5.8
AS. b/	58.8	22.9	5.0	45.7	242.2	236.8	43.2	29.6	10.4	10.5	12.7	0.3	9.5	2.0
AF. c/	0.5	0.02	1.0	9.3	4.7	16.1	1.2	43.7	1.9	8.1	0.1	1.1	4.7	1.2
OC. d/	h/	h/	h/	0.005	0.02	2.6	0.004	0.2	h/	0.004	h/	0.04	0.9	0.009
TCPC. e/	68.5	23.8	9.0	86.9	257.7	505.5	52.9	103.0	16.3	26.2	21.5	4.5	33.8	9.1
TW. f/	360.0	171.0	12.6	294.3	321.0	655.7	296.2	103.0	39.8	50.3	56.9	4.8	36.4	42.3
% g/	19.0	13.9	71.2	29.5	80.3	77.1	17.8	100.0	41.0	52.0	37.7	92.7	92.9	21.4

a/ L. A. Latin America

b/ AS. Asia

c/ AF Africa

d/ OC Oceania

e/ TCPC Total Cassava Producing Countries

f/ TW Total world

g/ % Percentage of the Cassava Producing Countries in relation to the world total.

h/ Data is not available.

SOURCE: FAO 1975 : Production Yearbook Vd. 28-1

Table 2. Annual production of some important agricultural crops in the cassava producing countries and other countries of the world. (Millions of tons) 1974.

Product	1st country		2nd country		3rd country		Total World
	Name	Mill. Tons	Name	Mill. Tons	Name	Mill. Tons	Mill. Tons
Wheat	U.S.S.R.	83.9	United States	48.3	China	37.0	359.9
Barley	U.S.S.R.	54.2	China	20.5	France	9.9	170.9
Dry Beans	India	2.5	Brazil	2.2	China	2.0	12.5
Maize	United States	118.5	South Africa	11.2	Brazil	17.3	294.3
Rice	China	115.3	India	60.4	Indonesia	22.8	321.0
Sugar Cane	India	140.9	Brazil	96.4	Cuba	56.0	655.9
Potatoes	U.S.S.R.	81.0	Poland	48.5	China	38.0	296.1
Cassava	Brazil	24.7	Nigeria	10.0	Indonesia	13.8	102.9
Cotton Cake	U.S.S.R.	8.4	United States	6.6	China	6.4	39.8
Sorghum	United States	16.0	India	10.2	Argentina	6.1	50.3
Soy	United States	33.1	China	11.8	Brazil	7.8	58.8
Coffee Pulp	Brazil	1.6	Colombia	4.6	Ivory Coast	2.6	4.8
Bananas	Brazil	7.0	Ecuador	3.4	India	3.2	36.4
Meat	United States	10.7	U.S.S.R.	6.4	Argentina	2.2	42.2

SOURCE: FAO 1975, Production Yearbook. Vol. 28-1

Table 3. Cassava production (thousands of metric tons) in Latin American countries, total in Africa, Asia, Oceania, Latin America and World Total 1964 - 1974*

Country	1964	1974
Brazil	24356	24715
Colombia	700	1320
Paraguay	1449	1109
Peru	497	485
Ecuador	189	424
Argentina	240	299
Venezuela	312	293
Bolivia	150	270
Cuba	200	234
Dominican Republic	153	205
Haiti	120	144
Honduras	16	44
Panama	45	40
Nicaragua	12	18
El Salvador	8	15
Jamaica	8	15
Costa Rica	7	10
Guatemala	3	7
Puerto Rico	6	5
French Guiana	6	4
TOTAL		
Africa	20727	43473
Asia	18978	29638
Oceania	113	217
Latin America	28502	29656
Total CPC **	68320	102984

* Excluding Barbados, Trinidad & Tobago, Guadeloupe, Martinique, Surinam and Guiana, as there is no information available for some periods.

** Total Cassava Producing Countries.

SOURCE: FAO 1975. Production Yearbook, Vol. 29.

Table 4. Area planted to cassava (thousands of hectares) in Latin American countries total for Africa, Asia, Oceania, Latin America and World total 1964 - 1974*

Country	1964	1974
Brazil	1716	1989
Colombia	125	165
Paraguay	103	80
Ecuador	24	49
Venezuela	25	40
Peru	50	38
Cuba	30	35
Haiti	30	34
Argentina	21	23
Bolivia	9	21
Dominican Republic	15	20
Honduras	5	6
Panama	6	5
Nicaragua	3	4
Guatemala	1	3
Jamaica	3	2
Costa Rica	3	2
El Salvador	1	1
Puerto Rico	2	1
French Guiana	1	1
TOTAL		
Africa	3461	5636
Asia	2228	2853
Oceania	10	20
Latin America	2174	2519
Total CPC**	7873	11028

* Excluding Surinam, Barbados, Guadeloupe, Martinique, Trinidad & Tobago, and Guiana, as there is no information available for some periods.

** Total Cassava Producing Countries.

SOURCE: See Table 1.

Table 5. Average cassava yield (tons/ha) in Latin American countries, total for Africa, Asia, Oceania, Latin America and World Total 1964 - 1974*

Country	1964	1974
El Salvador	8.0	15.0
Paraguay	14.1	13.9
Argentina	11.4	13.0
Bolivia	16.6	12.9
Peru	9.9	12.8
Brazil	14.2	12.4
Dominican Republic	10.2	10.2
Ecuador	7.8	8.6
Panama	7.5	8.0
Colombia	5.6	8.0
Jamaica	2.6	7.5
Venezuela	12.0	7.3
Honduras	3.2	7.3
Cuba	6.6	6.7
Costa Rica	2.3	5.0
Puerto Rico	3.0	5.0
Nicaragua	4.0	4.5
Haiti	4.0	4.2
French Guiana	6.0	4.0
Guatemala	3.0	2.3
Total		
Africa	5.9	7.7
Asia	8.5	10.4
Oceania	11.3	10.4
Latin America	13.1	11.7
Total Cassava Producing Countries	8.7	9.3

* Excluding Surinam, Barbados, Guadeloupe, Martinique, Trinidad & Tobago, and Guiana, as there is no information available for some periods.

** Total Cassava Producing Countries.

Average yield estimated on the basis of area and production data supplied by FAO, 1975, Production Yearbook, Vol. 29.

Table 6. Countries showing cassava production (thousands of metric tons) equivalent to at least one percent of the world production, 1974

Country	Production	Percentage of World Production
Brazil (Latin America)	24715	24
Indonesia (Asia)	13775	11
Nigeria (Africa)	10000	10
Zaire (Africa)	8879	9
India (Asia)	6421	6
Thailand (Asia)	6240	6
Burundi (Africa)	4000	4
Tanzania (Africa)	3500	3
Mozambique (Africa)	2400	2
Ghana (Africa)	1770	2
Angola (Africa)	1640	2
Madagascar (Africa)	1378	1
Colombia (Latin America)	1320	1
Paraguay (Latin America)	1109	1
Central African Republic (Africa)	1100	1
Sudan (Africa)	1100	1
Uganda (Africa)	1100	1
Total CPC*	102984	100

* Total cassava producing countries.

SOURCE: FAO Production Yearbook, Vol. 29.

Table 7. Farming systems in some of the countries having a production of cassava of at least one percent of the total world production, 1974

Country	Type of Farming
Brazil (a) (Latin America)	1. Monoculture. Commercial planting for industrial use. 2. Culture intercropped with maize, sorghum, beans in the majority of family farms in the northeast.
Nigeria (b) (Africa)	1. Monoculture. 2. Cultures of African Palm and cassava (cassava becomes a weed).
Indonesia (c) (Asia)	1. Monoculture. Commercial planting. 2. Intercropped. 58% of growers, primarily with maize (one half), legumes or annual crops or other crops.
India (d) (Asia)	1. Monoculture. Commercial planting. 2. Cassava is intercropped, the majority is produced by small farmers. 3. A small proportion is planted in the shade of coconut palm.
Thailand (e)	1. Monoculture. Primarily commercial. 2. Intercropped with young plantations of rubber, primarily in the south.
Ghana (b) (Africa)	1. Monoculture. 2. The majority in parcels of cassava and maize.
Colombia (f) (Latin America)	1. Monoculture. 68% of the area planted. 2. Cassava, maize, 13% of the are planted. 3. Cassava, beans, plantains, coffee and sesame, 19% of area planted.
Paraguay (g) (Latin America)	1. Most of the farmers in the country plant cassava in small parcels along with other crops.
Uganda (b) (Africa)	1. Monoculture. Small scale. 2. The majority of cassava is intercropped.
Cameroons (b) (Africa)	1. Monoculture. Small scale. 2. The majority of cassava is intercropped.
Togo (b) (Africa)	1. The majority planted in small parcels along with legumes, maize, rice, sorghum.
Peru (h) (Latin America)	1. The majority are small family farms with small cassava parcels. 2. Occasionaly cassava is intercropped with maize or plantains.
Philippines (i) (Asia)	1. The majority of cassava is intercropped with coconut palm or maize.

Table 7. (continued)

a/ Toro, J.C. 1977. Personal communication, CIAT, Colombia.

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Table 8. Annual per capita production of some important agricultural crops in the cassava producing countries of the world, 1974*.

Region	Wheat	Barley	Dry Beans	Maize	Rice	Sugar Cane	Potatoes	Cassava	Cotton (Fiber)	Sorghum	Soy	Coffee	Bananas	Meat
LA. a/	38.39	3.58	11.86	132.63	44.67	1039.21	35.41	123.27	16.57	31.74	36.25	12.22	77.85	24.3
AS. b/	33.61	13.07	2.88	26.12	138.45	135.35	24.67	16.94	5.96	5.98	7.23	0.19	5.41	1.1
AF. c/	1.97	0.10	4.19	37.45	18.93	64.81	4.75	174.79	7.50	32.40	0.29	4.59	17.57	4.7
OC. d/	f/	f/	f/	1.41	6.48	730.22	1.13	61.11	f/	1.13	f/	11.16	246.97	2.5
TCPC. e/	30.56	10.59	4.00	38.76	114.93	225.44	23.58	45.92	7.27	11.67	9.57	1.98	14.92	4.0

(a) A.L. Latin America

(b) AS. Asia

(c) AF. Africa

(d) OC. Oceania

(e) TCPC. Total Cassava Producing Countries

(f) Non-available data.

* Index estimated on the basis of production and population data.

Table 9. Population (thousands of persons) in cassava producing countries in Latin America, total for Africa, Asia, Oceania, Latin America and World total 1964 - 1974. *

Country	1964	1974
Brazil	80216	106659
Colombia	18086	25088
Argentina	21869	25051
Peru	11124	14887
Venezuela	8818	11862
Cuba	7646	9285
Ecuador	4929	6867
Guatemala	4475	5952
Bolivia	4148	5275
Dominican Republic	3588	4951
Haiti	3888	4483
El Salvador	2857	3983
Honduras	2141	2933
Puerto Rico	2580	2868
Paraguay	1965	2572
Nicaragua	1653	2243
Jamaica	1742	1999
Costa Rica	1445	1940
Panama	1223	1631
French Guiana	39	58
Total		
Africa	192481	248709
Asia	1418673	1749642
Oceania	2795	3551
Latin America	184432	240587
Total Cassava Producing Countries	1798381	2242489

*Excluding Barbados, Trinidad & Tobago, Guiana, Surinam, Martinique, Guadeloupe, as there is no information available for some periods.

SOURCE: FAO 1975. Production Yearbook, Vol. 29

Table 10. Annual per capita production of cassava (kilograms) in Latin America countries, total for Africa, Asia, Oceania, Latin America and total for cassava producing countries, 1964 - 1974. *

Country	1964	1974
Paraguay	737.40	431.18
Brazil	303.63	231.72
French Guiana	153.85	68.97
Ecuador	38.34	61.74
Colombia	38.70	52.61
Bolivia	36.16	51.18
Dominican Republic	42.64	41.41
Peru	44.68	32.58
Haiti	30.86	32.12
Cuba	26.16	25.20
Venezuela	35.38	24.70
Panama	36.79	24.52
Honduras	7.47	15.00
Argentina	10.97	11.94
Nicaragua	7.26	8.02
Jamaica	4.59	7.50
Costa Rica	4.84	5.15
El Salvador	2.80	3.77
Puerto Rico	2.33	1.74
Guatemala	0.67	1.18
TOTAL		
Africa	107.68	174.79
Asia	13.38	16.94
Oceania	40.43	61.11
Latin America	154.54	123.27
Total CPC **	37.99	45.92

* Excluding Barbados, Guiana, Guadeloupe, Martinique, Surinam, and Trinidad & Tobago, as no information is available for certain periods.

** Total cassava producing countries

Index estimated on the basis of production data (Table 2) and population data (Table 8).

Table 11. Annual per capita production of cassava (kilograms)for those countries having an index greater than the world per capita production, 1974*.

Countries	Production per capita	Production Index per capita
Burundi (Africa)	1009.51	2198.41
Central African Republic (Africa)	627.85	1367.27
Republic of Congo (Africa)	462.65	1007.51
Paraguay (Latin America)	431.18	938.98
Zaire (Africa)	371.72	809.49
Togo (Africa)	343.09	747.15
Comoro Islands (Africa)	335.57	730.77
Gabon (Africa)	326.30	710.58
Mozambique (Africa)	265.81	578.85
Tonga (Oceania)	265.31	577.77
Angola (Africa)	264.35	575.68
Benin (Africa)	240.72	524.22
Tanzania (Africa)	233.80	509.15
Brazil (Latin America)	231.72	504.60
Madagascar (Africa)	177.01	385.47
Nigeria (Africa)	163.35	355.73
Figi (Oceania)	157.24	342.42
Liberia (Africa)	155.97	339.66
Thailand (Asia)	153.19	333.60
Equatorial Guinea (Africa)	150.82	328.44
Ivory Coast (Africa)	131.27	285.87
Cameroons (Africa)	127.43	277.50
Indonesia (Asia)	103.93	226.33
Uganda (Africa)	99.84	217.42
Guinea (Africa)	97.47	212.26
Ruanda (Africa)	88.08	191.81
French Guiana (Latin America)	68.97	150.20
Sudan (Africa)	62.11	135.26
Ecuador (Latin America)	61.74	134.45
Kenya (Africa)	58.51	127.42
Sarawak (Asia)	55.12	120.03
Pacific Islands (Oceania)	52.63	114.61
Colombia (Latin America)	52.61	114.57
Sri Lanka (Asia)	51.76	112.72
Bolivia (Latin America)	51.18	111.45
Total Cassava Producing Countries	45.92	100.

* Index estimated on the basis of production and population statistics in:
FAO 1975, Production Yearbook, Vol. 29.

Table 12. Apparent daily per capita availability of calories of some agricultural products important in the cassava producing countries, 1974*.

	Wheat	Barley	Dry Beans	Maize	Rice	Potatoes	Cassava	Sorghum	Soy	Bananas	Availability of total Kilocalories	% (g)
Region	(3290)	(3122)	(3020)	(3460)	(3570)	(800)	(1220)	(3450)	(4500)	(1000)		
LA. a/	342.34	30.28	98.13	1243.99	432.31	76.80	407.91	296.89	442.11	211.04	3601.80	100
AS. b/	302.50	111.62	23.83	247.22	1352.39	54.01	56.55	56.52	89.14	14.82	2308.60	88
AF. c/	17.76	0.86	34.50	353.68	184.47	10.37	582.09	305.11	3.58	47.97	1540.39	59
OC. d/	h/	h/	h/	12.89	60.93	2.37	196.60	10.21	h/	666.19	949.19	36
TCPC. e/	274.74	90.41	33.01	366.48	1121.08	51.53	153.12	110.02	117.62	40.79	2358.80	90

(a) L.A. Latin America

(b) AS. Asia

(c) AF. Africa

(d) OC. Oceania

(e) TCPC Total cassava producing countries.

(f) The figures within the parentheses are equivalent to the average kilocalories in one kilogram of edible material of each product.

(g) Percentage availability of needs considering 2,600 kilocalories as the average caloric requirement per capita per day.

(h) Information not available.

* Figures estimated by multiplying the per capita production data in Table 7 by the factors shown in parentheses and dividing this result by 365 days per year.

Table 13. Apparent daily per capita availability of calories from cassava in Latin American countries, total for Africa, Asia, Oceania, Latin America and World Total, 1974*.

Countries	Apparent Daily per capita Availability of Calories (a)	Percentage of the Caloric Requirements (b)
Paraguay	1441.20	55
Brazil	774.52	30
French Guiana	230.53	9
Ecuador	206.36	8
Colombia	175.85	7
Bolivia	171.07	7
Dominican Republic	138.41	5
Haiti	107.36	4
Peru	108.90	4
Venezuela	82.56	3
Cuba	84.23	3
Panama	81.96	3
Honduras	50.14	2
Argentina	39.91	2
Nicaragua	26.81	1
Jamaica	25.07	1
Costa Rica	17.21	1
El Salvador	12.60	0
Puerto Rico	5.82	0
Guatemala	3.94	0
TOTAL		
Africa	372.48	14
Asia	44.92	2
Oceania	33.63	1
Latin America	412.03	16
Total Cassva Producing Countries	120.50	5

* Excluding Barbados, Guiana, Guadaloupe, Martinique, Trinidad & Tobago, and Surinam, as there is no information available for certain periods.

(a) 1 Kgr of fresh cassava is equivalent to 1.2 digestible megacalories, IN: Maner, J. H., J. Buitrago, R. Portela and I. Jimenez, 1972. La Yuca en la Alimentación de Cerdos. ICA. CIAT (in press) p. 3.

(b) 2.6 megacalories as an average of the daily per capita caloric requirements, In: National Livestock and Meat Board, 1965. Lessons on meat. Chicago, Illinois, p. 27.

Table 14. Relation between apparent daily per capita availability of proteins in grams and the apparent daily per capita availability of calories from cassava in Latin America.

Countries	Apparent Daily Per Capita Availability of Proteins (grs) (a)	Index (b)	Apparent Daily Per Capita Availability of Calories (c)	Inde (d)
Argentina	95	144.40	39.91	10.(
Paraguay	70	106.90	1441.20	362.4
Nicaragua	69	104.88	26.81	6.7
Brazil	67	101.84	774.52	194.7
Jamaica	67	101.84	25.07	6.3
Costa Rica	63	95.76	17.21	4.3
Cuba	63	95.76	84.23	21.1
Panama	62	94.24	81.96	20.6
Venezuela	62	94.24	82.56	76.(
Peru	62	94.24	108.90	27.3
Guatemala	58	88.16	3.94	0,9
Honduras	53	80.53	50.14	12.6
El Salvador	51	77.52	12.60	3.1
Colombia	50	76.00	175.85	44.2
Dominican Republic	50	76.00	138.41	34.8
Bolivia	47	71.44	171.07	43.(
Ecuador	43	65.36	206.36	51.8
Haiti	39	59.28	107.36	27.(

(a) U.S.D., ERS. F.D.C.D. Working Paper, Agriculture in the Americas. Statistical Data, April 1976.

(b) (Average for Latin America 66 gr.) = 100

(c) The same data in Table 9.

(d) (Average for Latin America 397.65 kilocalories) = 100

Table 15. Area planted to cassava, production and yield in Colombia 1955 - 1974

Years	AREA (1,000) Has	AREA Index*	PRODUCTION (1,000) Metric tons	PRODUCTION Index	YIELD Tons/Ha	YIELD Index*
1955	111	98.2	633	82.4	5.7	83.8
1956	110	97.3	682	88.8	6.2	91.2
1957	109	96.5	687	89.4	6.3	92.6
1958	113	100.0	768	100.0	6.8	100.0
1959	115	101.8	748	97.4	6.5	95.6
1960	100	88.5	650	84.6	6.5	95.6
1961	98	86.7	539	70.2	5.5	80.9
1962	108	95.6	734	95.6	6.8	100.0
1963	112	99.1	773	100.7	6.9	101.5
1964	102	90.3	561	73.0	5.5	80.9
1965	127	112.4	864	112.5	6.8	100.0
1966	129	114.2	890	115.9	6.9	101.5
1967	115	101.8	794	103.4	6.9	101.5
1968	118	104.4	814	106.0	6.9	101.5
1969	134	118.6	965	125.6	7.2	105.9
1970	148	131.0	1095	142.6	7.4	108.8
1971	145	128.3	754	98.2	5.2	76.5
1972	155	137.2	961	125.1	6.2	91.2
1973	165	146.0	1320	171.8	8.0	117.6
1974	165	146.0	1320	171.8	8.0	117.6

* Index: 1958 = 100

SOURCE: DANE. Bol. Mensual de Estadística. Area and Yield. No. 276, July, 1974. Area, Yield and Production, 1973 and 1974. Ministry of Agriculture Agricultural Programs.

Table 16. Cassava prices in Colombia, 1955 - 1972

Years	CURRENT PRICES		CONSTANT PRICES	
	Pesos/Ton (1)	Index 1958 = 100	Pesos/Ton (2)	Index 1958 = 100
1955	193	96.5	84.5	152.5
1956	198	99.0	80.0	144.4
1957	215	107.5	69.9	126.2
1958	200	100.0	55.4	100.0
1959	250	125.0	63.2	114.1
1960	303	151.5	73.0	131.8
1961	378	189.0	86.1	155.4
1962	338	169.0	75.0	135.4
1963	398	199.0	69.9	126.2
1964	755	377.5	112.9	203.8
1965	658	329.0	90.9	164.1
1966	691	345.5	80.9	146.0
1967	795	397.5	87.6	158.1
1968	955	477.5	98.5	177.8
1969	891	445.5	86.6	156.3
1970	891	445.5	79.7	143.9
1971	1361	680.5	109.1	196.9
1972	1467	733.5	101.2	182.7

(1) Boletin Mensual de Estadística. No. 227, August 1974.

(2) Current prices deflated by the price index at wholesale levels reported by the Central Bank.

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