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LeBaron,A. D.; Michaelson, Leon

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9. ABSTRACT

This report contains some estimates of the world demand for bananas in 1970, 1975, and 1980, along with an analysis to determine the extent to which Colombian data, in isolation, are inadequate for predicting future sales of Colombian bananas. The broad conclusion is that it is difficult to predict with much confidence any single European nation's demand for Colombian bananas.

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Progress Report

MEASURING THE MARKET FOR COLOMBIAN BANANAS: PRELIMINARY NOTES

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USU Economics Research Center
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CUSUSWASH/Ut/Econ. P3

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MEASURING THE MARKET FOR COLOMBIAN BANANAS: PRELIMINARY NOTES

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This report contains some estimates of the demand for bananas in 1970, 1975, and 1980. The analysis utilized rather simple research techniques, but the methods are sufficient for present purposes, namely to determine the extent to which Colombian data, in isolation, is adequate for predicting future sales of Colombian bananas. The broad conclusion, not surprisingly, is that it is difficult to predict with much confidence any single European nation's demand for Colombian bananas.

Income Elasticity of Demand for Colombian Bananas

One well-known method of estimating future banana sales is to relate predicted population and national income growth in main markets to each other by means of coefficients of income elasticity of demand (I_e). I_e expresses the percentage change in quantity demanded of any commodity when consumer incomes rise by a given percentage; $I_e = \frac{dQ}{dI} \cdot \frac{I}{Q}$, where I and Q equal original incomes and quantity demanded respectively.

The necessary data requirements for estimating the coefficient, I_e, for the particular countries constituting the bulk of Col mbian banana export markets and for the work and certain regional groupings are shown in Tables 1, 2, 3, and 4.

Projections of per capita income growth are shown in Tables 1 and 2. As far as the regional groupings are concerned, per capita growth of GNP during the 1965-66 -- 1980 period will be greater in Weatern Europe than in the world of North America. Among the Weatern European nations, West Germany will have the greatest percentage per capita income growth

Table 1 Per capita GDP and projections for and world and selected national groupings [4/]

Year	World Index [1/]	7-European [2/]		North America [2/]
1950	66			
1951	70			
1952	71			
1953	74			
1954	75			
1955	80			
1956	82	892		2979
1957	84	893		2984
1958	85	942		2907
1959	88	1014		3002
1960	92	1051		3064
1961	94	1069		3063
1962	97	1206		3219
1963	100	1250		3289
1964	105	1312		3421
1965	109	1350		3575
1966	113	1388		3769
Projections				
1966	111.4	1422	Adj [3/]	3525
1970	126.6	1750	1734.0	3891
1975	140.6	2271	2159.8	4422
1980	174.3	2939	2635.0	5054
Per capita income growth factor	1.56		1.85	1.43

1/ Based on Table 63, Yearbook of National Accounts, UN, 1967. Extra populations based on estimating equation (7) Table A8.

2/ In terms of US Dollar; Includes W. Germany, Netherlands, Sweden, Norway, Belgium, Italy, and Switzerland.

3/ Implied growth rate reduced to hold per capita income growth factor below that of W. Germany, Cf.Table A7 and A6.

4/ The series on 7-European and North America arbitrarily started in 1959 to conform with available banana data, in order to also estimate income elasticities in same series of computer passes.

Table 2 Per capita GDP for selected Colombian export

YEAR	West Germany[1/]	Netherlands[2/]	Sweden[3/]	Norway[4/]
1956	3696	3722	7514	9154
1957	3089	3770	7696	9307
1958	3975	3683	7723	9296
1959	4211	3805	8072	9559
1960	4515	4095	8289	9860
1961	5008	4160	8710	10415
1962	5194	4284	8983	10794
1963	5358	4370	9821	11255
1964	5656	4721	9926	11712
1965	5851	4914	10209	12104
1966	5953	5002	10396	12545
1967	6050[e]	5100[e]	10500[e]	12900[e]
PROJECTIONS				
1966	6289	4914	10275	12578
1970	7963 (7862)	5736	12055	14009
1975	10803 (9906)	6830	14399	16370
1980	14532 (12264)	8154	17223	19212
Per capita income growth factor	2.301 1.95	1.65	1.65	1.50

[e] Estimated

1/ Deutschmarks

2/ Guilders

3/ Kronor

4/ Kroner

5/ Values in parenthesis are adjusted for anticipated leveling of West German and Common Market growth. Cf. Table A7 n6.

prior to 1980.

Trends in per capita consump ion of bananas have risin steadily except in North America. In the latter region, consumption (on a gross weight basis) exceeded 10.5 kilos/capita in 1960, then fell off and has again risen to about 9.6 kilos annually. It may be that absolute levels of consumption per capita will ordinarily be reached between 10 and 15 kilos/year.

The volume of Colombian exports have generally risen proportionally with increases in world consumption, but regional and individual nation markets have often proven unstable (Table 3 and 4). For a number of years, Colombia has not been a factor in North American markets, but some success has been achieved in maintaining about a 20 percent share of the seven nation European market specified. Only in the cases of West Germany and the Netherlands, has Colombia been able to command steady, substantial markets. Indeed, only in the latter market is there definite evidence of capturing larger and larger shares in recent years.

Tables 5 and 6 list some estimates of income elasticities for the areas and nations in question. (They are based on equations that were fitted with varying degrees of success. Several statistical tests are shown in Tables A-9 and A-10 in conjunction with each equation.) The numbers in parenthesis represent a judgement about the relative degree of reliability of each I_e estimate. The values shown are rough averages of the results obtained from at least three functions in every case.

Table 3 Banana imports: World and selected national groupings (1000 M.T.)

Year	World		7-European		North American**	
	Total	Colombian	Total	Colombian	Total	Colombian
1956	3067	215.8	517.4	159.8	1696	54.4
1957	3383	184.1	556.1	162.4	1733	20.9
1958	3537	174.0	699.1	149.1	1796	22.0
1959	3750	203.4	706.9	175.7	1858	27.6
1960	3955	190.7	722.9	185.2	2123	5.0
1961	3932	205.5	826.1	201.5	2036	3.4
1962	3971	147.0	863.1	146.5	1760	0.5
1963	4240	202.6	895.3	201.4	1812	0.8
1964	4229	171.6	915.0	171.4	1899	--
1965	4897	2533	1157.8	253.3	1995	--
1966	5374	310.9	1274.6	309.4	2080	1.5
1967	5546	325.6	1384.3	325.6	--	--
1968	5716					
1969	6447*					
Kilos per capita						
1956	1.084	0.076254	3.832	1.181	9.118	0.32000
1957	1.353	0.064146	4.086	1.193	9.218	0.12151
1958	1.203	0.059183	5.097	1.093	9.326	0.12571
1959	1.250	0.067800	5.104	1.268	9.480	0.15506
1960	1.284	0.061915	5.166	1.323	10.684	0.02778
1961	1.258	0.065760	5.859	1.429	10.129	0.01868
1962	1.253	0.046372	6.083]	1.032	8.627	0.00270
1963	1.317	0.067919	6.260	1.411	8.712	0.00426
1964	1.289	0.052317	6.354	1.171	9.043	--
1965	1.471	0.076066	7.957	1.741	9.309	--
1966	1581	0.091441	8.712	2.096	9.630	0.00765
1967	1.608	0.094376	9.911	2.165	--	--
1968	1.633					
1969	1.803					

*Preliminary

**Estimated on basis of U.S. shares

Table 4 Banana imports in major Colombian markets (1000 M.T.)

Year	Germany		Netherlands		Sweden		Norway		Belgium	
	Total	Colombian	Total	Colombian	Total	Colombian	Total	Colombian	Total	Colombian
1956	296	88.5	41	22.1	43.6	18.3	12.6	0	53	21.0
1957	342	94.0	47	20.5	42.5	18.6	28.8	1.6	57	18.6
1958	423	103.0	52	19.5	39.6	0.2	28.5	0.4	61	16.5
1959	430	118.5	57	43.5	38.4	11.3	23.6	1.5	61	0.6
1960	452	137.4	60	35.5	38.6	7.1	24.4	5.2	66	--
1961	473	136.3	68	47.7	41.6	11.4	27.4	6.1	68	--
1962	469	108.2	71	33.3	44.7	4.2	28.0	0.8	68	--
1963	475	131.3	72	62.3	43.8	4.2	24.7	--	65	--
1964	487	85.9	69	69.0[e]	45.4	2.1	27.9	--	68	4.4
1965	585	130.0	81.3	81.3[e]	53.3	24.8	33.1	1.2	78	--
1966	606	128.1	99.5	89.5[e]	57.3	29.9	34.8	10.9	98	--
1967	639[e]	68.3	103[e]	103.0[e]	60.0[e]	18.6	36.5[e]	7.2	110.0[e]	.5
Kilos per capita										
1956	5.084	1.735	3.796	2.046	6.055	2.542	3.673	0		
1957	6.641	1.825	4.253	1.855	5.862	2.565	8.252	0.458		
1958	8.135	1.981	4.643	1.741	5.388	0.122	8.050	0.113		
1959	8.190	2.257	5.022	3.832	5.175	1.523	6.629	0.421		
1960	8.493	2.582	5.217	3.087	5.160	0.949	6.815	1.452		
1961	8.800	2.536	5.837	4.094	5.539	1.518	7.590	1.690		
1962	8.656	2.005	6.017	2.822	5.913	0.555	7.671	0.219		
1963	8.780	2.427	6.025	5.213	5.748	1.076	6.694	0		
1964	8.903	1.570	5.726	5.726	5.896	0.273	7.365	0		
1965	10.521	2.338	6.691	6.691	6.877	3.200	8.827	0.320		
1966	10.841	2.291	8.103	8.103	7.346	3.833	9.206	2.883		
1967	11.390	1.217	8.293	8.293	7.653	2.372	9.605	1.895		

[e] Estimated.

Table 5 Estimated income elasticities of demand for bananas in selected areas and nations

	I_e		
	1966		1980
World	1.0	(4)	1.2
7-European	1.6	(1)	1.4
North America	-0.1	(nil)	-0.15
West Germany	0.97	(4)	1.0
Netherlands	1.8	(3)	1.5
Sweden	0.8	(5)	1.0
Norway	1.2	(7)	1.1

Source: Table A-9

Table 6 Estimated income elasticities of demand for Colombian bananas in selected markets

7-European	1.1	(6)	1.0
Netherlands	4.0	(2)*	2.0 *
Norway	4.0	(8)	2.0

Source: Table A-10

Numbers in parenthesis refer to rank of reliability of estimate based on goodness of fit of estimating equation.

*These values must be assumed to hold only to the degree Colombia doesn't have all of the Netherlands market, otherwise I_e from Table 5 should be used.

Table 5 Base values for computing $C_t = C_o\left(\frac{Y_t}{Y_o}\right)^n$

General	C_o	Y_t/Y_o 1975	Y_t/Y_o 1980	$\ln Y_t/Y_o$ 1975	$\ln Y_t/Y_o$ 1980	$I_E = n$ 1975	$I_E = n$ 1980	$\ln (Y_t/Y_o)^n$ 1975	$\ln (Y_t/Y_o)^n$ 1980
World	1.581	1.33	1.56	0.28518	0.44469	1.1	1.2	0.31369	0.53362
7-European	8.712	1.518	1.85	0.41871	0.61514	1.5	1.4	0.62806	0.86126
North America	9.630	1.254	1.43	0.33767	0.35767	-0.13	-0.15	-0.04649	-0.05365
West Germany	10.841	1.575	1.95	0.45400	0.66783	0.98	1.0	0.44492	0.66783
Netherlands	8.103	1.389	1.65	0.32850	0.50078	1.6	1.5	0.52560	0.75117
Sweden	7.346	1.401	1.65	0.33652	0.50078	0.9	1.0	0.30286	0.50078
Norway	9.206	1.301	1.50	0.26245	0.40547	1.15	1.1	0.30181	0.44601
World	0.091441		1.56		0.4469				
7-European	2.096	1.518	1.85	0.41871	0.61519	1.05	1.0	0.43964	0.61519
West Germany	2.291	1.575	1.95		0.66783				
Netherlands	8.103	1.389	1.65	0.32850	0.50078	3.0	2.0	0.98550	1.0056
Sweden	3.833		1.65		0.50078				
Norway	2.383	1.301	1.50	0.26245	0.40547	3.0	2.0	0.78735	0.81094

Since none of the fitted relationships take into account banana substitutes, or allow for price effects and do not exhibit particularly good coefficients of determination in any case, these results must be preliminary. Nevertheless the I_e values are indicative of the current situation and of certain possible trends.

For every 10 percent gain in per capita incomes, substantially more than a 10 percent increase in bananas will be demanded in European markets in general, at least until some saturation level is reached. The Netherlands looks especially attractive for Colombian exports, but for virtually all other "usual" Colombian markets, there is no evidence of trustworthy I_e values. West Germany has been a good customer, but the erratic pattern of purchases produces coefficients of regression that are not significant at any reasonable level of probability. And, in any case, the West German per capita consumption is very near that of North America's, where I_e values are or may even be negative. This seems to occur at about 10-11 kilos/capita/year. Thus the West German I_e estimate for 1980 has been underlined, because it is very suspect.

Colombia's situation with respect ot total marketing in the seven European countries specified[1] appears relatively weak, if the current overall I_e value is really in the region of 1.6, since Colombia would not share proportionately in banana imports generated through rapid increases in European per capita incomes (the elasticity for

---

[1] West Germany, Sweden, Netherlands, Norway, Switzerland, Belgium, and Italy.

Table 7 Projections of estimated kilos per capita demand for bananas in areas indicated - 1975, 1980 [1/]

[illegible] General	1966 C_o	$\left(\frac{Y_t}{Y_o}\right)^n$ 1975	1980	kilos/capita Q_t 1975	1980
World	1.531	1.368	1.70509	2.16	2.70
7-European	8.712	1.874	2.36614	16.326	20.614
North America	9.630	.9546	.94776	9.192	9.1269
West Germany	10.041	1.5604	1.9500	16.9159	21.1399
Netherlands	8.103	1.6916	2.11947	13.7060	17.1741
Sweden	7.431	1.3537	1.6500	9.9444	12.1209
Norway	9.206	1.3523	1.56207	12.449	14.3804
Exports from Colombia					
7-European	2.096	1.5521	1.85001	3.253	3.8776
Netherlands	8.103	2.6792	2.7335	21.709	22.149.
Norway	2.883	2.1976	2.25002	6.3356	6.4868

[1/] Average of values of fitting various functions as indicated in Table 8.

Table 3 Projections of per capita banana consumption based on equations in Tables A-9 and A-10

	1970	1975	1980
World			
L	2.136	2.513	2.953
LL			
3L	2.329	3.037	4.141
North America			
L	9.195	9.046	8.869
LL	9.186	9.068	8.946
SL	9.195	9.057	8.897
7-European			
L	11.162	14.576	18.534
LL	11.360	15.869	21.486
SL	13.369	23.242	44.138
West Germany			
L	13.690	17.144	21.129
LL	13.647	17.041	20.923
SL	15.414	23.164	37.059
Netherlands			
L	9.312	11.990	15.231
LL	9.624	13.193	18.170
SL	10.262	16.170	28.036
Sweden			
L	7.804	9.126	10.718
LL	7.595	8.708	10.000
3L	9.912	9.742	12.518
Norway			
L	9.942	11.683	13.780
LL	10.135	12.181	14.714
SL	10.487	13.564	18.488
Colombia-7 European			
L	2.236	2.825	3.483
LL	2.080	2.564	3.101
SL	2.307	3.342	5.058
Colombia- Netherlands			
-As above, if Colombia has 100% of the market.			
Colombia-Norway			
L	2.352	3.295	4.432
LL	2.146	4.253	8.594
SL	2.396	6.178	19.318

L=Linear LL= Log Log SL= Semi log when transformation is on dependent variable.

Table 9 Annual market share achieved by Colombian Bananas in individual countries and groups of countries.

	1956 %	1957 %	1958 %	1959 %	1960 %	1961 %	1962 %	1963 %	1964 %	1965 %	1966 %	1967 %
Germany	29.8	18.7	24.3	27.5	30.3	28.8	23.1	27.6	17.6	22.3	21.1	10.6
Netherlands	53.9	43.6	37.5	76.3	59.1	70.1	46.9	86.5	100	100	100	100
Sweden	41.9	43.7	2.2	29.4	18.3	27.4	9.3	18.7	4.6	46.5	52.1	31.0
Norway	0	5.5	1.4	6.4	21.2	22.2	2.8	0	0	3.6	31.3	19.7
Weighted annual average 6 nations	32.7	22.7	22.7	31.8	32.2	33.6	23.9	32.7	24.9	31.6	33.6	23.6
Italy	0	0	0	0	0	0	0	0	0	2.7	6.8	2.1
Belgium	39.6	32.6	27.0	0.9	0	0	0	0	6.4	0	0	0.4
Switzerland	41.3	36.6	28.9	0.8	0	0	0	0	0	0	0	0
Weighted annual average 7 nation	30.8	23.8	21.4	24.8	23.9	24.3	16.9	22.5	17.6	21.1	22.7	14.9
7 nation imports in 1000 metric tons	517.4	556.1	699.9	706.9	722.9	826.1	863.8	895.8	915.0	1157.8	1274.6	1384.4

Colombian bananas, at 1.0 is considerably less.

The estimates for Norway, as indicated by the underline are quite suspect. About all that can be said is that the relationships appear to be weighted in Colombia's favor.

These values for $I_e()$ in Table 5 are utilized in Table 6 to form base values upon which prediction of demand for bananas can be made.

Table 7 shows estimated of future levels of per capita banana import in the selected areas and in selected nations. These are assumed to be ranked as in Tables 5 and 6 and, in addition, are conditioned by all the usual dangers inherent in such extrapolations. Some consumption estimates are above 20 kilos/capita by 1980. Such results appear to run counter to North American experience (thus far). Thus it is difficult to decide at just what level "saturation" will take place. Total expected volumes of banana purchases can readily be approximated by multiplying any per capita consumption estimate by the appropriate population forecasts found in Appendix Table A-3.

Table 9 contains alternative projections obtained by extrapolation the equations of Tables A-9 and A-10 (the necessary values for future per capita incomes which must be inserted for future values of the independent variable) are found in Tables 1 and 2. As expected, the results bracket the values shown in Table 8. They do serve to illustrate, however, the consequences of fitting certain equation forms, in addition to showing that, where I_e are computed from time

series data, a less biased result might be secured by making projections in the traditional framework: $C_t = C_o(Y_t/Y_o)^u$, instead of resorting to projections of the I_e estimating equations.

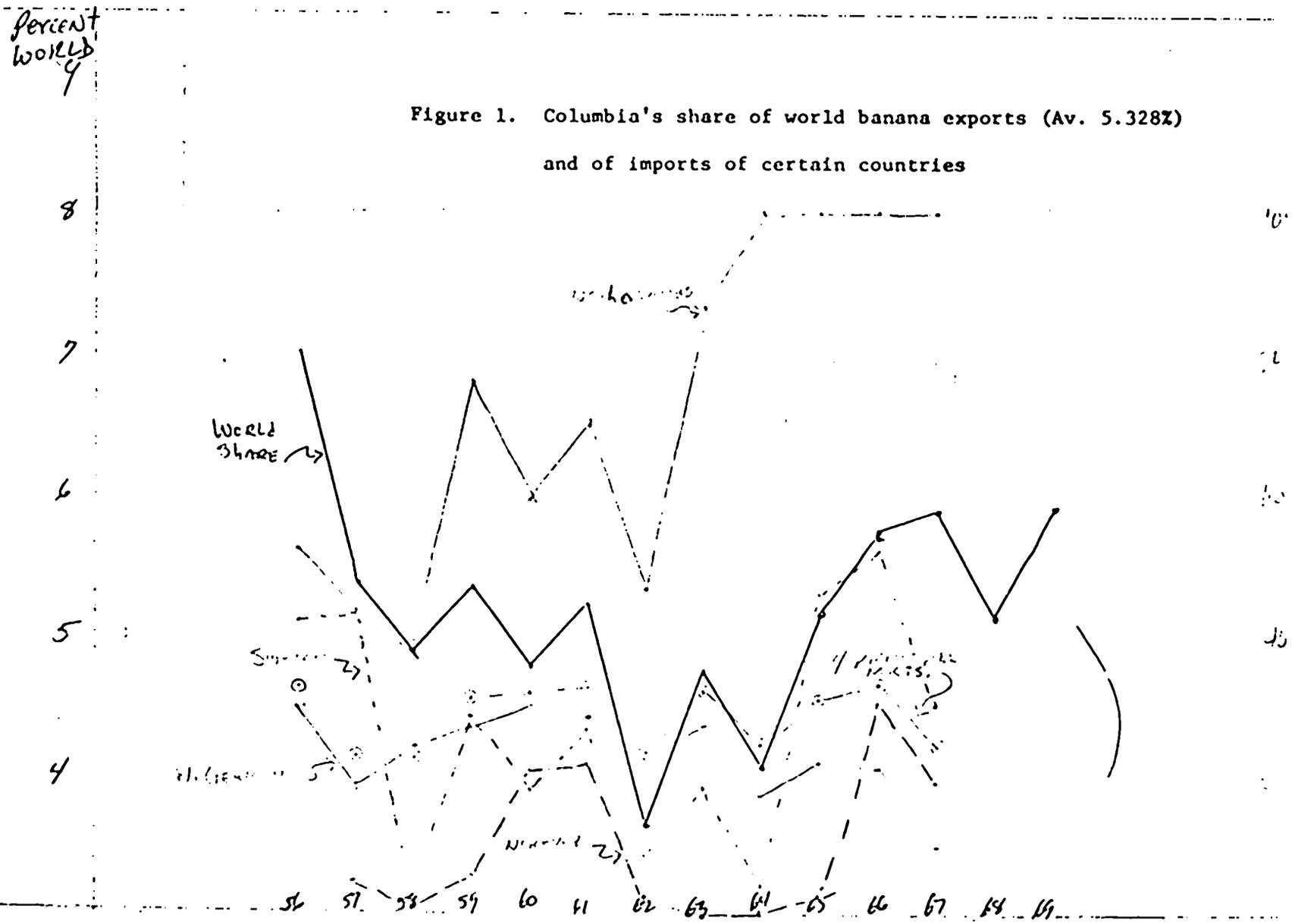
Colombia's Share of the World and European Banana Market

Another possible forecasting method would require that we project the total banana demand of a given region or grouping of markets, for example, the seven nation market specified for Europe. Following this, it might not be unreasonable to assume that Colombia would continue to get some well-defined share.

In the present analysis it may be observed Table A-9 that our regression analysis for 7-Europe constitutes the best single effort to result of all the groupings tried. Bearing in mind the effect in future years of the relatively high I_e values determined, it is possible to multiply the per captia values shown in Table 7 or 8 by the projected 7-Europe population of Table A-3 and then apply some coefficients appropriate for Colombia's weighted average share has been roughly 20 percent of the 7-Europe market in a given year. The 4-nation average (West Germany, Netherlands, Sweden and Norway) is roughly 30 Percent. Both of these values are depicted in Figure 1. Obviously this estimating system is gross and is hampered by large swings in annual purchases. No single nation appears to offer the requisite stablity (see Figure 1) unless one assumes that Colombia will in fact maintain 100 percent of the Dutch market. (It also may be noted that Columbia's share of world markets has been very unstable.) Thus, this system could not be very useful except for the 4 or 7-nation European grouping, and the Netherlands. This result

Figure 1. Columbia's share of world banana exports (Av. 5.328%)

and of imports of certain countries



Source: Table 9

Time Period and Dates

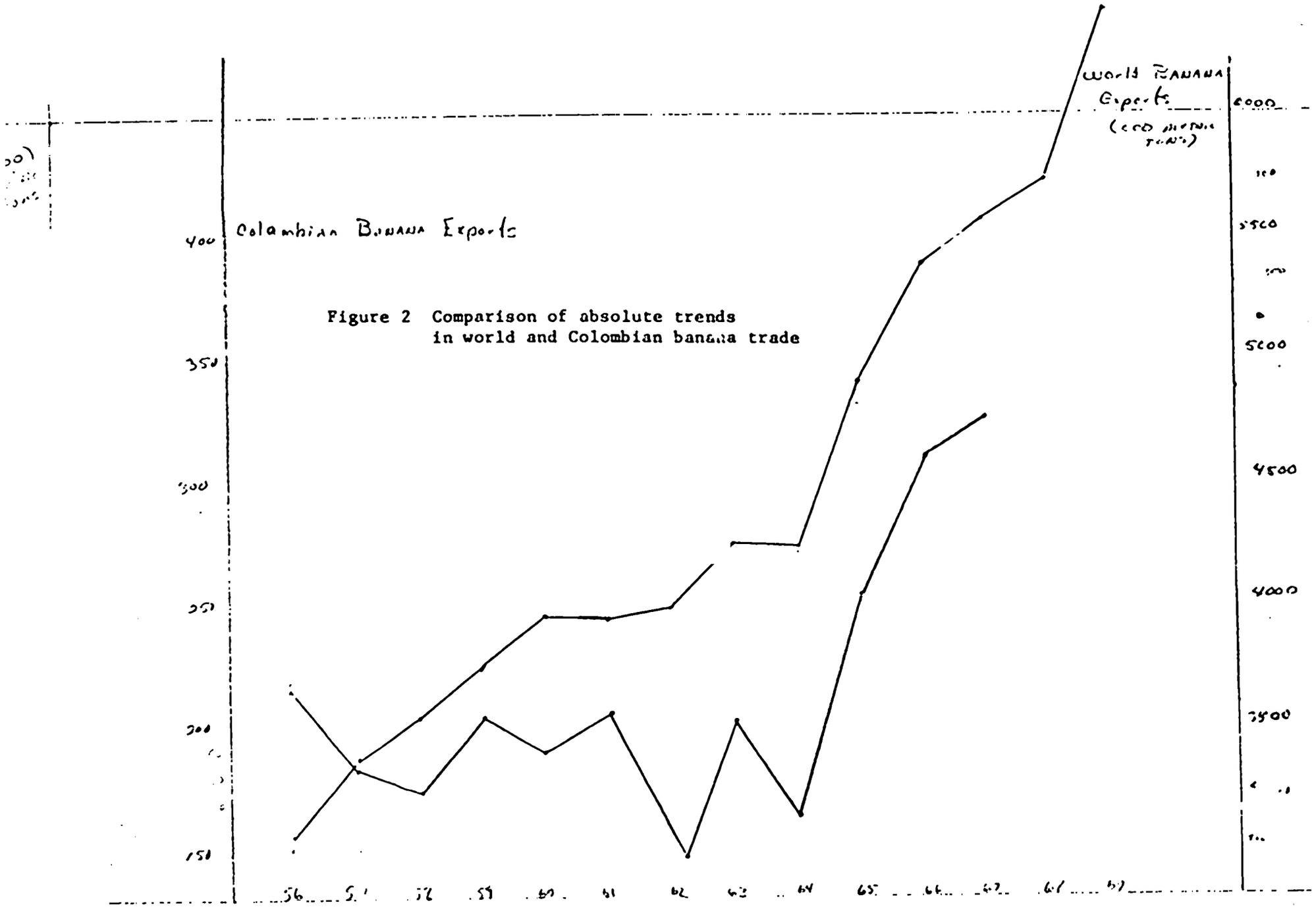


Figure 2 Comparison of absolute trends in world and Colombian banana trade

Table 10 Tentative forecasts of Colombian banana demand - 1975, 1980
(Assuming per capita saturation at 15 kilos/year)
--Metric tons--

	1975	1980
Total 7 Europe	2,301,900	2,368,875
Colombian Share, I_e=1.0	398,996	410,605
Colombia Share, 20%	460,380	473,775

Source: Table A3, Table 8 and Table 9

complacence that is shown in Table 6, namely that computed values are not at all reliable except in the same instances.

Conclusion

(1) Colombia's share of world banana trade is slipping (Figure 2). (2) Colombia will fare unequally in any new turn expansion of West German imports, North American imports, 7-Europe imports, and possibly Swedish imports. (3) Colombia should fare above average in income generated imports in Netherlands and probably Norway, (Tables 5, 6, A-8, and A-9). (4) Some gross calculations of future total sales can be made by employing the population projection of Table A-3 in connection with the per capita consumption estimates of [illegible] Table 8 (or 9), <u>if</u> some adjustment is made for saturation level of consumption per capita in future years. The result is shown in Table A-10. (5) Any possibility of obtaining further insights from purely income-consumption relationships may be ruled out (in the case of bananas). However, it is possible that a more complex model, one requiring estimates of price and cross elasticities, would prove useful for better predictions of export demands or of likely future competitive trends. Thus for any consuming nation or area:

$$Q_C = P_C + P_E + P_P + P_o + P_{FN} + P_N + I + T$$

$$Q_E = P_C + P_E + P_P + P_o + P_{FN} + P_N + I + T$$

$$Q_P = P_C + P_E + P_P + P_o + P_{FN} + P_N + I + T$$

$$Q_o = P_C + P_E + P_P + P_o + P_{FN} + P_N + I + T$$

$$Q_{FN} = P_C + P_E + P_P + P_o + P_{FN} + P_N + I + T$$

$$Q_N = P_C + P_E + P_P + P_o + P_{FN} + P_N + I + T$$

Where:

T = Trend or time variable

I = Per capita Income

Q_i = Per capita Consumption

C = Colombia E = Ecuador P = Panama --- N Bananas

o = other fruit

FN = Food other than fruit (index)

N = Non-food index(s)

P_i = Prices of fruit, bananas, other food, non food index

The coefficients of the set of equations can be utilized to obtain price and income elasticities and cross-elasticities between substitute and complementary food items. The matrix of such elasticities ($[E_p]^{-1} X [Q_F] = [P_F]$) divided into a vector of future expected demands might also be used to compute future expected prices, (given target demand levels).

APPENDIX TABLES

Table A1. Estimated populations selected countries (millions)

Year	World	West Germany	Netherlands	Sweden	Norway	United States	North America	7 Europe
1955	2.78							
1956	2.83	51.0	10.80	7.70	3.43	170.0	186	135.0
1957	2.87	51.5	11.05	7.25	3.49	172.0	188	136.1
1958	2.94	52.0	11.20	7.35	3.54	175.0	193	137.3
1959	3.00	52.5	11.35	7.42	3.56	178.0	196	138.5
1960	3.08	53.22	11.50	7.48	3.58	180.7	198.7	139.92
1961	3.125	53.75	11.65	7.51	3.61	182.0	201	141
1962	3.17	53.95	11.80	7.56	3.65	185.0	204	142
1963	3.22	54.10	11.95	7.62	3.69	188	208	143
1964	3.28	54.70	12.05	7.70	3.72	190.0	210	144
1965	3.33	55.60	12.15	7.75	3.75	194.4	214.3	145.50
1966	3.40	55.90	12.28	7.80	3.78	196.0	216.0	146.3
1967	3.45	56.40	12.42	7.84	3.8	198.0	217	147.1
1968	3.50	56.30	12.55	7.87	3.82	200.0	222	147.9
1969	3.575	56.50	12.65	7.89	3.84	203.0	225	148.7
1970	3.63	56.60	12.75	7.92	3.9	207.5	229.3	149.57

Source: World; World Population Bull 21(4):73-79, October 1965.
Remainder; World Population Prospects U.N. 1963.

Table A2. Average annual population growth rates implicit in U.N. Data

	1965-1970 Percent	1970-1975 Percent	1975-1980 Percent
West Germany	0.359	0.247	0.419
Sweden	0.571	0.581	0.552
Brazil	3.058	3.005	2.908
United States	1.352	1.489	1.604
North America	1.402	1.536	1.650
Adjusted	1.000	0.800	0.700
World	1.92	2.17	2.32
Adjusted	1.9	1.8	1.7

Source: Same as table A1. Adjustments have been made where indicated to allow for expected decreases in birth rates that could not be forseen at the time of the U.N. study (1963).

Table A3. Projected population growth

	1965		1970		1975		1980
West Germany	55,600		56,000		57,300		58,50(
Sweden	7,700		7,920		8,150		8,37:
Netherlands	12,150		12,750		13,400		14,05·
Norway	3,375		3,900		4,080		4,25·
North America	214,307	(1.4)	229,329	(1.54)	246,943	(1.65)	267,31
Adjusted	-	(1.0)	225,022	(0.8)	234,023	(0.7)	242,21
World	3,300,000	(1.92)	3,626,000	(2.17)	4,020,000	(2.32)	4,487,00'
Adjusted	[illegible]	(1.9)	3,622,260	(1.8)	3,948,263	(1.7)	4,283,86
Belgium	9,360		9,5'0		9,850		10,10
Italy	51,200		52,900		54,600		56,400
Switzerland	5,760		5,920		6,080		6,25
7 European	145,520		149,570		153,460		157,92

Source: Same as Table A1. Figures in brackets contain the implied average annual growth rates for five year increments.

Table A4. Gross domestic product of selected countries in terms of national currencies (All values in millions -- 1963 Market prices.)

Year	West Germany	Netherlands	Sweden	Norway	Switzerland	Italy	Belgium
1956	188,500	40,200	54,100	31,400	30,500	20,000,000	543,00
1957	200,300	41,660	55,796	33,403	31,770	20,989,000	556,50
1958	206,700	41,250	56,686	32,909	31,455	22,015,000	552,40
1959	221,100	43,190	59,097	34,030	33,325	23,419,000	567,20
1960	240,300	47,090	62,001	35,298	35,234	24,907,000	597,80
1961	269,200	48,470	65,416	37,600	37,025	26,044,000	627,60
1962	280,200	50,550	67,910	39,398	39,715	28,493,000	660,90
1963	289,900	52,231	71,027	41,560	41,560,	30,072,000	690,50
1964	309,400	56,090	76,432	43,567	43,655	30,891,000	738,60
1965	325,200	59,700	79,120	45,389	45,315	31,924,000	763,60
1966	332,800	61,420	81,030	47,420	46,380	33,656,000	785,60
	Deutsche Mark	Guilders	Kronors	Kronors	Francs	Lira	Francs

Source: U.N. Yearbook of National Accounts, 1967 Table 16. Totals exclude allowances for Government services.

Table A5. Foreign exchange rates of various currencies in United States cents.

Year	West Germany	Netherlands	Sweden	Norway	Switzerland	Italy	Belgium
1956	23.85	26.12	19.37	14.03	23.34	0.16005	2.011
1957	23.815	26.14	19.36	14.03	23.35	0.16005	1.9925
1958	23.87	26.44	19.35	14.03	23.24	0.16004	2.006
1959	23.94	26.53	19.34	14.06	23.22	0.16113	2.004
1960	23.903	26.52	19.39	14.02	23.165	0.16003	2.0072
1961	25.145	27.84	19.37	13.95	23.175	0.16003	2.01
1962	25.11	27.835	19.45	14.015	23.176	0.16003	2.0115
1963	25.126	27.767	19.305	14.00	23.11	0.16095	2.0045
1964	25.161	27.645	19.41	13.98	23.162	0.1605	2.0076
1965	24.975	27.750	19.34	13.983	23.092	0.16006	2.0152
1966	25.02	27.71	19.44	13.98	23.173	0.16025	2.0074
1967	25.027	27.76	19.39	14.00	23.15	0.16019	2.0153
1968	24.95	27.615	19.352	14.005	23.257	0.16062	2.0004
	Deutsche Mark	Guilders	Kronors	Kronors	Francs	Lira	Francs

Table A6. Weighted G.D.P. and weighted average per capita incomes of 7 European Nations. (Millions of U.S. dollars -- 1963 prices)

Year	G.D.P.	Per Capita Y
1956	120290.51	891.78
1957	121562.72	893.18
1958	129293.42	941.68
1959	140470.48	1014.22
1960	147069.17	1051.07
1961	150781.32	1069.37
1962	171257.13	1206.03
1963	178715.81	1249.76
1964	188832.02	1311.68
1965	196388.50	1349.70
1966	203038.05	1387.81

Table A7. Projected G.D.P. for selected nations and areas

	1966 Actual	1966	1970	1975	1980
West Germany[1]	332.8	349.691	450.721	618.997	850.097
Adjusted data[2]	332.8	349.691	444.975	522.555	662.274
Netherlands[3]	61.420	61.110	73.130	91.523	114.564
Sweden[4]	81.091	80.953	95.473	117.355	144.244
Norway[5]	47.420	46.523	54.634	66.791	81.652
North America[6]	765		875.582	1034.927	1224.118
World Index (1963=100)	-	-	132	161	196
World Per Capita Index (1963=100)	-	111.4	126.6	148.6	174.3
7 European (Billion US $)	203.030	208.133	261.745	348.579	464.218

[1]Thousand Million DM

[2]Growth rate implied in original data adjusted to hold predicted West German per capita income increase factor below 2.

[3]Thousand Million Guilders

[4]Thousand Million Kronor

[5]Thousand Million Kronor

[6]Billion U.S. Dollars

Table A8. Estimating equations utilized in projecting gross domestic products[1/]

	$\ln b_0$	b_1	R^2	t[2/] $H:B_1>B$	DF
West Germany	4.770440	0.06345893 (t) Where t1967=12 (0.00000524)	.987	27.7	11
Netherlands	10.25727	0.0448917 (t) Where t1967=12 (0.00000313)	.985	25.4	11
Sweden	10.60017	0.04125982 (t) Where t1967=12 (0.0000017)	.990	31.6	11
Norway	10.06464	0.04125982 (t) Where t1967=12 (0.00000295)	.982	23.4	11
North America U.N. Index	4.146088	0.03357938 (t) Where t1966=17 (0.00000256)	.967	21.0	16
7 European	11.61565	0.05729845 (t) Where t1966=12 (0.000005284)	.986	25.0	10
World Per Capita G.D.P. Index	4.169880	0.03197175 (t) Where t1966=17 (0.00000034)	.995	54.8	16

1/ Independent variable : time in all cases.

2/ Critical value of t at α = .995 : 3.169, 3.106, and 2.947, given 10, 11 and 16 DF respectively.

Table A9. Measurements of per capita income elasticity of demand for bananas - general

Equation Form	b_o	b_1	# of Observ.	r^2	$t(b_i)$	F	E_I	Independent Variable
World								
Linear	-0.031385496	0.017121242 (0.00238562)	13	.811	7.177	51.50	1.02 1.02 1.01	U.N. World Per Capita G.D.P. Ind.
Loglog	-0.03984724	0.97574541 (0.14434552)	13	.792	6.760	45.69	0.98	Per Capita G.D.P. Ind
Semilog (a)	-0.68190336	0.012064527 (0.0016497888)	13	.818	7.313	53.47	0.796 1.206 1.809	Per Capita G.D.P. Ind
Semilog (b)	-4.6958408	1.3795668 (0.21109831)	13	.781	6.535	42.701		
No. America								
Linear	10.285608	-0.00028027051 (0.00070706457	10	.017	-0.396	0.157	-0.07 -0.09 -0.17	Wgt. Per Capita G.D.P. ($)
Loglog	3.0516911	-0.100897 (0.24797243)	10	.019	-0.415	0.172	0.172	Per Capita G.D.P. ($)
Semilog (a)	2.328747	-0.00002829552 (0.000073666668)	10	.016	-0.384	0.148	-0.084 -0.106 -0.164	Per Capita G.D.P. ($)
Semilog (b)	17.384140	-0.99102771 (2.3322710)	10	.020	-0.425	0.181		
7 Europe								
Linear	-3.4142914	0.0083229527 (0.00097870087)	11	.879	8.511	72.43	1.85 1.40 1.23	Per Capita G.D.P. ($)
Loglog	-8.9362793	1.5239619 (0.16092439)	11	.900	9.470	89.68	1.52	Per Capita G.D.P. ($)
Semilog (a)	0.23112774	0.0013495996 (0.00013690328)	11	.907	9.858	97.18	1.203 1.926 2.430	
Semilog (b)	-59.457125	9.3287427 (1.2016672)	11	.858	7.763	60.267		
West Germany								
Linear	0.40419757	0.0016898653 (0.000251602)	11	.819	6.716	45.11	0.94 0.96 0.97	Per Capita G.D.P. (DM)
Loglog	-6.007678	0.96113578 (0.14781998)	11	.809	6.502	42.28	0.96	Per Capita G.D.P. (DM)
Semilog (a)	1.1686144	0.00019927343 (0.000031191042)	11	.803	6.389	40.82	0.736 1.205 1.594	Per Capita G.D.P. (DM)
Semilog (b)	59.970856	8.0939344 (1.2286072)	11	.813	6.588	43.400		

Table 9. Continued

Equation Form	b_o	b_1	# of Obser.	R^2	$t(b_1)$	F	E_I	Independen. Variable
Netherlands								
Linear	-4.7302742	0.0024401146 (0.0003250403	11	.850	7.532	56.73	2.08 1.61 1.37	Per Capita G.D.P. (Gu
Semilog	-13.371506	1.8066711 (0.24337586)	11	.846	7.423	55.11	1.80	Per Capita G.D.P. (Gu
Semilog (a)	-0.055689108	0.00041566473 (0.000056456795)	11	.844	7.362	54.21	1.547 2.119 2.909	Per Capita G.D.P. (Gu
Semilog (b)	-82.739853	10.590851 (1.4379751)	.844		7.354	54.245		
Sweden								
Linear	1.0082045	0.00056376111 (0.00014976404)	11	.506	3.764	14.17	0.81 0.85 0.89	Per Capita G.D.P. (Kr
Loglog	-5.2074957	0.76990615 (0.22[illegible]9368)	11	.544	3.457	11.95	0.77	Per Capita G.D.P. (Kr
Semilog (a)	0.9983724	0.0[illegible]765963 (0.000002387023)	11	.580	3.717	13.82	0.667 0.932 1.331	Per Capita G.D.P. (Kr
Semilog (b)	-30.403244	1.8054496 (1.3982462)	11	.550	3.497	12.228		
Norway								
Linear	-0.39231724	0.00073765757 (0.00028065613)	11	.409	2.620	6.91	1.06 1.04 1.03	Per Capita G.D.P. (Kr
Loglog	-3.9534[illegible]	1.1303597 (0.51470978)	11	.344	2.293	5.26	1.18	Per Capita G.D.P. (Kr
Semilog (a)	0.82365978	0.00010896716 (0.000047526906)	11	.345	2.293	5.26	0.997 1.406 2.179	Per Capita G.D.P. (Kr
Semilog (b)	-65.912262	7.9186403 (3.5081391)	11	.401	2.589	6.70		

H: $b_1 > 0$ where calculated F exceeds the tabulated values shown:

	DF	
	10, 1	12, 1
.995	12.83	11.8
.990	10.04	9.33
.950	4.96	4.75

Semilog equations (a) & (b) refer to transformations of the dependent and independent variables respectively. Transformations on X, (b), cause the function to increase at a decreasing rate and values for E get lower through time.

The linear and semilog function imply elasticities that vary thoughout the length of the consumption functions. The low values shown in column E_I are for the earliest years of observation (usually 1956), the ending year (usually 1967) and some date roughly estimated at 1980.

Table A10. Measurements of per capita income elasticity of demand for Colombian bananas

Equation Form	b_o	b_1	# of Observ.	R^2	$t(b_1)$	F	E_I	Independen. Variable
World								
Linear	0.013418455	0.0006842115 (0.00045508637)	11	.184	1.503	2.26	0.77 0.84 0.80	U.N. Worl. Per Capit. G.D.P. In.
Loglog	-5.3078947	0.59467184 (0.54825144)	11	.105	1.085	1.18	0.59	Per Capit. G.D.P. In.
Semilog (a)	-3.3717041	0.0083267883 (0.0067988529)	11	.130	1.225	1.80	0.55 0.83 1.25	Per Capit. G.D.P. In.
Semilog (b)	-0.14903766	0.049631633 (0.036855946	11	.154	1.346	1.813		
7 Europe								
Linear	-0.16666871	0.0013849388 (0.00042491284)	11	.515	3.259	10.62	1.16 1.09 1.06	Wgt. Per Capit. G.D.P. (S
Loglog	-6.3998117	0.95619791 (0.32703706)	11	.461	2.924	8.55	0.96	Per Capi... G.D.P. (
Semilog (a)	-0.67679501	0.00087202453 (0.00027989029)	11	.493	3.116	9.71	0.777 1.244 1.569	Per Capit. G.D.P. (S
Semilog (b)	-9.229614	1.5149346 (0.49898581)	11	.480	3.036	9.27		
West Germany								
Linear	2.2251434	-0.000032645931 (0.00015339374)	11	0.004	-0.213	0.04	-0.06 -0.07 -0.13	Per Capit. G.D.P. (DM
Loglog	1.6213541	-0.10812950 (0.39341431)	11	0.007	-0.273	0.08	-0.11	
Semilog (a)	0.86255527	-0.000032233263 (0.000081519426)	11	0.015	-0.395	0.16	-0.119 -0.195 -0.258	
Semilog (b)	2.6339369	-0.067153890 (0.73869317)	11	0.008	-0.0901	0.008		
Netherlands								
Linear	-13.79145	0.0042420588	11	.895	9.228	85.16	7.90 2.75 1.82	Per Capita G.D.P. (Guild.)

Table A10. Continued.

Netherlands cont.								
Loglog	-34.454132	4.2837824 (0.556 8842)	11	.856	7.702	59.32	4.28 3.66	Per Capita G.D.P. (Gu
Semilog(a)	-2.9786449	0.0009854883 (0.00012949336)	11	.853	7.607	57.87	5.024 6.856	Per Capita G.D.P. (Gu
Semilog(b)	-148.49632	18.295575 (2.1020255)	11	.884	8.70378	75.756		
Sweden								
near	-1.3802834	0.0003455898 (0.00032046654)	11	.104	1.078	1.16	2.13 1.61 1.36	Per Capit G.D.P. (1C
Loglog	-17.482971	1.9423161 (2.6023348)	11	0.053	0.746	0.56	1.94	Per Capita G.D.P. (IC
Semilog (a)	-1.8816109	0.00023004647 (0.00028964333)	11	0.059	0.794	0.63	1.72 2.44 3.45	Per Capita G.D.P. (IC
Semilog (b)	-24.254364	2.855881 (2.8938370)	11	.089	.986	.97		
Norway								
near	-3.2486134	0.00039975748 (0.00020796163)	8	.345	1.922	3.19	8.91 2.70 1.68	Per Capita G.D.P. (Kr
Loglog	-41.186722	4.393851 (2.7955894)	8	.261	1.57	2147	4.39	Per Capita G.D.P. (Kr
Semilog (a)	-4.7456732	0.00040113968 (0.00025501525)	8	.261	1.57	2.47	3.672 5.175 8.022	Per Capita G.D.P. (Kr
Semilog (b)	-39.3575513	7.9186483 (4.3564391)	8	.342	1.905	3.63		

$H: b_1 > 0$ where calculated F exceeds:

	DF	
	10, 1	7, 1
α .995	12.83	29.2
α .990	10.04	12.2
α .950	4.96	5.59

Only the b_1's for 7 Europe and Netherlands are significant at α = .95 or above.

Two semilog equation fitted: The first (a) transforms the dependent variable, the second (b) transforms independent data.

Cf. notes in Table A9.

Table A11. Colombian banana exports 1956 - 1967

Country	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967
West Germany	88.5	94.0	103.0	118.5	137.4	136.3	108.2	131.1	85.9	130.0	128.1	68.3
Netherlands	22.1	20.5	19.5	43.5	35.5	47.7	33.3	62.3	71.3	89.8	115.6	216.4
Sweden	18.3	18.6	0.9	11.3	7.1	11.4	4.2	8.2	2.1	24.8	29.9	18.6
Belgium	21.0	18.6	16.5	0.6	-	-	-	-	4.4	-	-	0.5
Norway	-	1.6	0.4	1.5	5.2	6.1	0.8	-	-	1.2	10.9	7.2
Italy	-	-	-	-	-	-	-	-	-	7.5	22.2	8.0
Finland	-	-	-	-	-	-	-	-	-	-	-	
East Germany	-	-	-	-	.	-	-	-	-	-	2.7	2.2
France	-	-		-	-	-	-	-	-	-	-	3.2
Czechoslavakia	-	-	-	-	-	-	-	-	-	-	-	1.2
United States	54.4	20.9	22.6	27.6	5.0	3.4	0.5	0.8	-	-	1.5	
Switzerland	9.6	9.1	9.8	0.3	-	-	-	-	-	-	-	
United Kingdom	-	-	-	-	-	-	-	-	2.7	-	-	
Rest of World	1.9	0.8	1.9	0.1	0.5	0.6	-	-	-	0.2	-	
Total	2.5.8	184.1	174.0	203.4	190.7	205.5	147.0	202.6	171.6	253.3	310.9	325.6

Table A12. World exports in thousand metric tons

Year	Equador	Honduras	Panama	Costa Rica	Brazil	Colombia	Other Latin America	Africa	Rest of World	Total
1956	579	393	248	233	188	216	540	352	318	3067
1957	669	337	290	310	219	184	652	400	322	3383
1958	743	398	267	302	271	174	658	396	328	3537
1959	1045	359	291	213	213	213	795	375	249	3750
1960	1065	363	263	273	242	191	906	388	264	3955
1961	985	430	272	231	246	206	897	353	312	3932
1962	1100	368	251	293	216	147	834	441	311	397[illegible]
1963	1340	344	298	262	206	293	808	472	307	4240
1964	1320	349	267	294	226	172	695	450	456	4229
1965	1200	527	335	316	216	254	791	427		48[illegible]
1966	1265	739	385	359	205	311	810	370		537[illegible]
1967	1262	825	454	371	171	326	822	370		5546
1968	1253	835	524	480	160	295	1005	366		5716
1969	1300	920	575	650	220	380	1000	381		6447

Table A13. World imports of bananas in 1,000 metric tons[1/]

Country	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967
W. Germany	296	342	423	430	452	473	467	475	487	585 580	606.2	639
France	266	309	351	341	353	367	398	362	353	399.3 430	460.4	
Italy	48	44	62	62	87	103	135	161	164	316.5 275	322.4	
Netherlands	41	47	52	57	60	68	71	72	69	81.3 75	99.5	103.[illegible]
Belgium	53	57	61	61	66	68	68	65	68	79.7 75	98.3	
United Kingdom	320	319	313	339	350	371	374	365	352.5 355	376.3 408	369.2	
United States	1533.5 1557	1558 1589	1616 1649	1704 1704	1951 1951	15653 1886	13113 1615	13785 1667	14483 1744	15653 1820	1617.6	
Canada	139	144	147	154	172	136 164	132 153	136 151	152.3 157	167 185	174.9	
Argentina	113	175	240	206	191	212	176	163	167	190.5 170	173.3	
Rest of World	148	170	207	214	267	281	272	503	570	609		
Sweden	43.6	42.5	39.6	38.42	38.65	41.6	44.75	43.8	45.37	53.33	57.33	60.0
Norway	12.6	28.8	28.5	23.59	24.43	27.42	28.07	24.75	27.45	33.11	34.79	36.5
Switzerland	23.2	28.4	33.8	35.06	44.8	47.56	53.08	53.78	54.27	56.10	60.82	
World Total	3205	3455	3747	3741	4142	4210	3968	4219	4393	5170		

1/ Data for Sweden, Norway, Switzerland from FAO Trade Yearbook 1968; data shown in double amounts from same source.