Staff Papers Series

Staff Paper P86-42 September 1986

COUNTRY SIZE, LEVEL OF DEVELOPMENT,
RELATIVE IMPORTANCE OF AGRICULTURE
AND AGRICULTURAL RESEARCH IN LDCs

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Country Size, Level of Development, Relative Importance of Agriculture and Agricultural Research in LDCs

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Table of Contents

I. Introduction

Aside from differences in opinion concerning the role of technical change in agriculture, the process by which new agricultural technologies are generated is unanimously perceived as one of enormous importance for sustaining the world's growing population.

In recent years efforts on the part of national governments and multilateral assistance agencies have been made to build strong and effective national agricultural research systems into significant factors for the transformation and modernization of LDC agricultures. Yet these attempts, in a number of developing countries, have appeared to be hindered by factors such as insufficient research expenditures and lack of scientific personnel.

It has been persistently argued that most LDCs are either economically too small and/or economically too poor to develop and support the national research capacity required to greatly improve both their levels of agricultural production and productivity. In addition, the importance of agriculture within the country has been seen as yet another determinant of the level of support that agricultural research can expect to receive. However, no comprehensive empirical evidence for either of the above arguments has been forthcoming.

Within this context, this paper is aimed at (1) proposing a more plausible definition of country size than the ones currently available in the literature; (2) relating this concept to agricultural research policy in LDCs: and (3) describing an eventual empirical relationship between financial and human resources allocated to agricultural research and measures of size, level of development, and relative importance of agriculture. The analysis will utilize a sample of 56 developing countries using 1980 data.

The paper is composed of six main sections. Section I is introductory and provides a brief overview of the problem, objectives and hypotheses.

In Section II a general review of literature on size as related to economic development is presented in order to identify the most important arguments for and against smallness in LDCs.

Section III suggests a more plausible definition of country size than the ones currently available in the literature.

Section IV is an attempt to determine whether there can be found an empirical relationship between either (a) research expenditures as a percent of Agricultural Gross Domestic Product ; (b) research expenditures per scientist; (c) research expenditures per million of agricultural population; or (d) the number of scientists per million of agricultural population and size as measured by either population, agricultural land corrected for quality and gross national product independently or derived from these variables.

Section V makes use of a sample of 56 LDCs to analyze the same policy issues, though only one measure of size (agricultural land corrected for quality) is employed, and three new variables (per capita income, agricultural population as a percent of total population, and agricultural GDP as a percent of total GDP), which are utilized as a measure of both the level of development and relative importance of agriculture, are introduced in the analysis.

Section VI summarizes the general findings of the paper and its implications for further research.

II. Country Size and Economic Development

During the last three decades there has been a general belief that small countries face special disadvantages or problems in their development. This view appears to be at least partially supported by the fact that there is an impressive number of small nations among the so-called developing countries[1]. Using population as a quick measure of size, for example, it is found that of 141 developing countries for which data are available, 88 countries have populations of less than seven million, and as many as 48 of these have populations of less than two million, and 22 of these 88 countries are considered by the United Nations to be part of the 31 least developed countries[2].

Given these facts, it is not surprising that interest has been expressed in the particular problems of these countries. The paragraphs below are an attempt to briefly review the literature on size as related to economic development. To begin with, Kuznets (1959) in his search for a reasonable answer to the question of whether a variant of a theory of economic growth for the many small national units differs from that for the few large ones initiated a debate which later resulted in Demas (1965) demanding a more precise distinction between large and small developing countries, and Robinson (1960) questioning how some of the emerging independent small nations of the sixties could escape the penalties of their smallness.

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[1] Following the Overseas Development Council (1983), developing countries will be hereafter defined as those with per capita GNP of US $ 3,500 or less and Physical Quality of Life Index (a composite index which includes life expectancy, infant mortality and literacy) of 90 or below.

[2] All these numbers correspond to mid-1984 and were obtained from Todaro (1985).

Following these pioneering observations, in 1972 a collection of papers was prepared for a conference on Problems of Small Developing Countries which was organized by the Institute of Development Studies of the University of Sussex and presented at the University of the West Indies in Barbados[3]. While the main focus of the conference was on the dependent relationships of small Caribbean States with the former metropolitan powers, it generated much discussion on how far smallness could impose constraints on the future growth prospects of these countries.

Similarly, another conference held in 1979 by the Development Studies Centre of the Australian National University[4] explored problems of economic development in the small island states and territories of the Pacific and Indian Oceans. The wider range of this conference permitted it to deal with such broad issues as isolation; population and migration; trade, transport and tourism; finance and economic stability; health and education; and administration, law and politics. The papers concluded that, for the most part, the development situations of small island states differ in significant ways and that policy options open to different island categories will have to vary accordingly[5].

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[3]For the collection of papers presented at this conference, see Selwyn (1975).

[4]The papers presented at this conference appeared in Shand (1980).

[5]In another paper Selwyn (1980) argues, however, that small islands as distinct from small countries, are not a useful category in analytical, predictive or policy terms, mainly because the problems that face island states could be parallelled in small, remote mainland countries, or indeed in peripheral regions of many larger countries.

More recently, in 1981, the Commonwealth Secretariat organized the last conference on problems and policies in small economies, held at Malborough House in England[6]. The studies presented at this conference included conceptual and theoretical issues as well as issues of practical interest and application. These issues can be analyzed either in terms of disadvantages or in terms of compensating advantages of being small.

In the view of the conference, the most important disadvantages were that

(1) smallness tends to reduce the scope for exploitation of scale economies particularly in manufacturing (Bhaduri, et al, 1982).

(2) small countries face special handicaps in the provision of public services (such as infrastructure and research) especially for agriculture (Persaud, 1982) so that these services probably will not receive the necessary support from policy-makers[7].

(3) there is a tendency for small economies to concentrate production in a few commodities and a few industries (i.e. the concentration phenomenom), thereby increasing their vulnerability to fluctuations in commodity trade and capital inflows, and reducing their ability to adjust to shocks (Lloyd and Sundrum, 1982).

Regarding the compensating advantages of smallness, the conference found that

(1) small economies are likely to be more open, which appears to foster competitive and efficient economic behavior in the face of a chang-

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[6]For the complete collection of papers presented at this conference, see Jalan (1982).

[7]Following a similar reasoning, human resources and skills in small economies are also likely to be scarce (Jalan, 1982a).

ing external environment (Jalan, 1982a).

(2) they are also likely to have greater social homogeneity and cohesion, and a more equitable distribution of income which can ease resistance to the social ajustments that are an inherent feature of economic change (Jalan, 1982a).

Despite all these efforts, no plausible or consistent theory of size as an independent factor in development is available to date, and the view that there is no discernible association between country size and economic development appears, at least empirically, undisputed[8].

One objective of this paper is to analyze the second purported disadvantage of smallness by describing an eventual empirical relationship between financial and human resources allocated to agricultural research and several measures of size for a sample of 56 developing countries using 1980 data.

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[8]Based on a sample of 30 developing countries during the period 1954-67, Khalaf (1979) found that the coefficients obtained from a regression between economic development (as measured by average per capita income for the years 1951-57, adjusted for price changes) and country size (as measured by population and GNP size), and between economic growth (measured in terms of average annual rates of growth of GNP for each country) and country size are positive but neither coefficient is statistically significant.

III. Definition of Country Size

The fact that there are many small nations in the world has forced most writers on small economies to use arbitrary cut-off points either in terms of population or usable land area to distinguish small from large countries[9].

This section is aimed at proposing a composite country size index[10] which includes population (as a proxy for labor force), total national income (as a proxy for capital stock and/or market size) and agricultural land[11] corrected for quality, which may be taken as representing different dimensions of a country's development potential. Thus, it is hypothesized that differences in economic performance caused by size will be explained by the size of its capital, human and natural resources.

Because size is a relative concept, the relative size of a country based on the three above criteria should be measured in relation to the highest values of these criteria for all the developing countries taken together. Assuming equal weights, a composite country size index can be constructed for all LDCs where the largest country for each criterion is taken

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[9] Kuznets (1960) used a cut-off point of 10 million population, Demas (1965) defined small countries as those with a population of 5 million or less and with usable land area of 10 to 20 thousand square miles or less, and Chenery and Syrquin (1975) used a cut-off point of 15 million population.

[10] Bhaduri, Mukherji and Sengupta (1982) criticize this approach on the following grounds. First, "a statistically satisfactory composite index of smallness will not be found because the various relevant variables are not, in general, positively correlated in any significant sense". Second, "the ordering of countries in terms of their relevant indices of smallness will not remain invariant over time".

[11] Agricultural land is here defined as the sum of arable land under temporary crops and land under permanent pasture, plus land devoted to permanent pasture.

as 100. More specifically, the size index for 110 developing countries was calculated according to the following formula:

$$MCSI_i = 100/3\ (POPUL_i/POPUL_{max} + AGLCQ_i/AGLCQ_{max} + TGNP_i/TGNP_{max})$$

where

$MCSI_i$ is the country size index for country i;

$POPUL_i$, $AGLCQ_i$ and $TGNP_i$ are population , agricultural land corrected for quality and gross national product of each country respectively; and

$POPUL_{max}$, $AGLCQ_{max}$ and $TGNP_{max}$ are the highest values of population, agricultural land corrected for quality and gross national product for all developing countries taken together

This index differs from the one originally proposed by Jalan (1982b) in two respects. First, it includes agricultural land in lieu of arable land. Second, it utilizes the international land quality index developed by Peterson (1984) to correct agricultural land for quality. It is argued that agricultural, rather than arable land (i.e. area under temporary crops) more accurately reflects a country's long term endowment of natural (i.e. agricultural) resources. The international land quality index is derived from land quality weights obtained from a regression run on data in the US. It estimates the quality of an acre of (agricultural) land for 115 les developed and developed countries. Unavailability of data prevented Peterson from using information on nitrogen content as a proxy for organic matter or soil fertility. Instead two variables were used to measure the combined effects of topography and irrigated land. These are (1) nonirrigated cropland as a percent of all crop land (i.e. arable land under temporary crops and land under permanent crops) plus land under permanent pasture in farms, and (2) irrigated cropland as a percent of all cropland in farms. Long-run average rainfall was used to measure the relative productivity of the soil[12].

Peterson proceeds to argue that these land quality weights when applied to international data should result in "an international land quality index that is still far superior to a simple area measure". His approach appears to have some practical appeal for it would not be possible to estimate those weights directly from international information either because, for many countries, such data do not exist, particularly the centrally planned economies, or because if land prices were available for the world, exchange rate distortions would make the former somewhat unreliable. Peterson also mentions that since the land market in the US is open and competitive, those weights "should reflect true quality differences after accounting for population density". Finally, because many countries have precipitation figures which typically exceed 100 inches per year, whereas the wettest state in the US (i.e. Alabama) averaged only 57 inches per year, a truncating procedure was employed which assumed that precipitation in excess of 60 inches has no effect on land prices and quality.

Since the indices computed by Peterson do not provide a complete picture of land quality in the world, especially due to the exclusion of many developing countries, most of them also small, it was necessary to extend them.

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[12] Indeed, the predicting equation used by Peterson was the following:

$$\log LPV = .0077\ PNICL + .0133\ PIL + \log .4161\ LP$$

where
LPV represents the predicted value of land
PNICL is nonirrigated land as a percent of all cropland plus permanent pasture
PIL constitutes the percent of irrigated land of all cropland
LP is annual average precipitation

After taking anti-logs of LPV, dividing each value by the sample average and multiplying by 100, the final land quality indices were obtained.

The results of such an attempt are shown in TABLE 1. They more or less correspond to the same ordering of countries but in general the actual magnitudes are relatively lower than the results reported by Peterson (see TABLE2 in the Appendix). These differences can be partially explained as follows. First, all data on land area correspond to 1983 instead of 1977[13]. During this period, some countries experienced both significant improvements in irrigation facilities and tended to reduce their pasture land as a percent of agricultural land thereby improving their overall land quality, whereas other countries did not. Given the limited comparability of the results, the very few updated indices which showed similar magnitudes to or greater magnitudes than those presented by Peterson, for example, do not necessarily reflect the real improvements in land quality experienced by those countries. Second, data on rainfall were obtained from different sources of information[14]. Although in both cases long-run average rainfall data were used, they exhibitted some variation for certain countries. Third, the sample of countries was different. The inclusion of more countries in the sample led to a different ranking because now new countries lie inbetween Peterson's countries. Similarly, the larger number of countries yielded a different sample average which in turn resulted in different country indices from those obtained by Peterson[15].

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[13]Information on cropland, pasture land and irrigation were obtained from FAO Production Yearbook (1984) and FAO Production Yearbook (1982) respectively.

[14]Peterson's precipitation figures are from the British Air Ministry Meteorological Office (1958), whereas the updated indices used data on rainfall from Rudloff (1981).

[15]Because the differences still appeared considerable, Peterson's data were double-checked. Apart from some other minor errors, it was found that the correct sample average of the land predicted values (LPVs) was 7.42 and not

TABLE 1

LAND QUALITY INDICES

Rank	Country	LQI	Rank	Country	LQI	Rank	Country	LQI
(81)	Afghanistan	60	(30)	Guadeloupe	123	(24)	P. New Guinea	132
(6)	Albania	172	(34)	Guatemala	117	(65)	Paraguay	78
(92)	Algeria	40	(50)	Guinea	95	(52)	Peru	93
(80)	Angola	61	(61)	Guinea-Bissau	83	(13)	Philippines	157
(79)	Argentina	62	(33)	Guyana	120	(52)	Poland	93
(78)	Australia	63	(34)	Haiti	117	(34)	Portugal	117
(60)	Austria	84	(47)	Honduras	99	(28)	Puerto Rico	125
(30)	Bahamas	123	(4)	Hong Kong	182	(18)	Reunion	147
(89)	Bahrain	46	(51)	Hungary	94	(48)	Romania	98
(9)	Bangladesh	168	(7)	India	171	(42)	Rwanda	104
(23)	Barbados	133	(18)	Indonesia	147	(77)	St. Helena	65
(62)	Belgium	82	(77)	Iran	65	(19)	St. Lucia	144
(37)	Belize	114	(77)	Iraq	65	(16)	St. Vincent	149
(32)	Benin	121	(54)	Israel	91	(39)	Salomon Islands	112
(70)	Bolivia	73	(36)	Italy	115	(15)	Samoa	155
(91)	Botswana	43	(38)	Ivory Coast	113	(32)	Sao Tome and P.	121
(50)	Brazil	95	(49)	Jamaica	96	(97)	Saudi Arabia	32
(41)	Bulgaria	105	(1)	Japan	220	(65)	Senegal	78
(12)	Burma	161	(86)	Jordan	51	(40)	Seychelles	110
(45)	Burundi	101	(72)	Kenya	71	(44)	Sierra Leone	102
(43)	Cameroon	103	(7)	Korea Dpr	171	(14)	Singapore	156
(63)	Canada	81	(3)	Korea,Rep.of	196	(90)	Somalia	45
(87)	Cape Verde	48	(88)	Kuwait	47	(82)	South Africa	58
(49)	C.A.R.	96	(33)	Laos	120	(58)	Spain	86
(84)	Chad	56	(29)	Lebanon	124	(11)	Sri Lanka	162
(50)	Chile	95	(84)	Lesotho	56	(85)	Sudan	53
(31)	China	122	(35)	Liberia	116	(2)	Suriname	211
(57)	Colombia	87	(96)	Libya	33	(47)	Swaziland	99
(20)	Comoros	140	(51)	Madagascar	94	(55)	Sweden	90
(67)	Congo	76	(50)	Malawi	95	(70)	Switzerland	73
(14)	Cook Islands	156	(11)	Malaysia	162	(86)	Syria	51
(55)	Costa Rica	90	(82)	Mali	58	(74)	Tanzania	69
(27)	Cuba	126	(38)	Malta	113	(8)	Thailand	170
(59)	Cyprus	85	(27)	Martinique	126	(25)	Togo	128
(55)	Czechoslovakia	90	(96)	Mauritania	33	(17)	Tonga	148
(31)	Denmark	122	(10)	Mauritius	164	(12)	Trinidad and Tobago	161
(98)	Djibouti	26	(56)	Mexico	89	(78)	Tunisia	63
(39)	Dominican Rep.	112	(96)	Mongolia	33	(51)	Turkey	94
(45)	Ecuador	101	(83)	Morocco	57	(44)	Uganda	102
(79)	Egypt	62	(76)	Mozambique	66	(78)	USSR	63
(27)	El Salvador	126	(94)	Namibia	36	(64)	United Kingdom	79
(30)	Eq. Guinea	123	(36)	Nepal	115	(57)	USA	87
(69)	Ethiopia	74	(21)	Netherlands	135	(73)	Upper Volta	70
(22)	Fiji	134	(78)	New Caledonia	63	(73)	Uruguay	70
(46)	Finland	100	(24)	New Zealand	132	(68)	Venezuela	75
(55)	France	90	(54)	Nicaragua	91	(5)	Vietnam	173
(24)	F. Polynesia	132	(85)	Niger	53	(95)	Yemen Arab	35
(66)	Gabon	77	(38)	Nigeria	113	(93)	Yemen Democratic	39
(26)	Gambia	127	(74)	Norfolk Is.	69	(55)	Yugoslavia	90
(46)	Germany Dr.	100	(32)	Norway	121	(49)	Zaire	96
(53)	Germany Fr.	92	(69)	Oman	74	(75)	Zambia	68
(55)	Ghana	90	(27)	Pakistan	126	(71)	Zimbabwe	72
(54)	Greece	91	(48)	Panama	98			

The indices reported in TABLE 1 were then applied to the equal-weight country size index by first dividing each country's index by the world's highest land quality index (i.e. Japan's), and second, multiplying the resulting weights by the corresponding cropland plus permanent pasture (i.e. agricultural land) values.

In TABLE 4, the four indicators of size for 110 developing countries are presented. For the purposes of this paper, a total of 20 so-called developing countries for which reliable data are available were deliberately excluded. They can be roughly grouped into the following categories: (a) countries highly dependent on oil and other mineral exports such as Saudi Arabia, Iran, Venezuela, Algeria, Iraq, Kuwait, Libya, Qatar, United Arab Emirates, Brunei, Ecuador, South Africa and Trinidad and Tobago; (b) highly specialized small countries such as Hong Kong, Singapore and Puerto Rico: and (c) high-income small European countries such as Yugoslavia, Portugal and Romania.

It is apparent that the MCSI[16] for most countries is quite small and the mean and the median are 4.22 and .98 (on a scale from 0 to 100). There is also a considerable discontinuity at the beginning fo the series which clearly separates four countries (China, India, Brazil and Mexico) from the rest. Due to this skewed distribution, using the median as a cut-off point might be a convenient way to distinguish between small and large countries (Jalan, 1982b).

6.98 which was the number used by Peterson to compute the final land quality indices. For purposes of comparison, the results of this exercise are presented in TABLE 3 of the Appendix.

[16] The first methodological problem of using a composite index of size suggested by Bhaduri et al (1982) (in footnote 10) is successfully addressed by the MCSI because the three variables (POPUL, AGLCQ and TGNP) in the sample of 110 countries are found to be highly positively correlated with each other (see TABLE 5).

TABLE 4

INDICATORS OF SIZE IN SELECTED COUNTRIES

COUNTRY	obs	POPUL (mill.)	AGLCQ (000)	TGNP (US$mill)	MCSI
CHINA	1	1019.100	212621.2	305730.0	100.0000
INDIA	2	733.2000	140634.0	190632.0	66.81396
BRAZIL	3	129.7000	102641.0	243836.0	46.91879
MEXICO	4	75.00000	39239.60	168000.0	26.92168
INDONESIA	5	155.7000	21580.70	87192.00	17.98243
ARGENTINA	6	29.60000	50008.00	61272.00	15.48850
NIGERIA	7	93.60000	26201.25	72072.00	15.02710
SOUTH KOREA	8	40.00000	1990.040	80400.00	10.38623
TURKEY	9	47.30000	15303.70	58652.00	10.34108
PAKISTAN	10	89.70000	14529.30	34983.00	9.025918
THAILAND	11	49.20000	15152.06	40344.00	8.383354
COLOMBIA	12	27.50000	14276.00	39325.00	7.425135
PHILIPPINES	13	52.10000	8782.700	39596.00	7.398110
BANGLADESH	14	95.50000	7399.360	12415.00	5.637284
EGYPT	15	45.20000	691.8800	31640.00	5.036564
ETHIOPIA	16	40.90000	20121.20	4908.000	5.027362
PERU	17	17.90000	12867.54	18616.00	4.632449
SUDAN	18	20.80000	16427.52	8320.000	4.162854
VIETNAM	19	58.30000 *	6207.030	11077.00	4.087719
MALAYSIA	20	14.90000	3231.580	27714.00	4.015604
CHILE	21	11.70000	7494.040	21879.00	3.942994
NORTH KOREA	22	19.20000	1825.200	21696.00	3.279634
MOROCCO	23	20.80000	5432.440	15808.00	3.255526
TANZANIA	24	20.80000	12458.90	4992.000	3.177833
MONGOLIA	25	1.900000	18746.40	1482.000	3.162662
MADAGASCAR	26	9.500000	15914.73	2945.000	3.126826
BURMA	27	35.50000	7619.740	6390.000	3.052420
MOZAMBIQUE	28	13.40000 *	14124.00	3216.000	3.003198
SYRIA	29	9.600000	3217.930	16896.00	2.660636
ZAIRE	30	29.70000	6899.640	5049.000	2.603611
ZAMBIA	31	6.300000	12448.98	3654.000	2.556123
ANGOLA	32	7.800000 *	9100.000	6162.000	2.353599
AFGHANISTAN	33	14.40000 *	10274.58	2448.000	2.348686
CAMEROON	34	9.600000	7172.200	7872.000	2.296686
BOLIVIA	35	6.000000	10007.25	3060.000	2.098749
CHAD	36	5.000000	12037.50	400.0000	2.094313
URUGUAY	37	3.000000	4824.960	7470.000	1.668995
MALI	38	7.200000	8333.780	1152.000	1.667617
KENYA	39	18.90000	1939.200	6426.000	1.622826
IV. COAST	40	9.500000	3562.350	6745.000	1.604612
UGANDA	41	13.90000	5198.000	3058.000	1.602967
PARAGUAY	42	3.200000	6121.500	4512.000	1.556293
BOTSWANA	43	1.000000	9072.000	900.0000	1.553082
NAMIBIA	44	1.100000	8570.880	1551.000	1.548768
TUNISIA	45	6.900000	2233.290	8901.000	1.546274
GUATEMALA	46	7.900000	1668.970	8848.000	1.484734
DOM. REP.	47	6.000000	1811.520	8220.000	1.376465
SRI LANKA	48	15.40000	1942.500	5082.000	1.362328

TABLE 4 (Cont...)

INDICATORS OF SIZE IN SELECTED COUNTRIES

COUNTRY	obs	POPUL (mill.)		AGLCQ (000)	TGNP (US$mill)	MCSI
ZIMBABWE	49	7.900000		2487.540	5846.000	1.285759
GHANA	50	12.80000		2546.100	3968.000	1.250456
SOMALIA	51	5.100000		5983.200	1275.000	1.243832
NEPAL	52	15.70000		2141.360	2512.000	1.123113
SENEGAL	53	6.200000		3823.750	2728.000	1.099686
MAURITANIA	54	1.600000		5916.750	768.0000	1.063656
UPPER VOLTA	55	6.700000		4042.560	1407.000	1.006317
YEMEN ARAB	56	7.600000		1566.400	4180.000	0.949895
CONGO	57	1.800000		3735.550	2214.000	0.885899
NIGER	58	6.100000		3067.200	1464.000	0.839996
HONDURAS	59	4.100000		2326.500	2747.000	0.798340
NICARAGUA	60	3.000000		2589.970	2640.000	0.792000
GABON	61	1.000000	*	1803.200	4000.000	0.751517
JORDAN	62	3.200000		118.6800	5248.000	0.695456
EL SALVADOR	63	5.200000		760.9500	3692.000	0.691915
GUINEA	64	5.800000		1967.250	1740.000	0.687832
PANAMA	65	2.000000		785.2500	4240.000	0.650805
MALAWI	66	6.600000		1799.120	1386.000	0.649045
LEBANON	67	2.600000	*	172.4800	4914.000	0.647850
SIERRA LEONE	68	3.600000		1828.500	1188.000	0.533937
COSTA RICA	69	2.400000		1148.820	2448.000	0.525507
C.A.R.	70	2.500000		2186.800	700.0000	0.500924
HAITI	71	5.300000		742.5300	1590.000	0.463120
RWANDA	72	5.700000		681.5000	1539.000	0.461075
P.NEW GUINEA	73	3.400000	*	284.4000	2788.000	0.459767
YEMEN DEM	74	2.000000		1669.860	1040.000	0.440596
BENIN	75	3.800000		1236.400	1102.000	0.438277
JAMAICA	76	2.300000		206.3600	2990.000	0.433577
BURUNDI	77	4.500000		1019.360	1080.000	0.424748
BAHRAIN	78	0.400000	*	1.260000	3712.000	0.417995
CYPRUS	79	0.700000	*	204.7500	2688.000	0.348064
TOGO	80	2.800000		943.6600	784.0000	0.325003
LAOS	81	3.700000	*	929.5000	407.0000	0.311117
REUNION	82	0.500000	*	42.88000	2005.000	0.241679
GUYANA	83	0.800000	*	948.7500	536.0000	0.233345
LIBERIA	84	2.100000		323.8300	1008.000	0.229357
LESOTHO	85	1.500000		574.5000	690.0000	0.214359
FIJI	86	0.700000	*	180.5600	1365.000	0.200027
F. POLYNESIA	87	0.200000	*	57.00000	1596.000	0.189488
MAURITIUS	88	1.000000	*	85.50000	1240.000	0.181308
MALTA	89	0.400000	*	7.140000	1520.000	0.179926
SWAZILAND	90	0.600000	*	578.7000	564.0000	0.171842
MARTINIQUE	91	0.300000	*	29.07000	1404.000	0.167446
SURINAME	92	0.400000	*	77.76000	1180.000	0.153928
GUADELOUPE	93	0.300000	*	34.16000	1260.000	0.152544
GUINEA-BISSAU	94	0.800000	*	595.4600	136.0000	0.134347
BARBADOS	95	0.300000	*	22.20000	1050.000	0.127773
N.CALEDONIA	96	0.100000	*	75.40000	700.0000	0.091412

TABLE 4 (Cont...)

INDICATORS OF SIZE IN SELECTED COUNTRIES

COUNTRY	obs	POPUL (mill.)	AGLCQ (000)	TGNP(US$mill)	MCSI
BAHAMAS	97	0.200000 *	6.160000	766.0000	0.091023
GAMBIA	98	0.700000 *	145.0000	252.0000	0.073103
COMOROS	99	0.500000 *	68.48000	170.0000	0.045625
EQ. GUINEA	100	0.300000 *	187.0400	52.50000	0.044859
SALOMON IS.	101	0.300000 *	46.92000	198.0000	0.038756
SAMOA	102	0.200000 *	86.10000	170.0000	0.038575
BELIZE	103	0.200000 *	50.44000	216.0000	0.038000
DJIBOUTI	104	0.300000 *	24.00000	142.8000	0.029144
SEYCHELLES	105	0.100000 *	5.500000	179.7000	0.023726
CAPE VERDE	106	0.300000 *	14.30000	105.0000	0.023502
TONGA	107	0.100000 *	38.86000	62.00000	0.016123
ST. VINCENT	108	0.100000 *	12.92000	72.00000	0.013146
ST. LUCIA	109	0.100000 *	13.00000	48.00000	0.010542
SAO TOME &P	110	0.100000 *	20.35000	37.00000	0.010495

SOURCES: World Bank (1985), FAO (1984) and Todaro (1985). All figures are for 1983 unless otherwise indicated.

* Figures correspond to mid-1984 and were obtained from Todaro (1985).

Note.- See text for the formula to compute the MCSI.

According to the data in TABLE 4, Upper Volta and Yemen Arab represent the median countries. The median values for the three criteria can be obtained by taking the average between the values that correspond to these two countries.

Since there is no logical basis for assigning equal weights to different factors, the validity of combining separate indices of size can be subject to question. To overcome this problem, Jalan (1982b) suggests considering the three variables as three independent measures of size where the highest values of these in the sample of countries with a MCSI below .98 (i.e. the median aggregate country size index for the sample) are taken as the corresponding cut-off points for the classification of small economies. That is, all countries which have populations of less than 6.6 million (which can be rounded to 7 million), agricultural land corrected for quality of less than 3,735 thousand hectares (which can be rounded to 4,000 thousand hectares) and GNPs of less than

SMPL 1 - 110 TABLE 5

110 Observations CORRELATION BETWEEN MEASURES OF SIZE

Series	Mean	S.D.	Maximum	Minimum
MCSI	4.2243914	12.498028	100.00000	0.0104953
POPUL	30.109091	120.17511	1019.1000	0.1000000
AGLCQ	9136.6149	26365.879	212621.20	1.2600000
TGNP	16575.345	45395.121	305730.00	37.000000

	Covariance	Correlation
MCSI,MCSI	154.78069	1.0000000
MCSI,POPUL	1406.7661	0.9452182
MCSI,AGLCQ	321247.18	0.9838339
MCSI,TGNP	535678.86	0.9528401
POPUL,POPUL	14310.765	1.0000000
POPUL,AGLCQ	2925690.6	0.9318324
POPUL,TGNP	4402611.2	0.8144282
AGLCQ,AGLCQ	688839934	1.0000000
AGLCQ,TGNP	1.078D+09	0.9091477
TGNP,TGNP	2.042D+09	1.0000000

SOURCE: TABLE 4

US$ 5.248 billion (which can be rounded to US$ 5.5 billion) may be classified as small.

Due to a high correlation between agricultural land corrected for quality and the other two variables (See TABLE 6), when the smallest LDCs are selected according to the MCSI, it is observed that, by and large, they are also countries with less than 4,000 thousand hectares of high-quality agricultural land[17]. Thus it may be statistically sufficient to classify countries by quality adjusted agricultural land alone[18].

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[17]For a similar point, using population as the only indicator of size, see Lloyd and Sundrum (1982).

[18]This last criterion also seems to respond quite effectively to an early observation advanced by Bhaduri, et al (1982) in footnote 10. In particular, agricultural land corrected for quality appears to be less time-variant than both population and GNP as a measure of size, and thus will be used as the only size indicator in Section V of this paper.

TABLE 6

CORRELATION OF MEASURES OF SIZE

	Number of countries with Agricultural Land Corrected for Quality of: (000 hectares)		
	Less than 4,000	4,000 and over	TOTAL
(a) Population (in millions)			
Less than 7	58	10	68
7 and over	13	29	42
	71	39	110
(b) GNP (US $ billion)			
Less than 5.5	59	18	77
5.5 and over	11	22	33
	70	40	110

SOURCE: TABLE 4. Based on similar table presented by Lloyd and Sundrum (1982).

IV. Country Size and Agricultural Research

In general, there are two central policy issues in agricultural research, namely, a country's research needs and the amount of financial (i.e. research expenditures) and human (i.e. scientific personnel) resources available to meet those needs. On the one hand, "some research capacity is essential in support of agricultural development, no matter how small the country may be"[19] (Gamble and Trigo, 1985). On the other hand, as the same authors indicate, "the amount of resources a nation can devote to agricultural research is determined by its size and the importance of agricultural production within its economy". In this section, an attempt is made to determine whether there exists an empirical association between (1) research expenditures as a percent of Agricultural GDP (EPAGDP), (2) research expenditures per scientist (RPS), (3) research expenditures per million of Agricultural Population (RPAP), and (4) number of scientists per million of Agricultural Population (SPAP), and size[20] (as measured by either one of the four criteria developed in the previous section) for a sample of 56 (large and small) developing countries using 1980 data[21].

In order to do this, a simple regression analysis is used in which EPAGDP, RPS, RPAP and SPAP are treated as the dependent variables and the size measures are taken as explanatory variables. The results are shown in TABLE 7 and can be summarized as follows:

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[19] Yet these needs vary from one country to another and this kind of analysis seems to be directed towards a level of specificity that this paper will not address.

[20] The eventual empirical relationship between the same policy issues and both the relative importance of agriculture and the level of development of countries will be analyzed in Section V of this paper.

[21] For the complete data used, see TABLES 11, 12, 13, 14 and 15.

TABLE 7

COUNTRY SIZE AND AGRICULTURAL RESEARCH

REGRESSION RESULTS

DEPENDENT VARIABLE	EXPLANATORY VARIABLES POP	ALCQ	GNP	CSI	CONSTANT TERM	$\bar{R}^2$	r	# of obs.
1. EPAGDP	3.467D-05 (.1521165)				.4469677	.000428	.0206960	56
		6.277D-07 (.5963184)			.4389350	.006542	.0808828	56
			2.271D-07 (.3660505)		.4419558	.002475	.0497515	56
				.0008661 (.3890049)	.4422890	.002794	.0528629	56
2. RPS	-3.484D-06 (-.1606709)				.0450871	.000478	-.0218593	56
		5.071D-08 (.5059181)			.0440925	.004718	.0686842	56
			2.263D-08 (.3835792)		.0442058	.002717	.0521276	56
				5.633D-05 (.2657698)	.0444671	.001306	.0361431	56
3. RPAP	-.0014105 (-.6399724)				1.9918740	.007527	-.0867608	56
		5.785D-06 (.5661540)			1.8226744	.005901	.0768162	56
			4.090D-06 (.6815580)		1.7896445	.008529	.0923519	56
				.0053768 (.2486529)	1.8733983	.001144	.0338180	56
4. SPAP	-.0457976 (-.6070789)				53.598095	.006779	-.0823325	56
		-3.528D-05 (-.1006285)			51.637615	.000187	-.0136925	56
			-6.279D-06 (-.0304482)		51.270232	1.72D-05	-.0041434	56
				-.1767410 (-.2388760)	52.422885	.001056	-.0324897	56

SOURCE: TABLES 11,12,13, 14 and 15 . Note.- t-ratios are in parentheses.

1. There appears to be no significant relationship between EPAGDP (Research Expenditures as a percent of Agricultural GDP) and any measure of country size for the sample of 56 countries utilized in the analysis. All regression coefficients denote positive signs which imply a positive, albeit non-significant, association between research expenditures and size. In other words, there was, in 1980, a weak tendency for large developing countries to allocate a relatively higher percentage of their agricultural GDP to agricultural research than their smaller counterparts[22]. However, it is quite intriguing that the countries with the highest EPAGDP in 1980 do not seem to be quite large (see TABLE 12 in the Appendix). In fact, most of them are rather small African countries (i.e. Mali, Burundi, Senegal, Zambia and Zimbabwe) in which the success of their agricultural sectors does not seem to be strongly related to their level or growth-rate of agricultural research outlay (Lipton, 1985).
2. No significant statistical linkage was found between RPS (Research Expenditure per Scientist) and any of the country size measures for the same sample of countries. All regressions but that of RPS on population showed positive (non-significant) relationships between research costs per scientist and size. The negative (insignificant) effect of population

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[22] In an interesting analysis of the agricultural sector in small economies Persaud (1982) points out that because agriculture is very demanding of public services, the bigger agricultural sector of large countries often provides scope for external economies. He goes on to argue that, in the case of agricultural research, "returns tend to be higher the wider the area over which resulting innovations are adopted". Ruttan (1985) also makes a similar point when he states that "the cost of developing a new variety that will be grown on a million acres is unlikely to[ba] substantially greater than one that will be grown on half a million acres". Following this reasoning (and assuming government rationality), small developing countries would be expected to spend relatively more on research than larger ones. However, there is evidence to indicate that investment policy in LDCs is far from optimal (see Boyce and Evenson, 1975). Thus it also seems reasonable to think that larger countries will be willing to spend more on research than smaller ones. It is just more profitable for them to do so.

on research expenditures per scientist suggests that, in 1980, some countries with small populations paid relatively more money per scientist year than countries with large populations. Lipton observes that the cost of doing a comparable piece of research was at least three times as high in Sub-Saharan African countries such as Mali, Burundi, Zimbabwe,etc., as in South Asian countries such as India, Pakistan, Bangladesh, Sri Lanka and Nepal[23], but that they also appear to have obtained much less national research output than did the South Asian countries (see also TABLE 13 in the Appendix).

3. The regression of RPAP (Research Expenditures per million of Agricultural Population) on population gave a negative coefficient indicating an inverse relationship between these two variables. This association was not statistically significant. A weak tendency for small countries as measured by population to spend relatively more money per million of agricultural population on agricultural research than larger ones was observed. The regressions of RPAP on ALCQ, GNP and CSI, however, yielded exactly the opposite results, but again it was not possible to obtain a significant outcome.

4. Finally, the results of similar regressions of SPAP (Scientists per million of Agricultural Population) on POP (Population), ALCQ (Agricultural Land corrected for quality), GNP (Gross National Product) and CSI (the Country Size Index) all showed negative coefficients. While they some-

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[23]It is important to mention, however, that salaries in Sub-Saharan countries are likely to be higher than in South Asian countries (Lipton, 1985) and that the inclusion of dummy variables for continents in the regressions would have probably provided more precise information on this regard (Evenson, 1986).

what contradict the general view that small countries face constraints in terms of availability of scientific personnel for agricultural research, they also appear to suggest the presence of economies of scale in agricultural research[24]. Nonetheless, these results are not statistically conclusive either.

In brief, the above results are not consistent with the argument that the size of a country has a strong impact upon the amount of resources it devotes to agricultural research. They also show, however, that there are some "weak effects" that deserve some attention[25].

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[24]That is, small countries would require relatively more scientists per million of agricultural population than large countries in order to achieve a comparable research output. But this could also result in diseconomies to the system in the form of a rapid expansion of research stations and dispersion of knowledge and personnel (Boyce and Evenson, 1975; Lipton, 1985).

[25]Other things being equal, two reasonable hypotheses -both favoring large as against small countries- for these "weak effects" can be advanced. On the one hand, a positive association between level level of financial resources allocated to agricultural research and size implies that large developing countries may have more incentives to invest in agricultural research than small countries simply because if they spend more then their gains are larger. On the other hand, a negative relationship between level of resources and country size suggests that large countries do not have to spend as much on research to obtain similar results to those of small countries (see also footnote 22). It can be argued that these two factors probably offset each other (Ruttan, 1986) which obscures the real effect of scale in agricultural research.

V. Country Size, Level of Development, Relative Importance of Agriculture and Agricultural Research

In this section the same sample of 56 countries is used to analyze the same policy issues, though only one measure of size (agricultural land corrected for quality) is employed, and three new variables (per capita income, agricultural population as a percent of total population and agricultural GDP as a percent of total GDP) are utilized to measure both the level of development and the relative importance of agriculture[26].

In order to determine whether per capita income (PCI), agricultural population as a percent of total population (PAGP) and agricultural GDP as a percent of total GDP (PAGDP) had any impact upon availability of research resources in 1980, a multiple regression analysis is employed in which ALCQ, PCI, PAGP and PAGDP are explanatory (independent) variables of EPAGDP (Research Expenditures as a percent of Agricultural GDP), RPS (Research Expenditures per Scientist), RPAP (Research Expenditures per million of Agricultural Population) and SPAP (number of Scientists per million of Agricultural Population). The results are shown in TABLE 8 and can be summarized as follows:

1. All regressions of EPAGDP on different combinations of independent variables designated to describe an eventual empirical relationship between research expenditures and measures of size, level of development and relative importance of agriculture presented either non-significant results or high levels of multicollinearity among explanatory variables[27], and the signs of their coefficients varied, accordingly, from one regression to another. The six regressions reported in TABLE 8, however, show that

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[26] For the complete data used, see TABLES 16,17, 18 and 19.

[27] See TABLE 9.

TABLE 8

COUNTRY SIZE, LEVEL OF DEVELOPMENT, RELATIVE IMPORTANCE OF AGRICULTURE AND AGRICULTURAL RESEARCH

REGRESSION RESULTS

DEPENDENT VARIABLE	INDEPENDENT VARIABLES ALCQ	PCI	PAGP	PAGDP	CONSTANT TERM	$\bar{R}^2$	# of obs.
1. EPAGDP	6.314D-07 (.5943469)	1.039D-05 (.1795636)			.4301849	.007146	56
	6.173D-07 (.5794298)		-.0002334 (-.1317663)		.4522822	.006867	56
	6.564D-07 (.6313009)			-.0035300 (-1.5370787)	.5376363	.048938	56
		9.715D-06 (.1689966)			.4407459	.000529	56
			-.0003097 (-.1764407)		.4663684	.000576	56
				-.0035040 (-1.5345577)	.5472993	.041786	56
2. RPS	5.087D-08 (.5027094)	4.407D-07 (.0799854)			.0437212	.004838	56
	5.904D-08 (.5887466)		.0001862 (1.1168580)		.0334426	.027603	56
	4.997D-08 (.4946093)			9.075D-05 (.4066621)	.0415550	.007813	56
		3.865D-07 (.0706659)			.0445720	9.25D-05	56
			.0001789 (1.0826155)		.0347899	.021244	56
				9.273D-05 (.4185490)	.0422907	.003234	56

TABLE 8 (Cont...)

DEPENDENT VARIABLE	INDEPENDENT VARIABLES ALCQ	PCI	PAGP	PAGDP	CONSTANT TERM	$\bar{R}^2$	# of obs.
3. RPAP	6.741D-06	.0026626			-.4204641	.427390	56
	(.8609413)	(6.2459960)***					
	2.236D-06		-.0793281		6.3594930	.405041	56
	(.2794660)		(-5.9628898)***				
	6.316D-06			-.0652706	3.6476763	.159811	56
	(.6659589)			(-3.1158999)**			
		.0026554			-.3077195	.419382	56
		(6.245344)***					
			-.0796046		6.4105237	.404164	56
			(-6.0521844)***				
				-.0650201	3.7406534	.152780	56
				(-3.1205623)**			
4. SPAP	-6.386D-06	.0805104			-16.189943	.329386	56
	(-.0220293)	(5.1007134)***					
	-.0001476		-2.5099030		195.18046	.341504	56
	(-.5123678)		(-5.2413096)***				
	-1.983D-05			-1.9009322	104.78870	.111704	56
	(-.0594258)			(-2.5794532)*			
		.0805172			-16.296761	.329380	56
		(5.1500028)***					
			-2.4916525		191.81277	.338242	56
			(-5.2536502)***				
				-1.9017186	104.49682	.111644	56
				(-2.6050845)*			

SOURCE: TABLES 16, 17,18 and 19
Note.- t-ratios are within parentheses

*** Coefficient is signficant at the 1% level
** " " " " " 5% "
* " " " " " 10% "

SMPL 1 - 56 TABLE 9
56 Observations

Series	Mean	S.D.	Maximum	Minimum
EPAGDP	0.4488749	0.2765362	1.2655820	0.0766635
ALCQ	15835.565	35633.765	212621.20	118.68000
PCI	836.78571	654.47858	2490.0000	80.000000
PAGP	56.482143	21.431957	92.100000	11.000000
PAGDP	28.089286	16.132719	82.000000	7.0000000

	Covariance	Correlation
EPAGDP,EPAGDP	0.0751067	1.0000000
EPAGDP,ALCQ	782.78864	0.0808828
EPAGDP,PCI	4.0868443	0.0229914
EPAGDP,PAGP	-0.1397221	-0.0240036
EPAGDP,PAGDP	-0.8956777	-0.2044172
ALCQ,ALCQ	1.247D+09	1.0000000
ALCQ,PCI	-447592.29	-0.0195412
ALCQ,PAGP	-55792.331	-0.0743834
ALCQ,PAGDP	10139.246	0.0179582
PCI,PCI	420693.24	1.0000000
PCI,PAGP	-11235.397	-0.8155611
PCI,PAGDP	-7532.2130	-0.7263483
PAGP,PAGP	451.12647	1.0000000
PAGP,PAGDP	249.22124	0.7339070
PAGDP,PAGDP	255.61703	1.0000000

SOURCE: TABLE 16

the level of development of countries influences positively, although non-significantly, the percentage of agricultural GDP devoted to agricultural research in LDCs[28] and that the importance of agriculture appears to be negatively related to EPAGDP[29].

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[28] This is consistent with the view that as development occurs, countries tend to have a better understanding of how investments in science are linked to economic and social growth. Thus they can be expected to spend more on research (Gamble and Trigo, 1985).

[29] That is, the larger the relative economic and social size of agriculture, the less attention it received from policymakers in 1980.

SMPL 1 - 56 TABLE 10
56 Observations

Series	Mean	S.D.	Maximum	Minimum
RPS	0.0448955	0.0263085	0.1123985	0.0116549
ALCQ	15835.565	35633.765	212621.20	118.68000
PCI	836.78571	654.47858	2490.0000	80.000000
PAGP	56.482143	21.431957	92.100000	11.000000
PAGDP	28.089286	16.132719	82.000000	7.0000000

	Covariance	Correlation
RPS,RPS	0.0006798	1.0000000
RPS,ALCQ	63.239651	0.0686842
RPS,PCI	0.1626146	0.0096160
RPS,PAGP	0.0807138	0.1457520
RPS,PAGDP	0.0237042	0.0568651
ALCQ,ALCQ	1.247D+09	1.0000000
ALCQ,PCI	-447592.29	-0.0195412
ALCQ,PAGP	-55792.331	-0.0743834
ALCQ,PAGDP	10139.246	0.0179582
PCI,PCI	420693.24	1.0000000
PCI,PAGP	-11235.397	-0.8155611
PCI,PAGDP	-7532.2130	-0.7263483
PAGP,PAGP	451.12647	1.0000000
PAGP,PAGDP	249.22124	0.7339070
PAGDP,PAGDP	255.61703	1.0000000

SOURCE: TABLE 17

2. Regressing RPS on similar combinations of independent variables also gave highly variable results due to the same kind of collinearity problems (See TABLE 10). Nevertheless, a relatively strong positive relationship between research expenditures per scientist and PAGP was observed, both including ALCQ and without ALCQ as an independent variable. This finding supports the view that in 1980, the relative importance of agriculture affected positively the research costs per scientist in LDCs. But this result does not appear to have an intuitive explanation.

3. Regressing RPAP on PCI provided significant t-ratios for the coefficient of PCI with and without ALCQ[30]. This finding implies that relatively

[30] Note (in TABLE 8) that including ALCQ in the regression results in a higher, although still insignificant, t-ratio for the coefficient of this variable than that previously shown in TABLE 7.

richer countries were able to invest more in agricultural research per million of agricultural population than their poorer counterparts[31]. On the other hand, the results of regressing RPAP on the two measures of the relative importance of agriculture yielded negative significant t-ratios which endorse the view that in many countries agricultural research lacked the necessary support, despite agriculture being the principal sector of these countries, in both economic and social terms (ISNAR, 1984).

4. The results of regressions of SPAP on ALCQ and PCI, and of SPAP on PCI alone clearly suggest that richer countries were able to capture relatively more scientists per million of agricultural population than poor countries, whereas regressing SPAP on the two measures of relative importance of agriculture, with and without ALCQ, provided similar results to those for RPAP.

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[31]Using a different dependent variable, Peterson (1979) also found a strong positive association between research and per capita income.

VI. Summary of Results and Implications for Further Research

Overall, the general findings of this paper, though limited as they are, support the view that (1) there is no direct relationship between a country's size and the relative amount of resources it devotes to agricultural research; (2) the level of development of countries influences positively both the amount of research expenditures and the number of scientists per million of agricultural population; and (3) the relative importance of agriculture as measured either by agricultural population as a percent of total population or by agricultural GDP as a percent of total GDP appears to be negatively related to the level of expenditures and the number of scientists per million of agricultural population in LDCs.

Finally, three implications for further research emerge from the paper.

First, it is quite apparent that the search for an appropriate statistical measure of size has not been exhausted. The discussion in Section III suggests that combining different factors into an overall composite index of size may still be particularly meaningful so long as the troublesome issue of assigning equal weights to different variables is successfully addressed. A feasible approach along these lines appears to be redefining a country's potential for development (i.e. its size) in terms of its aggregate production function in which land, labor and capital are the corresponding factors of production. This would also avoid further problems of double-counting as noted by Peterson (1986b).

Unlike the approach developed by Jalan (1982b) and the one proposed in this paper, this approach implies using actual measures of the three primary production factors and not simple proxies. As before, land could be measured

in terms of quality adjusted agricultural land; labor may be measured as the number of people in the economically active population adjusted for differences in acquired skills by a human capital variable; and nonhuman, reproducible capital may be measured by summing gross domestic investment for each country for a reasonable life span (i.e. 30 years) of machines and tools, infrastructure and buildings (Peterson 1986a). Moreover, in view of the results of fitting a Cobb-Douglas production function (defined in terms of the above three inputs) to data of 98 countries obtained by Peterson, which clearly show that agricultural land corrected for quality, for example, has relatively less explanatory power than both capital and labor adjusted by the human capital variable in the regression, it would appear more reasonable to assign differential rather than equal weights to different factors into a new composite index of size. But there are two problems with this approach. One is that if a country's potential for development is solely defined in terms of its aggregate production function, then GNP alone should be a good measure of size(Peterson, 1986b), and constructing a differential-weight composite size index would become a worthless task. Another problem with this approach, which also applies to using GNP as the only size indicator, is that it considers only one dimension of size, that is the production side of size. This point is of utmost importance if one agrees that a country's development potential also depends on its domestic demand (i.e. its market size), that is the number of effective consumers it has. On the one hand, the variable labor corrected for differences in acquired skills does not appear to capture this relation. On the other hand, GNP may not be an appropriate measure of the size of the market because two countries may have the same national income but their demands for a product will not necessarily be the same (Lloyd and Sundrum, 1982).

Second, much more effort on the part of agricultural economists and plan-

ers directed to understand the precise relationship between size (or scale) and effectiveness in agricultural research is warranted.

As Lipton (1985) points out, to certain extent, government willingness to spend more on agricultural research depends on the perceived efficiency (effectiveness?) of such spending. A prevailing argument in the literature is that "the research investment per acre or per hectare will have to be higher in a small system than in a larger system in order to achieve an equal level of effectiveness" (Ruttan, 1985). The results of this paper suggest, however, that a country's size has no strong effect upon the amount of resources it devotes to research. It does not follow that smaller countries have less incentives to invest in agricultural research than their larger counterparts. Evidence from small Sub-Saharan countries, for instance, suggests exactly the opposite. But Lipton also finds that such high levels of research outlay and scientist numbers have had less impact on output in Sub-Saharan Africa than in most other poor countries. Thus, at least empirically, other factors than size (per se) and levels of financial and human resources allocated to research (per se) appear to influence research effectiveness in LDCs.

Third, still following Lipton (1985), the efficiency (effectiveness) of research can be evaluated in terms of a three-stage process: (a) the stage between initiation and successful output of the research, (b) the stage between output and adoption by the farmer, and (c) the stage between adoption and achievement of higher levels of agricultural production and productivity. Within this context, while in a final sense the efficiency of research will depend on some elements of research policy (i.e. availability of financial and human resources), in an initial sense, it is an adequate agricultural policy that is required. This leaves out the puzzle of the kind of agricultural policy that is needed. Lipton argues that the most important single policy may be "to raise the propor-

tion of resources reaching the sector".

In Section V of this paper it was found that the larger the relative economic and social size of agriculture, the less attention that agricultural research received from policymakers in 1980. Granted this argument can be extended to the entire agricultural sector of many developing countries. One explanation for this kind of behavior is that a large agricultural sector in LDCs is often comprised of a large number of poor subsistence small farmers with little or no power to make their majority interests known (Rohrbach,1984). However, this situation is further complicated by the fact that the level of development of countries also influences the amount of resources devoted to agricultural research in less developed economies. In fact, strong positive relationships between research expenditures and number of scientists per million of agricultural population and per capita income in a sample of 56 LDCs were found in 1980. It is not clear whether developing countries with large agricultural sectors do not provide the necessary support to agriculture and research due to the concentrated political power of urban-based industrial elites or wage labor force or whether they simply cannot afford it.

VII. APPENDIX

TABLE 2

PETERSON'S LAND QUALITY INDICES

Rank	Country	LQI	Rank	Country	LQI	Rank	Country	LQI
(63)	Afghanistan	64	(38)	Ghana	102	(21)	Norway	128
(73)	Algeria	43	(42)	Greece	98	(10)	Pakistan	170
(52)	Angola	82	(17)	Guatemala	136	(34)	Panama	106
(64)	Argentina	62	(37)	Guinea	103	(13)	P.New Guinea	143
(64)	Australia	62	(18)	Guyana	134	(51)	Paraguay	83
(51)	Austria	83	(20)	Haiti	130	(44)	Peru	96
(4)	Bangladesh	179	(33)	Honduras	107	(9)	Philippines	171
(47)	Belgium	91	(36)	Hungary	104	(35)	Poland	105
(17)	Benin	136	(6)	India	176	(16)	Portugal	137
(61)	Bolivia	69	(12)	Indonesia	160	(32)	Romania	108
(71)	Botswana	49	(65)	Iran	61	(31)	Rwanda	109
(39)	Brazil	101	(63)	Iraq	64	(52)	Senegal	82
(29)	Bulgaria	111	(56)	Ireland	77	(30)	Sierra Leone	110
(7)	Burma	175	(43)	Israel	97	(72)	Somalia	44
(40)	Burundi	100	(27)	Italy	115	(63)	South Africa	64
(29)	Cameroon	111	(25)	Ivory Coast	122	(46)	Spain	92
(40)	Canada	100	(35)	Jamaica	105	(7)	Sri Lanka	175
(34)	C.A.R.	106	(1)	Japan	240	(62)	Sudan	68
(69)	Chad	55	(51)	Jordan	83	(36)	Swaziland	104
(38)	Chile	102	(55)	Kenya	79	(41)	Sweden	99
(19)	China	131	(2)	Korea Dpr	204	(54)	Switzerland	80
(53)	Colombia	81	(2)	Korea Rep	204	(68)	Syria	56
(52)	Congo	82	(14)	Lebanon	142	(57)	Tanzania	75
(41)	Costa Rica	99	(67)	Lesotho	57	(3)	Thailand	183
(15)	Cuba	141	(23)	Liberia	126	(13)	Togo	143
(28)	Cyprus	113	(39)	Madagascar	101	(62)	Tunisia	68
(42)	Czechoslovakia	98	(38)	Malawi	102	(39)	Turkey	101
(19)	Denmark	131	(5)	Malaysia	177	(30)	Uganda	110
(26)	Dominican Rep.	121	(67)	Mali	57	(61)	USSR	69
(29)	Ecuador	111	(74)	Mauritania	30	(48)	UK	89
(8)	Egypt	172	(11)	Mauritius	165	(47)	USA	91
(22)	El Salvador	127	(46)	Mexico	92	(59)	Upper Volta	72
(60)	Ethiopia	71	(66)	Morocco	60	(58)	Uruguay	74
(29)	Finland	111	(21)	Nepal	128	(49)	Venezuela	88
(44)	France	96	(32)	Netherlands	108	(45)	Yugoslavia	94
(28)	Gabon	113	(25)	New Zealand	122	(34)	Zaire	106
(20)	Gambia	130	(41)	Nicaragua	99	(50)	Zambia	85
(29)	Germany Dr	111	(70)	Niger	54			
(43)	Germany Fr	97	(24)	Nigeria	124			

SOURCE: Peterson (1984)

TABLE 3

PETERSON'S LAND QUALITY INDICES (REVISED)

Rank	Country	LQI	Rank	Country	LQI	Rank	Country	LQI
(63)	Afghanistan	63	(37)	Ghana	96	(21)	Norway	121
(73)	Algeria	40	(41)	Greece	92	(10)	Pakistan	160
(52)	Angola	77	(16)	Guatemala	128	(33)	Panama	100
(65)	Argentina	59	(36)	Guinea	97	(13)	P.New Guinea	134
(66)	Australia	58	(18)	Guyana	126	(51)	Paraguay	78
(51)	Austria	78	(20)	Haiti	122	(43)	Peru	90
(4)	Bangladesh	168	(32)	Honduras	101	(9)	Philippines	161
(47)	Belgium	85	(35)	Hungary	98	(34)	Poland	99
(17)	Benin	127	(6)	India	166	(15)	Portugal	129
(61)	Bolivia	65	(12)	Indonesia	151	(32)	Romania	101
(71)	Botswana	46	(67)	Iran	57	(31)	Rwanda	102
(38)	Brazil	95	(64)	Iraq	60	(52)	Senegal	77
(29)*	Bulgaria	104	(56)	Ireland	72	(29)	Sierra Leone	104
(7)	Burma	165	(42)	Israel	91	(72)	Somalia	41
(39)	Burundi	94	(27)	Italy	108	(64)	South Africa	60
(29)	Cameroon	104	(26)	Ivory Coast	114	(45)	Spain	87
(39)	Canada	94	(34)	Jamaica	99	(7)	Sri Lanka	165
(33)	CAR	100	(1)	Japan	226	(62)	Sudan	64
(69)	Chad	51	(52)*	Jordan	77	(35)	Swaziland	98
(37)	Chile	96	(55)	Kenya	74	(42)	Sweden	93
(19)	China	123	(2)	Korea Dpr	192	(54)	Switzerland	75
(53)	Colombia	76	(2)	Korea Rep.	192	(68)	Syria	53
(52)	Congo	77	(13)	Lebanon	134	(57)	Tanzania	71
(40)	Costa Rica	93	(68)	Lesotho	53	(3)	Thailand	172
(14)	Cuba	132	(23)	Liberia	119	(13)	Togo	134
(28)	Cyprus	107	(38)	Madagascar	95	(62)	Tunisia	64
(41)	Czechoslovakia	92	(39)	Malawi	96	(38)*	Turkey	95
(19)	Denmark	123	(5)	Malaysia	167	(30)	Uganda	103
(26)	Dominican Rep.	114	(68)	Mali	53	(61)	USSR	65
(29)	Ecuador	104	(74)	Mauritania	28	(47)	UK	83
(8)	Egypt	162	(11)	Mauritius	155	(46)	USA	86
(23)	El Salvador	119	(45)	Mexico	86	(59)	Upper Volta	68
(60)	Ethiopia	66	(68)	Morocco	56	(58)	Uruguay	70
(29)	Finland	104	(22)	Nepal	120	(48)	Venezuela	83
(43)	France	90	(31)	Netherlands	102	(44)	Yugoslavia	88
(49)*	Gabon	79	(25)	New Zealand	115	(34)	Zaire	99
(20)	Gambia	122	(40)	Nicaragua	93	(49)	Zambia	80
(29)	Germany Dr	104	(70)	Niger	50			
(42)	Germany Fr	91	(24)	Nigeria	117			

SOURCES: FAO (1982); British Air Ministry Meteorological Office (1958)

* indicates indices which were corrected.

Note.- Except for rounding errors, indices which were not corrected should retain the ranking presented in TABLE 2.

TABLE 11

COUNTRY	obs	AGGDP	REXP	SCIENT	AGPOP
CHAD	1	285.0000	1.602000	42.00000	3.744000
BANGLADESH	2	6015.600	27.61300	1320.000	73.92800
ETHIOPIA	3	1881.900	3.400000	155.0000	25.33400
NEPAL	4	1060.200	2.634000	226.0000	13.57800
MALI	5	592.2000	6.141000	68.00000	6.095000
BURUNDI	6	434.5000	3.608000	41.00000	3.364000
RWANDA	7	537.6000	0.945000	24.00000	4.606000
UPPER VOLTA	8	392.0000	1.105000	12.00000	5.622000
ZAIRE	9	1971.200	5.005000	97.00000	21.18700
INDIA	10	52543.70	120.1670	2345.000	435.7350
SRI LANKA	11	1052.800	5.057000	422.0000	7.885000
SIERRA LEONE	12	334.8000	0.698000	35.00000	2.145000
TANZANIA	13	2262.000	7.214000	212.0000	15.28800
CHINA	14	92519.00	643.5550	17272.00	599.3750
PAKISTAN	15	6652.600	29.89900	1212.000	46.64400
UGANDA	16	9720.400	7.452000	175.0000	10.66000
MADAGASCAR	17	1173.600	4.878000	68.00000	7.249000
SUDAN	18	2732.200	13.60000	150.0000	14.35800
GHANA	19	10157.40	12.65500	352.0000	5.874000
KENYA	20	2036.600	22.71200	400.0000	13.00600
LESOTHO	21	99.20000	0.465000	14.00000	1.121000
INDONESIA	22	18148.00	33.20000	1473.000	88.84700
MAURITANIA	23	127.4000	0.284000	8.000000	1.350000
SENEGAL	24	768.5000	9.726000	172.0000	4.246000
LIBERIA	25	374.4000	0.394000	20.00000	1.304000
HONDURAS	26	691.3000	1.047000	60.00000	2.310000
ZAMBIA	27	568.5000	5.202000	96.00000	3.763000
BOLIVIA	28	1098.000	11.37400	125.0000	2.784000
EGYPT	29	4823.700	23.71700	903.0000	20.78600
ZIMBABWE	30	1081.800	10.56000	201.0000	4.317000
EL SALVADOR	31	915.3000	2.391000	78.00000	2.465000
CAMEROON	32	1923.200	3.788000	106.0000	6.904000
THAILAND	33	8362.500	21.60000	1264.000	35.00800
PHILIPPINES	34	8162.700	9.533000	640.0000	22.11700
NICARAGUA	35	487.6000	2.211000	57.00000	1.157000
MOROCCO	36	3229.200	8.026000	686.0000	10.25600
PERU	37	1539.200	8.163000	290.0000	6.845000
NIGERIA	38	18226.00	121.8400	1084.000	42.89800
JAMAICA	39	212.8000	0.935000	40.00000	0.449000
IVORY COAST	40	2340.900	12.77100	116.0000	6.543000
DOMINICAN R.	41	1197.000	2.514000	40.00000	3.118000
COLOMBIA	42	8279.600	32.23100	881.0000	7.062000
PARAGUAY	43	1335.000	5.357000	63.00000	1.549000
TUNISIA	44	1241.000	6.764000	285.0000	2.594000
SYRIA	45	2580.000	4.963000	179.0000	4.180000
JORDAN	46	175.2000	0.849000	35.00000	0.754000
TURKEY	47	12378.00	26.46300	623.0000	24.21300
SOUTH KOREA	48	9320.000	29.01200	960.0000	14.70800
MALAYSIA	49	5664.000	30.39100	386.0000	6.497000
COSTA RICA	50	824.5000	2.168000	75.00000	0.799000
PANAMA	51	349.0000	2.482000	51.00000	0.674000
BRAZIL	52	27385.80	174.0120	2935.000	46.31900
MEXICO	53	13336.00	70.92900	1079.000	24.99500
CHILE	54	1965.600	11.31900	177.0000	2.099000
ARGENTINA	55	11782.80	59.75000	1065.000	3.660000
URUGUAY	56	843.0000	3.821000	222.0000	0.345000

SOURCES: World Bank (1982); Evenson (1986); FAO (1984)

Note.- All figures are for 1980

TABLE 12

COUNTRY	obs	EPAGDP	POP	ALCQ	GNP	CSI
CHAD	1	0.562105	5.000000	12037.50	400.0000	2.094313
BANGLADESH	2	0.459023	95.50000	7399.360	12415.00	5.637284
ETHIOPIA	3	0.180669	40.90000	20121.20	4908.000	5.027362
NEPAL	4	0.248444	15.70000	2141.360	2512.000	1.123113
MALI	5	1.036981	7.200000	8333.780	1152.000	1.667617
BURUNDI	6	0.830380	4.500000	1019.360	1080.000	0.424748
RWANDA	7	0.175781	5.700000	681.5000	1539.000	0.461075
UPPER VOLTA	8	0.281888	6.700000	4042.560	1407.000	1.006317
ZAIRE	9	0.253906	29.70000	6899.640	5049.000	2.603611
INDIA	10	0.228699	733.2000	140634.0	190632.0	66.81396
SRI LANKA	11	0.480338	15.40000	1942.500	5082.000	1.362328
SIERRA LEONE	12	0.208483	3.600000	1828.500	1188.000	0.533937
TANZANIA	13	0.318921	20.80000	12458.90	4992.000	3.177833
CHINA	14	0.695592	1019.100	212621.2	305730.0	100.0000
PAKISTAN	15	0.449433	89.70000	14529.30	34983.00	9.025918
UGANDA	16	0.076664	13.90000	5918.000	3058.000	1.715844
MADAGASCAR	17	0.415644	9.500000	15914.73	2945.000	3.126826
SUDAN	18	0.497767	20.80000	16427.52	8320.000	4.162854
GHANA	19	0.124589	12.80000	2546.100	3968.000	1.250456
KENYA	20	1.115192	18.90000	1939.200	6426.000	1.622826
LESOTHO	21	0.468750	1.500000	574.5000	690.0000	0.214359
INDONESIA	22	0.182940	155.7000	21580.70	87192.00	17.98243
MAURITANIA	23	0.222920	1.600000	5916.750	768.0000	1.063656
SENEGAL	24	1.265582	6.200000	3823.750	2728.000	1.099686
LIBERIA	25	0.105235	2.100000	323.8300	1008.000	0.229357
HONDURAS	26	0.151454	4.100000	2326.500	2747.000	0.798340
ZAMBIA	27	0.915040	6.300000	12448.98	3654.000	2.556123
BOLIVIA	28	1.035883	6.000000	10007.25	3060.000	2.098749
EGYPT	29	0.491677	45.20000	691.8800	31640.00	5.036564
ZIMBABWE	30	0.976151	7.900000	2487.540	5846.000	1.285759
EL SALVADOR	31	0.261226	5.200000	760.9500	3692.000	0.691915
CAMEROON	32	0.196963	9.600000	7172.200	7872.000	2.296686
THAILAND	33	0.258296	49.20000	15152.06	40344.00	8.383354
PHILIPPINES	34	0.116787	52.10000	8782.700	39596.00	7.398110
NICARAGUA	35	0.453445	3.000000	2589.970	2640.000	0.792000
MOROCCO	36	0.248545	20.80000	5432.440	15808.00	3.255526
PERU	37	0.530341	17.90000	12867.54	18616.00	4.632449
NIGERIA	38	0.668495	93.60000	26201.25	72072.00	15.02710
JAMAICA	39	0.439380	2.300000	206.3600	2990.000	0.433577
IVORY COAST	40	0.545559	9.500000	3562.350	6745.000	1.604612
DOMINICAN R.	41	0.210025	6.000000	1811.520	8220.000	1.376465
COLOMBIA	42	0.389282	27.50000	14276.00	39325.00	7.425135
PARAGUAY	43	0.401273	3.200000	6121.500	4512.000	1.556293
TUNISIA	44	0.545044	6.900000	2233.290	8901.000	1.546274
SYRIA	45	0.192364	9.600000	3217.930	16896.00	2.660636
JORDAN	46	0.484589	3.200000	118.6800	5248.000	0.695456
TURKEY	47	0.213791	47.30000	15303.70	58652.00	10.34108
SOUTH KOREA	48	0.311287	40.00000	1990.040	80400.00	10.38623
MALAYSIA	49	0.536564	14.90000	3231.580	27714.00	4.015604
COSTA RICA	50	0.262947	2.400000	1148.820	2448.000	0.525507
PANAMA	51	0.711175	2.000000	785.2500	4240.000	0.650805
BRAZIL	52	0.635409	129.7000	102641.0	243836.0	46.91879
MEXICO	53	0.531861	75.00000	39239.60	168000.0	26.92168
CHILE	54	0.575855	11.70000	7494.040	21879.00	3.942994
ARGENTINA	55	0.507095	29.60000	50008.00	61272.00	15.48850
URUGUAY	56	0.453262	3.000000	4824.960	7470.000	1.668995

SOURCE: TABLES 4 and 11

TABLE 13

COUNTRY	obs	RPS	POP	ALCQ	GNP	CSI
CHAD	1	0.038143	5.000000	12037.50	400.0000	2.094313
BANGLADESH	2	0.020919	95.50000	7399.360	12415.00	5.637284
ETHIOPIA	3	0.021935	40.90000	20121.20	4908.000	5.027362
NEPAL	4	0.011655	15.70000	2141.360	2512.000	1.123113
MALI	5	0.090309	7.200000	8333.780	1152.000	1.667617
BURUNDI	6	0.088000	4.500000	1019.360	1080.000	0.424748
RWANDA	7	0.039375	5.700000	681.5000	1539.000	0.461075
UPPER VOLTA	8	0.092083	6.700000	4042.560	1407.000	1.006317
ZAIRE	9	0.051598	29.70000	6899.640	5049.000	2.603611
INDIA	10	0.051244	733.2000	140634.0	190632.0	66.81396
SRI LANKA	11	0.011983	15.40000	1942.500	5082.000	1.362328
SIERRA LEONE	12	0.019943	3.600000	1828.500	1188.000	0.533937
TANZANIA	13	0.034028	20.80000	12458.90	4992.000	3.177833
CHINA	14	0.037260	1019.100	212621.2	305730.0	100.0000
PAKISTAN	15	0.024669	89.70000	14529.30	34983.00	9.025918
UGANDA	16	0.042583	13.90000	5918.000	3058.000	1.715844
MADAGASCAR	17	0.071735	9.500000	15914.73	2945.000	3.126826
SUDAN	18	0.090667	20.80000	16427.52	8320.000	4.162854
GHANA	19	0.035952	12.80000	2546.100	3968.000	1.250456
KENYA	20	0.056780	18.90000	1939.200	6426.000	1.622826
LESOTHO	21	0.033214	1.500000	574.5000	690.0000	0.214359
INDONESIA	22	0.022539	155.7000	21580.70	87192.00	17.98243
MAURITANIA	23	0.035500	1.600000	5916.750	768.0000	1.063656
SENEGAL	24	0.056547	6.200000	3823.750	2728.000	1.099686
LIBERIA	25	0.019700	2.100000	323.8300	1008.000	0.229357
HONDURAS	26	0.017450	4.100000	2326.500	2747.000	0.798340
ZAMBIA	27	0.054187	6.300000	12448.98	3654.000	2.556123
BOLIVIA	28	0.090992	6.000000	10007.25	3060.000	2.098749
EGYPT	29	0.026265	45.20000	691.8800	31640.00	5.036564
ZIMBABWE	30	0.052537	7.900000	2487.540	5846.000	1.285759
EL SALVADOR	31	0.030654	5.200000	760.9500	3692.000	0.691915
CAMEROON	32	0.035736	9.600000	7172.200	7872.000	2.296686
THAILAND	33	0.017089	49.20000	15152.06	40344.00	8.383354
PHILIPPINES	34	0.014895	52.10000	8782.700	39596.00	7.398110
NICARAGUA	35	0.038789	3.000000	2589.970	2640.000	0.792000
MOROCCO	36	0.011700	20.80000	5432.440	15808.00	3.255526
PERU	37	0.028148	17.90000	12867.54	18616.00	4.632449
NIGERIA	38	0.112398	93.60000	26201.25	72072.00	15.02710
JAMAICA	39	0.023375	2.300000	206.3600	2990.000	0.433577
IVORY COAST	40	0.110095	9.500000	3562.350	6745.000	1.604612
DOMINICAN R.	41	0.062850	6.000000	1811.520	8220.000	1.376465
COLOMBIA	42	0.036585	27.50000	14276.00	39325.00	7.425135
PARAGUAY	43	0.085032	3.200000	6121.500	4512.000	1.556293
TUNISIA	44	0.023733	6.900000	2233.290	8901.000	1.546274
SYRIA	45	0.027726	9.600000	3217.930	16896.00	2.660636
JORDAN	46	0.024257	3.200000	118.6800	5248.000	0.695456
TURKEY	47	0.042477	47.30000	15303.70	58652.00	10.34108
SOUTH KOREA	48	0.030221	40.00000	1990.040	80400.00	10.38623

COUNTRY	obs	RPS	POP	ALCQ	GNP	CSI
MALAYSIA	49	0.078733	14.90000	3231.580	27714.00	4.015604
COSTA RICA	50	0.028907	2.400000	1148.820	2448.000	0.525507
PANAMA	51	0.048667	2.000000	785.2500	4240.000	0.650805
BRAZIL	52	0.059289	129.7000	102641.0	243836.0	46.91879
MEXICO	53	0.065736	75.00000	39239.60	168000.0	26.92168
CHILE	54	0.063949	11.70000	7494.040	21879.00	3.942994
ARGENTINA	55	0.056103	29.60000	50008.00	61272.00	15.48850
URUGUAY	56	0.017212	3.000000	4824.960	7470.000	1.668995

SOURCE: TABLES 4 and 11

TABLE 14

COUNTRY	obs	RPAP	POP	ALCQ	GNP	CSI
CHAD	1	0.427885	5.000000	12037.50	400.0000	2.094313
BANGLADESH	2	0.373512	95.50000	7399.360	12415.00	5.637284
ETHIOPIA	3	0.134207	40.90000	20121.20	4908.000	5.027362
NEPAL	4	0.193990	15.70000	2141.360	2512.000	1.123113
MALI	5	1.007547	7.200000	8333.780	1152.000	1.667617
BURUNDI	6	1.072533	4.500000	1019.360	1080.000	0.424748
RWANDA	7	0.205167	5.700000	681.5000	1539.000	0.461075
UPPER VOLTA	8	0.196549	6.700000	4042.560	1407.000	1.006317
ZAIRE	9	0.236230	29.70000	6899.640	5049.000	2.603611
INDIA	10	0.275780	733.2000	140634.0	190632.0	66.81396
SRI LANKA	11	0.641344	15.40000	1942.500	5082.000	1.362328
SIERRA LEONE	12	0.325408	3.600000	1828.500	1188.000	0.533937
TANZANIA	13	0.471873	20.80000	12458.90	4992.000	3.177833
CHINA	14	1.073710	1019.100	212621.2	305730.0	100.0000
PAKISTAN	15	0.641004	89.70000	14529.30	34983.00	9.025918
UGANDA	16	0.699062	13.90000	5918.000	3058.000	1.715844
MADAGASCAR	17	0.672920	9.500000	15914.73	2945.000	3.126826
SUDAN	18	0.947207	20.80000	16427.52	8320.000	4.162854
GHANA	19	2.154409	12.80000	2546.100	3968.000	1.250456
KENYA	20	1.746271	18.90000	1939.200	6426.000	1.622826
LESOTHO	21	0.414808	1.500000	574.5000	690.0000	0.214359
INDONESIA	22	0.373676	155.7000	21580.70	87192.00	17.98243
MAURITANIA	23	0.210370	1.600000	5916.750	768.0000	1.063656
SENEGAL	24	2.290627	6.200000	3823.750	2728.000	1.099686
LIBERIA	25	0.302147	2.100000	323.8300	1008.000	0.229357
HONDURAS	26	0.453247	4.100000	2326.500	2747.000	0.798340
ZAMBIA	27	1.382408	6.300000	12448.98	3654.000	2.556123
BOLIVIA	28	4.085488	6.000000	10007.25	3060.000	2.098749
EGYPT	29	1.141008	45.20000	691.8800	31640.00	5.036564
ZIMBABWE	30	2.446143	7.900000	2487.540	5846.000	1.285759
EL SALVADOR	31	0.969980	5.200000	760.9500	3692.000	0.691915
CAMEROON	32	0.548667	9.600000	7172.200	7872.000	2.296686
THAILAND	33	0.617002	49.20000	15152.06	40344.00	8.383354
PHILIPPINES	34	0.431026	52.10000	8782.700	39596.00	7.398110
NICARAGUA	35	1.910977	3.000000	2589.970	2640.000	0.792000
MOROCCO	36	0.782566	20.80000	5432.440	15808.00	3.255526
PERU	37	1.192549	17.90000	12867.54	18616.00	4.632449
NIGERIA	38	2.840226	93.60000	26201.25	72072.00	15.02710
JAMAICA	39	2.082405	2.300000	206.3600	2990.000	0.433577
IVORY COAST	40	1.951857	9.500000	3562.350	6745.000	1.604612
DOMINICAN R.	41	0.806286	6.000000	1811.520	8220.000	1.376465
COLOMBIA	42	4.564004	27.50000	14276.00	39325.00	7.425135
PARAGUAY	43	3.458360	3.200000	6121.500	4512.000	1.556293
TUNISIA	44	2.607556	6.900000	2233.290	8901.000	1.546274
SYRIA	45	1.187321	9.600000	3217.930	16896.00	2.660636
JORDAN	46	1.125995	3.200000	118.6800	5248.000	0.695456
TURKEY	47	1.092925	47.30000	15303.70	58652.00	10.34108
SOUTH KOREA	48	1.972532	40.00000	1990.040	80400.00	10.38623
MALAYSIA	49	4.677697	14.90000	3231.580	27714.00	4.015604
COSTA RICA	50	2.713392	2.400000	1148.820	2448.000	0.525507
PANAMA	51	3.682493	2.000000	785.2500	4240.000	0.650805
BRAZIL	52	3.756817	129.7000	102641.0	243836.0	46.91879
MEXICO	53	2.837728	75.00000	39239.60	168000.0	26.92168
CHILE	54	5.392568	11.70000	7494.040	21879.00	3.942994
ARGENTINA	55	16.32514	29.60000	50008.00	61272.00	15.48850
URUGUAY	56	11.07536	3.000000	4824.960	7470.000	1.668995

SOURCE: TABLES 4 and 11

TABLE 15

COUNTRY	obs	SPAP	POP	ALCQ	GNP	CSI
CHAD	1	11.21795	5.000000	12037.50	400.0000	2.094313
BANGLADESH	2	17.85521	95.50000	7399.360	12415.00	5.637284
ETHIOPIA	3	6.118260	40.90000	20121.20	4908.000	5.027362
NEPAL	4	16.64457	15.70000	2141.360	2512.000	1.123113
MALI	5	11.15669	7.200000	8333.780	1152.000	1.667617
BURUNDI	6	12.18787	4.500000	1019.360	1080.000	0.424748
RWANDA	7	5.210595	5.700000	681.5000	1539.000	0.461075
UPPER VOLTA	8	2.134472	6.700000	4042.560	1407.000	1.006317
ZAIRE	9	4.578279	29.70000	6899.640	5049.000	2.603611
INDIA	10	5.381712	733.2000	140634.0	190632.0	66.81396
SRI LANKA	11	53.51934	15.40000	1942.500	5082.000	1.362328
SIERRA LEONE	12	16.31702	3.600000	1828.500	1188.000	0.533937
TANZANIA	13	13.86709	20.80000	12458.90	4992.000	3.177833
CHINA	14	28.81668	1019.100	212621.2	305730.0	100.0000
PAKISTAN	15	25.98405	89.70000	14529.30	34983.00	9.025918
UGANDA	16	16.41651	13.90000	5918.000	3058.000	1.715844
MADAGASCAR	17	9.380604	9.500000	15914.73	2945.000	3.126826
SUDAN	18	10.44714	20.80000	16427.52	8320.000	4.162854
GHANA	19	59.92510	12.80000	2546.100	3968.000	1.250456
KENYA	20	30.75504	18.90000	1939.200	6426.000	1.622826
LESOTHO	21	12.48885	1.500000	574.5000	690.0000	0.214359
INDONESIA	22	16.57906	155.7000	21580.70	87192.00	17.98243
MAURITANIA	23	5.925926	1.600000	5916.750	768.0000	1.063656
SENEGAL	24	40.50872	6.200000	3823.750	2728.000	1.099686
LIBERIA	25	15.33742	2.100000	323.8300	1008.000	0.229357
HONDURAS	26	25.97403	4.100000	2326.500	2747.000	0.798340
ZAMBIA	27	25.51156	6.300000	12448.98	3654.000	2.556123
BOLIVIA	28	44.89943	6.000000	10007.25	3060.000	2.098749
EGYPT	29	43.44270	45.20000	691.8800	31640.00	5.036564
ZIMBABWE	30	46.56011	7.900000	2487.540	5846.000	1.285759
EL SALVADOR	31	31.64300	5.200000	760.9500	3692.000	0.691915
CAMEROON	32	15.35342	9.600000	7172.200	7872.000	2.296686
THAILAND	33	36.10603	49.20000	15152.06	40344.00	8.383354
PHILIPPINES	34	28.93702	52.10000	8782.700	39596.00	7.398110
NICARAGUA	35	49.26534	3.000000	2589.970	2640.000	0.792000
MOROCCO	36	66.88768	20.80000	5432.440	15808.00	3.255526
PERU	37	42.36669	17.90000	12867.54	18616.00	4.632449
NIGERIA	38	25.26924	93.60000	26201.25	72072.00	15.02710
JAMAICA	39	89.08686	2.300000	206.3600	2990.000	0.433577
IVORY COAST	40	17.72887	9.500000	3562.350	6745.000	1.604612
DOMINICAN R.	41	12.82874	6.000000	1811.520	8220.000	1.376465
COLOMBIA	42	124.7522	27.50000	14276.00	39325.00	7.425135
PARAGUAY	43	40.67140	3.200000	6121.500	4512.000	1.556293
TUNISIA	44	109.8689	6.900000	2233.290	8701.000	1.546274
SYRIA	45	42.82297	9.600000	3217.930	16896.00	2.660636
JORDAN	46	46.41910	3.200000	118.6800	5248.000	0.695456
TURKEY	47	25.72998	47.30000	15303.70	58652.00	10.34108
SOUTH KOREA	48	65.27060	40.00000	1990.040	80400.00	10.38623
MALAYSIA	49	59.41203	14.90000	3231.580	27714.00	4.015604
COSTA RICA	50	93.86733	2.400000	1148.820	2448.000	0.525507
PANAMA	51	75.66766	2.000000	785.2500	4240.000	0.650805
BRAZIL	52	63.36493	129.7000	102641.0	243836.0	46.91879
MEXICO	53	43.16863	75.00000	39239.60	168000.0	26.92168
CHILE	54	84.32587	11.70000	7494.040	21879.00	3.942994
ARGENTINA	55	290.9836	29.60000	50008.00	61272.00	15.48850
URUGUAY	56	643.4783	3.000000	4824.960	7470.000	1.668995

SOURCE: TABLES 4 and 11

TABLE 16

COUNTRY	obs	EPAGDP	ALCQ	PCI	PAGP	PAGDP
CHAD	1	0.562105	12037.50	80.00000	81.00000	64.00000
BANGLADESH	2	0.459023	7399.360	130.0000	82.80000	47.00000
ETHIOPIA	3	0.180669	20121.20	120.0000	77.40000	48.00000
NEPAL	4	0.248444	2141.360	160.0000	92.10000	59.00000
MALI	5	1.036981	8333.780	160.0000	85.40000	46.00000
BURUNDI	6	0.830380	1019.360	240.0000	81.50000	58.00000
RWANDA	7	0.175781	681.5000	270.0000	88.10000	46.00000
UPPER VOLTA	8	0.281888	4042.560	210.0000	80.00000	41.00000
ZAIRE	9	0.253906	6899.640	170.0000	72.60000	36.00000
INDIA	10	0.228699	140634.0	260.0000	60.90000	36.00000
SRI LANKA	11	0.480338	1942.500	330.0000	52.40000	27.00000
SIERRA LEONE	12	0.208483	1828.500	330.0000	63.00000	32.00000
TANZANIA	13	0.318921	12458.90	240.0000	79.30000	52.00000
CHINA	14	0.695592	212621.2	300.0000	57.20000	37.00000
PAKISTAN	15	0.449433	14529.30	390.0000	51.90000	27.00000
UGANDA	16	0.076664	5918.000	220.0000	79.10000	82.00000
MADAGASCAR	17	0.415644	15914.73	310.0000	80.90000	41.00000
SUDAN	18	0.497767	16427.52	400.0000	75.10000	34.00000
GHANA	19	0.124589	2546.100	310.0000	48.90000	53.00000
KENYA	20	1.115192	1939.200	340.0000	76.00000	33.00000
LESOTHO	21	0.468750	574.5000	460.0000	81.40000	23.00000
INDONESIA	22	0.182940	21580.70	560.0000	56.50000	26.00000
MAURITANIA	23	0.222920	5916.750	480.0000	81.10000	34.00000
SENEGAL	24	1.265582	3823.750	440.0000	72.60000	21.00000
LIBERIA	25	0.105235	323.8300	480.0000	67.70000	36.00000
HONDURAS	26	0.151454	2326.500	670.0000	61.40000	27.00000
ZAMBIA	27	0.915040	12448.98	580.0000	64.60000	14.00000
BOLIVIA	28	1.035883	10007.25	510.0000	48.30000	23.00000
EGYPT	29	0.491677	691.8800	700.0000	49.20000	20.00000
ZIMBABWE	30	0.976151	2487.540	740.0000	57.00000	11.00000
EL SALVADOR	31	0.261226	760.9500	710.0000	48.70000	20.00000
CAMEROON	32	0.196963	7172.200	819.9999	79.40000	24.00000
THAILAND	33	0.258296	15152.06	820.0000	73.90000	23.00000
PHILIPPINES	34	0.116787	8782.700	760.0000	43.90000	22.00000
NICARAGUA	35	0.453445	2589.970	880.0000	40.20000	22.00000
MOROCCO	36	0.248545	5432.440	760.0000	49.40000	17.00000
PERU	37	0.530341	12867.54	1040.000	35.20000	8.000000
NIGERIA	38	0.668495	26201.25	770.0000	50.50000	26.00000
JAMAICA	39	0.439380	206.3600	1300.000	18.50000	7.000000
IVORY COAST	40	0.545559	3562.350	710.0000	77.50000	27.00000
DOMINICAN R.	41	0.210025	1811.520	1370.000	54.50000	17.00000
COLOMBIA	42	0.389282	14276.00	1430.000	24.80000	20.00000
PARAGUAY	43	0.401273	6121.500	1410.000	47.80000	26.00000
TUNISIA	44	0.545044	2233.290	1290.000	37.90000	14.00000
SYRIA	45	0.192364	3217.930	1760.000	46.40000	19.00000
JORDAN	46	0.484589	118.6800	1640.000	23.60000	8.000000
TURKEY	47	0.213791	15303.70	1240.000	50.10000	19.00000
SOUTH KOREA	48	0.311287	1990.040	2010.000	35.00000	14.00000
MALAYSIA	49	0.536564	3231.580	1860.000	45.40000	21.00000
COSTA RICA	50	0.262947	1148.820	1020.000	33.00000	23.00000
PANAMA	51	0.711175	785.2500	2120.000	32.50000	8.000000
BRAZIL	52	0.635409	102641.0	1880.000	35.80000	12.00000
MEXICO	53	0.531861	39239.60	2240.000	33.50000	8.000000
CHILE	54	0.575855	7494.040	1870.000	17.00000	10.00000
ARGENTINA	55	0.507095	50008.00	2070.000	12.10000	12.00000
URUGUAY	56	0.453262	4824.960	2490.000	11.00000	12.00000

SOURCE: TABLES 4 and 11; World Bank (1984,1985); FAO (1984)

Note.- All figures but those of EPAGDP correspond to 1983. Figures for EPAGDP are for 1980

TABLE 17

COUNTRY	obs	RPS	ALCO	PCI	PAGP	PAGDP
CHAD	1	0.038143	12037.50	80.00000	81.00000	64.00000
BANGLADESH	2	0.020919	7399.360	130.0000	82.80000	47.00000
ETHIOPIA	3	0.021935	20121.20	120.0000	77.40000	48.00000
NEPAL	4	0.011655	2141.360	160.0000	92.10000	59.00000
MALI	5	0.090309	8333.780	160.0000	85.40000	46.00000
BURUNDI	6	0.088000	1019.360	240.0000	81.50000	58.00000
RWANDA	7	0.039375	681.5000	270.0000	88.10000	46.00000
UPPER VOLTA	8	0.092083	4042.560	210.0000	80.00000	41.00000
ZAIRE	9	0.051598	6899.640	170.0000	72.60000	36.00000
INDIA	10	0.051244	140634.0	260.0000	60.90000	36.00000
SRI LANKA	11	0.011983	1942.500	330.0000	52.40000	27.00000
SIERRA LEONE	12	0.019943	1828.500	330.0000	63.00000	32.00000
TANZANIA	13	0.034028	12458.90	240.0000	79.30000	52.00000
CHINA	14	0.037260	212621.2	300.0000	57.20000	37.00000
PAKISTAN	15	0.024669	14529.30	390.0000	51.90000	27.00000
UGANDA	16	0.042583	5918.000	220.0000	79.10000	82.00000
MADAGASCAR	17	0.071735	15914.73	310.0000	80.90000	41.00000
SUDAN	18	0.090667	16427.52	400.0000	75.10000	34.00000
GHANA	19	0.035952	2546.100	310.0000	48.90000	53.00000
KENYA	20	0.056780	1939.200	340.0000	76.00000	33.00000
LESOTHO	21	0.033214	574.5000	460.0000	81.40000	23.00000
INDONESIA	22	0.022539	21580.70	560.0000	56.50000	26.00000
MAURITANIA	23	0.035500	5916.750	480.0000	81.10000	34.00000
SENEGAL	24	0.056547	3823.750	440.0000	72.60000	21.00000
LIBERIA	25	0.019700	323.8300	480.0000	67.70000	36.00000
HONDURAS	26	0.017450	2326.500	670.0000	61.40000	27.00000
ZAMBIA	27	0.054187	12448.98	580.0000	64.60000	14.00000
BOLIVIA	28	0.090992	10007.25	510.0000	48.30000	23.00000
EGYPT	29	0.026265	691.8800	700.0000	49.20000	20.00000
ZIMBABWE	30	0.052537	2487.540	740.0000	57.00000	11.00000
EL SALVADOR	31	0.030654	760.9500	710.0000	48.70000	20.00000
CAMEROON	32	0.035736	7172.200	819.9999	79.40000	24.00000
THAILAND	33	0.017089	15152.06	820.0000	73.90000	23.00000
PHILIPPINES	34	0.014895	8782.700	760.0000	43.90000	22.00000
NICARAGUA	35	0.038789	2589.970	880.0000	40.20000	22.00000
MOROCCO	36	0.011700	5432.440	760.0000	49.40000	17.00000
PERU	37	0.028148	12867.54	1040.000	35.20000	8.000000
NIGERIA	38	0.112398	26201.25	770.0000	50.50000	26.00000
JAMAICA	39	0.023375	206.3600	1300.000	18.50000	7.000000
IVORY COAST	40	0.110095	3562.350	710.0000	77.50000	27.00000
DOMINICAN R.	41	0.062850	1811.520	1370.000	54.50000	17.00000
COLOMBIA	42	0.036585	14276.00	1430.000	24.80000	20.00000
PARAGUAY	43	0.085032	6121.500	1410.000	47.80000	26.00000
TUNISIA	44	0.023733	2233.290	1290.000	37.90000	14.00000
SYRIA	45	0.027726	3217.930	1760.000	46.40000	19.00000
JORDAN	46	0.024257	118.6800	1640.000	23.60000	8.000000
TURKEY	47	0.042477	15303.70	1240.000	50.10000	19.00000
SOUTH KOREA	48	0.030221	1990.040	2010.000	35.00000	14.00000
MALAYSIA	49	0.078733	3231.580	1860.000	45.40000	21.00000
COSTA RICA	50	0.028907	1148.820	1020.000	33.00000	23.00000
PANAMA	51	0.048667	785.2500	2120.000	32.50000	8.000000
BRAZIL	52	0.059289	102641.0	1880.000	35.80000	12.00000
MEXICO	53	0.065736	39239.60	2240.000	33.50000	8.000000
CHILE	54	0.063949	7494.040	1870.000	17.00000	10.00000
ARGENTINA	55	0.056103	50008.00	2070.000	12.10000	12.00000
URUGUAY	56	0.017212	4824.960	2490.000	11.00000	12.00000

SOURCE: TABLES 4 and 11; World Bank (1984, 1985); FAO (1984)

Note.- All figures but those for RPS correspond to 1983. Figures for RPS are for 1980

TABLE 18

COUNTRY	obs	RPAP	ALCQ	PCI	PAGP	PAGDP
CHAD	1	0.427885	12037.50	80.00000	81.00000	64.00000
BANGLADESH	2	0.373512	7399.360	130.0000	82.80000	47.00000
ETHIOPIA	3	0.134207	20121.20	120.0000	77.40000	48.00000
NEPAL	4	0.193990	2141.360	160.0000	92.10000	59.00000
MALI	5	1.007547	8333.780	160.0000	85.40000	46.00000
BURUNDI	6	1.072533	1019.360	240.0000	81.50000	58.00000
RWANDA	7	0.205167	681.5000	270.0000	88.10000	46.00000
UPPER VOLTA	8	0.196549	4042.560	210.0000	80.00000	41.00000
ZAIRE	9	0.236230	6899.640	170.0000	72.60000	36.00000
INDIA	10	0.275780	140634.0	260.0000	60.90000	36.00000
SRI LANKA	11	0.641344	1942.500	330.0000	52.40000	27.00000
SIERRA LEONE	12	0.325408	1828.500	330.0000	63.00000	32.00000
TANZANIA	13	0.471873	12458.90	240.0000	79.30000	52.00000
CHINA	14	1.073710	212621.2	300.0000	57.20000	37.00000
PAKISTAN	15	0.641004	14529.30	390.0000	51.90000	27.00000
UGANDA	16	0.699062	5918.000	220.0000	79.10000	82.00000
MADAGASCAR	17	0.672920	15914.73	310.0000	80.90000	41.00000
SUDAN	18	0.947207	16427.52	400.0000	75.10000	34.00000
GHANA	19	2.154409	2546.100	310.0000	48.90000	53.00000
KENYA	20	1.746271	1939.200	340.0000	76.00000	33.00000
LESOTHO	21	0.414808	574.5000	460.0000	81.40000	23.00000
INDONESIA	22	0.373676	21580.70	560.0000	56.50000	26.00000
MAURITANIA	23	0.210370	5916.750	480.0000	81.10000	34.00000
SENEGAL	24	2.290627	3823.750	440.0000	72.60000	21.00000
LIBERIA	25	0.302147	323.8300	480.0000	67.70000	36.00000
HONDURAS	26	0.453247	2326.500	670.0000	61.40000	27.00000
ZAMBIA	27	1.382408	12448.98	580.0000	64.60000	14.00000
BOLIVIA	28	4.085488	10007.25	510.0000	48.30000	23.00000
EGYPT	29	1.141008	691.8800	700.0000	49.20000	20.00000
ZIMBABWE	30	2.446143	2487.540	740.0000	57.00000	11.00000
EL SALVADOR	31	0.969980	760.9500	710.0000	48.70000	20.00000
CAMEROON	32	0.548667	7172.200	819.9999	79.40000	24.00000
THAILAND	33	0.617002	15152.06	820.0000	73.90000	23.00000
PHILIPPINES	34	0.431026	8782.700	760.0000	43.90000	22.00000
NICARAGUA	35	1.910977	2589.970	880.0000	40.20000	22.00000
MOROCCO	36	0.782566	5432.440	760.0000	49.40000	17.00000
PERU	37	1.192549	12867.54	1040.000	35.20000	8.000000
NIGERIA	38	2.840226	26201.25	770.0000	50.50000	26.00000
JAMAICA	39	2.082405	206.3600	1300.000	18.50000	7.000000
IVORY COAST	40	1.951857	3562.350	710.0000	77.50000	27.00000
DOMINICAN R.	41	0.806286	1811.520	1370.000	54.50000	17.00000
COLOMBIA	42	4.564004	14276.00	1430.000	24.80000	20.00000
PARAGUAY	43	3.458360	6121.500	1410.000	47.80000	26.00000
TUNISIA	44	2.607556	2233.290	1290.000	37.90000	14.00000
SYRIA	45	1.187321	3217.930	1760.000	46.40000	19.00000
JORDAN	46	1.125995	118.6800	1640.000	23.60000	8.000000
TURKEY	47	1.092925	15303.70	1240.000	50.10000	19.00000
SOUTH KOREA	48	1.972532	1990.040	2010.000	35.00000	14.00000
MALAYSIA	49	4.677697	3231.580	1860.000	45.40000	21.00000
COSTA RICA	50	2.713392	1148.820	1020.000	33.00000	23.00000
PANAMA	51	3.682493	785.2500	2120.000	32.50000	8.000000
BRAZIL	52	3.756817	102641.0	1880.000	35.80000	12.00000
MEXICO	53	2.837728	39239.60	2240.000	33.50000	8.000000
CHILE	54	5.392568	7494.040	1870.000	17.00000	10.00000
ARGENTINA	55	16.32514	50008.00	2070.000	12.10000	12.00000
URUGUAY	56	11.07536	4824.960	2490.000	11.00000	12.00000

SOURCE: TABLES 4 and 11; World Bank (1984,1985); FAO (1984)

Note.- All figures but those for RPAP correspond to 1983. Figures for RPAP are for 1980

TABLE 19

COUNTRY	obs	SPAP	ALCQ	PCI	PAGP	PAGDP
CHAD	1	11.21795	12037.50	80.00000	81.00000	64.00000
BANGLADESH	2	17.85521	7399.360	130.0000	82.80000	47.00000
ETHIOPIA	3	6.118260	20121.20	120.0000	77.40000	48.00000
NEPAL	4	16.64457	2141.360	160.0000	92.10000	59.00000
MALI	5	11.15669	8333.780	160.0000	85.40000	46.00000
BURUNDI	6	12.18787	1019.360	240.0000	81.50000	58.00000
RWANDA	7	5.210595	681.5000	270.0000	88.10000	46.00000
UPPER VOLTA	8	2.134472	4042.560	210.0000	80.00000	41.00000
ZAIRE	9	4.578279	6899.640	170.0000	72.60000	36.00000
INDIA	10	5.381712	140634.0	260.0000	60.90000	36.00000
SRI LANKA	11	53.51934	1942.500	330.0000	52.40000	27.00000
SIERRA LEONE	12	16.31702	1828.500	330.0000	63.00000	32.00000
TANZANIA	13	13.86709	12458.90	240.0000	79.30000	52.00000
CHINA	14	28.81668	212621.2	300.0000	57.20000	37.00000
PAKISTAN	15	25.98405	14529.30	390.0000	51.90000	27.00000
UGANDA	16	16.41651	5918.000	220.0000	79.10000	82.00000
MADAGASCAR	17	9.380604	15914.73	310.0000	80.90000	41.00000
SUDAN	18	10.44714	16427.52	400.0000	75.10000	34.00000
GHANA	19	59.92510	2546.100	310.0000	48.90000	53.00000
KENYA	20	30.75504	1939.200	340.0000	76.00000	33.00000
LESOTHO	21	12.48885	574.5000	460.0000	81.40000	23.00000
INDONESIA	22	16.57906	21580.70	560.0000	56.50000	26.00000
MAURITANIA	23	5.925926	5916.750	480.0000	81.10000	34.00000
SENEGAL	24	40.50872	3823.750	440.0000	72.60000	21.00000
LIBERIA	25	15.33742	323.8300	480.0000	67.70000	36.00000
HONDURAS	26	25.97403	2326.500	670.0000	61.40000	27.00000
ZAMBIA	27	25.51156	12448.98	580.0000	64.60000	14.00000
BOLIVIA	28	44.89943	10007.25	510.0000	48.30000	23.00000
EGYPT	29	43.44270	691.8800	700.0000	49.20000	20.00000
ZIMBABWE	30	46.56011	2487.540	740.0000	57.00000	11.00000
EL SALVADOR	31	31.64300	760.9500	710.0000	48.70000	20.00000
CAMEROON	32	15.35342	7172.200	819.9999	79.40000	24.00000
THAILAND	33	36.10603	15152.06	820.0000	73.90000	23.00000
PHILIPPINES	34	28.93702	8782.700	760.0000	43.90000	22.00000
NICARAGUA	35	49.26534	2589.970	880.0000	40.20000	22.00000
MOROCCO	36	66.88768	5432.440	760.0000	49.40000	17.00000
PERU	37	42.36669	12867.54	1040.000	35.20000	8.000000
NIGERIA	38	25.26924	26201.25	770.0000	50.50000	26.00000
JAMAICA	39	89.08686	206.3600	1300.000	18.50000	7.000000
IVORY COAST	40	17.72887	3562.350	710.0000	77.50000	27.00000
DOMINICAN R.	41	12.82874	1811.520	1370.000	54.50000	17.00000
COLOMBIA	42	124.7522	14276.00	1430.000	24.80000	20.00000
PARAGUAY	43	40.67140	6121.500	1410.000	47.80000	26.00000
TUNISIA	44	109.8689	2233.290	1290.000	37.90000	14.00000
SYRIA	45	42.82297	3217.930	1760.000	46.40000	19.00000
JORDAN	46	46.41910	118.6800	1640.000	23.60000	8.000000
TURKEY	47	25.72998	15303.70	1240.000	50.10000	19.00000
SOUTH KOREA	48	65.27060	1990.040	2010.000	35.00000	14.00000
MALAYSIA	49	59.41203	3231.580	1860.000	45.40000	21.00000
COSTA RICA	50	93.86733	1148.820	1020.000	33.00000	23.00000
PANAMA	51	75.66766	785.2500	2120.000	32.50000	8.000000
BRAZIL	52	63.36493	102641.0	1880.000	35.80000	12.00000
MEXICO	53	43.16863	39239.60	2240.000	33.50000	8.000000
CHILE	54	84.32587	7494.040	1870.000	17.00000	10.00000
ARGENTINA	55	290.9836	50008.00	2070.000	12.10000	12.00000
URUGUAY	56	643.4783	4824.960	2490.000	11.00000	12.00000

SOURCE: TABLES 4 and 11; World Bank (1984, 1985); FAO (1984)

Note.- All figures but those for SPAP correspond to 1983. Figures for SPAP are for 1980

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