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Investment in Agricultural Research and Extension: A Study of International Data

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CENTER DISCUSSION PAPER NO. 124

INVESTMENT IN AGRICULTURAL RESEARCH AND EXTENSION;

A SURVEY OF INTERNATIONAL DATA

Robert E. Evenson and Yoav Kislev

August 1971

Note: Center Discussion Papers are preliminary materials circulated to stimulate discussion and critical comment. References in publications to Discussion Papers should be cleared with the author to protect the tentative character of these papers.

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DO NOT QUOTE

Investment in Agricultural Research and Extension:

A Survey of International Data

Robert E. Evenson and Yoav Kislev

When authors request that their manuscripts not be quoted they usually have in mind a certain probability that the next version will differ in some aspects from the present one. The next version of this survey will be a substantially modified version, with probability one. Being a survey of data in a statistically neglected field, this paper draws heavily on a wide assortment of sources and on more than a regularly justified share of estimates, judgments and data adaptations (not to mention errors). Since the main purpose of this version of the survey is to invite criticism, corrections and hopefully also the discovery of new data sources, we decided to make its coverage as wide as possible. In the next draft we not only hope to correct and improve the data, but it will also be necessary to eliminate a few countries or items for which the reliability of the available information is clearly lower than for the rest of the material.

It is widely acknowledged that the development and use of new techniques of production has been a dominant feature of the agricultural economics of most developed countries. There is also wide agreement among economists concerned with economic development problems, that changes in the techniques of production and productivity gains in the agricultural sector are of critical importance to the process of development. In spite of this agreement on the importance of the introduction of new techniques of production very little attention has been given to study of the economic activities that develop new techniques and facilitate their adoption by farmers.

This paper is a report of the first phase of a study of agricultural research and extension activities. The primary focus of the larger study will be the testing of hypotheses regarding the "productivity" or production-increasing effects of organized (and usually publicly supported) research and extension. It is a measure of the limited emphasis on research and extension as economic activities, that a comprehensive compilation of data on research and extension activities for all countries of the world does not presently exist.¹ This paper develops a compilation which, while not as complete as would be desirable, does enable an overview of this important activity. While we present a number of calculations for comparative purposes, this paper is not intended to be an analysis of the productivity of research and extension nor is it an analysis of the determinants of the demand for public investment in these activities.

Expenditure and Man-Year Data

Ideally time series data for each country in the world on expenditures and manpower for carefully defined research activities and extension activities is desirable. A number of regional surveys of research and development activities have been undertaken by such organizations as OECD, UNESCO and FAO, and we have relied heavily on them in this paper. These prior efforts have contributed considerably to the development of consistent definitions of research activities for purposes of collecting data with international comparability, but many problems remain. In our review of the available

¹Several regional compilations for different parts of the world do exist and will be mentioned below.

data, for example, we find that the definition of a researcher ranges from " a person engaged in independent research with graduate training at the Ph.D. level" to people with less than college or university training.

Some of these problems can only be solved arbitrarily. The distinction between the researcher and the technician and between quality research and repetitive and unimaginative field trial work is not easily measured. We had to accept the country's definitions. The Latin American countries and Spain for example, grant the Ingeniero Agronomo degree as the basic degree in the agricultural sciences. This degree appears to be a strong professional degree in most Latin American countries, but with a relatively small research training component. Since it is the degree which most researchers hold in these countries, any definition of research qualifications which excluded it would preclude the collection of data.

Basically, we have tried to make determinations consistent with the OECD research survey definitions. Even this has not been possible in all countries and as a result, the data for scientific man years (SMY) reflect considerable quality differences.²

The data on research expenditures pose probably smaller consistency problems, though the definition of what constitutes genuine research may differ from country to country. In general, agricultural research is what experiment stations do, even though it may vary greatly in quality. We have expressed all expenditure data in this survey in 1965 constant U.S. dollars.

²As part of this study a number of surveys were sent to Ministries of Agriculture and other agencies throughout the world. The survey asked that researchers be defined as having graduate training at the Ph.D. level. The replies reflected the difficulty with the definitions and where we have included survey data we have tried to make it consistent with data from other sources.

No doubt errors due to exchange rates and price deflators have been introduced.

A major problem with the research data is the coverage of the administrative units. Most countries support and organize agricultural research under the Ministry of Agriculture. However, in many cases other Ministries or organizations also conduct agricultural research. We have not been able to collect data on research by private firms in the machinery and chemicals industries for example. More serious is the possibility that some of the figures include only Ministry of Agriculture data, when the Colleges and Universities and the Ministry of Science are supporting substantial unreported research.³ For the most part, these problems are not serious for the large spending countries.

The extension data are somewhat less susceptible to errors of definition. We generally have tried to exclude home economic and youth activities from our data. In some countries the field workers may have relatively little training and may function as community development agents. We have not included community development agents (such as the Grom Sevak's in India) where we could exclude them.

The set of Appendix Tables 1.1 to 1.6 include the data on research and extension that we have been able to assemble. All sources are given in the notes to Appendix Tables 1. An attempt has been made to exclude research work on forestry and fisheries from the data. Research work by international institutes is generally not included in the tables.

³We have found several instances where one group claimed it was doing all of the research in agriculture when this was not the case.

The reader will note that we have not been able to develop complete time series data. The coverage is quite good in the most recent years, however. (We hope to be able to obtain more data with another survey mailing.) In view of the spotty coverage over time, we have decided to concentrate more heavily on the data for the 1962-68 period centering on 1965. In Table 2 of the appendix we present data for 1965 levels of expenditures in research and extension and in research man years and numbers of extension workers for most of the countries of the world. These data are summarized by World regions in Table 1. (They are based on the row data in Appendix Tables 1.) Some adjustments have been made where choices between conflicting numbers are involved and where data for a year different from 1965 was used. A comparison of the two tables (Appendix Tables 1 and 2) will allow the reader to determine the adjustments made.

In discussing Table 1 we must note several factors. First the data on expenditures and man years in the first four columns are adjusted for the missing data in Appendix Table 2. They represent our best estimates of the 1965 data for the entire region.⁴ Thus, the regional data can be summed to get world total research expenditures of 941 million dollars and extension

⁴The procedure for estimation was to fill in the missing data by applying the region's ratio of expenditures to SMY to existing data on SMY's or Expenditures. Many gaps were thus filled. Where this could not be done, the ratio of research expenditure to extension expenditure was used to estimate the missing element. Finally, expenditures per farm were used. In some cases data from other regions were used to get extension data. In Africa, only East Africa had extension data of wide coverage. Its ratio of extension per farm and per research dollar was used to fill in North and West Africa figures. Wherever more than 10 percent of a figure in Table 1 was based on estimates it is placed in parentheses. All of the ratios in the Table are based on actual data for only those countries in the region which had data for both components of the ratio.

Table 1

Agricultural Research and Extension - Interregional Comparisons

Region	Expenditures on Research millions \$	Scientific Man Years millions	Expenditures on Extension	No. of Ext. Workers	Expenditures per SMY	Expenditures per Ext. Worker
Northern Europe	190.0	8,232	106.4	17,480	23.08	6.39
Southern Europe	23.1	2,236	25.1	5,335	10.35	4.71
Eastern Europe & U.S.S.R.	(62.0)	13,840	(62.0)	(33,000)	4.33	n.a.
North America	390.2	15,283	204.4	9,137	25.53	22.38
Central America & Caribbean	5.5	575	5.2	900	8.93	4.55
South America	15.1	1,856	17.7	2,983	8.19	5.95
Middle East	29.0	1,400	(30.0)	(13,000)	19.80	2.76
South Asia	36.0	4,220	(45.9)	74,392	8.55	.67
East Asia	65.7	5,195	36.3	18,443	12.66	2.57
North Africa	(4.3)	208	(3.0)	(2,500)	35.93	n.a.
East Africa	18.7	416	17.7	14,020	31.06	1.21
West Africa	14.8	928	(10.3)	(9,800)	16.09	n.a.
South Africa	24.3	1,107	(11.0)	(6,500)	21.91	n.a.
Oceania	62.4	2,564	(32.0)	(1,450)	24.32	n.a.
World	941.1	58,060	607.0	208,940		

Table 1 (continued)

Region	Ratio:				% of Agr. Commodity Value spent on:				Agr. SMY per thou- sand farms	Ext. Workers per thou- sand farms
	Res. Exp/ Ext. Exp.	Agr. Res.	Agr. Extension	Res. Exp. Per Farms	Ext. Exp. Per Farms	Agr. SMY per thou- sand farms	Ext. Workers per thou- sand farms			
Northern Europe	1.80	.93	.53	32.55	16.74	1.49	2.66			
Southern Europe	.92	.38	.41	2.44	2.51	.22	.54			
Eastern Europe & U.S.S.R.	n.a.	.17	n.a.	1.99	n.a.	.51	2.00			
North America	1.91	.84	.44	93.11	48.78	3.65	2.18			
Central America & Caribbean	1.31	.43	.56	1.81	.90	.20	.33			
South America	.51	.14	.33	1.50	5.75	.23	.37			
Middle East	.46	.57	.36	6.55	n.a.	.24	1.53			
South Asia	.83	.24	.28	.43	.50	.05	.87			
East Asia	1.72	.79	.57	7.15	6.00	.56	2.01			
North Africa	n.a.	.48	n.a.	1.79	n.a.	.05	1.90			
East Africa	.70	.64	.80	2.26	3.43	.05	1.80			
West Africa	n.a.	.33	n.a.	3.94	n.a.	.12	n.a.			
South Africa	n.a.	1.51	n.a.	181.74	n.a.	2.01	n.a.			
Oceania	n.a.	1.65	n.a.	191.88	n.a.	7.89	6.47			

Table 1 (continued)

<u>Region</u>	<u>Expenditures Per Research Pub. (thousand dollars)</u>	<u>SMY Research Publications</u>
Northern Europe	81.61	3.54
Southern Europe	63.35	6.12
Eastern Europe & U.S.S.R.	32.64	7.32
North America	113.77	4.66
Central America & Caribbean	171.99	6.76
South America	80.60	9.97
Middle East	203.23	9.90
South Asia	43.90	5.03
East Asia	182.20	14.40
North Africa	346.06	22.80
East Africa	147.93	4.62
West Africa	190.25	12.34
South Africa	249.64	11.14
Oceania	137.75	5.66

For definitions and sources see notes to Appendix Tables 2 and 3.

expenditures of 607 million dollars. (These expenditure levels have risen considerably since 1965, perhaps by a factor of 50 percent or more in some cases). This estimate does not include private research activity relevant to agriculture which ranges from practically nothing in the low income countries to a level approximately the same as the public research activity for the U.S.A.

It also does not include a substantial amount of agriculturally related research conducted in institutions not considered part of the agricultural research establishment. Research in plant physiology, for example is conducted in general biology departments to a large extent. Nonetheless, the estimate of the level of research expenditure must be considered very low in light of comparable research spending in other fields.

The regional distribution of spending for both research and extension is apparent. Central and South America, the Middle East, South Asia, and North, East and West Africa account for only 13 percent of the total research expenditures. These regions which are dominated by low (and medium) per capita income countries are not spending proportionately as much on research as the other regions (as will be noted below they have increased their activities at a rapid rate in recent years, however). The Table includes a number of additional calculations of interest. All ratios in Table 1 (and Appendix Table 2) are based on actual data from Appendix Table 2 (indirectly from Appendix Tables 1). They are based on data from those countries in the region for which data for both components of the ratio was available.

The relative spending on agricultural research and extension by region is reflected in the figures on the percent of the value of all agricultural

output spent on research and extension (in 1965). South Africa and Oceania spend in excess of 1.5 percent. East Asia (mostly Japan), North America and Northern Europe spend from .8 to 1 percent. In contrast South Asia and South America spend less than 1/4 percent.

Research expenditures per man year vary considerably and probably reflect some of the definitional problems mentioned earlier. It is somewhat surprising that this figure is almost as high in Northern Europe as it is in North America. The very low figure for Eastern Europe is based heavily on data from Yugoslavia and is subject to problems of definition. The data for South Asia and Latin America indicate that it may be possible to purchase a scientific man year for one third the U.S. price, (providing the SMY data are comparable).

Extension expenditures per worker appear to be very much higher in North America than elsewhere. In general the expenditures per extension worker fall relative to expenditures per SMY as the level of per capita income declines. In spite of this the ratio of expenditures on research to extension appears to be much lower in the low per capita income countries. When the data are expressed in per farm terms, the large differences in the size of farm between regions tend to dominate the results.

Agricultural research work has grown in complexity and sophistication over the last several decades. It often requires the incorporation of knowledge and methods from biology, chemistry and physics and collaboration of specialists from different lines of research. This may make the size of the research institution an important factor in determining the productivity of the work done. Table 2 presents size distributions of experiment stations

Table 2

Size Distribution of Experiment Stations: Selected Regions and Countries

	Number of Stations with Senior Research Staff				
	0-4	5-9	10-19	20-49	50+
U.K.	10	16	16	31	10
Canada	21	17	10	14	3
U.S.A.	--	--	--	--	20
West Africa	65	14	6	4	0
East Africa	61	4	7	0	0
Central Africa	26	8	1	0	0
South Africa	29	8	6	17	2
Afghanistan	0	1	0	1	0
Ceylon	1	0	4	1	0
Taiwan	1	0	1	3	2
Indonesia	1	1	3	0	0
S. Korea	0	2	0	1	1
Malaysia	3	0	0	2	0
Nepal	0	0	0	4	
Phillipines	1	0	0	2	3
Thailand	1	0	0	2	1
Japan	3	5	1	4	18
Australia	6	8	7	12	6
New Zealand	2	1	6	2	3
India	5	8	18	14	8
Pakistan	12	5	6	1	1

in several countries and regions. Note, for instance, the large American stations and the very small African stations (except South Africa).

Research Publications in the Agricultural Sciences

The last two columns in Table 1 (and in Appendix Table 2) are the ratios of research expenditures and SMY per publication in the agricultural sciences. We introduce data on publications in this paper because in some ways they overcome many of the difficulties with the expenditure and man-year data. Table 2 (and Appendix Table 3) present detailed data on publications by commodity orientation for three different time periods.

The use of scientific publications counts can be defended on at least three grounds: 1) they are more comparable internationally, 2) they enable a complete time series, and 3) it is possible to allocate research effort to commodities. The publications reported in these tables are the result of complete country by country counts of approximately 205,000 publications in the agricultural sciences. They are taken from several scientific abstracting journals, and represent papers from more than 1,000 scientific journals. The organizations publishing the abstracts apply international standards to the selection of papers and journals and classify the papers according to commodity orientation. There may be some bias in the application of the standard for abstracting, but we do not believe it to be too serious.⁵

⁵In Table 3 and Appendix Table 3, the crop oriented publication data are from Plant Breeding Abstracts, a journal that has provided abstracts of the world literature since the 1930's. Dairy research is from Dairy Science Abstracts and the remainder from Biological Abstracts. They are all classified to countries by the address of their first author.

The application of a single standard by the abstracting journal not only bypasses the exchange rate problem but enables a quality of research measure as well. If the distribution of quality of papers is not seriously biased by country or region, the total number of papers per period should be a good measure of meaningful research activity.

Table 3 presents data for three 7 year periods, 1948-54, 1955-61, and 1962-68. All publications are totals for the seven year period. Publications per \$100 million of commodity value are expressed on a mid-period year basis. Publications are the average for the period, commodity values are in 1957-59 U.S. dollars for the mid-period year.⁶

The Tables enable to see what has been happening over time quite clearly. We notice for example that Northern Europe has increased only moderately over time, while Eastern Europe and USSR experienced a five-fold increase over the three periods. The numbers of publications are closely related to the research expenditures as expected and when expressed as publications per unit of commodity value we observe Northern Europe and Oceania with substantially higher values than other regions. Again, Latin America, the Middle East, and Africa do poorly by this measure, while South Asia shows up somewhat better than the earlier measures indicated. The low income regions are expanding publications relatively rapidly over the period.

Publications by commodity show considerable variability, some of which is caused by a lack of commodity value data (which show up as -0.0 in the Table).

⁶Actually 1957-59 average commodity values are used for the middle period. Commodities are summed using 1957-59 price units except for Oceania and South Asia where 1961-65 units are used.

TABLE 3- RESEARCH PUBLICATIONS IN THE AGRICULTURAL SCIENCES

	WHT	BAR	MAZ	SOPG	RICE	SUGR	PUTA	COT	ANIM	POUL	DAIR	PYTO	SOIL	PHYS	CROP	LIVE	TOTAL	GRAND
NORTHERN EUROPE																		
48-54	290	534	267	10	17	237	904	5	764	90	9034	768	426	1748	3458	9888	13346	
55-61	303	702	254	9	35	335	977	15	699	125	9134	1063	391	*	4084	9958	14042	
62-68	336	430	235	16	27	347	984	24	1574	291	8943	1828	863	7721	5491	10807	16298	
	ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																	
48-54	7.0	11.8	53.5	-0.0	38.7	6.6	5.2	-0.0	0.7	24.3	0.7	24.3	7.2	11.3	7.2	11.3	13.5	
55-61	2.2	8.7	25.1	-0.0	37.6	8.2	5.7	-0.0	0.7	21.2	0.7	21.2	7.4	8.9	7.4	8.9	11.7	
62-68	1.8	5.7	11.3	-0.0	38.2	7.1	6.8	-0.0	1.1	17.8	1.1	17.8	8.6	7.8	8.6	7.8	11.3	
SOUTHERN EUROPE																		
48-54	154	18	210	4	100	22	30	8	82	9	890	332	148	245	1026	981	2007	
55-61	174	34	168	20	75	64	70	17	77	10	929	266	99	*	987	1016	2003	
62-68	194	35	196	26	70	52	63	20	173	41	1174	385	128	830	1169	1387	2556	
	ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																	
48-54	1.9	1.2	9.2	-0.0	10.9	2.5	1.2	9.7	0.3	16.8	0.3	16.8	4.2	6.9	4.2	6.9	6.1	
55-61	1.7	2.6	5.7	-0.0	7.8	5.3	2.7	7.6	0.2	13.7	0.2	13.7	3.7	5.2	3.7	5.2	5.3	
62-68	1.7	2.5	6.7	-0.0	8.8	3.7	2.5	6.5	0.4	16.7	0.4	16.7	4.3	5.1	4.3	5.1	5.9	
EAST F AND USSR																		
48-54	433	153	166	9	38	129	438	160	55	7	1155	106	107	705	1739	1217	2956	
55-61	658	302	944	21	55	418	562	320	340	46	2147	272	731	*	4283	2532	6815	
62-68	1296	595	1886	174	90	844	950	695	1079	153	3884	1623	1531	6160	9683	5116	14799	
	ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																	
48-54	1.5	2.4	1.8	-0.0	15.8	2.9	1.4	0.1	0.1	3.7	0.1	3.7	1.2	1.6	1.2	1.6	1.6	
55-61	1.4	3.9	7.9	-0.0	20.4	5.4	1.4	3.7	0.3	4.9	0.3	4.9	2.3	2.2	2.3	2.2	2.7	
62-68	2.9	4.3	14.4	-0.0	19.7	7.5	2.3	6.4	0.7	7.5	0.7	7.5	4.7	3.6	4.7	3.6	5.1	
NORTH AMERICA																		
48-54	220	441	756	120	57	266	521	310	1501	1198	7301	2242	1516	2130	6549	10000	16549	
55-61	474	510	646	146	51	147	389	229	2110	1368	7130	4640	2214	*	9446	10608	20053	
62-68	530	741	1373	369	102	223	429	594	3800	1833	5633	5802	2581	8831	12743	11265	24009	
	ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																	
48-54	1.9	11.9	3.6	8.4	3.2	14.5	13.6	2.0	6.4	18.6	6.4	18.6	5.8	8.1	5.8	8.1	6.9	
55-61	2.4	15.5	2.3	4.4	3.0	7.0	10.1	1.5	6.4	18.0	6.4	18.0	6.8	7.4	6.8	7.4	6.9	
62-68	2.3	19.6	4.7	9.1	4.2	8.1	9.3	3.7	7.9	14.0	7.9	14.0	7.7	6.8	7.7	6.8	7.4	
CENTRAL AM. AND CARIBBEAN																		
48-54	4	7	78	1	5	7	15	5	12	5	28	36	4	14	162	45	207	
55-61	10	4	63	15	6	3	38	8	14	6	32	71	7	*	225	52	278	
62-68	14	1	123	16	16	1	31	9	65	29	12	112	14	56	337	106	443	
	ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																	
48-54	0.9	10.9	3.2	1.5	1.0	0.3	14.7	0.2	-0.0	0.9	-0.0	0.9	1.3	0.8	1.3	0.8	1.2	
55-61	1.6	5.8	2.1	13.2	1.0	0.1	26.1	0.4	-0.0	0.9	-0.0	0.9	1.5	0.8	1.5	0.8	1.4	
62-68	1.4	1.5	3.2	5.9	2.4	0.0	14.5	0.3	-0.0	0.3	-0.0	0.3	1.7	1.5	1.7	1.5	1.7	
SOUTH AMERICA																		
48-54	44	36	177	11	32	80	107	40	47	7	129	128	41	56	696	183	879	
55-61	101	68	134	13	22	47	98	62	51	12	87	161	52	*	758	150	908	
62-68	53	36	104	26	38	76	98	36	222	51	100	351	133	364	951	373	1325	
	ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																	
48-54	1.3	18.8	4.1	62.9	1.0	2.7	5.4	1.5	-0.0	2.5	-0.0	2.5	2.0	1.2	2.0	1.2	1.8	
55-61	3.9	16.3	2.7	11.5	0.6	1.3	4.5	2.0	-0.0	1.4	-0.0	1.4	1.7	0.9	1.7	0.9	1.6	
62-68	2.1	11.9	3.8	0.0	0.6	1.5	3.6	1.0	-0.0	1.3	-0.0	1.3	1.8	1.8	1.8	1.8	1.9	

TABLE 3 - RESEARCH PUBLICATIONS IN THE AGRICULTURAL SCIENCES

	WHT	BAR	MAZ	SORG	RICE	SUGR	POTA	COT	ANIM	POUL	DAIR	PYTO	SOIL	PHYS	CROP	LIVE	TOTAL	GRAND TOTAL
MIDDLE EAST																		
48-54	25	17	12	14	0	8	15	80	31	5	156	34	8	33	213	192	405	
55-61	22	28	6	9	2	7	8	97	74	30	189	68	60	*	307	293	600	
62-68	50	41	10	24	2	9	8	109	86	109	196	238	105	672	596	391	987	
	ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																	
48-54	0.6	1.2	1.1	2.2	0.0	1.0	3.1	2.0	0.9	0.9	2.3	0.9	0.9	0.9	0.9	1.9	1.3	
55-61	0.4	1.6	0.6	1.3	0.1	0.6	1.3	2.0	4.5	4.5	2.3	1.2	1.2	1.2	2.3	2.3	1.5	
62-68	0.8	2.2	0.9	2.9	0.1	0.5	1.0	1.5	12.1	12.1	2.1	1.8	1.8	1.8	2.6	2.6	2.1	
SOUTH ASIA																		
48-54	44	21	84	92	394	292	88	390	194	16	382	328	156	243	1889	592	2481	
55-61	157	86	124	144	392	274	63	489	207	34	504	527	265	*	2521	745	3266	
62-68	230	170	152	281	798	340	181	584	546	65	723	1197	397	1603	4330	1335	5664	
	ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																	
48-54	1.0	2.2	4.5	1.7	1.5	5.6	12.1	15.9	-0.05000.0						2.7	27.5	3.5	
55-61	2.6	8.4	5.5	2.0	1.2	4.0	6.8	18.8	-0.06160.0						2.8	30.2	3.5	
62-68	3.2	17.9	5.4	4.5	2.2	3.6	13.3	16.8	-0.09480.1						4.3	46.5	5.5	
EAST ASIA																		
48-54	136	131	30	0	271	181	25	6	21	7	294	118	28	110	926	322	1248	
55-61	306	157	31	1	535	87	59	2	82	36	472	228	191	*	1596	589	2186	
62-68	225	110	66	12	732	101	31	6	87	103	534	416	103	2233	1801	724	2526	
	ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																	
48-54	11.1	5.6	68.8	0.0	1.3	98.3	3.0	11.7	1.0	113.9	2.5	14.7	2.5	3.3	3.4	10.7	4.3	
55-61	25.3	6.2	42.6	0.7	1.9	18.3	5.5	7.7	2.2	46.3	3.4	10.7	3.4	4.3	6.8	6.8	4.3	
62-68	20.0	5.3	75.6	11.7	2.6	14.9	2.3	46.3	2.5	27.9	3.4	10.7	3.4	4.3	6.8	6.8	4.3	
NORTH AFRICA																		
48-54	13	6	13	1	10	2	5	11	1	0	9	2	3	0	71	10	81	
55-61	16	1	11	0	3	3	6	8	1	0	9	1	4	*	53	10	63	
62-68	10	2	5	1	1	2	0	13	6	1	7	4	12	18	50	14	64	
	ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																	
48-54	0.9	0.7	23.0	6.5	28.0	-0.0	4.3	392.9	0.0	0.0	0.8	1.5	0.5	1.2	0.5	0.5	1.1	
55-61	1.3	0.2	12.4	0.0	9.7	-0.0	4.0	142.9	0.0	1.0	1.0	1.3	0.5	1.1	0.5	0.5	1.1	
62-68	0.7	0.4	6.2	6.8	4.5	40.8	0.0	46.4	0.5	0.9	0.9	1.1	0.8	1.0	0.8	0.8	1.0	
EAST AFRICA																		
48-54	8	10	31	24	10	2	19	77	10	0	39	5	6	2	192	49	240	
55-61	20	16	50	35	2	1	1	91	58	3	48	28	22	*	266	110	376	
62-68	12	7	31	33	5	4	6	73	75	18	91	84	37	14	292	183	475	
	ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																	
48-54	4.6	9.1	5.8	5.5	1.7	3.7	57.8	43.3	0.0	3.1	3.1	3.1	3.1	3.1	3.1	1.4	2.5	
55-61	12.1	8.4	9.1	6.0	0.3	0.9	2.5	37.2	3.8	3.5	3.5	3.5	3.5	3.5	3.7	2.9	3.5	
62-68	15.5	3.0	5.7	5.4	0.6	1.9	8.1	20.7	17.5	6.1	6.1	6.1	6.1	6.1	3.4	4.4	3.8	
WEST AFRICA																		
48-54	1	0	13	15	20	0	11	15	2	0	11	2	5	0	82	13	94	
55-61	0	1	37	10	25	3	0	22	10	2	33	41	14	*	153	45	198	
62-68	4	0	54	35	47	4	1	86	35	7	23	77	51	42	359	65	425	
	ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																	
48-54	15.9	-0.0	1.2	0.7	1.8	0.0	120.9	5.6	0.0	3.3	3.3	3.3	3.3	3.3	0.4	0.8	0.4	
55-61	0.0	-0.0	2.8	0.4	1.9	4.7	0.0	7.1	0.9	9.9	9.9	9.9	9.9	9.9	0.7	2.6	0.9	
62-68	44.0	-0.0	3.7	1.3	3.2	5.3	7.9	34.8	2.3	6.9	6.9	6.9	6.9	6.9	1.4	3.1	1.5	

TABLE 3 - RESEARCH PUBLICATIONS IN THE AGRICULTURAL SCIENCES

	WHT	BAR	MAZ	SORG	RICE	SUGR	POTA	COT	ANIM	POUL	DAIR	PYTO	SOIL	PHYS	CROP	TOTAL		GRAND TOTAL
																LIVE		
SOUTHERN AFRICA PUBLICATIONS																		
48-54	3	1	108	21	4	102	17	40	39	9	102	26	20	30	342	149	491	
55-61	6	2	102	5	0	35	13	27	48	16	120	36	27	*	253	184	438	
62-68	17	9	71	19	0	41	18	29	117	40	175	71	61	126	336	331	667	
	ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																	
48-54	1.0	17.9	6.3	8.2	95.2	29.6	10.5	114.3	5.2	8.8					6.9	3.9	5.7	
55-61	1.5	35.7	5.6	1.7	0.0	8.0	7.1	85.7	11.1	9.4					4.5	4.6	4.6	
62-68	3.8	85.7	3.3	5.3	0.0	7.5	8.3	28.0	13.6	12.2					4.5	6.9	5.6	
OCFANIA PUBLICATIONS																		
48-54	80	42	49	16	11	218	128	21	283	19	865	213	134	142	912	1167	2079	
55-61	61	57	54	13	2	97	45	9	539	49	1034	413	346	*	1097	1622	2719	
62-68	138	52	20	25	22	99	54	16	779	44	1136	400	383	1232	1209	1960	3169	
	ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																	
48-54	5.0	23.3	102.6	67.8	34.8	52.3	56.6	-0.0	3.1	20.7					23.3	8.9	12.4	
55-61	3.0	22.1	69.0	28.3	3.9	13.8	15.1	28.8	7.3	20.9					19.9	9.2	12.0	
62-68	5.2	15.8	25.8	55.5	35.4	8.9	18.0	15.4	4.8	20.6					16.6	10.1	12.0	

SEE NOTES TO APPENDIX TABLE 3.

When we aggregate papers to include Phytopathology and Soil Science with all crops and Animal, Poultry and Dairy with Livestock, the publications per \$100 million of commodity value vary less than we might have expected. (Plant Physiology publications are not included in the calculations). Papers on Dairy research appear to be constantly high relative to value though some of the figures are inflated by poor data for the value of dairy production in South Asia. Poultry, Wheat, Sorghum, and Rice publications tend to be low relative to value. Variability of the ratio over countries and regions is considerable.

Plant physiology research is included in the Tables to get a measure of the agriculturally-related "basic" research undertaken. Only 10 to 20 percent of this research is conducted in the agricultural research "establishments". The bulk of it is done in biological science departments in universities. The Table indicates that very little of this research is done in Latin America and Africa.

Summary

This compilation of data relevant to investment in research and extension reflects many of the difficulties involved in developing an appropriate measure of knowledge production and distribution activities. Some improvements can be made with more data, especially for extension work. Many of the problems with the research data will not be easily resolved. It seems that FAO is now preparing the machinery of collecting international data; if this is done it will represent an improvement over the present data.

Table 4

Regional Shares: Research and Extension - 1965

Region's Share in World Total:

Region	Agr. Res. Ex- penditure	Agr. SMY	Agr. Sci. Publications	Plant Phys. Pub.	General Science Research	Agr. Extension	
	(1)	(2)				Expend. (3)	Workers (4)
Northern Europe	.202	.142	.222	.258	.270	.175	.084
Southern Europe	.024	.038	.035	.028	.024	.041	.026
Eastern Europe & USSR	.066	.238	.202	.206	.140	.102	.158
North America	.415	.263	.327	.295	.451	.337	.044
Central America & Carribean	.006	.010	.006	.002	.002	.008	.004
South America	.016	.032	.018	.012	.006	.029	.014
Middle East	.031	.024	.013	.022	.012	.049	.062
South America	.038	.073	.077	.054	.025	.076	.356
East Asia	.070	.089	.034	.075	.044	.060	.088
North Africa	.004	.004	.001	.001	.001	.005	.012
East Africa	.020	.007	.006	.001	.001	.029	.067
West Africa	.016	.016	.006	.001	.001	.017	.047
South Africa	.026	.019	.009	.004	.003	.018	.031
Oceania	.066	.044	.043	.041	.020	.053	.007

Note: General Science Research--received from Professor Price, Department of the History of Science and Medicine, Yale University.

For purposes of analysis it will be important to have historical data and we believe that this compilation will be of some value in that context. Our examination of the data on publications leads us to conclude that over-all it is the most internationally comparable and complete of the measures available.

Table 4 presents regional share data for several measures and will serve to summarize some of the substantive features of the data. North America and Europe expenditure shares dominate. The shares of both plant physiology and general science research are lower than the comparable measures for the agricultural sciences for most low-income regions.

These data no doubt reflect many factors. To some extent they are associated with the productivity of research. We believe that they tell very much about the productivity issue, however, that is subject to analysis in a different framework. Certain demand factors are also reflected in the data. The relationship of almost all of the measures with the level of development is quite apparent. The processes by which decisions regarding public expenditures for these activities are made, are quite varied and complicated and we do not believe that the relationships presented in this paper reveal more than the most general effects of economic factors on them.

Appendix Tables

General Notes

- 1) -0.0 = no information available (blanks in Tables 1.1-1.6)
0 = item at zero level

- 2) Regional classification

Northern Europe: Austria, Belgium, Denmark, Finland, France, Germany (Fed. Rep.), Ireland, Netherlands, Norway, Sweden, Switzerland, United Kingdom.

Southern Europe: Greece, Italy, Portugal, Spain.

Eastern Europe
& U.S.S.R.: Bulgaria, Czechoslovakia, Germany (East), Hungary, Poland, Romania, Yugoslavia, U.S.S.R.

North America: Canada, U.S.A.

Central America
& Caribbean: Cuba, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama.

South America: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, Venezuela, Guyana.

Middle East: Libya, Sudan, United Arab Republic, Cyprus, Iran, Iraq, Israel, Jordan, Lebanon, Syria, Turkey.

South Asia: Burma, Cambodia, Ceylon, India, Indonesia, Malaysia, Pakistan, Philippines, Thailand, Republic of Vietnam.

East Asia: Taiwan, Japan, Republic of Korea.

North Africa: Algeria, Morocco, Tunisia.

East Africa: Ethiopia, Kenya, Madagascar, United Republic of Tanzania, Uganda.

West Africa: Cameroon, Angola, Democratic Republic of Congo, Dahomey, Ghana, Guinea, Ivory Coast, Liberia, Mali, Nigeria, Senegal, Sierra Leone, Togo, Upper Volta.

Southern Africa: South Africa
Southern Rhodesia

Oceania: Australia, New Zealand.

Appendix Table 1.1

Agricultural Research & Extension Data

Western Europe

	<u>Research</u>		<u>Extension</u>	
	Expenditures	SMY	Expenditures	Workers
Austria				
1964	1,800 ^b			
1963		156 ^b		
1962		248 ^c		
1960				726 ^w
1959				499 ^w
1953				214 ^w
1950	1,300 ^a			
Belgium				
1967	12,755 ^d	690 ^d		292 ^y
1965	9,258 ^d	650 ^d		
1964	3,430 ^b			
1963	7,536 ^c	570 ^d		
1961		264 ^c		
1959				345 ^w
1957				348 ^w
1950				248 ^w
Denmark				
1970	10,400 ^e	529 ^e	6,784 ^y	840 ^y
1967	10,200 ^y	458 ^y		
1965	5,600 ^e			
1960	2,600 ^e			
1959				742 ^w
1956	1,750 ^e			682 ^w
1950	872 ^a			
Finland				
1970	3,840 ^f	139 ^f		
1965	2,320 ^f	129 ^f		
1960	1,480 ^f	87 ^f		
1955	900 ^f	668 ^f		
1950	480 ^f			
France				
1967			34,200 ^y	4,400 ^y
1966	43,000 ^g	755 ^g		
1965	29,000 ^l			
1964	27,120 ^b			
1963	21,000 ^l	870 ^l		
1962	16,000 ^l			
1961	7,400 ^c			

Appendix Table 1.1 (continued)

	<u>Research</u>		<u>Extension</u>	
	Expenditures	SMY	Expenditures	Workers
France				
1960	9,500 ^l		11,300 ^x	
1959	10,000 ^g			1,770 ^w
1957				1,140 ^w
1950	4,092 ^g			399 ^w
Germany (West)				
1967	39,927 ^h		23,180 ^y	4,402 ^y
1963	55,851 ^b	1,788 ^b		
1961	13,600 ⁱ			
1959				2,195 ^w
1957				1,966 ^w
1953				1,284 ^w
1950				1,116 ^w
Greece				
1967			1,444 ^y	552 ^y
1965	3,200 ^j			
1963	3,318 ^b	295 ^b		
1961	3,600 ^c	209 ^c		
1960				469 ^w
1959				439 ^w
1957				320 ^w
Iceland				
1970	400 ^k	21 ^k		
1965	417 ^k	20 ^k		
1960	175 ^k	23 ^k		
1957	200 ^k	24 ^k		
1950	110 ^k			
Ireland				
1969	7,200 ^m	373 ^m		
1967	6,700 ^m	328 ^m		502 ^y
1964	3,933 ^b	336 ^b		
1963		136 ^c		
1963	5,200 ^m	297 ^m		
1959			2,200 ^x	527 ^w
1958				507 ^w
1950	194 ^a			266 ^w
Italy				
1967	12,000 ⁿ		14,112 ^y	3,082 ^y
1965		853 ⁿ		
1963	3,300 ^b	682 ^b		
1959				2,000 ^w
1950	2,029 ^a			1,000 ^w

Appendix Table 1.1 (continued)

	<u>Research</u>		<u>Extension</u>	
	Expenditures	SMY	Expenditures	Workers
Netherlands				
1970	40,000 ⁿ	900 ⁿ		
1967				
1965	27,700 ⁿ	820 ⁿ		1,898 ^y
1964	24,450 ^b			
1963		740 ^b		
1961	11,000 ^c			
1960	18,300 ⁿ	680 ⁿ	3,795 ^x	
1959		596 ^c		1,219 ^w
1957				1,286 ^w
1953				1,273 ^w
1950	5,267 ^a			1,150 ^w
Norway				
1969	8,660 ^p	545 ^p		
1967	7,620 ^p		6,062 ^y	652 ^y
1966	6,480 ^p			
1965	6,235 ^p	495 ^p		
1963	5,336 ^p			
1963	6,230 ^b	395 ^b		
1961	6,209 ^c	350 ^c		
1960		360 ^p		664 ^w
1957				637 ^w
1955	5,319 ^c	203 ^p		
1953				471 ^w
1950	1,947 ^a	250 ^c		417 ^w
1940		120 ^p		
Portugal				
1967			3,965 ^y	807 ^y
1964		394 ^b		
1963	2,450 ^b			
1961	2,000 ^c	323 ^c		
Spain				
1967			5,630 ^y	894 ^y
1966		1,500 ^q		
1965				772 ^z
1964				238 ^z
1963	4,336 ^b	694 ^b		
1961		492 ^c		
1960			2,000 ^x	
1959				494 ^w
1957				45 ^w

Appendix Table 1.1 (continued)

	<u>Research</u>		<u>Extension</u>	
	Expenditures	SMY	Expenditures	Workers
Sweden				
1970	12,200 ^r	184 ^r	5,800 ^y	610 ^y
1967				
1965		136 ^r		
1963	10,925 ^b	408 ^b		
1961	10,340 ^c	811 ^c		
1960	2,500 ^r	86 ^r		
1959				469 ^w
1957				422 ^w
1955	2,200 ^r	76 ^r		
1953				359 ^w
1950	3,017 ^a			336 ^w
Switzerland				
1968	5,800 ^s	392 ^s	1,730 ^y	406 ^y
1965	3,000 ^t			
1961		219 ^c		
1953				265 ^w
1950	1,192 ^a			
United Kingdom				
1970	40,000 ^v	2,319 ^v	13,460 ^y	1,648 ^y
1969	38,000 ^v			
1967	29,760 ^v	1,850 ^v		1,772 ^y
1965	28,500 ^v			
1964	27,000 ^b			
1963	26,000 ^v			
1961	25,200 ^c	1,100 ^v	13,200 ^x	
1960	20,600 ^v	1,554 ^v		
1959				1,539 ^w
1957				1,720 ^w
1953				1,544 ^w
1951	12,000 ^u			
1950	10,734 ^a			1,471 ^w

Notes to Table 1.1

- a. R.W. Phillips, I. Moskovits and F.F. Lininger, eds., The Organization of Agricultural Research in Europe, F.A.O. Development Paper No. 29, Rome, Italy, June 1955.
- b. O.E.C.D., Statistical Tables and Notes, Paris, 1968. (O.E.C.D. Science Survey Tables--Data include Government and University Expenditures).
- c. O.E.C.D., Intellectual Investment in Agriculture for Economic and Social Development, Paris, 1961.
- d. Survey Response: Dr. J. Spaey, Office of the Secretary General, Programmation De La Politique Scientifique, 8 Rue De La Science, Bruxelles 4, Belgium. (Coverage appears to be more complete than O.E.C.D.).
- e. Survey Response: Kirsten Stenbjerre, Forskningssekretariatet, Store Kongensgade 45, 1264, Kobenhavn K. Denmark.
- f. Survey Response: Marjatta Lietsamo, Ministry of Agriculture and Forestry, Bureau for International Affairs, Rolevardi 5A 00120, Helsinki 12, Finland.
- g. Marion D. Edsell, ed., Guide to World Science, Vol. 3, France, Francis Hodgson, London, 1968.
- h. Perry Freestone, ed., Guide to World Science, Vol. 2, Germany, 1968.
- i. National Science Foundation, Organization of Science in Germany, Washington, D.C., June 1963 (incomplete data).
- j. Based on O.E.C.D. Review of National Science Policy, Greece, 1966, (for Ministry of Agricultural Expenditures) and Survey Response for the Tobacco Institute, A.G. Sficas, and the Cotton Board, Philotas Georgiados.
- k. Survey Response: Steingrimur Hermannsson, The National Research Council, Reykjavik, Iceland.
- l. O.E.C.D., Reviews of National Science Policy, France, 1966.
- m. Survey Response: C.O. Riain, Department of Agriculture and Fisheries, Dublin 2, Ireland. Also Diarmuid Murphy, Chief Scientific Officer, National Science Council, St. Martin's House, Waterloo Road, Dublin 4, Ireland.

Notes to Table 1.1 (cont.)

- n. Marianne Mittel, ed., Guide to World Science, Vol. 4, Italy, 1970.
- o. Survey Response: N.A. Dijkveld Stol, Nationale Raad voor Landbouwkundig Onderzoek, TNO, Juliana van Stolberglaan 148, 's-Gravenhage, Netherlands, (Precinct 5% Fountain).
- p. Survey Response: Anders Ringen, The Agricultural Research Council of Norway, Wergelandsveien 15, Oslo, Norway, Forestry Research excluded. (10% in 1970).
- q. F.A.O. and I.B.R.D., The Development of Agriculture in Spain, Washington, D.C., February 1966.
- r. Survey Response: H. Boberg, Ministry of Agriculture, Fack 103, 10 Stockholm 2, Sweden (Agricultural College Expenditure reported to be 80% of total R and D. Adjustment made in expenditure data, not in personnel.)
- s. Politique de La Science, Bulletin d'information du Conseil, suisse de la Science, No. 6, Berne, Switzerland, 1970.
- t. Dr. John Watson, ed., Guide to World Science, Vol. 8, Austria and Switzerland, 1968.
- u. The Agricultural Research Service, ARC, London, 1953.
- v. Annual Report of Agricultural Research Council made available by H.R. Barron, Agricultural Research Service, 160 Great Portland Street, London, W1.N 6DT. Researchers include Scientific Senior Officers and Experimental Officers.
- v¹. S.E. Maccreay, ed., Guide to World Science, Vol. 1, United Kingdom, 1968.
- w. O.E.E.C., Agricultural Advisory Services in Europe and North America, 1960, Paris, 1961.
- x. O.E.E.C., Agricultural Advisory Services in Europe and North America, 1963, Paris, 1966.
- y. O.E.C.D., Agricultural Advisory Services in Europe and North America, 1968, Paris, 1969.
- z. Emilio Tejada, Agricultural Extension Work in Spain, March 1964, A.I.D., Washington, D.C., and I.B.R.D. and F.A.O., The Development of Agriculture in Spain, Washington, D.C., February 1966.

Appendix Table 1.2
 Agricultural Research and Extension Data
 Eastern Europe and U.S.S.R.

	Research		Extension	
	Expenditures	SMY ^b	Expenditures	Workers
Bulgaria				
1965	11.5m Leva ^b			
Czechoslovakia				
1963		492 ^a		
1962		431 ^a		
1961		403 ^a		
Poland				9,330 ^e
Rumania				
1965		1,285 ^b		
Yugoslavia				
1965	5,233 ^c	1,340 ^c		
1964	5,599 ^c			
1963	6,407 ^c			
1962	5,041 ^c			
1961	3,724 ^c			
1959				3,076 ^f
1957				2,365 ^f
U.S.S.R.				
1964		9,624 ^d		
1961		8,375 ^d		
1956		6,896 ^d		

Notes to Table 1.2

- a. UNESCO, Science Policy and Organization of Scientific Research in the Czechoslovak Socialist Republic, Paris, 1965.
- b. Perry Freestone, ed., Guide to World Science, Vol. II, Communist Countries, 1968.
- c. UNESCO, Science Policy and Organization of Research in the Socialist Federal Republic of Yugoslavia, Paris, 1968.
- d. UNESCO, Science Policy and Organization of Research in the U.S.S.R., Paris, 1967.
- e. U.S., Department of Agriculture, Cooperative Extension Service, South Dakota State University, Proceedings of International Conference of Extension Administrators, 1965.
- f. O.E.E.C., Agricultural Advisory Services in Europe and North America, 1960, Paris, 1961.

Table 1.3

Agricultural Research and Extension Data
Central America, Latin America, and Caribbean

	<u>Research</u>		<u>Extension</u>	
	Expenditures	SMY	Expenditures	Workers
Argentina				
1969				352 ^q
1962		300 ^b	1,800 ^b	392 ^a
1961		400 ^a		
1960				285 ^r
1958		312 ^a		
Bolivia				
1969		62 ^d		94 ^q
1962	270 ^d	29 ^c	248 ^c	
1961			299 ^c	
1960				79 ^r
Brazil				
1969				1,221 ^q
1967				1,088 ^q
1966				824 ^q
1965				603 ^q
1964				508 ^q
1962	4,500 ^a		344 ^r	
1960		520 ^a		
1958				
Colombia				
1970			411 ^d	
1969				241 ^q
1962			338 ^a	142 ^a
1960				83 ^r
Costa Rica				
1969				93 ^q
1965	579 ^d	76 ^d		166 ^t
1964				96 ^s
1962		86 ^a		
1960				94 ^r
Chile				
1970	3,000 ^m	308 ^m		475 ^d
1965	1,300 ^m	223 ^m		
1963		228 ^e	297 ^e	122 ^a
1962		168 ^a		122 ^a
1961				91 ^e
1960				97 ^r

Table 1.3 (continued)

	<u>Research</u>		<u>Extension</u>	
	Expenditures	SMY	Expenditures	Workers
Ecuador				
1970		71 ^d		
1969				327 ^q
1966			1,645 ^t	183 ^t
1965	1,370 ^g	87 ^g		339 ^g
1964				160 ^s
1962		180 ^o		136 ^a
1960				54 ^r
1959				44 ^g
El Salvador				
1969				72 ^q
1965	584 ^d	56 ^d	885 ^t	70 ^t
1964				77 ^s
1962	399 ^a			
1960				50 ^r
Guatemala				
1969				42 ^q
1965	300 ^d	15 ^d		83 ^u
1962	866 ^a			
1960				55 ^r
Haiti				
1962			687 ^a	28 ^a
1960				79 ^r
Honduras				
1969				61 ^z
1966				39 ^u
1965		19 ^d		31 ^t
1960				37 ^r
Jamaica				
1970		52 ^h		
1956		50 ^h		
1950		30 ^h		
Mexico				
1970	1,656 ^j			
1969				700 ^q
1964				216 ^s
1963			150 ^j	
1962	1,837 ^a	231 ^a		215 ^j
1961		300 ⁱ		
1960				121 ^r

Table 1.3 (continued)

	<u>Research</u>		<u>Extension</u>	
	Expenditures	SMY	Expenditures	Workers
Nicaragua				
1969				46 ^q
1966				147 ^u
1965				32 ^t
1964	503 ^d	43 ^d		99 ^s
1962	285 ^a			21 ^r
1960				21 ^r
Panama				
1969				53 ^q
1963			378 ^v	
1961	305 ^v	7 ^v		42 ^r
1960				
Paraguay				
1969				53 ^q
1962		10 ^k		30 ^k
1961				22 ^r
1960				
Peru				
1970		403 ^d		
1970	5,000 ¹	171 ¹		684 ^q
1965	1,500 ¹	131 ¹		
1964				670 ^s
1963	1,000 ¹	108 ¹		280 ^a
1962	840 ^a		1,238 ^a	
1961	750 ^a			87 ^r
1960				
1958		150 ⁿ		
Puerto Rico				
1960				229 ^r
Uruguay				
1963	367 ^o	93 ^o	433 ^o	
1960				40 ^r
Venezuela				
1970		337 ^d		
1970		129 ^p		
1969				489 ^q
1966	681 ^j	102 ^p		
1965	543 ^j			
1964	460 ^j			
1962			6,420 ^j	
1960				147 ^r

Notes to Table 1.3

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- h. Commonwealth Agricultural Bureaux, List of Research Workers, Farnham House, Farnham Royal, Buckinghamshire, United Kingdom (for 1950-1956-1966)
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- l. Survey Response: Dr. Felix Quevedo I. e Alejandro Carughi D., Direccion General de Investigaciones Agropecuarias-Estocion Experimental Agricola de La Molina - Apartado 2791, Lima, Peru.
- m. Survey Response: Hiram Grove Valenzuela, Instituto de Investigaciones Agropecuarias, Casilla 5427, Santiago, Chile.
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Notes to Table 1.3 (continued)

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- s. U.S., Department of Agriculture, Cooperative Extension Service, Proceedings of International Conference of Extension Administrators, South Dakota State University, 1968.
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Table 1.4

Agricultural Research and Extension Data

Africa

	<u>Research</u>		<u>Extension</u>	
	Expenditures	SMY	Expenditures	Workers
Ivory Coast				
1967		135 ^c		
1966		80 ^b		
1963		70 ^a		
Dahomey				
1967	1,292 ^c	18 ^c		
1966		13 ^b		
1965		8 ^a		
Gambia				
1967	16 ^c	7 ^c		
1966		6 ^b		
1963		5 ^a		
Ghana				
1967		128 ^d		
1967	2,385 ^c	77 ^c		
1966		64 ^b		
1963		68 ^a		
Upper Volta				
1970	208 ^e	9 ^e		
1967	180 ^e	9 ^c		
1966	224 ^e	7 ^b		
1963	156 ^e	12 ^a		
Liberia				
1967	160 ^c	34 ^c		
1966		24 ^b		
1963		22 ^a		
Mali				
1967	625 ^c	21 ^c		
1966		10 ^b		
1963		9 ^a		
Mauritania				
1967		6 ^c		
1966		8 ^b		
1963		2 ^a		
Niger				
1967		10 ^c		
1966		2 ^b		
1963		2 ^a		

Table 1.4 (continued)

	<u>Research</u>		<u>Extension</u>	
	Expenditures	SMY	Expenditures	Workers
Nigeria				
1970				
1967	2,125 ^e	207 ^d	7,832 ^o	18,050 ^o
1967	3,354 ^f	177 ^c		
1966		146 ^b		
1965				
1964				
1963		172 ^a		
1956		65 ^d		
1950		68 ^d		
Senegal				
1967	1,851 ^c	51 ^c		
1966		28 ^b		
1963		60 ^a		
Sierra Leone				
1967	165 ^c	23 ^c		
1966		1 ^b		
1963		8 ^a		
1956		13 ^d		
1950		24 ^d		
Togo				
1967		9 ^c		
1966		5 ^b		
1963		20 ^a		
Basutoland				
1966		3 ^b		
1963		3 ^a		
Bechuanoland				
1966		2 ^b		
1963		3 ^a		
Botswana				
1970		12 ^g	556 ¹	
1968				
1967	347 ^c			
Burundi				
1967		19 ^c		
1962		19 ^a		

Table 14. (continued)

	<u>Research</u>		<u>Extension</u>	
	Expenditures	SMY	Expenditures	Workers
Ethiopia				
1968		2,400 ^k	308 ^k	124 ^k
1967		30 ^c		
1966		13 ^b		
1964				110 ^m
1963		36 ^a		
Kenya				
1968			4,608 ^k	5,277 ^k
1967		123 ^c		
1966		73 ^b		
1963		180 ^a		
1956		55 ^d		
1950		49 ^d		
Kenya - CRF				
1968	504 ^c	23 ^c		
Kenya - EAAFRO				
1967	935 ^c	50 ^c		
Rwanda				
1967	270 ^c	10 ^c		
1963		10 ^a		
Malagasy Republic				
1968	3,900 ^k		3,384 ^k	2,669 ^k
1967	2,534 ^c	60 ^c		
1966		26 ^b		
1963		60 ^a		
Malawi				
1968	1,200 ^k		1,288	778
1967	966 ^c	48 ^c		
1966		22 ^b		
1963		15 ^a		
Mauritius				
1967	1,050 ^c	71 ^c		
1966		15 ^b		
1963		28 ^a		
Somalia				
1968			59 ^k	29 ^k
1967	280 ^c	12 ^c		
1963		8 ^a		
Swaziland				
1967	175 ^e	11 ^e		
1966		9 ^b		
1963		6 ^a		

Table 1.4 (continued)

	<u>Research</u>		<u>Extension</u>	
	Expenditures	SMY	Expenditures	Workers
East African Trypanosomiasis Research Organ.		SMY		
1970	486 ^q	12 ^q		
1965	346 ^q	129		
1960	3,229	119		
Uganda				
1968	4,490 ^k		3,646 ^k	1,024 ^k
1967	2,100 ^c	50 ^c		
1966		40 ^b		
1963		55 ^a		
1956		12 ^d		
1950		20 ^d		
Tanzania				
1968				2,455 ^k
1967	1,288 ^c	51 ^c		
1966		33 ^b		
1963		67 ^a		
1956		37 ^d		
1950		47 ^d		
Zambia				
1968	2,436 ^k		4,357 ^k	2,236 ^k
1967	1,505 ^c	29 ^c		
1966		18 ^b		
1963		22 ^a		
Mozambique				
1970	1,633 ^h			
1969	1,500 ^h			
1968	1,280 ^h			
1967	1,000 ^h	42 ^h		
Cameroon				
1967	800 ^j	32 ^c		
1966	660 ^j	21 ^b		
1964				310 ^m
1963	500 ^j	10 ^a		
Central African Republic				
1967		30 ^c		
1966		19 ^b		
1963		21 ^a		

Table 1.4 (continued)

	<u>Research</u>		<u>Extension</u>
	Expenditures	SMY	Expenditures Workers
Chad			
1967	392 ^c	22 ^c	
1966		17 ^b	
1963		25 ^a	
Congo (B)			
1967	233 ^c	29 ^c	
1966		4 ^b	
1963		3 ^a	
Congo (R)			
1967		21 ^c	
1966		37 ^b	
1963		26 ^a	
Gabon			
1967		8 ^c	
1966		2 ^b	
1963		1 ^a	
Algeria			
1967			
1966		5 ^b	
1962		139 ^a	
Libya			
1967	1,960 ^c		
1962			78 ⁿ
Morocco			
1967	1,976	37 ^e	
1966		55 ^b	
1964			2,100 ^m
1963		69 ^a	
Sudan			
1967	4,798 ^c	82 ^c	
1966		27 ^b	
1963		45 ^a	
1960			18 ^p
1950		55 ^d	
Tunisia			
1966		16 ^b	
1963		39 ^a	
U.A.R.			
1967	9,200 ^c	400 ^c	
1963		569 ^a	

Table 1.4 (continued)

	<u>Research</u>		<u>Extension</u>	
	Expenditures	SMY	Expenditures	Workers
South Africa		SMY		
1970	18,850 ¹	897 ¹		
1967				
1956		522 ^d		
1953		409 ^d		
Southern Rhodesia				
1967		178 ^d		
1966		165 ^b		
1963		103 ^a		
1956		179 ^d		
1950		115 ^d		

Notes to Table 1.4

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- e. Survey Response: A. Dakoure, Direction du Developement Rural B.P. No. 505, Ouagadougou, Republique de Haute-Volta.
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- h. Survey Response: A. Baiao Esteves, Director, Instituto de Investigacao Agronomica De Mozambique, C. Postal 1731, Mavalane, Lourenco Marques, 8 Mozambique.
- i. Survey Response: Department of Agricultural Technical Services, Agriculture Building, Beatrix St. Private Bag 116, Pretoria, Republic of South Africa, including List of Research Workers and Lecturing Staff in the Agricultural Field, Registered Projects and Research Workers.
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- k. Beleg Hailes, "A Comparative Analysis of Agricultural Extension Systems of Eight East African Countires."
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Notes to Table 1.4 (cont.)

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- o. F.A.O., Agricultural Development in Nigeria, 1965-1980, Rome, 1966.
- p. A.I.D., Near East-South Asia Regional Extension Seminar, New Delhi, India, January 1970.
- q. Survey Response: Dr. R.J. Onyango, P.O. Box 96, Tororo, Uganda.

Table 1.5

Agricultural Research and Extension Data

Asia

	<u>Research</u>		<u>Extension</u>	
	Expenditures	SMY	Expenditures	Workers
Burma				
1966	87 ^a			
1961	93 ^b	39 ^b		1,262 ^p
1959				
Cambodia				
1963				100 ^q
Ceylon				
1966	1,395 ^a	87 ^a		
1961		80 ^b		2,000 ^m
1960				
1956		67 ^d		
1950		32 ^d		
Hong Kong				
1966		9 ^d		
1957		9 ^d		
1950		6 ^d		
India				
1966		1,462 ^d		55,903 ^r
1964				100,765 ^s
1963				
1961	9,808 ^b	1,153 ^b		48,569
1960	6,843 ^o			
1956		1,326 ^d		
1950		1,346 ^d		
Indonesia				
1966	131 ^a	54 ^d		
1961	225 ^b	15 ^b		6,000 ^q
1960				
Japan				
1968				13,885 ^u
1967			36,310	
1966		5,324 ^a		14,126 ^u
1965				14,011 ^u
1964	62,500 ⁿ			13,841 ^u
1963	58,000 ⁿ	4,480 ⁿ		13,625 ^u
1962				13,473 ^u
1960	12,558 ^o			13,104 ^u
1959				12,590 ^u
1958				9,250 ^u
1957				
Laos				
1964				69 ^r

Table 1.5 (continued)

	<u>Research</u>		<u>Extension</u>	
	Expenditures	SMY	Expenditures	Workers
Malaysia				
1966	820 ^b	32 ^a		
1961		39 ^b		
1959				317 ^P
Nepal				
1967	459 ^a	142 ^a		
1963				313 ¹
Pakistan				
1968				8,873 ^V
1966	5,014 ^a	654 ^a		
1965			6,037 ^V	9,000 ^V
1962				7,585 ^V
1959				6,000 ^V
1956		422 ^d		
1950		167 ^d		
Phillipines				
1967	7,078 ^a	1,256 ^a		
1962				850 ^q
1961		219 ^b		
1960	1,545 ^o			
1959				1,623 ^P
Singapore				
1967	1,360 ^a	13 ^a		
S. Korea				
1969		263 ^w		
1967		545		
1964	743 ^w	208 ^w		
1963	649 ^w			32,179
1961	561 ^w			937 ^P
1956				
Taiwan				
1967	1,922 ^a	401 ^a		
1961	1,120 ^b	272 ^b		
1960	735 ^o			1,100
1959				534
Thailand				
1967	8,423 ^a	422 ^a		
1966		434 ^a		
1962				440 ^q
1961		406 ^b		
1960	565 ^o			328 ^P
1959				
S. Vietnam				
1959				95 ^P

Table 1.5 (continued)

	<u>Research</u>		<u>Extension</u>	
	Expenditures	SMY	Expenditures	Workers
Afghanistan				
1967		36 ^d		
1966	1,500 ^a	170 ^a		
1962				109 ^l
1959				12 ^l
Cyprus				
1965	357 ^a			
1956		12 ^d		
1950		3 ^d		
Israel				
1970	7,340 ^e	430 ^f	3,428 ^e	607 ^e
1970	6,302 ^q			
1965	5,900 ^q			
1960	4,325 ^d			
Iran				
1970	50 ^{+h}	65 ^h		
Syria				
	1,000 ^k	69 ^k		
Turkey				
1970	9,723 ^j	479		
Jordan				
1964				148 ^l
1963				143 ^m
1962				79 ^l
Lebanon				
1966				22 ^l
1959				19 ^l
1957				14 ^l

Notes to Table 1.5

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- j. Survey Response: Professor Muharren Miraboglu, The Scientific and Technical Research Council of Turkey, Bayindir Sokak 33 Ankara, Turkey (and others).
- k. Survey Response: Dr. Mohamed El-Khash, Ministry of Agriculture and Agrarian Reform, Directorate of Agricultural Research, Damascus, Syria.
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- p. O.P. Dahoma, Extension and Rural Welfare, Agra Ram Prosed & Sons, 1962.

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Table 1.6

Agricultural Research and Extension Data

North America & Oceania

	<u>Research</u>		<u>Extension</u>	
	Expenditures	SMY	Expenditures	Workers
Australia				
1970	119,790 ^d			
1969		2,085 ^c		
1965	56,364 ^d			
1961	32,072 ^d			
1956	20,135 ^d	1,285 ^c		
1950	9,905 ^d	1,060 ^c		
New Zealand				
1970	10,987 ^a			
1969	9,192 ^a			
1968	8,843 ^a			
1967	8,980 ^a			
1966		479 ^c		
1963	5,294	227 ^e		
1962	5,296 ^e	220 ^e		
1961	5,355 ^e	213 ^e		
1959			472 ^h	
1956	4,065 ^e	432 ^c		
1950		405 ^c		
Canada				
1970		1,484 ^b		
1967	44,863 ^f		26,480 ^d	2,904 ^d
1966	40,217 ^f	1,527 ^c		
1965	34,432 ^f			
1963	56,273 ^d			
1956		1,316 ^c		
1950		1,212 ^c		
U.S.A.				
1964	321,000 ^q	13,800 ^q	178,932 ⁱ	6,233 ⁱ
1963				6,275 ⁱ
1962				
1961	250,000 ^j		142,000 ⁱ	
1960				6,406 ⁱ
1959				
1950			75,000 ⁱ	

Notes to Table 1.6

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APPENDIX TABLE 2- AGRICULTURAL RESEARCH AND EXTENSION -- INTERVENTIONAL COMPARISONS

	\$ PES	S.M.Y.	\$ EXT	E.WKRS	\$R/\$MY	\$E/\$EW	\$R/\$E	\$R/\$AG	\$E/\$AG	SMY/F	\$R/F	EW/F	\$E/F	\$R/PUB	SMY/PUB
AUSTRIA	1800.	170.	-0.	800.	10.59	-0.	0.28	-0.	0.43	0.43	4.53	2.02	-0.	34.93	3.30
BELGIUM	9260.	650.	-0.	292.	14.25	-0.	1.19	-0.	2.42	2.42	34.42	1.09	-0.	122.47	8.60
DENMARK	5600.	458.	6784.	840.	12.23	8.08	0.83	0.46	0.56	2.32	28.43	4.26	34.44	69.57	5.69
FINLAND	2320.	129.	-0.	-0.	17.98	0.	0.47	-0.	0.33	0.33	5.98	-0.	-0.	33.54	1.86
FRANCE	29000.	755.	34200.	4400.	38.41	7.77	0.85	0.48	0.57	-0.	-0.	-0.	-0.	117.20	3.05
WEST GERMANY	55951.	1788.	23180.	4402.	31.24	5.27	2.41	1.18	0.49	1.02	31.72	2.50	13.16	109.00	3.49
GREECE	3300.	295.	1444.	552.	11.19	2.62	2.29	0.47	0.21	0.26	2.85	0.48	1.25	225.15	20.13
IRELAND	6700.	328.	2400.	502.	20.43	4.78	2.73	1.43	0.51	0.91	18.61	1.39	6.67	296.27	14.50
ITALY	13000.	853.	14112.	3082.	15.24	4.58	0.92	0.40	0.44	0.20	3.03	0.72	3.29	49.04	3.22
NETHERLANDS	27700.	920.	4500.	1899.	33.78	2.37	6.15	2.33	0.38	2.72	92.03	6.31	14.95	117.98	3.49
NORWAY	6460.	495.	6062.	552.	13.09	9.30	1.07	2.70	2.53	1.14	14.93	1.50	13.97	120.26	9.19
PORTUGAL	2500.	394.	3965.	807.	6.35	4.91	0.63	0.70	1.10	-0.	-0.	-0.	-0.	114.70	18.08
SPAIN	4236.	694.	5630.	894.	6.25	6.30	0.77	0.23	0.29	0.23	1.44	0.30	1.87	68.11	10.90
SWEDEN	11000.	408.	5800.	610.	26.95	9.51	1.90	1.40	0.74	1.54	41.51	2.30	21.89	89.73	3.33
SWITZERLAND	5800.	392.	1730.	406.	14.80	4.26	3.35	1.62	0.48	-0.	-0.	-0.	-0.	71.07	4.80
U.K.	29500.	1839.	13460.	1648.	15.50	8.17	2.12	0.80	0.38	4.64	71.97	4.16	33.99	36.72	2.37
U.S.S.R.	42200.	6224.	-0.	-0.	4.38	0.	-0.	0.16	-0.	-0.	-0.	0.	0.	31.22	7.12
YUGOSLAVIA	5233.	1340.	-0.	3076.	3.91	-0.	-0.	0.26	-0.	0.51	1.99	1.17	-0.	51.53	13.19
CANADA	40217.	1483.	26450.	2904.	27.12	9.11	1.52	1.28	0.85	3.08	83.61	6.04	54.99	96.51	3.55
U.S.A.	350000.	13800.	178000.	6233.	25.36	28.56	1.97	0.81	0.41	3.72	94.34	1.68	47.98	116.16	4.58
ARGENTINA	-0.	300.	1800.	392.	-0.	4.59	-0.	-0.	0.09	0.64	-0.	0.83	3.81	-0.	6.49
BOLIVIA	270.	29.	350.	73.	9.31	4.79	0.77	0.22	0.28	-0.	-0.	-0.	-0.	94.97	10.20
BRAZIL	4500.	520.	-0.	603.	8.65	-0.	-0.	0.09	-0.	0.16	1.34	0.18	-0.	71.67	8.28
CHILE	1300.	223.	300.	122.	5.83	2.46	4.33	0.43	0.10	-0.	-0.	-0.	-0.	48.29	8.28
COLOMBIA	-0.	338.	-0.	235.	-0.	-0.	-0.	-0.	-0.	0.28	-0.	0.19	-0.	-0.	19.87
COSTA RICA	579.	76.	-0.	166.	7.62	-0.	-0.	-0.	0.	1.17	8.91	2.55	-0.	-0.	-0.
ECUADOR	1370.	87.	1645.	320.	15.75	5.14	0.83	0.53	0.64	-0.	-0.	-0.	-0.	686.47	43.59
EL SALVADOR	534.	56.	885.	70.	10.43	12.64	0.66	0.32	0.49	0.25	2.61	0.31	3.95	235.89	22.62

APPENDIX TABLE 2- AGRICULTURAL RESEARCH AND EXTENSION -- INTERNATIONAL COMPARISONS

	\$ PFS	S.M.Y.	\$ EXT	E. WKRS	\$R/\$MY	\$E/\$EM	\$R/\$E	\$R/\$AG	\$E/\$AG	SMY/\$F	\$R/\$F	EW/\$F	\$E/\$F	\$R/\$PUB	SMY/\$PUB
GUATEMALA	300.	15.	-0.	94.	20.00	-0.	0.13	-0.	0.04	0.04	0.72	0.23	-0.	35.78	1.79
HAITI	160.	50.	687.	28.	3.20	0.23	0.41	1.76	-0.	-0.	-0.	-0.	-0.	0.	0.
MEXICO	1837.	231.	250.	300.	7.05	0.83	1.73	0.24	0.17	0.17	1.35	0.22	0.18	324.72	40.83
NICARAGUA	503.	43.	-0.	41.	11.70	-0.	0.23	-0.	0.42	0.42	4.93	0.40	-0.	207.12	17.71
PANAMA	305.	7.	378.	85.	43.57	4.45	0.81	0.60	0.07	0.07	3.21	0.89	3.98	194.09	4.45
PARAGUAY	-0.	10.	-0.	46.	-0.	-0.	-0.	-0.	0.06	0.06	-0.	0.29	-0.	-0.	50.00
PERU	1400.	131.	1400.	670.	10.69	2.09	1.00	0.32	0.15	0.15	1.61	0.77	1.61	122.61	11.47
URUGUAY	367.	93.	450.	-0.	3.95	-0.	0.82	0.19	1.07	1.07	4.22	-0.	5.17	95.40	24.17
VENZUELA	691.	125.	6400.	422.	5.45	15.17	0.11	1.27	0.59	0.59	2.13	1.32	20.00	52.95	9.72
LIBYA	1040.	-0.	-0.	78.	-0.	-0.	-0.	3.56	-0.	-0.	13.52	0.54	-0.	4900.00	-0.
SUDAN	4708.	82.	-0.	18.	58.51	-0.	-0.	0.94	-0.	-0.	-0.	-0.	0.	269.98	4.61
U.A.P.	9200.	400.	-0.	-0.	23.00	0.	-0.	0.60	0.24	0.24	5.60	-0.	-0.	240.84	10.47
AFGHANISTAN	1500.	36.	-0.	109.	41.67	-0.	-0.	0.	-0.	-0.	-0.	-0.	0.	-0.	-0.
CYPRUS	357.	20.	-0.	-0.	17.85	0.	-0.	0.79	-0.	-0.	-0.	0.	0.	179.76	10.07
ISRAEL	7000.	403.	-0.	-0.	17.37	0.	-0.	3.17	-0.	-0.	-0.	0.	0.	99.72	5.74
SYRIA	440.	15.	-0.	-0.	29.33	0.	-0.	0.16	-0.	-0.	-0.	0.	0.	0.	0.
TURKEY	3500.	397.	7580.	2745.	8.82	2.76	0.45	0.17	0.36	0.36	-0.	-0.	-0.	1032.45	117.11
BURMA	93.	39.	-0.	1262.	2.38	-0.	-0.	0.04	-0.	-0.	-0.	-0.	0.	556.41	233.33
CEYLON	1395.	87.	-0.	200.	16.03	-0.	-0.	0.58	0.07	0.07	1.19	0.17	-0.	136.33	8.50
INDIA	12000.	1462.	-0.	55000.	8.21	-0.	-0.	0.15	0.03	0.03	0.25	1.15	-0.	18.46	2.25
INDONESIA	131.	54.	-0.	6000.	2.43	-0.	-0.	0.01	0.00	0.00	0.01	0.49	-0.	12.07	4.98
JAPAN	62500.	4500.	36310.	14126.	13.89	2.57	1.72	0.98	0.74	0.74	10.32	2.33	6.00	199.17	14.34
SOUTH KOPEA	1325.	294.	-0.	3217.	4.51	-0.	-0.	0.11	0.13	0.13	0.57	1.38	-0.	1960.89	435.10
MALAYSIA	820.	32.	-0.	317.	25.63	-0.	-0.	0.15	0.07	0.07	1.81	0.70	-0.	92.69	3.62
NEPAL	450.	142.	-0.	200.	3.23	-0.	-0.	0.	0.10	0.10	0.21	0.13	-0.	-0.	-0.
PAKISTAN	5014.	654.	6037.	9000.	7.67	0.67	0.83	0.23	0.05	0.05	0.41	0.74	0.59	85.69	11.18
PHILIPPINES	7078.	1256.	-0.	617.	5.64	-0.	-0.	0.69	0.58	0.58	3.27	0.28	-0.	113.83	20.20
TAIWAN	1922.	401.	-0.	1100.	4.79	-0.	-0.	0.28	0.50	0.50	2.38	1.36	-0.	41.45	8.65

APPENDIX TABLE 2- AGRICULTURAL RESEARCH AND EXTENSION -- INTERNATIONAL COMPARISONS

	\$ RES	S.O.M.Y.	\$ EXT	E.WKRS	\$R/\$MY	\$E/\$W	\$R/\$E	\$R/\$AG	\$E/\$AG	SMY/F	\$R/F	EW/F	\$E/F	\$R/PUB	SMY/PUB
THAILAND	8428.	442.	-0.	502.	19.07	-0.	-0.	1.13	-0.	0.14	2.62	0.16	-0.	1632.88	85.64
S. VIETNAM	547.	40.	-0.	95.	13.67	-0.	-0.	0.25	-0.	0.02	0.29	0.05	-0.	199.74	14.61
CAMEROON	800.	32.	-0.	310.	25.00	-0.	-0.	0.38	-0.	-0.	-0.	-0.	0.	521.90	20.88
CONGO, BRAZ.	235.	29.	-0.	-0.	8.03	0.	-0.	-0.	0.	0.26	2.08	-0.	-0.	-0.	-0.
GAHOMBY	1292.	18.	-0.	-0.	71.78	0.	-0.	2.53	-0.	-0.	-0.	0.	0.	456.77	6.36
ETHIOPIA	-0.	30.	308.	1204.	-0.	0.25	-0.	-0.	0.05	-0.	0.	-0.	-0.	-0.	17.90
GHANA	2385.	128.	-0.	-0.	18.63	0.	-0.	0.46	-0.	-0.	-0.	0.	0.	219.76	11.79
KENYA	-0.	123.	4608.	5277.	-0.	0.87	-0.	-0.	2.24	-0.	0.	-0.	-0.	-0.	4.69
LIBERIA	160.	34.	-0.	-0.	4.71	0.	-0.	0.25	-0.	-0.	-0.	0.	0.	53.33	11.33
MALAGASY REP	2534.	60.	3384.	2669.	42.23	1.27	0.75	1.09	1.45	0.07	2.87	3.03	-0.	3.84	2374.56
MALAWI	966.	48.	1288.	779.	20.13.	1.66	0.75	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.
MALI	625.	21.	-0.	-0.	29.76	0.	-0.	0.95	-0.	0.07	2.23	-0.	-0.	0.	0.
MAURITIUS	1050.	71.	-0.	-0.	14.79	0.	-0.	-0.	0.	-0.	-0.	0.	0.	-0.	-0.
MOROCCO	1076.	55.	-0.	2100.	35.93	-0.	-0.	0.48	-0.	0.05	1.79	1.90	-0.	346.06	9.63
MUZAMPIQUE	1090.	42.	-0.	-0.	23.81	0.	-0.	-0.	0.	-0.	-0.	0.	0.	-0.	-0.
NIGERIA	3354.	335.	-0.	18050.	10.01	-0.	-0.	0.17	-0.	-0.	-0.	-0.	0.	114.64	11.45
RWANDA	270.	10.	-0.	-0.	27.00	0.	-0.	-0.	0.	-0.	-0.	0.	0.	-0.	-0.
SENEGAL	1851.	51.	-0.	-0.	36.29	0.	-0.	1.16	-0.	0.17	6.27	-0.	-0.	658.72	18.15
SIERRA LEONE	165.	23.	-0.	-0.	7.17	0.	-0.	0.16	-0.	-0.	-0.	0.	0.	70.73	9.86
SOMALIA	290.	12.	59.	29.	23.33	2.03	4.75	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.
SOUTH AFRICA	1850.	897.	-0.	-0.	21.01	0.	-0.	1.51	-0.	8.15	171.36	-0.	-0.	249.54	11.89
RHODESIA	-0.	165.	-0.	-0.	-0.	0.	-0.	-0.	-0.	0.38	-0.	-0.	-0.	-0.	8.32
SWAZILAND	175.	11.	-0.	-0.	15.91	0.	-0.	-0.	0.	-0.	-0.	0.	0.	-0.	-0.
TANZANIA	1288.	51.	-0.	2455.	25.25	-0.	-0.	0.41	-0.	-0.	-0.	-0.	0.	102.54	4.06
UGANDA	2100.	50.	3646.	1024.	42.00	3.56	0.58	0.56	0.97	0.04	1.79	0.88	3.12	79.53	1.89
UPPER VOLTA	225.	9.	-0.	-0.	25.00	0.	-0.	0.30	-0.	-0.	-0.	0.	0.	192.78	7.71
AUSTRAIA	56264.	2085.	-0.	-0.	27.03	0.	-0.	2.11	-0.	6.27	223.67	-0.	-0.	168.14	6.22
NEW ZEALAND	6000.	479.	-0.	472.	12.53	-0.	-0.	0.55	-0.	6.56	82.19	6.47	-0.	51.05	4.08

Notes to Appendix Table 2

- \$RES, \$R - Expenditures on research (in thousand 1965 U.S. dollars)
- S.M.Y. - Scientific man-year.
- \$EXT, \$E - Expenditures on extension (in thousand 1965 U.S. dollars)
- E. WKRS, EW - Number of extension workers.
- \$ Ag - Value of agricultural production (in thousand 1965 U.S. dollars)
- F - Number of farms (in thousands).
- PUB - Number of publications.

APPENDIX TABLE 2- RESEARCH PUBLICATIONS IN THE AGRICULTURAL SCIENCES

COUNTRY	WHT	MAP	FAZ	SOPG	PICE	SUGR	POTA	COT	ANIM	POOL	DAIR	PYTD	SOIL	PHYS	CROP	LIVE	GRAND TOTAL	
																		PUBLICATIONS
AUSTRIA	49-54	7	12	27	0	0	8	24	0	30	3	2	22	12	23	112	35	147
	55-61	0	35	20	0	0	22	44	0	23	2	154	29	7	*	166	180	346
	62-68	13	36	17	2	3	8	25	0	24	6	173	49	5	172	158	203	361
	48-54	3.1	0.3	34.9	-0.0	-0.0	7.2	4.0	-0.0	1.7	0.1	0.1	0.1	0.1	0.1	7.4	1.3	4.8
	55-61	2.4	17.7	23.8	-0.0	-0.0	11.2	4.5	-0.0	0.5	10.5	0.5	10.5	0.5	0.5	7.4	5.0	8.0
62-68	3.0	13.1	15.3	-0.0	-0.0	5.2	3.5	-0.0	0.8	10.1	0.8	10.1	0.8	0.8	7.8	4.7	7.9	
BELGIUM	49-54	2	9	4	0	0	28	13	0	8	0	175	12	11	19	79	183	262
	55-61	10	20	6	0	0	18	22	2	4	1	172	9	16	*	103	177	281
	62-68	5	27	3	0	0	13	16	7	20	14	337	69	19	252	158	371	529
	48-54	0.6	6.2	357.1	-0.0	-0.0	14.4	2.2	-0.0	0.0	0.0	9.8	0.0	0.0	0.0	4.6	4.3	6.3
	55-61	1.9	10.8	357.1	-0.0	-0.0	7.6	4.2	-0.0	0.1	8.2	0.1	8.2	0.1	0.1	5.5	3.2	5.6
62-68	0.9	9.4	267.9	-0.0	-0.0	4.9	3.8	-0.0	0.8	15.8	0.8	15.8	0.8	0.8	8.7	5.9	9.7	
BULGARIA	49-54	19	4	12	0	0	0	11	6	0	0	21	0	0	0	43	21	64
	55-61	34	13	52	0	0	4	16	18	2	0	96	0	4	*	141	98	239
	62-68	108	29	76	7	4	24	29	24	4	0	278	6	5	140	311	281	592
	48-54	0.6	1.5	1.7	-0.0	0.0	0.0	9.3	5.0	0.0	0.0	5.9	0.0	0.0	0.0	0.8	1.3	1.1
	55-61	2.2	5.0	7.2	-0.0	0.0	3.0	17.4	15.1	0.0	0.0	18.5	0.0	0.0	2.8	4.1	3.9	4.9
62-68	5.7	6.3	11.0	-0.0	-0.0	16.4	36.3	32.9	0.0	0.0	37.6	0.0	0.0	4.8	8.1	7.4	8.1	
CZECHOSLOVAKIA	48-54	7	1	9	0	1	25	45	1	25	1	63	69	46	14	204	89	293
	55-61	26	29	44	2	2	36	72	2	6	3	460	37	6	*	256	469	725
	62-68	56	120	54	5	0	33	87	0	35	9	715	155	58	634	569	759	1328
	48-54	0.7	0.2	5.2	-0.0	-0.0	4.5	2.2	-0.0	0.2	0.2	3.3	0.0	0.0	0.0	3.1	2.1	3.4
	55-61	2.7	4.1	16.5	-0.0	-0.0	5.5	3.6	-0.0	0.4	23.0	0.4	23.0	0.4	3.7	8.9	7.6	7.6
62-68	4.3	16.3	24.5	-0.0	-0.0	5.5	8.4	-0.0	0.8	34.3	0.8	34.3	0.8	9.5	11.6	14.5	14.5	
DENMARK	48-54	9	24	10	0	0	17	22	0	30	0	377	7	11	47	110	407	517
	55-61	7	29	8	0	0	5	13	0	29	4	344	20	7	*	90	377	467
	62-68	3	56	5	0	0	4	12	0	49	8	358	31	37	77	148	415	563
	48-54	5.1	3.7	0.0	-0.0	-0.0	5.5	4.0	-0.0	0.0	0.0	13.6	0.0	0.0	0.0	3.9	7.0	8.3
	55-61	3.5	2.2	0.0	-0.0	-0.0	2.2	2.8	-0.0	0.4	12.2	0.4	12.2	0.4	3.0	5.3	6.4	6.4
62-68	0.8	2.6	0.0	-0.0	-0.0	2.0	4.6	-0.0	0.8	12.5	0.8	12.5	0.8	3.9	5.1	6.6	6.6	
FINLAND	49-54	17	0	0	0	0	1	27	0	3	0	252	22	7	35	83	255	338
	55-61	21	25	0	0	0	1	23	0	14	0	141	15	24	*	114	155	270
	62-68	29	22	1	0	0	2	23	0	31	4	226	34	121	74	223	261	484
	48-54	12.6	8.1	0.0	-0.0	-0.0	5.8	7.3	-0.0	0.0	0.0	21.6	0.0	0.0	0.0	7.5	13.4	15.2
	55-61	15.2	13.2	0.0	-0.0	-0.0	3.8	8.1	-0.0	0.0	8.3	0.0	8.3	0.0	9.9	6.0	10.1	10.1
62-68	6.1	8.3	0.0	-0.0	-0.0	4.7	6.5	-0.0	1.3	11.3	1.3	11.3	1.3	13.7	8.4	14.1	14.1	

APPENDIX TABLE 3- RESEARCH PUBLICATIONS IN THE AGRICULTURAL SCIENCES

	WHT	BAR	MAZ	SORG	RICE	SUGR	POTA	COT	ANIM	POOL	DAIR	PYTD	SOIL	PHYS	TOTAL			GRAND TOTAL	
															CROP	LIVE			
ITALY	PUBLICATIONS																		
	43-54	9	167	3	88	13	14	1	60	5	803	291	48	182	740	867	1607		
	55-61	20	149	19	50	55	28	7	40	6	816	184	24	*	675	863	1538		
	62-68	20	181	22	55	27	23	7	107	8	982	256	26	641	758	1098	1856		
	ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																		
	48-54	6.3	10.9	-0.0	16.3	2.1	1.7	8.7	0.2	21.2	0.2	21.2	0.2	6.8	9.7	10.0			
	55-61	13.1	7.2	-0.0	11.5	6.3	2.8	40.5	0.2	16.4	0.2	16.4	0.2	5.3	7.1	7.7			
	62-68	13.4	9.7	-0.0	15.0	2.8	2.3	90.9	0.1	20.6	0.1	20.6	0.1	5.7	6.9	8.2			
	PUBLICATIONS																		
	48-54	23	47	26	0	1	15	147	0	39	2	529	106	49	138	415	985		
55-61	31	102	26	3	3	17	177	0	73	4	677	210	63	*	632	1386			
62-68	49	109	12	0	1	23	175	0	65	4	832	255	119	403	901	1643			
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																			
48-54	13.1	42.8	12.0	-0.0	-0.0	6.2	13.8	-0.0	0.2	17.5	0.2	17.5	19.1	9.3	17.1				
55-61	11.1	71.4	16.7	-0.0	-0.0	5.0	17.2	-0.0	0.2	20.5	0.2	20.5	27.2	9.3	19.8				
62-68	10.9	55.7	14.2	-0.0	-0.0	6.1	19.3	-0.0	0.1	21.9	0.1	21.9	32.4	8.7	19.7				
NETHERLANDS	PUBLICATIONS																		
	48-54	24	7	0	0	1	31	0	19	0	179	0	0	5	82	198	280		
	55-61	4	22	1	0	1	22	0	16	1	219	4	4	*	57	236	294		
	62-68	3	32	0	0	0	18	0	59	14	198	14	37	102	105	272	377		
	ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																		
	48-54	73.0	37.1	-0.0	-0.0	-0.0	10.9	-0.0	0.0	21.3	0.0	21.3	17.7	13.1	20.8				
	55-61	27.9	13.1	-0.0	-0.0	-0.0	7.2	-0.0	0.5	25.5	0.5	25.5	10.4	14.1	19.2				
	62-68	38.3	13.0	-0.0	-0.0	-0.0	5.7	-0.0	7.3	22.0	7.3	22.0	16.5	15.1	22.5				
	NORWAY	PUBLICATIONS																	
		48-54	12	24	7	0	1	31	0	19	0	179	0	0	5	82	198	280	
55-61		4	22	1	0	1	22	0	16	1	219	4	4	*	57	236	294		
62-68		3	32	0	0	0	18	0	59	14	198	14	37	102	105	272	377		
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																			
48-54		73.0	37.1	-0.0	-0.0	-0.0	10.9	-0.0	0.0	21.3	0.0	21.3	17.7	13.1	20.8				
55-61		27.9	13.1	-0.0	-0.0	-0.0	7.2	-0.0	0.5	25.5	0.5	25.5	10.4	14.1	19.2				
62-68		38.3	13.0	-0.0	-0.0	-0.0	5.7	-0.0	7.3	22.0	7.3	22.0	16.5	15.1	22.5				
POLAND		PUBLICATIONS																	
		48-54	12	24	7	0	1	31	0	19	0	179	0	0	5	82	198	280	
	55-61	4	22	1	0	1	22	0	16	1	219	4	4	*	57	236	294		
	62-68	3	32	0	0	0	18	0	59	14	198	14	37	102	105	272	377		
	ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																		
	48-54	1.0	1.7	20.6	-0.0	-0.0	0.2	0.0	0.3	1.7	0.3	1.7	0.3	0.8	0.6				
	55-61	2.9	4.3	14.8	-0.0	-0.0	0.6	-0.0	0.1	3.4	0.1	3.4	1.1	1.5	1.6				
	62-68	2.0	5.4	57.4	-0.0	-0.0	0.9	-0.0	0.6	4.5	0.6	4.5	2.0	2.7	2.9				
	PORTUGAL	PUBLICATIONS																	
		48-54	13	1	10	0	9	0	2	1	8	1	14	3	6	16	23	73	
55-61		12	2	7	1	9	0	5	2	1	0	22	7	3	*	23	71		
62-68		17	4	3	2	11	0	7	1	8	0	51	22	26	25	59	153		
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																			
48-54		4.9	1.6	3.9	-0.0	8.9	-0.0	0.5	-0.0	0.4	10.4	0.4	10.4	2.7	2.2	2.9			
55-61		2.5	4.2	2.8	-0.0	7.9	-0.0	1.7	-0.0	0.0	13.1	0.0	13.1	2.7	2.0	2.9			
62-68		4.3	10.6	1.2	-0.0	11.0	-0.0	2.8	-0.0	0.0	25.6	0.0	25.6	6.0	3.6	6.1			
ROMANIA		PUBLICATIONS																	
		48-54	1	4	4	0	1	1	2	0	2	0	0	0	0	13	2	15	
	55-61	26	33	111	2	2	12	31	7	4	0	59	4	14	*	63	305		
	62-68	107	39	215	15	7	27	41	8	4	117	22	58	133	128	660	660		
	ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																		
	48-54	0.0	1.4	0.2	-0.0	3.1	0.7	0.3	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1			
	55-61	1.1	1.6	1.3	-0.0	6.5	4.7	3.8	61.0	0.0	4.7	0.0	4.7	2.5	1.4	2.5			
	62-68	2.3	14.9	6.5	-0.0	21.3	7.9	5.7	-0.0	0.3	9.2	0.3	9.2	4.4	2.2	4.4			

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APPENDIX TABLE 2 - RESEARCH PUBLICATIONS IN THE AGRICULTURAL SCIENCES

COUNTRY	YEAR	PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE											TOTAL LIVE	GRAND TOTAL			
		WHT	BAR	MAZ	SORG	RICE	SUGR	POTA	COT	ANIM	PRUL	DAIR			PLYD	SOIL	PHYS
SWEDEN	48-54	190	30	0	0	19	93	3	66	4	718	19	34	196	466	788	1254
	55-61	114	16	1	0	7	28	1	19	1	665	36	19	*	252	685	937
	62-68	25	6	2	2	7	28	0	57	8	512	56	26	403	281	577	858
															24.8	17.1	27.6
SWITZERLAND	48-54	128.2	-0.0	-0.0	-0.0	10.4	20.4	-0.0	0.7	28.9	0.7	28.9	0.7	11.5	11.5	15.3	19.6
	55-61	34.0	-0.0	-0.0	-0.0	3.6	7.0	-0.0	0.2	31.5	0.2	31.5	0.2	9.5	9.5	12.1	15.6
	62-68	2.7	-0.0	-0.0	-0.0	5.0	6.5	-0.0	1.2	26.3	1.2	26.3	1.2	24.8	24.8	17.1	27.6
															24.8	17.1	27.6
UNITED KINGDOM	48-54	10.0	-0.0	-0.0	-0.0	19.6	9.8	-0.0	1.9	80.1	1.9	80.1	1.9	12.2	12.2	28.1	31.6
	55-61	6.9	-0.0	-0.0	-0.0	17.8	13.7	-0.0	2.7	61.4	2.7	61.4	2.7	18.2	18.2	18.4	25.6
	62-68	4.3	-0.0	-0.0	-0.0	14.8	14.2	-0.0	1.8	45.2	1.8	45.2	1.8	17.4	17.4	14.5	21.8
															12.2	28.1	31.6
YUGOSLAVIA	48-54	4	12	0	0	0	11	6	2	0	126	2	3	0	45	128	173
	55-61	13	52	0	0	4	16	18	3	0	109	16	6	*	160	112	272
	62-68	29	76	7	4	24	29	24	44	22	210	169	7	115	434	276	711
															0.5	4.3	1.7
SPAIN	48-54	2.1	0.5	-0.0	0.0	0.0	2.4	77.9	0.0	14.1	0.0	14.1	0.0	1.5	1.5	2.5	2.1
	55-61	4.5	1.7	-0.0	0.0	1.9	2.0	117.4	0.0	8.4	0.0	8.4	0.0	4.0	4.0	4.3	5.1
	62-68	8.1	2.3	-0.0	22.4	8.7	4.4	209.1	2.4	16.0	2.4	16.0	2.4	20.4	20.4	82	286
															20.4	82	286
USSR	48-54	128	116	7	31	84	341	138	7	0	805	22	21	168	1279	812	2091
	55-61	162	546	15	27	251	350	273	306	39	1048	168	672	*	2913	1393	4306
	62-68	200	1272	118	43	539	624	646	721	88	2016	1033	1267	3731	6636	2824	9461
															1.6	1.8	2.0

APPENDIX TABLE 3- RESEARCH PUBLICATIONS IN THE AGRICULTURAL SCIENCES

COUNTRY	YR	PUB. COUNT	SUSCR	POTA	COT ANIM	POUL	DAIR	PYTO	SOIL	PHYS	CROP	LIVE	GRAND TOTAL	
														ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE
CANADA	43-54	148	36	0	0	117	422	176	74	147	604	630	1234	
	44-54	252	41	0	134	128	445	482	189	*	1241	707	1948	
	45-61	237	62	0	336	231	425	987	401	1008	1925	992	2917	
	46-54	115	28.2	-0.0	12.8	8.5	12.8				8.6	6.0	8.8	
	47-54	35.0	15.9	-0.0	33.1	7.8	11.4				16.0	6.3	13.1	
	48-54	17.0	12.5	-0.0	19.3	12.7	10.9				13.9	7.7	13.3	
	49-54	298	720	120	443	307	1081	6880	2064	1442	1962	5945	9370	15315
	50-54	298	605	146	273	229	1240	6885	4158	2025	*	8205	9900	18105
	51-61	504	1311	369	340	594	3464	1602	4615	2179	7823	10813	10274	21092
	52-68	11.9	3.4	6.4	13.8	2.0	6.2	19.2				5.7	8.3	6.7
53-61	10.1	2.2	4.4	7.8	1.5	6.3	18.8				6.2	7.5	6.6	
54-68	21.1	4.6	9.1	8.2	3.7	7.5	14.4				7.1	6.7	7.0	
ARGENTINA	43-54	17	92	8	3	9	25	8	1	33	41	5	14	284
	44-54	41	36	6	11	11	31	10	0	9	49	6	*	237
	45-61	24	32	21	39	7	19	4	30	28	271	52	323	
	46-54	0.0	5.3	45.7	10.3	1.6	-0.0	3.3			3.9	0.7	2.6	
	47-61	21.9	3.5	5.3	10.9	2.7	-0.0	0.9			3.3	0.4	2.1	
	48-68	35.3	3.0	17.1	7.7	1.4	-0.0	3.0			3.5	0.9	2.4	
	49-54	0	0	0	3	0	2	0	0	0	8	0	5	17
	50-61	0	0	0	4	0	0	0	0	0	2	0	*	7
	51-68	0	0	0	1	0	18	0	1	0	46	2	18	20
	52-68	5.3	3.0	-0.0	1.9	-0.0	-0.0	0.0				4.5	0.8	2.9
53-61	4.1	0.0	-0.0	2.0	-0.0	-0.0	0.0				1.5	0.0	0.9	
54-68	0.0	0.0	-0.0	0.5	-0.0	-0.0	0.0				0.5	4.8	2.3	
BRAZIL	43-54	9	33	0	4	12	9	5	6	74	26	21	143	254
	44-54	1	13	0	15	5	12	52	19	*	128	90	219	
	45-61	2	22	0	13	20	100	42	49	98	276	163	440	
	46-54	1.4	1.3	-0.0	2.0	0.4	-0.0	3.5			0.8	2.3	1.2	
	47-61	0.0	0.6	-0.0	2.6	0.3	-0.0	1.9			0.5	1.5	0.7	
	48-68	3.3	4.9	0.0	1.9	0.9	-0.0	1.2			0.9	2.3	1.2	
	49-54	0	2	0	16	0	0	7	0	1	0	26	33	
	50-61	0	4	0	3	0	10	2	12	3	*	31	43	
	51-68	1	16	2	14	0	51	13	48	23	46	122	66	188
	52-68	1.8	6.2	-0.0	7.6	-0.0	-0.0	2.1				3.0	0.7	1.9
53-61	1.9	5.8	-0.0	1.8	-0.0	-0.0	0.5				3.0	1.1	2.2	
54-68	3.0	16.7	-0.0	7.1	-0.0	-0.0	0.5				10.2	6.1	9.0	

APPENDIX TABLE 3-- RESEARCH PUBLICATIONS IN THE AGRICULTURAL SCIENCES

COUNTRY	YR	PUBS	SOPC	RICE	SUGR	PUTA	COT	ANIM	POUL	DAIR	PYTO	SOIL	PHYS	CROP	LIVE	GRAND TOTAL
COLOMBIA	48-54	7	12	0	3	11	1	4	0	4	7	5	9	63	8	71
	55-61	23	41	1	6	1	1	0	0	1	22	19	*	158	1	159
	62-68	7	16	0	15	1	2	8	2	7	34	14	4	102	17	119
	48-54	100	400	-0.0	100	200	600	0.8	0.0	0.0	0.5	0.0	0.0	1.5	0.6	1.3
	55-61	380	1500	-0.0	1000	500	0.3	0.0	0.0	0.1	0.0	0.0	0.0	3.2	0.1	2.5
62-68	40	120	-0.0	200	200	0.6	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.9	1.7	
CUBA	48-54	0	0	0	0	0	0	0	0	0	4	0	0	4	0	4
	55-61	0	0	0	0	0	0	1	0	2	9	0	*	9	3	12
	62-68	0	0	0	0	0	0	4	0	0	1	0	0	1	4	5
	48-54	0	0	0	0	0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.1
	55-61	0	0	0	0	0	-0.0	-0.0	-0.0	0.0	0.4	0.0	0.0	0.3	0.2	0.3
62-68	0	0	0	0	0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.1	
DOMINICAN REP	48-54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	55-61	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0
	62-68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	48-54	0	0	0	0	0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	55-61	0	0	0	0	0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
62-68	0	0	0	0	0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
ECUADOR	48-54	0	2	0	0	0	0	0	0	0	0	0	2	4	0	4
	55-61	0	1	0	0	0	0	0	0	0	2	0	*	6	0	6
	62-68	0	1	0	0	2	0	1	0	0	10	0	0	13	1	14
	48-54	0	20	-0.0	0	0	0	0	-0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.3
	55-61	0	20	-0.0	0	20	0.0	0.0	-0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.4
62-68	0	0	-0.0	0	0	0.0	0.0	-0.0	0.0	0.0	0.0	0.0	0.8	0.5	0.8	
EL SALVADOR	48-54	0	2	0	0	0	0	1	0	0	10	0	0	12	1	13
	55-61	0	0	0	0	0	0	0	0	0	5	1	*	6	0	6
	62-68	0	3	1	3	0	1	2	0	0	7	0	0	15	2	17
	48-54	0	20	0	0	0	0	0	-0.0	0.0	0.0	0.0	0.0	1.7	0.5	1.4
	55-61	0	20	0	0	0	0	0	-0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.6
62-68	0	30	4.0	13.0	0.0	0.4	-0.0	-0.0	0.0	1.4	0.0	0.0	1.4	1.1	1.4	
GUATEMALA	48-54	1	17	0	2	1	0	3	5	0	6	0	0	29	8	37
	55-61	2	7	0	0	2	0	5	6	11	9	1	*	21	22	43
	62-68	3	12	2	4	0	1	14	6	5	11	0	0	34	24	59
	48-54	50	80	0	35	20	20	0	-0.0	0.0	0.0	0.0	0.0	4.2	6.5	4.7
	55-61	30	60	0	30	30	30	0	-0.0	0.0	15	0	0	1.9	13.5	3.9
62-68	30	60	22	40	30	30	0	-0.0	0.0	6	0	0	2.2	15.2	3.5	

APPENDIX TABLE 3- RESEARCH PUBLICATIONS IN THE AGRICULTURAL SCIENCES

	WHT	MAZ	SORG	PICE	SUGR	POTA	COT	ANIM	POUL	DAIR	PYTO	SOIL	PHYS	CROP	LIVE	GRAND TOTAL
HAITI																
48-54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55-61	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0
62-68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																
48-54	-0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0
55-61	-0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0
62-68	-0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0
HONDURAS																
48-54	0	1	1	0	0	0	0	0	0	0	4	1	2	9	0	9
55-61	0	0	0	0	0	0	0	0	0	0	18	1	*	18	1	20
62-68	0	0	0	0	0	0	0	0	0	0	34	0	0	40	0	40
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																
48-54	0.0	10.2	2.3	-0.0	47.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	0.0	0.0	2.0
55-61	0.0	0.0	0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.8	0.8	3.6
62-68	0.0	0.0	0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.1	0.0	0.0	5.3
JAMAICA																
48-54	0	0	0	0	0	0	0	4	0	7	0	0	2	0	11	11
55-61	0	0	0	0	0	0	0	3	0	11	12	0	*	12	15	26
62-68	0	0	0	0	0	0	0	12	0	2	20	0	4	20	16	36
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																
48-54	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.3	0.0	0.0	0.0	15.7	2.1	2.1
55-61	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.6	2.3	21.0	2.3	21.0	4.5	4.5
62-68	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.6	3.2	19.4	3.2	19.4	5.1	5.1
MEXICO																
48-54	3	6	53	1	3	14	4	2	0	18	12	3	9	100	20	119
55-61	7	4	53	15	3	36	8	3	0	6	16	4	*	151	9	160
62-68	13	1	87	6	1	27	6	31	23	5	39	14	53	199	59	259
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																
48-54	0.7	0.3	3.0	1.2	0.8	27.8	0.2	0.2	0.0	1.1	1.6	0.7	1.6	1.6	0.7	1.4
55-61	1.1	5.3	2.4	27.8	4.0	42.9	0.5	0.5	0.0	0.3	2.0	0.3	2.0	0.3	1.6	1.6
62-68	1.3	1.5	2.9	3.1	3.2	18.2	0.2	0.2	0.0	0.2	1.8	1.5	1.8	1.5	1.9	1.9
NICARAGUA																
48-54	0	0	3	0	0	0	0	0	0	0	0	0	0	3	0	3
55-61	0	0	1	0	0	0	0	0	0	0	0	0	*	1	0	1
62-68	0	0	9	0	0	0	0	0	0	0	0	0	0	17	0	17
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																
48-54	-0.0	-0.0	4.7	0.0	0.0	-0.0	0.0	0.0	-0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.3
55-61	-0.0	-0.0	1.6	0.0	0.0	-0.0	0.0	0.0	-0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.1
62-68	-0.0	-0.0	10.2	26.0	4.8	0.0	0.0	0.2	-0.0	0.0	0.0	0.0	0.0	1.9	0.0	1.1
PANAMA																
48-54	0	0	2	0	1	2	0	0	0	0	4	0	0	5	6	11
55-61	1	0	2	0	1	0	0	1	0	0	2	0	*	3	3	9
62-68	0	0	8	1	2	0	0	0	0	0	0	0	0	11	0	11
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																
48-54	-0.0	-0.0	5.3	-0.0	11.9	-0.0	-0.0	-0.0	-0.0	10.9	2.1	8.7	2.1	8.7	3.7	3.7
55-61	-0.0	-0.0	5.0	-0.0	1.1	0.0	-0.0	-0.0	-0.0	4.3	2.2	3.6	2.2	3.6	2.7	2.7
62-68	-0.0	-0.0	19.0	-0.0	1.7	0.0	-0.0	-0.0	-0.0	0.0	3.0	0.0	3.0	0.0	2.5	2.5

APPENDIX TABLE 3- RESEARCH PUBLICATIONS IN THE AGRICULTURAL SCIENCES

WHT	BAR	MAZ	SORG	RICE	SUGR	POTA	COT	ANIM	POUL	DAIR	PYTO	SOIL	PHYS	CROP	LIVE	GRAND TOTAL
42-54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45-61	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0
62-69	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1
48-54	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55-61	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
62-69	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.2
48-54	5	18	0	1	2	25	24	1	0	5	9	0	0	84	6	90
55-61	25	27	6	2	1	24	45	2	0	5	12	0	*	143	8	150
62-69	5	7	0	1	1	9	6	12	2	5	20	12	4	61	19	80
48-54	7.5	17.6	-0.0	0.8	0.5	5.6	4.1	-0.0	-0.0	2.3	0.0	0.0	0.0	4.3	1.3	3.9
55-61	38.5	24.1	-0.0	1.7	0.2	6.4	6.7	-0.0	-0.0	2.6	0.0	0.0	0.0	5.6	1.4	5.8
62-69	8.5	2.9	-0.0	0.7	0.2	1.8	1.0	-0.0	-0.0	1.7	0.0	0.0	0.0	2.4	2.8	2.6
48-54	6	7	0	0	2	0	0	1	0	0	10	1	2	26	1	27
55-61	2	3	0	0	0	0	0	0	0	4	0	0	*	7	4	11
62-69	0	4	0	0	0	0	0	4	4	5	6	5	7	15	12	27
48-54	3.7	10.0	-0.0	0.0	11.0	0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	6.6	0.1	2.2
55-61	5.3	6.8	-0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0	2.3	0.0	0.0	0.0	3.3	0.5	1.1
62-69	0.0	2.4	18.0	0.0	0.0	0.0	-0.0	-0.0	-0.0	2.3	0.0	0.0	0.0	4.6	1.1	2.0
48-54	0	5	3	1	3	1	1	3	0	7	7	3	2	24	10	34
55-61	0	9	0	2	2	1	0	2	0	13	11	5	*	29	15	44
62-69	1	5	2	1	3	11	1	9	6	9	39	2	21	66	24	90
48-54	-0.0	2.1	-0.0	0.9	2.1	2.5	11.0	-0.0	-0.0	1.7	0.0	0.0	0.0	1.9	1.3	1.8
55-61	-0.0	5.5	-0.0	4.6	1.0	1.1	0.0	-0.0	-0.0	2.2	0.0	0.0	0.0	2.1	1.4	1.9
62-69	-0.0	2.0	-0.0	0.4	1.0	8.0	3.1	-0.0	-0.0	1.0	0.0	0.0	0.0	3.2	1.5	2.6
48-54	0	2	0	20	41	0	0	0	0	0	0	0	0	64	0	64
55-61	0	0	0	8	21	0	1	0	0	0	0	0	*	30	0	30
62-69	0	1	1	7	12	1	0	0	0	0	0	0	0	22	0	22
48-54	-0.0	-0.0	-0.0	44.0	48.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	45.7	0.0	43.5
55-61	-0.0	-0.0	-0.0	13.5	20.8	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	16.5	0.0	15.9
62-69	-0.0	-0.0	-0.0	5.6	10.9	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	9.5	0.0	9.2
48-54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55-61	0	0	0	0	0	0	0	0	0	0	0	0	*	1	0	1
62-69	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0	3
48-54	0.0	0.0	-0.0	-0.0	-0.0	0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55-61	0.0	1.7	0.0	0.0	-0.0	0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.3
62-69	0.0	0.0	0.0	-0.0	-0.0	0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.7

APPENDIX TABLE 3- RESEARCH PUBLICATIONS IN THE AGRICULTURAL SCIENCES

COUNTRY	YEAR	PAP	MAY	SPRC	WICE	SUGR	POTA	COT	ANIM	POUL	DAIR	PYTD	SOIL	PHYS	CROP	LIVE	TOTAL	GRAND TOTAL	
																			PUBLICATIONS
SUDAN	48-54	0	0	11	0	2	2	78	1	0	0	0	2	0	95	1	96		
	55-61	0	2	4	0	0	0	90	2	0	7	11	2	*	108	9	118		
	62-68	0	3	5	0	1	2	70	1	4	12	22	5	0	108	16	124		
	ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																		
	48-54	0.0	0.0	3.0	-0.0	-0.0	285.7	13.9	0.0	0.0	0.0	0.0	0.0	0.0	7.8	0.1	4.3		
	55-61	0.0	17.0	0.9	-0.0	0.0	14.0	0.8	0.0	0.0	0.8	0.0	0.0	0.0	6.8	0.8	4.4		
	62-68	0.0	18.6	0.6	-0.0	-0.0	142.9	6.3	4.6	1.2	4.6	1.2	0.0	0.0	4.7	3.3	3.5		
	UAE (EGYPT)	48-54	6	16	3	9	3	1	31	23	4	103	7	2	9	89	130	219	
		55-61	6	17	5	28	0	0	10	45	17	87	23	11	*	118	148	267	
		62-68	13	24	1	13	2	4	33	39	36	65	71	28	147	217	140	357	
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																			
48-54		1.4	15.0	2.2	1.6	1.7	1.5	1.3	4.8	8.4	4.8	8.4	0.0	0.0	1.5	6.7	2.8		
55-61		2.7	13.0	2.6	2.5	6.4	0.0	0.4	14.8	6.1	14.8	6.1	0.0	0.0	1.9	6.4	3.1		
62-68		3.9	25.8	3.0	0.4	1.8	0.8	0.9	19.4	4.1	19.4	4.1	0.0	0.0	2.7	5.4	3.4		
CYPRUS		48-54	4	5	1	0	0	5	1	0	0	7	0	0	0	24	7	31	
		55-61	0	0	0	0	0	0	0	1	0	6	0	0	*	10	7	17	
		62-68	0	0	0	0	0	0	1	4	0	7	1	0	0	3	11	14	
	ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																		
	48-54	6.3	26.0	-0.0	-0.0	-0.0	17.0	142.9	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	13.4	
	55-61	0.0	35.6	-0.0	-0.0	-0.0	0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.7	
	62-68	0.0	1.7	-0.0	-0.0	-0.0	0.0	142.9	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	4.4	
	IRAN	48-54	0	0	0	0	1	1	0	0	0	0	1	0	0	3	0	3	
		55-61	0	0	0	1	0	0	0	0	0	0	1	0	*	6	0	6	
		62-68	1	13	1	0	0	0	6	1	0	2	1	0	0	22	3	26	
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																			
48-54		0.0	0.0	-0.0	0.0	0.2	-0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	
55-61		0.0	1.3	-0.0	-0.0	0.2	-0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	
62-68		0.1	4.2	-0.0	-0.0	0.0	-0.0	0.8	0.0	0.0	0.0	0.2	0.0	0.0	0.3	0.1	0.3	0.0	
IRAQ		48-54	0	0	0	0	0	0	0	2	0	4	0	0	0	0	6	6	
		55-61	1	0	0	0	0	0	0	1	3	3	1	0	*	2	7	9	
		62-68	1	0	0	0	0	0	0	1	2	2	1	2	0	5	6	11	
	ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																		
	48-54	0.0	0.0	0.0	0.0	-0.0	-0.0	0.0	-0.0	0.5	-0.0	0.5	0.0	0.0	0.0	0.5	0.3	0.3	
	55-61	0.3	0.0	0.0	0.0	-0.0	-0.0	0.0	-0.0	0.3	-0.0	0.3	0.0	0.0	0.2	0.5	0.4	0.4	
	62-68	0.3	0.0	0.0	0.0	-0.0	-0.0	0.0	-0.0	0.2	-0.0	0.2	0.0	0.0	0.4	0.4	0.4	0.4	
	ISRAEL	48-54	5	6	1	0	3	7	0	4	1	32	24	4	14	56	37	93	
		55-61	3	5	4	0	5	8	5	25	7	73	32	47	*	112	105	217	
		62-68	17	24	6	19	7	5	32	38	53	91	127	70	473	309	182	491	
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																			
48-54		23.3	15.0	40.8	14.3	-0.0	-0.0	17.2	0.0	1.0	19.9	10.3	9.7	13.9	10.3	9.7	13.9		
55-61		6.7	17.4	22.9	28.6	-0.0	-0.0	16.8	15.9	3.5	40.0	15.3	16.1	23.3	15.3	16.1	23.3		
62-68		19.7	77.0	23.0	104.4	-0.0	-0.0	3.1	30.7	19.1	29.7	26.0	15.6	31.8	26.0	15.6	31.8		

APPENDIX TABLE 3- RESEARCH PUBLICATIONS IN THE AGRICULTURAL SCIENCES

COUNTRY	YEAR	PUBLICATIONS	WAT	RAF	MAZ	SUPG	RICE	SUGR	POIA	COT	ANIM	POUL	DAIR	PYTC	SJIL	PHYS	CROP	LIVE	TOTAL	GRAND TOTAL	
																					ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE
JORDAN	42-52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	55-61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	62-68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	42-54	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	55-61	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	62-68	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LEBANON	42-54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	55-61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	62-68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	42-54	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	55-61	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	62-68	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SYRIA	42-54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	55-61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	62-68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	42-54	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	55-61	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	62-68	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TURKEY	42-54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	55-61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	62-68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	42-54	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	55-61	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	62-68	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SUDAN	42-54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	55-61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	62-68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	42-54	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	55-61	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	62-68	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CAMBODIA	42-54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	55-61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	62-68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	42-54	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	55-61	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	62-68	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX TABLE 3 - RESEARCH PUBLICATIONS IN THE AGRICULTURAL SCIENCES

COUNTRY	YR	PUBLICATIONS	WATER	VEGETATION	SOIL	PLANT	ANIMAL	POULTRY	DAIRY	CROP	TOTAL	GRAND TOTAL
CEYLON	48-54	0	0	0	0	0	0	0	0	0	0	0
	55-61	0	0	0	0	0	0	0	0	0	0	0
	62-68	0	0	0	0	0	0	0	0	0	0	0
	48-54	-0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	55-61	-0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	62-68	-0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TAIWAN	48-54	2	0	25	136	1	2	0	0	8	0	175
	55-61	2	1	92	58	1	0	2	0	5	10	178
	62-68	1	1	145	47	0	3	6	0	69	12	315
	48-54	0.0	0.0	2.1	30.3	-0.0	-0.0	-0.0	-0.0	8.7	0.0	7.2
	55-61	0.0	0.0	5.2	17.1	-0.0	-0.0	-0.0	-0.0	6.3	0.2	4.9
	62-68	122.8	28.6	7.7	11.8	-0.0	-0.0	-0.0	-0.0	8.6	0.9	6.8
INDIA	48-54	41	86	258	255	79	357	12	343	292	123	224
	55-61	91	139	274	245	61	394	13	448	420	189	1564
	62-68	199	141	537	259	155	435	37	616	1050	331	1515
	48-54	1.3	1.6	2.0	6.6	15.9	18.8	-0.0	-0.0	3.9	-0.0	5.1
	55-61	2.0	4.5	2.0	5.1	8.9	19.4	-0.0	-0.0	3.6	-0.0	4.8
	62-68	3.5	5.5	4.4	3.9	15.1	16.3	-0.0	-0.0	6.0	-0.0	8.0
INDONESIA	48-54	0	0	34	6	6	2	0	0	18	17	91
	55-61	56	0	5	9	0	3	7	1	8	11	98
	62-68	0	0	10	11	0	0	11	0	33	7	76
	48-54	-0.0	0.0	1.0	-0.0	-0.0	-0.0	-0.0	-0.0	1.3	-0.0	1.3
	55-61	-0.0	0.0	0.2	-0.0	-0.0	-0.0	-0.0	-0.0	1.0	-0.0	1.2
	62-68	-0.0	0.0	0.3	-0.0	-0.0	-0.0	-0.0	-0.0	0.3	-0.0	0.8
JAPAN	48-54	136	28	246	45	24	4	21	7	294	110	44
	55-61	304	25	442	29	58	2	82	34	472	223	1419
	62-68	205	48	587	54	31	3	84	97	532	346	1484
	48-54	12.8	8.6	1.5	13.9	3.3	-0.0	-0.0	1.0	113.9	2.6	18.7
	55-61	30.1	5.6	2.0	21.3	6.4	-0.0	-0.0	2.0	46.3	3.7	12.6
	62-68	22.3	12.5	2.7	19.4	2.7	-0.0	-0.0	2.3	27.8	3.6	7.5
REP OF KOREA	48-54	0	0	0	0	0	0	0	0	0	0	3
	55-61	0	0	1	0	0	0	0	0	0	0	2
	62-68	1	0	36	0	2	1	0	0	2	1	47
	48-54	0.0	0.0	0.0	-0.0	0.0	0.0	-0.0	-0.0	0.0	-0.0	0.0
	55-61	0.0	0.0	0.0	-0.0	0.0	0.0	-0.0	-0.0	0.0	-0.0	0.0
	62-68	0.5	0.0	0.8	-0.0	0.9	7.7	-0.0	-0.0	0.5	-0.0	0.6

APPENDIX TABLE 3- RESEARCH PUBLICATIONS IN THE AGRICULTURAL SCIENCES

COUNTRY	YEAR	PUBLICATIONS	WHEAT	BARLEY	MAIZE	SORGHUM	RICE	SUGAR	POTATO	COTTON	ANIMAL	POULTRY	DAIRY	PHYTOLOGY	SOIL	PHYSIOLOGY	TOTAL CROPPING	TOTAL LIVELIVESTOCK	GRAND TOTAL
MALAYSIA	42-54	0	0	0	0	0	26	0	2	0	7	0	0	5	6	0	41	14	55
	55-61	0	0	0	0	30	17	0	0	0	0	0	3	43	14	*	90	8	98
	62-68	0	0	1	0	17	1	0	0	0	0	0	9	27	7	35	53	9	62
	42-54	-0.0	-0.0	-0.0	-0.0	5.3	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	91.7	-0.0	-0.0	1.7	200.0	2.2
	55-61	-0.0	-0.0	-0.0	-0.0	7.1	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	97.7	-0.0	-0.0	3.1	114.3	3.4
	62-68	-0.0	-0.0	-0.0	-0.0	2.7	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	122.3	-0.0	-0.0	1.4	133.3	1.6
PAKISTAN	42-54	1	8	3	13	24	1	31	1	1	0	0	18	3	5	0	92	19	110
	55-61	7	18	5	16	9	1	48	0	0	1	17	11	23	23	*	191	18	208
	62-68	25	30	14	25	21	20	138	25	1	33	34	19	58	410		351	58	410
	42-54	2.6	7.1	2.2	0.3	4.3	0.4	5.9	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	1.0	1.5	1.0
	55-61	15.4	12.5	2.1	0.3	0.9	0.4	16.5	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	1.7	1.3	1.7
	62-68	74.3	18.8	7.6	0.3	1.3	6.6	18.2	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	2.6	4.1	2.7
PHILIPPINES	42-54	0	11	0	42	7	0	1	28	4	4	4	4	6	0	2	68	35	103
	55-61	0	26	0	53	10	1	1	53	16	16	16	16	26	8	*	127	85	212
	62-68	1	15	0	208	39	5	5	54	19	16	16	16	55	14	18	347	89	435
	42-54	-0.0	4.3	-0.0	3.0	0.9	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	1.7	4.0	2.1
	55-61	-0.0	6.6	-0.0	2.8	1.3	18.3	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	2.9	8.5	3.7
	62-68	-0.0	3.2	-0.0	10.1	3.8	39.9	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	6.0	6.2	6.1
THAILAND	42-54	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	15	0	15
	55-61	0	0	0	6	0	0	2	0	1	0	0	0	2	0	*	11	1	12
	62-68	0	0	0	13	2	0	5	0	0	2	4	4	3	7	4	34	2	36
	42-54	-0.0	0.0	-0.0	0.6	0.0	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.5	-0.0	0.5
	55-61	-0.0	1.0	-0.0	0.3	0.0	-0.0	10.8	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.3	-0.0	0.4
	62-68	-0.0	1.0	-0.0	0.4	1.3	-0.0	16.5	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.6	-0.0	0.7
REP OF VIETNAM	42-54	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	9	0	9
	55-61	0	0	1	0	0	0	1	0	0	0	0	0	0	0	*	10	0	10
	62-68	0	0	0	8	7	0	1	0	0	0	0	0	0	0	0	18	1	19
	42-54	-0.0	29.5	-0.0	0.8	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	1.0	-0.0	1.0
	55-61	-0.0	10.2	-0.0	0.6	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.6	-0.0	0.6
	62-68	-0.0	0.0	-0.0	0.7	22.9	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	1.2	-0.0	1.2
ALGERIA	42-54	2	3	7	1	5	2	5	6	0	0	0	2	1	2	0	34	2	36
	55-61	4	0	3	0	1	1	6	1	1	0	5	5	0	0	*	16	6	22
	62-68	1	0	1	0	1	0	0	0	3	0	0	0	0	0	0	4	3	7
	42-54	0.3	166.7	-0.0	142.9	-0.0	5.1	-0.0	0.0	0.0	0.5	0.5	0.5	0.0	0.0	0.0	1.5	0.3	1.2
	55-61	0.7	0.0	107.1	-0.0	35.7	-0.0	6.3	-0.0	0.0	0.0	1.5	0.8	0.0	0.0	0.0	1.0	0.9	0.9
	62-68	0.2	0.0	23.8	-0.0	71.4	-0.0	0.0	-0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.6	0.6	0.3

APPENDIX TABLE 3- RESEARCH PUBLICATIONS IN THE AGRICULTURAL SCIENCES

COUNTRY	WHT	PAF	MAZ	SUPG	RICE	SUGR	PUTA	COT	ANIM	POUL	DAIR	PYTO	SOIL	PHYS	CROP	TOTAL	LIVE	GRAND
ANGOLA	48-54	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3
	55-61	0	4	0	0	0	0	0	0	0	0	0	0	*	4	4	0	4
	62-68	0	5	0	0	0	0	0	0	0	0	0	0	0	5	5	0	5
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																		
48-54	23.8	-0.0	1.3	0.0	8.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.3	0.0	0.3
55-61	0.0	-0.0	3.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.3	0.0	0.0	0.3
62-68	0.0	-0.0	5.6	0.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.5	0.0	0.0	0.5
CAMBODIA	48-54	0	0	2	0	1	0	0	0	0	0	0	0	0	3	3	0	3
	55-61	0	0	0	1	0	0	0	0	0	0	5	0	*	6	6	0	6
	62-68	0	1	1	0	0	4	0	0	0	0	1	2	0	11	11	0	11
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																		
48-54	-0.0	0.0	0.0	47.6	-0.0	-0.0	0.0	0.0	0.0	-0.0	-0.0	0.0	0.0	0.3	0.3	0.0	0.0	0.3
55-61	-0.0	0.0	0.0	0.0	0.0	-0.0	0.0	0.0	0.0	-0.0	-0.0	0.0	0.0	0.5	0.5	0.0	0.0	0.5
62-68	-0.0	1.4	1.3	17.9	-0.0	-0.0	9.2	0.0	0.0	-0.0	-0.0	0.0	0.0	0.8	0.7	0.0	0.0	0.7
DAHOVEY	48-54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	55-61	0	1	0	0	0	2	0	0	0	0	0	0	*	3	3	0	3
	62-68	0	5	1	0	0	9	0	0	0	0	3	0	0	20	20	0	20
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																		
48-54	-0.0	0.0	0.0	0.0	0.0	-0.0	0.0	0.0	0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55-61	-0.0	0.0	2.1	0.0	0.0	-0.0	71.4	0.0	0.0	-0.0	-0.0	0.0	0.0	1.0	0.9	0.0	0.0	0.9
62-68	-0.0	0.0	1.3	0.0	0.0	-0.0	163.7	0.0	0.0	-0.0	-0.0	0.0	0.0	5.8	5.5	0.0	0.0	5.5
ETHIOPIA	48-54	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	1
	55-61	0	5	1	0	0	2	0	0	0	0	0	0	*	10	10	0	10
	62-68	0	1	0	0	0	0	0	0	0	5	1	5	0	7	7	5	12
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																		
48-54	0.0	0.0	0.0	0.0	-0.0	0.0	17.9	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
55-61	0.0	2.8	1.2	-0.0	0.0	0.0	19.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.2
62-68	0.0	0.4	0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.3	0.2	0.0	0.0	0.2
GHANA	48-54	0	1	4	0	0	0	0	0	0	0	1	0	0	10	10	0	10
	55-61	0	4	2	3	1	0	0	5	1	3	16	7	*	33	33	9	42
	62-68	1	0	1	3	1	0	0	11	2	12	17	26	11	51	51	24	76
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																		
48-54	-0.0	0.0	1.3	3.0	22.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.5
55-61	-0.0	0.0	4.6	1.4	14.3	-0.0	-0.0	-0.0	4.0	26.8	0.0	0.0	0.0	1.4	1.7	0.0	5.1	1.7
62-68	-0.0	0.0	2.5	0.8	10.0	-0.0	-0.0	-0.0	3.7	83.3	0.0	0.0	0.0	1.7	2.1	0.0	7.8	2.1

APPENDIX TABLE B- RESEARCH PUBLICATIONS IN THE AGRICULTURAL SCIENCES

COUNTRY	YR	PUBLICATIONS	WHT	MAZ	SPRG	RICE	SUGR	POTA	COT	ANIM	POUL	DAIR	PYTD	SOIL	PHYS	CROP	LIVE	TOTAL	GRAND TOTAL		
																				ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE	
GUINEA	49-54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	55-61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	62-68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	48-54	-0.0	0.0	0.0	-0.0	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0
	55-61	-0.0	0.0	0.0	-0.0	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0
	62-68	-0.0	0.0	0.0	-0.0	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0
IVORY COAST	48-54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	55-61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	62-68	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	48-54	-0.0	0.0	0.0	-0.0	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0
	55-61	-0.0	0.0	0.0	-0.0	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0
	62-68	-0.0	0.0	0.0	-0.0	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0
KENYA	48-54	3	19	8	1	2	7	7	5	4	0	0	0	0	0	0	0	0	0	0	
	55-61	12	35	5	0	1	1	1	38	0	0	0	0	0	0	0	0	0	0	0	
	62-68	4	28	4	1	3	6	7	37	0	0	0	0	0	0	0	0	0	0	0	
	48-54	12.6	20.1	7.5	19.0	47.6	31.7	66.7	142.9	-0.0	-0.0	10.0	-0.0	-0.0	10.6	2.8	0.0	0.0	0.0	0.0	
	55-61	20.5	71.4	13.8	13.7	6.0	7.5	8.4	166.7	-0.0	-0.0	10.7	-0.0	-0.0	14.5	10.4	0.0	0.0	0.0	0.0	
	62-68	10.3	142.0	14.2	12.7	11.9	15.9	47.6	83.3	-0.0	-0.0	18.8	-0.0	-0.0	13.5	10.1	0.0	0.0	0.0	0.0	
LIBERIA	48-54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	55-61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	62-68	0	0	0	0	0	0	0	21	0	0	0	0	0	0	21	0	0	0	21	
	48-54	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	
	55-61	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	
	62-68	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	4.8	0.0	0.0	0.0	4.8	
MALAGASY REP	48-54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	55-61	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	62-68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	48-54	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	
	55-61	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	
	62-68	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	4.8	0.0	0.0	0.0	4.8	
MALI	48-54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	55-61	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	62-68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	48-54	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	
	55-61	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	
	62-68	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	

APPENDIX TABLE 3- RESEARCH PUBLICATIONS IN THE AGRICULTURAL SCIENCES

COUNTRY	WHT	FAP	MAZ	SORG	RICE	SUGR	POTA	COT	ANIM	POUL	DAIR	PYTD	SOIL	PHYS	CROP	LIVE	TOTAL	GRAND TOTAL
MOZAMBIQUE	48-54	3	0	7	0	5	0	0	0	0	0	0	0	1	0	21	0	21
	55-61	5	1	8	0	1	2	0	0	0	1	0	0	0	*	24	1	25
	62-68	2	2	4	1	0	1	0	0	0	1	7	3	7	7	32	8	40
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																		
48-54	0.0	0.0	0.6	0.0	15.5	-0.0	0.0	178.6	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.8	
55-61	1.0	0.4	0.4	0.0	3.6	-0.0	0.0	125.0	0.0	0.0	0.2	0.0	0.0	1.6	0.1	1.0		
62-68	0.3	0.7	5.5	7.5	0.0	-0.0	0.0	42.9	0.8	1.8	0.0	0.0	0.0	1.0	0.9	1.4		
NIGERIA	48-54	0	11	11	5	0	7	14	2	0	11	1	2	0	51	13	63	
	55-61	0	1	28	6	1	0	17	4	1	29	19	5	*	82	34	116	
	62-68	3	0	37	23	2	1	29	9	5	12	45	16	21	179	26	205	
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																		
48-54	-0.0	-0.0	1.8	0.9	1.5	0.0	-0.0	15.4	0.0	0.0	8.2	0.0	0.0	0.5	1.8	0.6		
55-61	-0.0	-0.0	3.8	0.4	1.3	4.5	-0.0	16.7	0.8	22.0	0.8	22.0	0.0	0.7	4.4	1.0		
62-68	-0.0	-0.0	4.6	1.4	4.5	7.1	-0.0	22.8	3.0	8.1	3.0	8.1	0.0	1.4	2.7	1.5		
SENEGAL	48-54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	55-61	0	0	0	2	0	0	0	0	0	0	0	0	0	*	5	5	
	62-68	0	0	2	4	7	1	0	2	0	0	0	2	0	17	2	20	
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																		
48-54	-0.0	-0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0		
55-61	-0.0	-0.0	0.0	1.0	5.7	-0.0	-0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.7	0.0	0.6		
62-68	-0.0	-0.0	26.6	2.2	13.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	1.9	1.2	1.8		
SIERRA LEONE	48-54	0	0	0	0	0	0	3	1	0	0	0	0	0	14	0	14	
	55-61	0	0	0	0	14	0	0	1	0	1	0	2	*	16	2	18	
	62-68	0	0	0	1	13	0	0	0	0	0	0	2	0	16	0	16	
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																		
48-54	-0.0	-0.0	0.0	0.0	2.9	-0.0	-0.0	-0.0	0.0	0.0	-0.0	-0.0	-0.0	2.5	0.0	2.4		
55-61	-0.0	-0.0	0.0	0.0	4.6	-0.0	-0.0	-0.0	0.0	0.0	-0.0	-0.0	-0.0	2.6	9.5	2.9		
62-68	-0.0	-0.0	0.0	8.4	3.4	-0.0	-0.0	-0.0	0.0	0.0	-0.0	-0.0	-0.0	2.3	0.0	2.2		
SOUTH AFRICA	48-54	2	1	66	12	1	95	13	22	38	9	84	22	18	252	131	383	
	55-61	5	2	45	3	0	35	8	3	47	16	105	29	19	149	168	318	
	62-68	13	6	50	13	0	39	15	12	79	39	152	57	54	259	269	529	
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																		
48-54	0.6	17.0	5.4	13.8	-0.0	27.7	8.3	78.6	7.1	8.0	7.1	8.0	7.1	7.1	4.0	5.7		
55-61	1.2	35.7	3.7	2.3	-0.0	8.1	4.5	11.9	11.4	9.2	11.4	9.2	11.4	3.7	5.0	4.4		
62-68	2.9	57.7	3.8	6.1	-0.0	8.8	7.3	18.8	18.2	12.1	18.2	12.1	18.2	5.4	6.6	6.1		
SOUTH AFRICA	48-54	1	0	42	9	3	7	4	18	1	0	18	4	2	90	19	108	
	55-61	1	0	57	2	0	0	5	24	1	0	15	7	8	104	16	120	
	62-68	4	3	21	6	0	2	3	17	37	1	23	14	7	77	62	139	
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																		
48-54	47.6	-0.0	8.5	5.4	71.4	333.3	71.4	257.1	0.0	17.6	0.0	17.6	0.0	6.4	3.6	5.8		
55-61	142.0	-0.0	5.4	1.2	0.0	0.0	79.4	381.0	0.0	11.3	0.0	11.3	0.0	6.2	2.7	5.5		
62-68	285.7	-0.0	2.5	4.2	0.0	1.9	26.8	42.6	1.5	13.4	1.5	13.4	0.0	3.0	8.5	4.3		

APPENDIX TABLE 3- RESEARCH PUBLICATIONS IN THE AGRICULTURAL SCIENCES

UNIT	WHT	BAR	SORG	RICE	SUSR	POTA	COI	ANIM	POUL	DAIR	PYTO	SOIL	PHYS	CROP	LIVE	TOTAL	GRAND TOTAL
TANZANIA																	
48-54	0	0	14	9	0	7	19	2	0	11	0	1	0	58	13	70	
55-61	0	0	21	2	0	4	42	4	2	15	0	3	*	72	21	93	
62-68	0	0	1	4	1	0	38	7	0	12	20	5	0	69	19	88	
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																	
48-54	0.0	0.0	2.7	25.7	0.0	11.1	37.7	0.0	0.0	7.1	0.0	0.0	0.0	5.4	3.0	4.9	
55-61	0.0	0.0	4.1	0.0	0.0	50.4	0.0	0.0	0.0	10.1	0.0	0.0	0.0	5.0	4.7	5.1	
62-68	0.0	0.0	0.3	5.2	3.3	0.0	24.9	0.0	0.0	7.7	0.0	0.0	0.0	4.0	3.6	4.0	
TOGO																	
48-54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
55-61	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	
62-68	0	0	0	0	0	0	0	0	0	0	4	0	0	4	0	4	
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																	
48-54	-0.0	0.0	0.0	0.0	-0.0	0.0	0.0	0.0	0.0	-0.0	-0.0	0.0	0.0	0.0	-0.0	0.0	
55-61	-0.0	0.0	0.0	0.0	-0.0	0.0	0.0	0.0	0.0	-0.0	-0.0	0.0	0.0	0.0	-0.0	0.0	
62-68	-0.0	0.0	0.0	0.0	-0.0	0.0	0.0	0.0	0.0	-0.0	-0.0	0.0	0.0	1.3	-0.0	1.3	
TUNISIA																	
48-54	8	3	4	0	0	0	0	1	0	7	1	0	0	16	8	24	
55-61	7	0	0	0	0	0	0	0	0	3	1	4	*	13	3	16	
62-68	7	0	0	0	1	0	0	2	0	0	1	5	11	14	2	16	
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																	
48-54	2.8	6.5	285.7	-0.0	-0.0	0.0	-0.0	-0.0	0.0	7.1	0.0	0.0	0.0	2.5	3.5	2.8	
55-61	3.0	0.0	0.0	-0.0	-0.0	0.0	-0.0	0.0	0.0	2.9	0.0	0.0	0.0	1.8	1.2	1.7	
62-68	3.0	0.0	0.0	-0.0	20.4	0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	0.9	1.8	
UGANDA																	
48-54	0	0	4	2	0	5	52	2	0	18	0	0	0	63	20	83	
55-61	0	2	9	8	0	0	40	15	1	23	2	3	*	64	39	104	
62-68	0	2	28	0	0	0	28	28	18	54	14	12	0	86	99	185	
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																	
48-54	-0.0	0.0	11.4	1.2	-0.0	0.0	44.0	0.0	0.0	20.5	0.0	0.0	0.0	3.4	9.3	4.0	
55-61	-0.0	0.0	23.8	6.5	-0.0	0.0	27.3	0.0	0.0	26.0	0.0	0.0	0.0	3.3	16.0	4.8	
62-68	-0.0	0.0	3.8	28.2	-0.0	0.0	16.9	0.0	0.0	59.0	0.0	0.0	0.0	3.6	36.3	7.0	
UPPER VOLTA																	
48-54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
55-61	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	
62-68	0	0	0	0	0	0	0	8	0	0	0	0	0	0	8	8	
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																	
48-54	-0.0	0.0	0.0	0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
55-61	-0.0	0.0	0.0	0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
62-68	-0.0	0.0	0.0	0.0	-0.0	0.0	0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8	1.6	
AUSTRALIA																	
48-54	62	28	46	16	10	218	99	19	215	19	513	108	100	774	747	1521	
55-61	47	49	52	13	2	97	27	8	372	47	602	233	*	807	1022	1829	
62-68	114	48	10	24	21	99	43	16	589	42	786	250	987	929	1417	2347	
ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE																	
48-54	4.0	18.7	105.3	57.8	31.6	52.3	58.2	-0.0	4.3	27.7	4.3	21.6	9.4	21.6	9.4	13.6	
55-61	2.4	21.0	71.8	28.3	3.9	13.8	11.4	25.6	9.9	24.3	15.7	8.8	11.2	15.7	8.8	11.2	
62-68	4.5	16.8	29.8	53.2	33.8	8.9	20.5	15.4	6.2	29.5	13.7	11.3	11.3	13.7	11.3	12.5	

APPENDIX TABLE 2- RESEARCH PUBLICATIONS IN THE AGRICULTURAL SCIENCES

NEW ZEALAND	WHT	RAP	MAY	SUNG	RICE	SUQR	POTA	COT	ANIM	POUL	DAIR	PYTO	SOIL	PHYS	CROP	LIVE	GRAND
48-54	12	14	3	0	1	0	29	2	68	0	352	45	26	42	138	420	558
55-61	14	8	2	0	0	0	18	1	166	2	432	134	113	*	290	600	890
62-68	24	4	1	1	1	0	11	0	190	2	350	105	133	245	280	542	822
48-54	25.7	45.4	73.9	-0.0	-0.0	-0.0	51.6	-0.0	15.1	0.0	15.1	42.9	8.1	42.9	8.1	10.1	10.1
55-61	17.7	32.8	34.4	-0.0	-0.0	-0.0	29.4	-0.0	1.0	17.6	17.6	81.3	10.0	81.3	10.0	14.0	14.0
62-68	19.9	9.3	7.2	-0.0	-0.0	-0.0	12.2	-0.0	0.9	12.4	12.4	54.8	7.8	54.8	7.8	10.8	10.8

ANNUAL PUBLICATIONS PER \$100 MILLION OF COMMODITY VALUE

Notes to Appendix Table 3

WHT - Wheat
BAR - Barley
MAZ - Maize
SOR - Sorghum
SUGR - Sugar Beet or sugar cane
POTA - Potatoes
COT - Cotton
ANIM - Animal Production
POUL - Poultry
DAIR - Dairy
PYTO - Phytopathology
SOIL - Soil Sciences
PHYS - Plant Physiology

CROP - Sum of the crops, Phytopathology and Soil Sciences

LIVE - Sum of Animal Production, Poultry and Dairy.

The ratio in the DAIR column is to value of milk production.

Plant Physiology is not included in the totals.

* No counts for this period in Plant Physiology.

All crop data (Plant Breeding Abstracts) are annual counts for the whole period. Other research publications were counted in selected years. All numbers in the table are adjusted to seven year base (totals may not sum exactly).

Commodity values are from Indices of Agricultural Production, U.S.D.A., ERS, (several issues).