AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

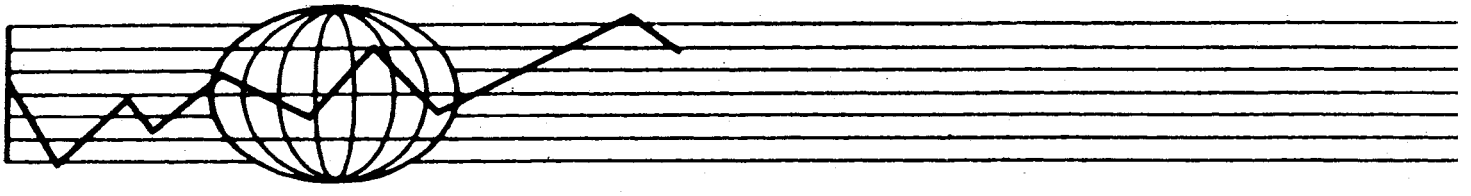
AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Bulletin Number 83-1

January 1983

ECONOMIC DEVELOPMENT CENTER



CONGRUENCE OF AGRICULTURAL RESEARCH IN INDONESIA 1974-1978

David C. Salmon

ECONOMIC DEVELOPMENT CENTER
Department of Economics, Minneapolis
Department of Agricultural and Applied Economics, St. Paul

UNIVERSITY OF MINNESOTA

CONGRUENCE OF AGRICULTURAL RESEARCH IN INDONESIA 1974-1978

By

David C. Salmon*

Bulletin No. 83-1
January 1983

* Graduate Research Assistant, Department of Agricultural and Applied Economics, University of Minnesota, St. Paul, Minnesota.

Funding for this research was provided under a contract from the U.S. Agency for International Development - University of Minnesota Asia Agricultural Research Review Project (Contract No. AID/ASIA-C-1456).

The author gratefully acknowledges the invaluable advice and help of Dr. Vernon W. Ruttan in preparing this paper and would also like to thank the following people for reviewing an earlier draft of this paper: Dr. Ir. Anwarhan, Dr. R. Bernsten, Dr. R. Cowan, Dr. Farid Bahar, Dr. Z. Harahap, Mr. A. Hurdus, Dr. Ibraham Manwan, Dr. J. McIntosh, Dr. Rusli Hakim, Dr. Carl Pray, Mr. Sadikin Sumintawikarta, Dr. B. H. Siwi, Dr. Soetarjo Brotenogoro, Dr. Sridodo, Dr. Suryatna Effendi, Dr. Ir. Syarifuddin, Dr. Syarifuddin Baharsyah and Mr. W. Tappan.

One of the considerations that is usually taken into account in the allocation of research resources - manpower, facilities and budget - is the relative value of crop and livestock production. Not all commodities are equally important. How resources are distributed among the various commodities should be a vital concern to those concerned with the efficient use of scarce agricultural research resources. While few would argue with the general rule that the size of the budget assigned to research for a particular crop should bear some relation to the importance of that crop to the society, the specifics of applying this rule are not so simple. The purpose of this paper is to present the congruence or parity criterion of resource allocation and apply it to Indonesian agricultural research for the mid-1970's.

The Congruence Criterion

The congruence criterion holds that the proportion of research resources spent on a particular commodity should be proportional to the value of that commodity. Or put another way, that the ratio of research expenditures to the value of output should be equal for all commodities. This sort of criterion has a great deal of intuitive appeal, allowing relatively simple comparisons over time and between countries. Also, this criterion is amenable to mathematical expression and allows us to quantify congruence and the degree to which actual research expenditures have deviated from the criterion. However, there are also disadvantages to judging resource allocations by this criterion. The most serious

being that there are several implicit assumptions within the idea of congruence which are not generally valid.[1/]

For this reason, the congruence criterion cannot be used as the sole guide to research resource allocations. But it may be regarded as a first approximation for (a) quantifying the way in which resources are spent or (b) as a departure point from which further discussion can proceed. It may be true that resources should not be spent in an exactly congruent fashion, but discussion will be more useful if congruence is quantified and administrators can argue about why and by how much special circumstances suggest a departure from congruence rather than arguing from only a subjective assessment of the importance of research for a commodity.

Measuring Congruence

Perhaps the simplest way to quantify congruence is to take the ratio of resources spent for a crop to the value of the output of that commodity. If resources are spent exactly congruently this ratio will be the same for all commodities. This ratio, however, does not allow us directly to judge relative congruence between two research systems, since the value of the ratio depends upon the amount of the overall research budget and value of output as well as how the budget was allocated. If two countries spend their resources in an exactly congruent fashion, these ratios will be the same within each country,

---

[1/] These assumptions would include:

(a) That the resources necessary to produce equally important technical breakthroughs are the same for each crop.
(b) The market value of a crop is a proper measure of its importance to society.
(c) That research resources are transformed into technical breakthroughs in a continuous one-period process.
(d) Meaningful research is, in fact, carried out on a crop-by-crop basis and there are no spillover or synergistic effects for research.

yet different between countries depending on the intensity of each countries' overall commitment to agricultural research. A more useful way of expressing congruence is by calculating the congruence ratio for each commodity:

$$R_i = \frac{\frac{\text{resources spent for research on commodity } i}{\text{resources spent for research on all commodities}}}{\frac{\text{value of output for commodity } i}{\text{value of output for all commodities}}}$$

Exact congruence will result in this ratio being equal to one, under allocation resulting in a ratio less than one and over allocation in a ratio greater than one. For example, if the value of output for a country is $400 M for food crops, and $200 M for estate crops, and the research budget is $3 M for each commodity, then the congruence ratio for food crops is (3/6)/(400/600) = 0.5, indicating a relatively low allocation of resources. The ratio for estate crops would be (3/6)/(200/600) = 1.5, indicating a relatively high allocation. Exact congruence would occur, of course, if $4 M were spent for food crops research and $2 M for estate crops.

A third way of expressing congruence is to calculate the percentage of the total research budget which would need to be transferred to each commodity in order to achieve perfect congruence. This may be useful if, for example, one commodity has a congruence ratio which is far from unity, but the value of output of that commodity is so small that only a small shift of total resources would be needed to achieve perfect congruence.

Indonesian Agricultural Research - Budgets and Expenditures

There are three separate budgets that support agricultural research in Indonesia. The first is called the development budget which is funded from revenues from the Indonesian government. This is a develop-

ment "investment" budget and is theoretically subject to wide variations from year to year. The second budget is the routine budget, also funded by the government, which is intended for the maintenance of regular government facilities and activities. Money from each of these budgets is allocated to research along organizational lines within the Agency for Agricultural Research and Development (AARD). There are several staff support and administrative organizations, but most funds are allocated to the central research institutes which correspond to major agricultural commodity groups; food crops, industrial (or estate) crops, animals, and fisheries. Within the central research institutes, money is budgeted along specific commodity lines and to staff and support groups.

The third budget is from foreign aid projects, almost always used for specific projects or programs. The disbursement of funds is done by the donor agency and the exact timing and purpose of expenditures is not formally monitored by the Indonesian government. A list of projects with associated funding and term of project is available, but further details are not.

In this paper, congruence ratios will be calculated on two levels and along the same organizational lines as the development and routine budgets. The first level is by major commodity group and corresponds to the major central research institutes; food crops, industrial crops, animals and fisheries. The second level is by major food crop and follows the budget lines within the Central Research Institute for Food Crops (CRIFC); rice, maize, and roots and pulses. It should be noted that not all research activities lend themselves to easy division into specific commodity groups and several assumptions were needed to allocate expenditures, especially those from foreign aid sources. The

assumptions and the methods used to determine research expenditures for each commodity group and the resulting budgets are explained in the appendix. Complete information was not available for every year, so the congruence ratios for major commodities were calculated for years 1975 through 1978 and for major food crops from 1974 through 1978.

At this point it would be well to mention a particular problem encountered in calculating congruence ratios for the major commodity groups. The research system in Indonesia is relatively young and a good deal of the foreign aid projects, especially for animals and fisheries research, were intended to provide funds for long-term investment in agricultural research such as buildings, roads and other facilities. Other funds were provided to hire foreign consultants who were not necessarily expected to engage in day to day research. In these circumstances, it may not be proper to charge all of a project's budget to the year it was spent. Unfortunately, it isn't possible to determine which portion of the money spent should be treated as an expense and which portion should be treated as long-term investment. Even if this were known it isn't clear how such long-term investments should be allocated by years.

The method chosen to handle this problem is to calculate the congruence ratios three different ways. The first way is to entirely expense all of the foreign aid projects, that is, allocate all expenditures to the year in which they were made. The second is to assume a capital charge of 10 percent per year against projects deemed to be long-term investment. The third is to assume that 10 percent of these project expenditures are expenses in the year they are spent, 50

percent are for facilities and roads and an amount is charged to each succeeding year sufficient to amortize the investment over 30 years at 15 percent, and 40 percent is for foreign consultants and is handled the same as for facilities except the period of amortization is only 10 years. It was expected that the first assumption would lead to fairly significant departures from congruence and the second would lead to results in which research expenditures were reasonably congruent with the relative importance of the several commodities. The third assumption was chosen to represent a reasonably conservative middle position. As will be seen later, all three assumptions led to about the same results.

Presentation of Results

Tables 1 through 3 present information for the major commodity groups under assumption (1), (2), and (3). As can be seen, there is no clear difference in congruence under the three different methods of handling long-term investments in research. The chart below shows

Congruence Ratios for Sum of Years 1975-1978
Under Assumptions (1), (2) and (3)

	(1)	(2)	(3)
Food Crops	.53	.56	.52
Industrial Crop	.79	.87	.80
Animals	4.35	3.57	4.05
Fisheries	2.99	3.30	3.43

the congruence ratios for the period 1975 through 1978. The differences seem rather slight. It seems reasonable to conclude that expensing all such investments is the best way to handle the problem. That

Table 1. Congruence Ratios of Major Commodities; Assumption (1)

	Government of Indonesia				Foreign Aid				Total			
	75	76	77	78	75	76	77	78	75	76	77	78
Food Crops	.74	.58	.55	.65	.27	.28	.30	.38	.56	.50	.49	.56
Industrial Crops	1.00	1.28	.88	.82	.45	.82	.37	.27	.80	1.15	.76	.63
Animals	1.95	2.42	4.86	3.20	6.29	6.84	9.56	6.37	3.55	3.66	6.04	4.29
Fisheries	3.01	3.75	2.78	2.48	3.99	2.40	2.93	3.20	3.37	3.37	2.81	2.73

Table 2 Congruence Ratios of Major Commodities; Assumption (2)

	Government of Indonesia				Foreign Aid				Total			
	75	76	77	78	75	76	77	78	75	76	77	78
Food Crops	.74	.58	.55	.65	.47	.37	.37	.35	.68	.54	.52	.56
Industrial Crops	1.00	1.28	.88	.82	.89	1.20	.50	.34	.97	1.26	.81	.68
Animals	1.95	2.42	4.86	3.20	3.86	4.09	6.46	5.25	2.39	2.77	5.18	3.80
Fisheries	3.01	3.75	2.78	2.48	3.82	4.29	4.60	4.64	3.20	3.86	3.14	3.12

Table 3. Congruence Ratios of Major Commodities; Assumption (3)

	Government of Indonesia				Foreign Aid				Total			
	75	76	77	78	75	76	77	78	75	76	77	78
Food Crops	.74	.58	.55	.65	.33	.28	.28	.28	.61	.50	.48	.52
Industrial Crops	1.00	1.28	.88	.82	.60	.86	.36	.26	.88	1.16	.75	.62
Animals	1.95	2.42	4.86	3.20	4.87	5.25	8.12	6.33	2.84	3.19	5.71	4.31
Fisheries	3.01	3.75	2.78	2.48	4.95	4.85	4.53	4.35	3.60	4.05	3.23	3.14

is the course followed in Tables 4 and 5 below. Tables 6, 7, and 8 provide information for the food crop groups.

The congruence ratios for the major commodities range from a low of .50 to a high of 6.04. For individual food crops the range is from .83 to 2.60. Clearly other criteria than congruence have entered into decisions about the allocation of Indonesian agricultural research resources. By U.S. and world standards the departure from congruence are not large. As mentioned before, the congruence criterion is properly used as a first approximation of how resources should be allocated and is only a departure point from which further discussion can proceed. At this point it may be useful to discuss some of the reasons why resource allocation may have deviated from exact congruence.

Foreign Aid's Influence on Allocation Decisions

It is interesting to note that with the exception of fisheries research, foreign aid agencies spent money on agricultural research on the major commodities in a less congruent manner than did the government of Indonesia. What may have happened is that foreign projects were selected for those areas where the donor agency was perceived to have a comparative advantage in research expertise, resulting in concentrations on commodities for which the donors were most experienced. The Australian government for example, placed over 97% of its aid money to agriculture on animals projects; a natural decision, perhaps, considering Australian agricultural scientists' familiarity with animals research. Once foreign aid donors grant money according to their expertise rather than to the market value of output, it is

Table 4. Rupiahs of Research Expenditures per 1000 Rupiahs of Output for Major Commodities (Assumption (1))

	75	76	77	78
Food Crops	.897	.828	.744	1.046
Industrial Crops	1.264	1.914	1.149	1.179
Animals	5.638	6.107	9.170	8.001
Fisheries	5.356	5.616	4.277	5.095

Table 5. Percent of the Total Research Budget Needed to be Shifted into (+) or away from (-) a Commodity to Achieve Exact Congruence - Major Commodities (Assumption (1))

	75	76	77	78
Food Crops	+30.9	+35.7	+34.7	+29.0
Industrial Crops	+ 3.1	- 2.4	+ 4.9	+ 7.3
Animals	-21.5	-21.4	-28.6	-25.1
Fisheries	-12.6	-11.9	-11.1	-11.2

Table 6. Congruence Ratios of Food Crop Groups

	74	75	76	77	78
Government of Indonesia					
Rice	.86	.86	.79	.78	.74
Maize	2.41	2.33	2.85	2.92	2.79
Roots & Pulses	.94	1.06	1.29	1.30	1.81
Foreign Aid					
Rice	1.15	1.17	1.16	1.18	1.19
Maize	1.02	.80	.74	.66	.21
Roots & Pulses	.40	.36	.33	.29	.13
Total					
Rice	.92	.91	.85	.84	.83
Maize	2.11	2.08	2.48	2.60	2.26
Roots & Pulses	.82	.95	1.12	1.16	1.47

Table 7. Rupiahs of Research Expenditures per 1000 Rupiahs of Output - Food Crop Groups

	Food Crops				
	74	75	76	77	78
Rice	.564	.727	.614	.589	.478
Maize	1.289	1.672	1.786	1.835	1.295
Roots & Pulses	.501	.764	.806	.819	.841

Table 8. Percent of the Total Research Budget Needed to be Shifted into (+) or away from (-) a Crop Group to Achieve Exact Congruence - Food Crop Groups

	Food Crops				
	74	75	76	77	78
Rice	+5.7	+7.1	+11.5	+12.7	+13.6
Maize	-8.9	-7.9	- 9.6	-10.0	- 8.1
Roots & Pulses	+3.3	+ .9	- 1.9	- 2.7	- 5.5

reasonable for the Indonesian government to respond with matching support. If the Australian government offers a large amount for an animals research project, the Indonesian government's component of the project is leveraged by this foreign aid and resources allocated to animals research may be quite congruent from the GOI's point of view.

This argument is more tenuous in the case of the food crops since GOI's expenditures are less congruent for maize than are foreign aid expenditures. It should be noted, though, that American agricultural scientists working in Indonesia in the 50's and early 60's spent a great deal of effort on maize, probably because they knew far more about maize than rice. Perhaps Indonesia found it reasonable to capitalize on this expertise and devote more resource to maize than they would have otherwise.

The Importance of Animal Protein

Another reason for disproportionate investment in animals and fisheries research may be a perceived importance of animal protein in the Indonesian diet. Generally we assume that the price of a food commodity fully accounts for its importance in the diet and is a proper measure of its value. But if we believe that the market does not correctly value a food commodity, then the congruence criterion will be misleading, and it may be proper for Indonesia to spend more on animal and fisheries research than the criterion would indicate. This might occur, for example, if the Indonesian people attach less importance to animal protein in their diet than is nutritionally sound, or if researchers believe that some change (such as rising income) will result

in increased demand for animal products in the future and believe research to provide for this demand should be performed now.

A related explanation may be that research administrators believe that demand for animal products is highly elastic. In this case a technical breakthrough could lower the price of animal products and increase demand and output enough to justify a much higher investment in animals research than would be reasonable under current market conditions.

Equity Considerations

One of the stated reasons for increased spending for maize research is that maize is a staple food of many of the poorest Indonesians. It has been argued that maize research helps these people more directly and is a more effective way to distribute the benefits of development.

Implications of the Study

As previously mentioned, research expenditures in Indonesia have significantly departed from the allocations suggested by the congruence criterion. In general, the direct expenditures of the Indonesian government have been more congruent than those by foreign aid donors. Foreign aid donors must certainly account for important special research considerations besides the congruence criterion when allocating resources for agricultural research in Indonesia, but in the end it may well be that these special considerations resulted in departures from congruence greater than intended when the total program is taken into consideration. This may be especially true if foreign aid expenditures influence Indonesian expenditures, biasing them further away from congruence. It should be useful for donor agencies, prefer-

ably as a group, to pay closer attention to the relationship between their research support and economic value of the commodities their resources support as they contemplate further appropriations for research.

Appendix

Methods and Assumptions Used in Calculating Congruence Ratios and Possible Sources of Error

I. Methods and Assumptions Used in Calculating Congruence Ratios

A. Research Expenditures, by Major Commodities, GOI

The Government of Indonesia's investment in research for each major commodity group is calculated as the sum of the Development and Routine Budgets for the appropriate Central Research Institute. Complete data is available only for years 1975 through 1978 and only for the Central Research Institute for Food Crops, the Central Research Institute for Industrial Crops, the Central Research Institute for Animal Science, and the Central Research Institute for Fisheries.

B. Research Expenditures by Major Commodities, Foreign Aid

A correct allocation of foreign aid payments by year and major commodity is more difficult. A list is available of foreign aid projects for the Ministry of Agriculture with a description of each project, the term of the project, the amount of the project and the agency in the Department of Agriculture which performed the project. Projects were first divided into research projects and non-research projects. In most cases projects under the administration of the AARD were considered research investment while others were not. It appears that several research projects for fisheries were funded through the Directorate for Fisheries rather than through AARD and these projects were assigned to the research or non-research category by examining the project description.

Research projects were assigned to major commodity group (food crops, industrial crops, animals and fisheries) by examining the project

descriptions. Soil Research and other research projects which could not be allocated by commodity were excluded since they probably serve as support for all commodities. While it is unlikely that a project could have been assigned to the wrong commodity group, the project descriptions were not complete enough that one could always be sure that fisheries projects were correctly designated as research or non-research projects. Hopefully any resulting errors are not important.

It was assumed that project payments were made in equal amounts over the life of the project. These straight-line payments were summed up over all projects for each year, 1975 to 1978. While most project funds were probably not spent in a straight-line manner, the resulting totals by year should still be a fairly good indicator of foreign aid investment in research by commodity group.

C. Research Expenditures by Food Crop Groups, GOI

The food crop groups are the rice group, the maize group (maize, sorghum and wheat) and the roots and pulses group (cassava, sweet potatoes, soybeans, peanuts and mung beans). Research for these crops is performed at six stations: Bogor, Sukamandi, Malang, Maros, Benjarmasin, and Sukarami. Since 1974 CRIFC has broken down each station's Operational Development Budget for these stations by these three crop groups. Unfortunately, Operational Development Budgets are not strictly comparable because the type of research costs included in the Operational Budget varied between stations and from year to year, and there were large differences in overhead activities between stations - construction, administration, etc. - and these costs must also be considered. To provide a more comparable measure between stations an overhead rate was calculated for each station for each year (1974-1978). This rate is

the ratio of each station's Operational Budget divided into its total Development and Routine Budget plus a factor to allocate each station a portion of AARD's central staff support (Library, Soils, etc.). This ratio was applied to each crop group's portion of the Operational Budget for each station and resulting figures are summed up by food crop group over all six stations.

D. Research Expenditures by Food Crop Group, Foreign Aid

There are only four research projects for food crops whose term falls within our period of interest (1974-78). These are a cooperative CRIFC-IRRI program, a project for facilities at the CRIFC lab in Bogor, the Sumatra Agricultural Research Project funded by USAID, and a Legume System Research project funded by Japan. According to people associated with the Sumatra project, insignificant amounts were paid out in the first year, 1978; and since we are not concerned with later years this project has been ignored. The Japanese Legume Cropping Project also began in 1978 and has been ignored for the same reason.

Payments from the cooperative CRIFC-IRRI program were allocated by year in the following manner: The total dollar amount of the program (funding was from several sources) and a list of consultant placement by year was known. This amount was allocated by year so that each advisor-year had associated with it the same expenditures in terms of U.S. dollar purchasing power. These amounts were converted to current dollars, and then converted to rupiahs at the year's average exchange rate. All payments from this project were allocated to rice. While this is not entirely right, since a component of this project was devoted to cropping system, this is the most conservative assumption, and a complete breakdown would change the resulting congruence ratios only slightly.

A project funded by the Japanese government provided new equipment and facilities at CRIFC's laboratory in Bogor. It is assumed that money was spent equally from the second year of the project until the second year before the end of the project and that start-up and wind-down expenses occurred in a straight line fashion over two years. AARD experiments by crop for the Bogor Laboratory were counted over the period of the project and project money was assigned to each food crop group in proportion to the number of laboratory experiments for that crop group.

E. Value of Output by Major Commodity Groups

The value of output for the major commodity groups was found in the 1979 Statistical Yearbook of Indonesia, page 660 (Table XI.1, "Gross Domestic Product at Current Market Prices by Industrial Origin").

F. Value of Output by Food Crop Group

Output in tons for rice, maize, cassava, sweet potatoes and soybeans was found in the 1979 Statistical Yearbook of Indonesia, page 199 (Table V.1.1, "Area Harvested, Production and Yield Rate of Food Crops in Indonesia"). Prices for these six food crops were obtained from the same source, page 614 (Table IX.5.11, "Wholesale Prices of Several Farm Crops in Jakarta"). Notice that there are three crops of interest for which information is unavailable: sorghum, wheat, and mung beans. The exclusion of these crops should not seriously affect results since the importance of these crops in the economy is slight and little research has been carried out on them before 1978.

II. Possible Source of Error

A. Major Commodity Groups

GOI expenditures for the major commodity groups may be considered

reliable. There is, however, more chance of error in expenditures by foreign aid projects. As mentioned before, there may be errors in the separation of fisheries projects into research and non-research projects. A second source of error is that there is almost certainly a component of agricultural research in many foreign aid projects not administered by AARD. The problem is partially one of definition (Is construction for extension research? Is a study for rice storage research?) and partially that most agricultural development investments need to be made with knowledge of the latest technical breakthroughs and consequently must have some component which could reasonably be considered research. The figures for research investment on Table I and IIIare based on a narrow definition of agricultural research, but it is unlikely that a broader definition would significantly alter the final congruence ratios.

B. Food Crop Groups

GOI research expenditure figures for food crop research are reliable, and the estimates of foreign aid payments for food crops are more reliable than for the major crops groups. There are, however, several sources of possible error. One is that two large projects which began in 1978 were excluded from consideration. Another is that some portion of the cooperative CRIFC-IRRI program funds should be allocated to other crops besides rice. These problems should not significantly alter the final congruence ratios.

A problem which may be more serious is that the method for calculating the overhead rate to apply to each food crop group's portion of the Operational Development Budget (see page 16), implicitly assumes that each crop's share of the total research budget for AARD is propor-

tional to its share of the Operational Budget. But this may not be the case. Since rice is the dominant crop at CRIFC in absolute expenditures (61% in 1978/79) Indonesia's decision to allocate funds to non-rice crops may have been made assuming that most of the routine and support structure in CRIFC is a sunk cost to rice. If this is true, the true resources spent on non-rice food crops would be less than the proportional allocation of overhead would suggest. It may be that most of the costs for building, electricity, travel and support personnel, etc., should be allocated to rice, while only the variable operational portion of the budget along with some much reduced portion of these overhead functions should be assigned to the other crops.

Table I. Research Expenditures by Major Commodities (1,000's Rupiahs)

	75	76	77	78
Government of Indonesia				
Food Crops	1,894,405	2,122,344	2,307,123	3,204,463
Industrial Crops	542,817	1,060,801	1,094,236	1,211,480
Animals	594,867	1,000,702	1,687,074	1,815,508
Fisheries	578,087	966,280	1,037,850	1,199,634
Foreign Aid, Assumption (1)				
Food Crops	397,772	397,772	417,419	970,147
Industrial Crops	142,070	267,949	155,226	210,435
Animals	1,111,627	1,111,627	1,111,627	1,884,956
Fisheries	443,797	242,314	365,835	804,525
Foreign Aid, Assumption (2)				
Food Crops	356,425	363,316	389,854	701,236
Industrial Crops	142,332	268,211	155,488	210,828
Animals	343,703	454,865	566,030	1,230,721
Fisheries	214,713	296,658	433,466	926,382
Foreign Aid, Assumption (3)				
Food Crops	371,055	381,794	412,181	740,683
Industrial Crops	142,478	268,357	155,634	211,048
Animals	646,829	820,074	993,324	1,967,701
Fisheries	414,144	471,962	595,483	1,150,361

Table II. Indonesia GDP by Major Commodities (billion rupiahs)

	75	76	77	78
Food Crops	2554.8	3043.9	3659.9	3991.4
Industrial Crops	541.9	694.2	1087.8	1205.6
Animals	302.7	345.9	305.2	462.5
Fisheries	190.8	215.2	328.2	393.4

Table III. Research Expenditures by Food Crop Group (1,000's Rupiahs)

	74	75	76	77	78
Government of Indonesia					
Rice	685,689.5	1,249,466.8	1,301,935.5	1,403,015.7	1,372,246.3
Maize	208,782.2	331,977.6	393,477.1	426,746.5	408,568.2
Roots & Pulses	182,895.8	364,171.2	433,621.7	503,622.3	483,483.6
Foreign Aid					
Rice	249,856	326,084	404,945	345,836	567,750
Maize	24,339	21,695	21,623	15,645	7,840
Roots & Pulses	21,280	23,708	23,780	18,407	9,254

Table IV. Value of Output by Food Crop Group (billion rupiahs)

	74	75	76	77	78
Rice	1659.4	2166.3	2779.1	2967.4	4058.0
Maize	180.8	211.5	232.4	241.1	321.5
Roots & Pulses	407.5	508.0	567.5	637.8	585.8

Table V. List of Agricultural Research Projects Funded by Foreign Aid (1968-1978), By Major Commodities.

Name of Project	Donor	Term of Project	Amount of AID(U.S.$)
Food Crops			
Agricultural Research	USAID	72-80	2,167,000
Regional Rice Research	USAID	72-84	1,138,000
Sumatra Agricultural Research	USAID	78-83	2,500,000
Ecological Research on Rice, Soybeans, Corn	Holland	74-77	1,056,510
Ecological Research on Horticultural Crops	Holland	74-78	852,540
Joint Food Crops Research	Japan	71-78	1,455,000
Legumes in Cropping Systems Research	Japan	78-83	2,317,000
Regional Rice Research	IRRI	77-79	140,000
Industrial (Estate) Crops			
Assistance to Research Institute for Estate Crops Agricultural Extension	Australia	70-80	62,000
Rehabilitation of Sugar Research Station	Holland	70-71	6,213
Tea Research and Sub Station	Holland	76-81	1,794,000
Feasibility Study for Pepper Development	Holland	79	27,300
Clove Disease Investigation	England	75-81	190,960
Strengthening Research in Rubber and Oil Palm	FAO/UNDP	72-77	220,756
Coconut Research Improvement	FAO/UNDP	73-76	1,071,000
Animals			
Rehabilitation of Animal Disease Research Institute	Australia	70-72	123,779
Rehabilitation of Animal Virology Station	Australia	70-72	118,563
Center for Animal R & D, Ciawi	Australia	72-80	23,764,000
Assistance to Animal Health Research Institute, Bogor	England	78	332,672
Fisheries			
Assistance to Institute of Fisheries Technology	England	76-79	239,000
Research on Fish Parasites	Canada	76-79	180,000
Brackish Water Pond Fisheries Production	USAID	71-81	217,000
Study on the Improvement of Brackish Water Ponds Irrigation System	USAID	77-78	500,000
Small Scale Fisheries Development	USAID	78-82	2,000,000
Fisheries Development Study	Japan	74	60,000
Aertembaga Fisheries Project	FAO/UNDP	70-75	3,500,000
Deep Sea Fisheries	FAO/UNDP	71-72	35,030
Fisheries Development Training	FAO/UNDP	71-73	1,051,651
Brackish Water Shrimp & Milk Fish Culture	FAO/UNDP	72-80	1,397,000
Fisheries Development & Management	FAO/UNDP	73-79	2,209,164