DETERMINING THE COST-BENEFITS OF AGRICULTURE AND RESOURCES RESEARCH: A CHALLENGE*

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This paper is an attempt to discuss present efforts to quantify the cost-benefits of agriculture and resources research in the Philippines. The paper referred to a number of foreign materials for dearth of local references.

The main limitation of this paper – which as such also serves as its challenge – is the observation that it was only recently that attention was being devoted to the proper assessment and determination of the actual and real costs-benefits of research activities in the country, particularly in agriculture and natural resources.

Through the years, the role of research continues to gain increasing recognition and accordingly receives more support and cooperation from both the public and the private sectors. Funds allocated for research have increased; national efforts tend now to be more focused and better planned, programmed and implemented.

But much more needs to be done to fill in gaps in operational/ administrative areas.

The creation of the Philippine Council for Agriculture and Resources Research (PCARR) six years ago, to coordinate and monitor the national research program in agriculture and resources, attests to the growing awareness of the research value and contribution to national development and well-being in general, and to agricultural development in particular.

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Importance of Agriculture and Resource Development

Like many countries similarly endowed, the Philippines relies mainly on the agricultural sector for: (1) *food supply,* (2) *income,* (3) *employment,* and (4) *export earnings.* Agriculture, being the major economic lifeblood of the country, is the foundation of the country's economy and its biggest source of national income. It is expected that progress and growth in the agricultural sector may likewise lead to national development in the long analysis.

As defined by the National Economic and Development Authority (NEDA), the major sources of value added in agriculture include crops, livestock, poultry, fishery and forestry. Available figures for the period 1946-73 indicate significant shifts and changes in the agricultural sector. On the whole, this sector has been contributing the following figures to the net domestic product (NDP) since 1946 to 1973. (see Table 1).

Due to the importance of agriculture, it has always enjoyed special consideration and attention from the government. Accordingly, a number of policies have been declared in support of agricultural development, e.g. agrarian reform, provision of credit facilities, initiation of cooperative programs, provision of infrastructure improvement, price support, farm inputs subsidy, and investment incentives.

Research and Agricultural Development

[From this point hereon, agricultural development refers not only to crop improvement, but also to the development of the livestock, fisheries and forestry sectors.]

Agricultural development can be promoted and held viable through the interplay of various factors: (1) provision of material inputs like fertilizers, certified seeds, irrigation, etc.; (2) improvement of agricultural efficiency like improved cultural practices and research/extension; (3) provision of economic incentives like price support, crop insurance and government subsidies; and (4) enactment of institutional reforms like land reform, credit extension, marketing system, etc.

TABLE 1

PERCENT CONTRIBUTION OF AGRICULTURE TO NET DOMESTIC PRODUCT (1946-1973) (BASED ON CURRENT PRICES).

	Crops	*Livestock Poultry*	*Fishery*	*Forestry*	*Net Value Added*
1946	27.6	9.4	4.7	1.0	42.7
1947	25.6	9.2	7.3	2.2	44.3
1948	26.6	9.1	3.0	3.0	41.7
1949	25.5	8.1	5.0	3.3	41.9
1950	25.0	9.5	3.3	3.3	41.1
1951	23.0	9.0	3.9	3.6	39.5
1952	21.2	9.0	4.0	2.8	37.0
1953	18.9	10.0	3.6	3.5	36.0
1954	18.0	11.3	3.4	3.5	36.2
1955	17.4	11.8	3.4	4.0	36.2
1956	16.8	10.0	3.3	4.4	34.5
1957	16.4	9.7	3.2	4.1	33.4
1958	16.0	10.0	3.2	3.5	32.7
1959	15.8	9.0	3.2	5.0	33.0

Source: Derived from figures obtained from Statistics Office, National Economic and Development Authority.

Table 1. (continued)

	Crops	*Poultry*	*Livestock*	*Fishery*	*Forestry*	*Net value added*
1960	16.8	2.4	4.8	3.1	5.1	32.2
1961	17.1	2.2	5.1	2.8	5.0	32.2
1962	17.3	1.9	4.7	2.9	5.5	32.2
1963	17.4	2.0	4.1	3.0	6.8	33.3
1964	17.4	2.2	4.5	3.3	4.8	32.2
1965	16.7	2.5	5.5	3.1	5.1	32.9
1966	16.9	2.2	6.1	2.8	4.7	32.7
1967	17.5	1.8	4.7	3.0	6.3	33.3
1968	18.2	1.4	4.6	3.8	6.8	34.8
1969	20.2	1.2	4.7	3.6	6.9	36.6
1970	20.9	1.9	4.0	3.7	5.8	36.3
1971	20.9	2.0	4.3	4.7	5.3	37.2
1972	22.0	1.7	4.4	4.4	4.0	76.5
1973	20.7	1.6	4.6	4.7	4.8	36.4

The sources of net value added in agriculture from 1946 to 1973 is summarized in Table 2.

TABLE 2

SOURCES OF NET VALUE ADDED[1] IN AGRICULTURE 1946-73
(EXPRESSED IN AVERAGE PERCENT CONTRIBUTION)

Sources	*1946-1952*	*1953-1959*	*1960-1966*	*1967-1973*
Crops	60.5	49.2	52.5	55.8
Livestock & poultry	22.0	29.6	22.0	17.2
Fishery	10.7	9.6	9.2	11.1
Forestry	6.8	11.6	16.3	15.9
Net value added	100.0	100.0	100.0	100.0

[1]Based on current prices.

Source: Derived from figures obtained from Statistics Office, National Economic and Development Authority.

The contribution of research to complement agricultural development needs acknowledgment, especially in the light of the ongoing global race between food production and burgeoning population. Research provides the backbone to produce sufficient and adequate food to feed the world's populace. Technological innovation is just an output of agricultural research; the adoption and utilization of innovations at the least cost and for the optimum benefit of the greatest number of users is of paramount importance.

The efficient application of agricultural research accelerates the rate of agricultural development in developing countries, and ensures the maintenance of this rate in developed ones. As such, agricultural research is something that both the developing and developed countries must promote and support. The future of agricultural development depends, to a large extent, on the present efforts and resources expended on research activities.

As is true in many countries, the national government usually takes the lead role in agricultural research planning, programming and fund allocation. In most cases, it is the government that formulates the research goals to solve agricultural problems and to satisfy national felt needs and demands. Generally, agricultural research has the following objectives:

(1) To increase the productivity of available resources;
(2) To increase the efficiency of these resources;
(3) To stabilize agricultural outputs;
(4) To improve the quality of these agricultural outputs; and
(5) To produce new outputs to satisfy local and/or foreign demands.

Whether basic or applied, biological or socio-economic, short or long-term, agricultural research must respond to the above challenges to deserve the growing importance attributed to it by countries throughout the world.

In the Philippines, agricultural research is now being coordinated and monitored by PCARR whose main responsibilities include: (1) the formulation of a national program in agriculture and natural resources; and (2) the review of all research proposals (including the budgetary aspects) to conform to this national program.

DETERMINING THE COSTS OF AGRICULTURAL RESEARCH

Allocation of Research Funds

Countries are spending steadily increasing proportions of their national income on research (see Table 3).

TABLE 3

ANNUAL INVESTMENT IN AGRICULTURAL RESEARCH BY REGION: SELECTED YEARS (Evenson, 1973)

	Expenditure in millions of 1970 US Dollars			
	1951	*1958*	*1965*	*1970*
1. North America	225	333	448	478
2. Northern Europe	60	104	217	258
3. Southern Europe	8	15	27	32
4. Oceania, S. Africa and Rhodesia	25	45	100	176
5. Eastern Europe & U.S.S.R.	65	150	265	300
6. Latin America	8	11	24	42
7. Near East and N. Africa	19	26	38	47
8. South and Southeast Asia	10	16	42	54
9. East Asia	24	36	91	113
10. Sub-Sahara Africa	10	20	39	69
All developed countries	405	679	1126	1324
Developing countries*	49	77	163	236
World total	454	756	1289	1560

*Defined as regions 6 through 10 excluding Japan.
Source: Food and Agriculture Organization of the United Nations. *The Planning and Programming of Agricultural Research.* 1975. p. 18.

However, in comparison with developed countries which spend approximately 2 percent of their gross national product (GNP) for research and development, developing countries spend only about 0.1-0.4 percent (see Table 4).

Unless the developing countries decide to spend more for research activities, the gap between the developed and developing countries will continue to widen. This is mainly the result of direct socio-economic-political-cultural benefits that the former derive from research activities, which tend to increase in proportion to invested amount.

TABLE 4

EXPENDITURES ON RESEARCH AND DEVELOPMENT AS PERCENT OF GNP

Country	*1960**	*1965-1970***
U.S.A.	2.8	2.8 (1969)
U.S.S.R.	2.3	4.2 (1970)
U.K.	2.7	2.4 (1968)
Ghana	0.2	0.2 (1966)
Lebanon	0.1	0.3 (1966)
Philippines	0.1	0.2 (1966)
India	0.1	0.4 (1969)
Pakistan	0.1	0.1 (1969)

*Dedijer, 1973.
**UNESCO, 1971.

Source: Food and Agriculture Organization of the United Nations *The Planning and Programming of Agricultural Research.* 1975. p. 13.

In setting national research goals and policies and allocating funds thereto, FAO identified four categories of decisions, at different levels:

(1) What proportion of the national budget should be devoted to research in general and to agricultural research in particular?

(2) How should the funds devoted to agricultural research be apportioned among the different problem areas (commodities, disciplines)?

(3) How should the total allocation for agricultural research be divided among the different categories of research – between basic and applied, short-term and long-term, and so on – to ensure a *balanced* program?

(4) How should priorities within each field be determined?

Since it is a worldwide phenomenon that national funds are never sufficient to satisfy competing development requirements, allocation of research funds is always a problem. How to have a balanced research program and how to prioritize within limited resources are two major considerations which require a careful approach in decision-making. FAO advanced two procedures in this regard:

(1) The *ex-ante approach* in which the overall national budget is based on the recommendations of an appropriate agency or council whose responsibility is to compile and review the research and development budgets and plans of the different research agencies; and

(2) *The ex-post approach,* in which the individual research sums allocated by each government agency are compiled to provide information on the total research funds allocated nationally and thereby uncover any omissions or imbalances in the overall national research programme.

In the Philippines, the first procedure is adopted with the creation of PCARR.

In allocating funds for the different fields of agricultural research, various measuring sticks can be used:

(1) Previous year's allocation for each field to which a fixed percentage is added or subtracted;

(2) A certain percentage, usually between 0.5 and 1.5 percent of the total gross value of the annual production, is devoted to research;

(3) Research funds allocated by the industry itself are matched by government funds in a fixed ratio; and

(4) Research funds are allocated on an *ad hoc* basis in which the overall policy is to favor certain sectors of production at the expense of others.

Ad-hoc allocations may be based on: the sector's growth potential; potential contribution to improvement of the trade balance; influence on other fields of production; and efficient use of available inputs.

PCARR's fund allocation policy is based on a commodity ranking system whereby commodities are assigned points relative to: (1) the importance of the commodity itself; and (2) identified research needs. (See Annex 1 for a more detailed discussion of the PCARR system.)

Determining Priorities for Agricultural Research

Assuming that a national research program is already drawn, the next step to undertake is the prioritizing of the various research projects falling under this general guideline. As funds and research resources are never enough, how should the projects be prioritized?

Arnon and FAO discussed three approaches to priority assignment: (1) the systematic approach; (2) the subjective approach; and (3) the rating system approach.

In the *systematic approach,* indices are constructed and modelled to determine research priorities, e.g. the relative contribution of the project to the national output of the commodity on which the work is to be carried out; the estimated added value that will accrue if the research is successful; the probability of achieving the above; and the cost of research.

The *subjective approach,* as the name implies, is based on judgment resulting from experience and familiarity with one or more aspects of the problem; intuition; and all pertinent data and other information presented in a systematic fashion.

The third approach, which is the use of *rating systems,* devises rating criteria by which research projects are assessed, like technical feasibility and cost; research direction and balance; timing of research; impact of research; etc.

As noted on Annex 1, PCARR attempted to devise a rating system to prioritize its research program. Although the system still calls for improvement, it enables PCARR to quantitatively measure the appropriateness of research projects; help eliminate personal biases; and provide a certain measure of consistency.

Until a more objective, methodological tool is developed, therefore, allocation of funds and prioritizing of research projects has to grapple with the following obstacles:

(1) The historical pattern in a given situation gives some research areas special emphasis which tends to be perpetuated through the years;

(2) Pressure groups may occasionally bring about changes in emphases, but this rarely occurs for these groups usually play a conservative role;

(3) The personal biases of people assigned the task of fund allocation are also influential;

(4) There is a tendency to favor short-term and "safe" problems, and to avoid untried areas; and

(5) The tenure and inflexibility of specialists.

Costing of National Research Programs in the Philippines

The allocating and costing of agricultural research programs are

usually expressed in terms of: (1) national budgets; and (2) specific research project budgets. Both must conform with set procedures. Government accounting and auditing rules ensure that public funds are properly expended for intended purpose/s.

At the national level, PCARR exercises a budgetary clout over all public funds allocated for agriculture and resources research. This means that no fund may be appropriated to any government agency for agricultural and resources research without PCARR's endorsement. The various government agencies' total agricultural and resources research budgets are summations of the individual research project budgets submitted to, and approved by, PCARR.

To effectively exercise its functions, a review and monitoring mechanism is instituted at PCARR to ensure that allocation of resources are invested to generate optimum returns, including:

(1) The formulation of: (a) a research allocation and priority system, and (b) a research evaluation and monitoring mechanism that take into account the needs of the country in general and the agricultural sector in particular;

(2) The preparation of an annual national research program that enumerates the research projects which have successfully passed through the PCARR's evaluation and allocation mechanism;

(3) The multi-disciplinary commodity team approach to national agricultural and resources research program planning and implementation;

(4) Frequent and meaningful interactions among regional and provincial officials; representatives from the private and international research sectors; and other government agencies and educational institutions; and

(5) The strengthening of the capabilities of the various research agencies through infrastructure development/improvement; research manpower improvement; improved research techniques; etc.

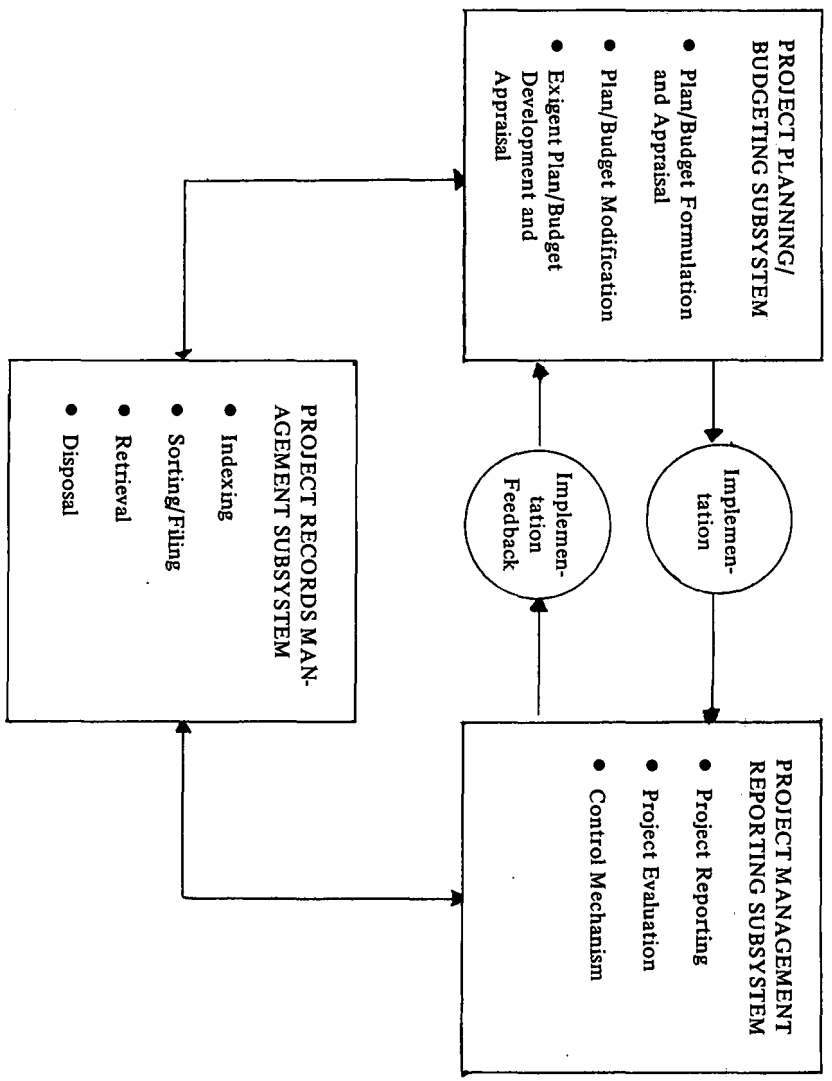
(Figure 1 gives the PCARR's operational framework for project planning/budgeting and monitoring; Figure 2, the process workflow; and Figure 3, the system's flowchart timetable.)

Costing of Specific Research Projects Monitored by PCARR

In addition to technical feasibility, the research proposals submitted to PCARR are evaluated in terms of their proposed budgets which include:

FIGURE 1
SYSTEMS FLOW CHART: OPERATIONAL FRAMEWORK

System : Project Planning/Budgeting and Monitoring

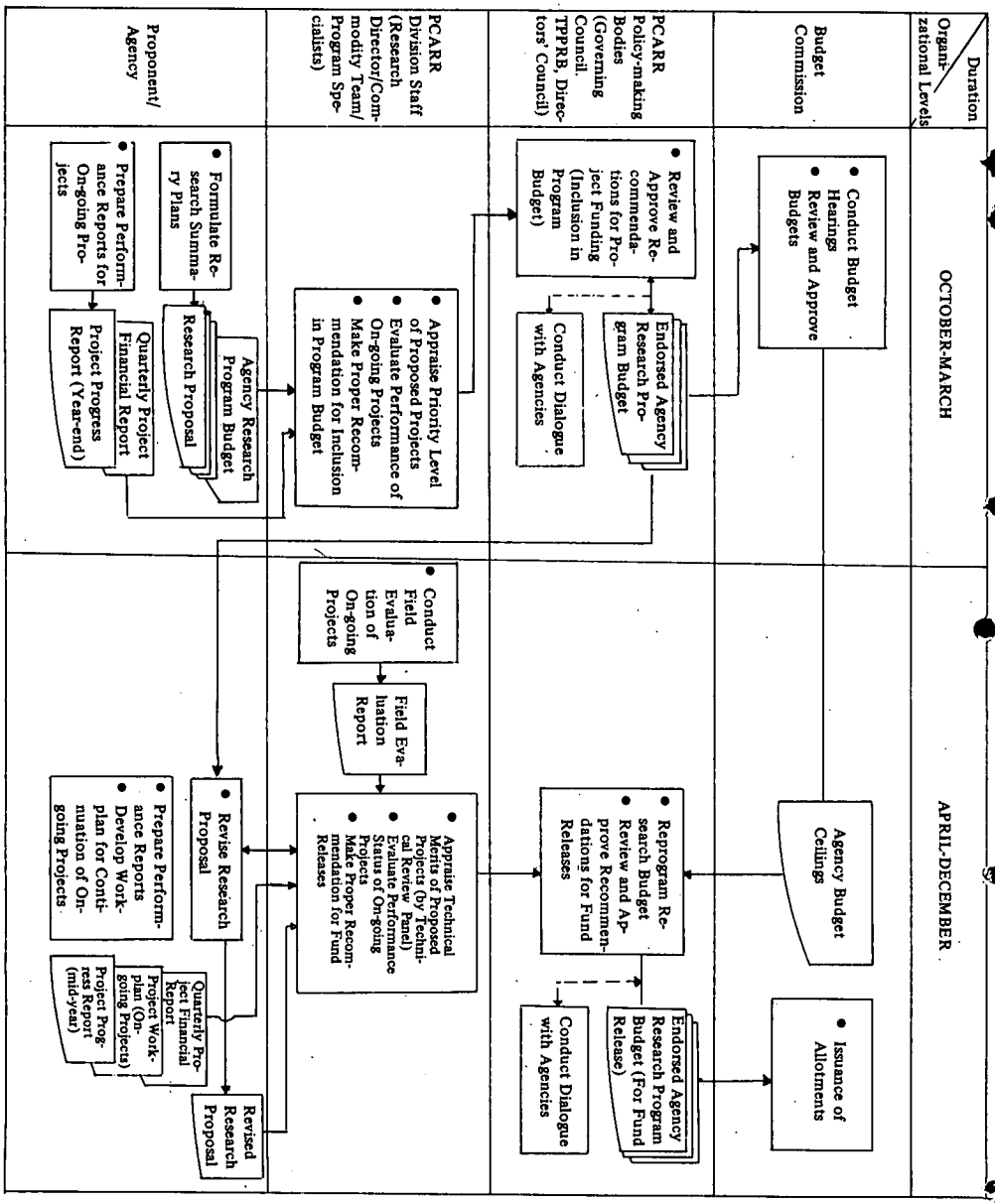


Source: PCARR, Project Planning/Budgeting and Monitoring System – Los Baños, Laguna, March 1978

FIGURE 2
SYSTEMS FLOWCHART: PROCESS WORKFLOW

System : Project Planning/Budgeting and Monitoring

Subsystem : Project Planning/Budgeting



Source: *Ibid.*

SYSTEMS FLOW CHART: TIMETABLE

System : Project Planning/Budgeting and Monitoring

Subsystem : Project Planning/Budgeting

	Activity	Responsibility	Inclusive Dates	
			For CY 1979 Budget	For CY 1980 Budget
1.	Development of research proposals	Research leader	Prior to Oct. 15, 1977	Prior to Sept. 8, 1978
2.	Endorsement of nation research program/proposals	Station Research Head	Oct. 15-31, 1977	Sept. 11-22, 1978
3.	Endorsement and submission of agency programs/proposals to PCARR	Agency Head/Research Director	Nov. 1-30, 1977	Sept. 25-Oct. 6, 1978
4.	Submission of Year-end Project progress reports	Research Leader	January 7, 1978	January 7, 1979
5.	Packaging of Commodity research programs and submission of recommended national research program budgets to Budget Commission	PCARR	Feb. 15-March 31, 1978	Nov. 1-Feb. 15, 1978
6.	Technical appraisal of proposals and subsequent revisions of proposals	PCARR Research Leader	April 1-July 31, 1978	March 1-June 30, 1979
7.	Conduct of field evaluation	PCARR	April-July 1978 (or earlier)	April-July 1979 (or earlier)
8.	Submission of mid-year project progress reports and workplans (activity schedule and budget)	Research Leader	July 7, 1978	July 7, 1979
9.	Evaluation of on-going project and workplans, and subsequent revisions of the workplans	PCARR Research Leader	July 8-Sept. 15, 1978	Aug. 1-31, 1979
10.	Reprogramming of agency budgets based on budget ceiling approved by the Budget Commission	PCARR Agency Head Research Director	Oct. 1-Nov. 20, 1978	Oct. 1-Nov. 21, 1979
11.	Dissemination and release of program/project budgets to research agencies	Budget Commission PCARR	Dec. 1-31, 1978	Dec. 1-Dec. 17, 1979
	Submission of Quarterly Financial Report	Agency Acctg. STaff	(15 days after end of quarter)	(10 days after end of quarter)

Source: *Ibid*

(1) *Personal services* – salaries, wages, state insurance, medicare and other related expenditures;

(2) *Travelling expenses* – transportation expenses, allowances/ per diem and other related expenditures;

(3) *Supplies and Materials* – field supplies, laboratory supplies and others needed by the project;

(4) *Sundry Items* – communication expenses; repairs and maintenance of research facilities, building; water supply; and others; administrative cost representing 5% of the total project cost before contingency allowance intended to cover the project's share in direct clerical services and use of office facilities of the implementing agency; contingency cost representing 10% of the cost of maintenance and operating expenses including administrative cost to cover price escalations and other related expenditures; and

(5) *Equipment and capital outlay* – equipment like tools, technical and scientific equipment, machinery and implements, motor vehicles, breeding animals, etc.; and capital outlay like cost of rights to land ownership, cost of building or structure; and cost of permanent improvements to land and structures.

These five items are commonly termed line-item budgets and constitute the *direct* costs of implementing research projects. Starting 1978, however, a new procedure was introduced by PCARR to quantify the *imputed or indirect* project costs, as well.

The idea of measuring the indirect or imputed costs of research is impelled by a desire to arrive at the estimated true costs of research activities. Costing on a direct-cost basis is insufficient since other items like supportive technical and real overhead costs are not usually included.

(See Annex 2 for the PCARR guidelines in computing inputed project costs.)

DETERMINING THE BENEFITS OF AGRICULTURAL RESEARCH

One can surmise from the above discussions that determining the real, true costs of agricultural research is difficult if not altogether impossible.

This difficulty is more keenly felt, however, when one attempts to measure and quantify the returns and benefits accruing from research; more so if one recognizes that real research returns can only

be based on accurate costings in the first place. How much is gained for each peso spent for research? How much of this amount goes to agricultural development, to economic development, to national development, and to national well-being?

A review of foreign references indicate that to some degree some nations have been able to devise mathematical formulas to determine cost-returns from national research undertakings. (See Tables 5 and 6 for summaries of direct cost-benefit type and sources-of-growth type studies of agricultural research productivity.)

TABLE 5
SUMMARY OF DIRECT COST-BENEFIT TYPE STUDIES OF AGRICULTURAL RESEARCH PRODUCTIVITY

Study	*Country*	*Commodity*	*Time Period*	*Annual Internal Rate of Return %*
Griliches (1958)	U.S.A.	Hybrid corn	1940-55	35-40
Griliches (1958)	U.S.A.	Hybrid sorghum	1940-57	20
Peterson (1966)	U.S.A.	Poultry	1915-60	21-25
Evenson (1969)	South Africa	Sugarcane	1945-62	40
Ardito Barletta (1970)	Mexico	Wheat	1943-63	90
Ardito Barletta (1970)	Mexico	Maize	1943-63	35
Ayer (1970)	Brazil	Cotton	1924-67	77 +
Schmitz & Seckler (1970)	U.S.A.	Tomato harvester with no compensation to displaced workers. Assuming compensation of displaced workers for 50% of earning loss.	1958-59	37-46 16-28
Hines (1972)	Peru		1954-67	35-40[a] 50-55[b]
Hayami & Akino (1975)[c]	Japan	Rice	1915-50	25-27
Hayami & Akino (1975)[c]	Japan	Rice	1930-61	73-75

Table 5 (continued)

Study	*Country*	*Commodity*	*Time Period*	*Annual Internal Rate of Return %*
Hertford, Ardila, Rocha, & Trujillo (1975)	Colombia	Rice	1957-72	60-82
	Colombia	Soybeans	1960-71	79-96
	Colombia	Wheat	1953-73	11-12
	Colombia	Cotton	1953-72	None
Peterson & Fitzharris (1975)[c]	U. S. A.	Aggregate	1937-42	50
			1947-52	51
			1957-62	49
			1967-72	34

[a]Returns to maize research only.

[b]Returns to maize research plus cultivation "package."

[c]From papers presented at Conference on Resource Allocation and Productivity in National and International Agricultural Research, Agricultural Development Council, Research and Training Network Program, Airlie House, Virginia, January 26-29, 1975, and which appear as chapter 2 (Hayami & Akino), chapter 3 (Peterson and Fitzharris), and chapter 4 (Hertford, et al.) in the present volume.

Source: Thomas M. Arndt, et al., edited by *Resource Allocation and Productivity*. U. of Minnesota, U. S. A. 1977, p. 5.

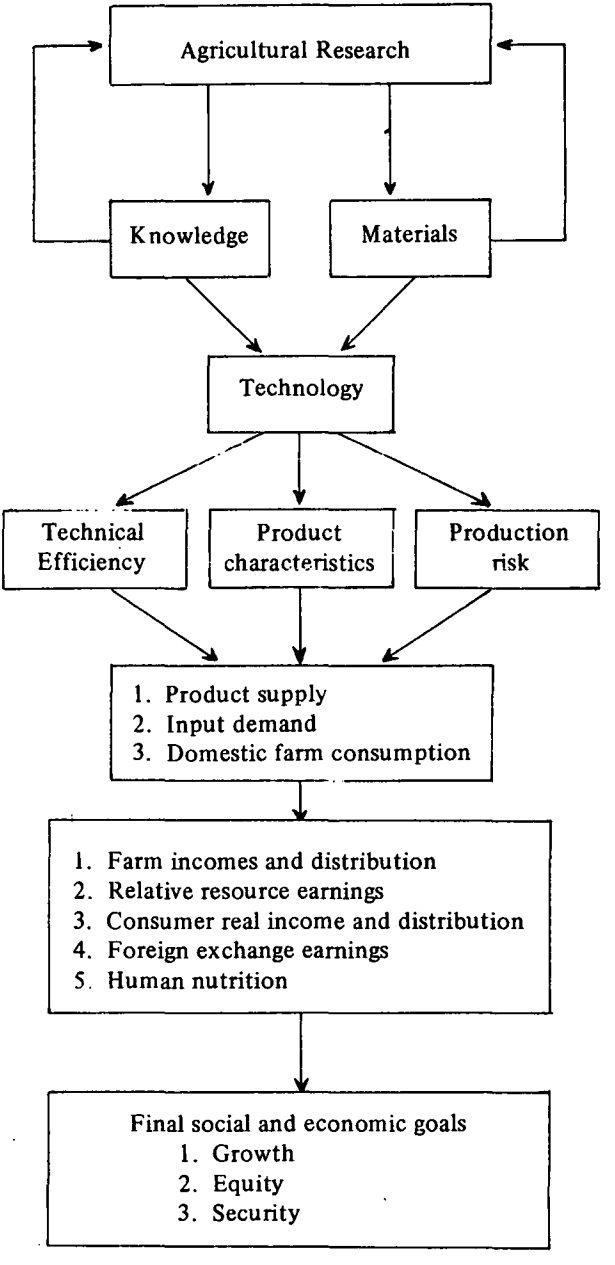
If one goes by productivity measures, research increases agricultural productivity in three general ways: (1) by raising returns to factors of agriculture through the lowering of costs or the increasing of outputs; (2) by improving product quality or introducing new products; and (3) by reducing the farmers' vulnerability to forces beyond his control. Any of these results may contribute to national development goals through changes in such elements as farm income and its distribution among farmers' group, relative resource earnings, consumer real income and its distribution among consumer groups, foreign exchange earnings, and human nutrition. (Figure 4 illustrates the potential outcome and implications of agricultural research.)

Through the years, a number of methods have been devised to measure the returns of agricultural research, with the following factors separately or aggregately considered:

(1) *Consumers' surplus* – represents the compensated demand curve showing the maximum prices a consumer would be prepared to pay for successive, additional units of a commodity.

(2) *Producers' surplus* – difference between what is actually received from the sale of a good and the minimum amount required to induce a seller to part with it.

FIGURE 4
ILLUSTRATION OF THE POTENTIAL OUTCOMES AND IMPLICATIONS OF AGRICULTURAL RESEARCH



(1) set of means to carry out research

(2) working objectives for the scientist

(3) vehicle by which activities, meetings (2) influence the achievement

(4) alternative approach to (5)

(5) final goals

Source: *Ibid.*, p. 418.

TABLE 6

SUMMARY OF SELECTED SOURCES OF GROWTH TYPE STUDIES OF AGRICULTURAL RESEARCH PRODUCTIVITY

Study	*Country*	*Commodity*	*Time Period*	*Annual Internal Rate of Return %*
Tang (1963)	Japan	Aggregate	1880-1938	35
Griliches (1964)	U.S.A.	Aggregate	1949-59	35-40
Latimer (1964)	U.S.A.	Aggregate	1949-59	Not significant
Peterson (1966)	U.S.A.	Poultry	1915-60	21
Evenson (1968)	U.S.A.	Aggregate	1949-59	47
Evenson (1969)	South Africa	Sugarcane	1945-58	40
Evenson (1969)	Australia	Sugarcane	1945-58	50
Evenson (1969)	India	Sugarcane	1945-58	60
Ardito Barletta (1970)	Mexico	Crops	1943-63	45-93
Evenson & Jha (1973)	India	Aggregate	1953-71	40
Kahlon, Saxena, Bal & Jha (1975)[a]	India	Aggregate	1960/61-1972/73	63

[a]From paper presented at Conference on Resource Allocation and Productivity in National and International Agricultural Research, Agricultural Development Council, Research and Training Network Program, Airlie House, Virginia, January 26-29, 1975, and which appears as chapter 5 in the present volume.
Source: *Ibid.*, p. 6.

(3) *Traded commodities* – effects of research in a traded good are critically dependent upon the extent to which its world price is affected by changes in supply.

(4) *Resource unemployment* – research can result in the unemployment of agricultural resources and if not taken into account can lead to errors in estimating research benefits.

(5) *Derived Demand Curve* – demands for farm outputs resources, etc. involve largely derived not final demand curves, yet past research has not made this distinction.

(6) *Distributional effects* – consumers and producers surpluses are not enough; generally it would be more accurate to determine the others who will be affected within the producing and consuming sectors.

If present statistical models are an indication, research returns tend to be quite high averaging about 30-50 percent. Is this the normal trend? Or are some factors (that ought to be considered) not included? The situation is made doubly difficult when time lag is considered from the time a research study is initiated to the time it is finished; and from the time the research is diffused and finally adopted or utilized.

Recent studies point to two major factors that seem to have not yet received due consideration in the computation of research returns:
(1) the imputed costs of the research study itself and of the adoption of its results afterwards at the farm level; and (2) the cost of getting the technology transferred from the research stations to the farms through extension.

At the same time, there are some benefits – especially social ones – that are difficult to quantify for the following reasons:

(1) A given research project is not always equally useful to individual farmers, to the agricultural industry, and to the society as a whole; and it is, therefore, difficult to assign relative weights to the demands of the various groups.

(2) Predicting future research results is obviously difficult and only short-term effects may be readily calculated.

(3) Certain types of research may have negative effects that may not be immediately apparent.

(4) Because of the inelastic demand for certain farm products and the highly competitive nature of agriculture, increasing agri-

cultural productivity can, in some cases, depress farm prices and reduce the total revenue of farmers.

The Philippines has just started looking into determining costs-benefits of research. Naturally, it can refer to the experiences of other countries which have made use of mathematical models to quantify cost-returns of research undertakings.

CHALLENGE

If the PCARR budget from 1972 to 1978 is an acceptable gauge of the growing interest in national agriculture and resources research (see Table 7), indeed the Philippines' concern for the development of a responsive research program is continually growing.

From the period 1972-78, a total of 2,420 projects amounting to ₱271,616,109 were processed by PCARR (see Table 8). These figures do not include the research funds directly allocated to the various government research agencies to finance their individual research and development activities.

On the whole, research efforts in the Philippines are now gaining more support and momentum with the government taking the lead. But like other developing countries in the world, much more is left to be desired:

(1) If we really wish to maximize benefits derived from research, we should be ready to expend a bigger percentage of our national income for research.

(2) Let us intensify coordinative undertakings with the private sector and with the international research agencies in order to gain more support and/or benefits from them. Likewise, expensive research efforts need not be duplicated.

(3) A more systematic device or tool has to be prepared and used to quantify the costs-returns of research, including *all* factors bearing on the research projects.

(4) Some indicators may be difficult to quantify, but nevertheless have to be identified and given due recognition even if only in descriptive form.

(5) Research is just one way to attain national development, but it is a very primary or basic factor.

(6) Agriculture, being the major source of economic growth in the country, has to develop in response to present situations, needs

TABLE 7

PCARR BUDGET (1972-78)

	1972-73	*1973-74*	*1974-75*	*1975-76 (up to June '76)*	*CY 1976 (Jul-Dec. 76)*	*1977*	*1978*
I. Current Operating Expenses	1,500,000	6,000,000	15,000,000	14,504,410	6,998,000	25,818,000	27,604,000
II. Fixed Expenditures	–	–	–	150,000	75,000	150,000	315,000
III. Capital Outlays	–	–	–	1,000,000	–	26,979,000	37,859,000
GRAND TOTAL	1,500,000	6,000,000	15,000,000	15,654,410	7,073,000	52,947,000	65,778,000

Source: J. D. Drilon, Jr. *Paper on Challenge and Opportunities at PCARR – A Management View.* Presented at the 6th Anniversary Program of PCARR, 17 November 1978, Los Baños, Laguna.

TABLE 8.

SUMMARY OF RESEARCH PROPOSALS SUBMITTED TO PCARR EVALUATION MECHANISM (1972-78) BY RESEARCH CATEGORIES

	Biological/Physical Research				*Socio-Economic Research*					
	Basic		*Applied*		*Macro*		*Micro*		*TOTAL*	
Proposals Received/ Processed But Not Approved	176	15,920,298	854	104,192,331	38	5,823,595	36	3,402,157	1,104	129,338,381
Proposals Received/ Processed/Funded by PCARR	73	4,990,019	343	35,278,956	87	7,764,801	12	1,355,129	515	49,388,905
Proposals Processed By PCARR But Funded By Other Agencies	53	5,086,731	488	48,130,029	43	7,034,898	3	387,477	587	60,639,135
Proposals Received/ Processed/Funded By PCARR But Not Implemented For Lack of Funds	18	1,020,174	183	29,390,713	12	1,794,260	1	44,541	214	32,249,688
TOTAL	320	27,017,222	1,868	216,992,029	180	22,417,554	52	5,189,304	2,420	271,616,109

Source: *Ibid.*

and demands. Again, research is a basic contributor to the overall efforts in agricultural development.

(7) The mathematical cost-benefit models presently used by other countries may be a good reference. But before any model is adopted for local use, it should be modified to fit local requirements and conditions.

(8) A satisfactory model has to be evolved in allocating and prioritizing research resources considering their limitations.

(9) A national program that truly reflects the needs of our country and its people has to be formulated and continually updated.

All the above pose a challenge, not only to government policy-makers, research administrators, researchers and academicians, but also to social scientists especially the economists and the statisticians. Are we really interested in quantifying the costs-benefits of research? If so, how can this be done accurately?

The element of uncertainty makes research planning difficult at all stages – from project development to completion. The time element from project initiation to completion as well as from result diffusion and adoption usually take about six to seven years. This time element should also be costed.

The approach by which a research project is viewed – either as a crash program or as a regular one – affects research costs. The amount actually allocated versus the amount requested must be considered carefully. It is not advisable to cut the project budget to unviable proportions, nor is it proper to be too flexible.

In determining the expected returns on research, the ability to predict correctly and to objectively evaluate research projects are two factors that are not quite easy to analyze, much less quantify.

What will be the nature of the research output? What current situations or conditions will the output affect? Who will apply the newly generated techniques? Who and how many will be affected by or be the eventual beneficiaries? How much will be gained or saved annually in the economy as a result of research? How long will it take before new information becomes obsolete? What are and how much are required to apply the research results? How are similar ongoing projects affected by the research results?

Based on the above discussions, two issues stand out: (1) quantification of research costs-benefits in the most accurate and com-

prehensive way possible; and (2) making these quantifications acceptable to the most number of people here and abroad.

In closing, we wish to throw the above challenges to you for consideration. We sincerely hope that in our humble way we have been able to arouse interest that could lead to eventual action. We realize that so much remains to be done; only through concerted action can we expect success.

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ANNEX 1

PRIORITY RESEARCH PROGRAM RANKING

Rationale/Explanatory Note

The developing economy of the Philippines demands the production of impact projects to solve our urgent development needs. The implementation of specified, directed thrusts in our research efforts would give us the needed depth in the achievement of our developmental goals.

Thus, the Secretariat considered the suggestion concluded at the 2nd National Agriculture and Resources System Congress in November, 1976 to establish priorities to meet the demands of the times. The recommendation submitted by the Secretariat was revised by the Governing Council during its 48th Meeting on 18 May 1977. In ranking priorities by research programs, the following criteria were taken into consideration:

I. Relative Importance of the Commodity – points were given based on the commodity's importance, such as major food, foreign exchange earner, etc.
II. Research Needs – Commodities were also given points based on research needs.

As part of the ranking which cannot be accommodated by the commodity approach, Applied Social Sciences are hereby stated to be priorities by the Council:

1) All studies on Applied Economics, Rural Sociology, etc. which have to do with any of the commodities or number of commodities.
The ranking will be based on the ranking of the commodity involved.
2) National studies which cut across commodity lines which are deemed by the Council to be of critical importance to research in agriculture and natural resources, such as macroeconomics studies (e.g., credit policies, irrigation policies, employment and income situation). Specific research priority areas are indicated in Items A and B.

The Governing Council, in its 49th Meeting, approved the following budget allocation:

Priority I	90%	
Priority II	10%	
Priority III	3%	(transitional budget allocation)
Special Urgent Studies and Applied Social Sciences Studies	7%	

*Source: As approved by the PCARR Governing Council in its 49th meeting, 17 June 1977.

Budget allocation within each priority group will be done with the use of the point system evolved by the Secretariat (Item C).

This priority research program rankings will be subject to review once every three years. However, the Governing Council may make necessary changes anytime in cases of:

1) breakthroughs in any particular commodity
2) other circumstances/evidences justify such change/s.

ITEM A

Research Priority Areas For Applied Rural Sociology

1. Improvement of Sociological Data Base
   - 1.1 Development of improved social data base
   - 1.2 Data base and management information systems development for agrarian reform
2. Extension-Development Communications
   - 2.1 Delivery systems for agricultural technology
   - 2.2 Productivity of extension workers
   - 2.3 Role congruence of extension workers
   - 2.4 Organization and management of extension systems
   - 2.5 Feasibility of alternative extension systems
   - 2.6 Studies of support communication prototype materials and programs
   - 2.7 Communication training needs of development agents
   - 2.8 Distribution, utilization, and impact of support development communication programs and materials
   - 2.9 Adoption process and adoption variables in Philippine agriculture
   - 2.10 Typology of communication roles in Philippine rural society.
3. Social organizations and development programs
   - 3.1 Variables associated with sustained rural development
   - 3.2 Extent of participation of rural people in rural development planning
   - 3.3 Study of development models
   - 3.4 Management study of formal social organizations
   - 3.5 Evaluation of integrated area development scheme
   - 3.6 Use and effectiveness of para-professionals for agricultural development
   - 3.7 Social organizations (Selda, Samahang Nayon, Compact Farms, etc.) as channels of development communication
   - 3.8 Communication patterns and styles in coordinating development programs
4. Formal and Non-Formal Education in Agriculture and Natural Resource
   - 4.1 Cost/benefit analysis of education in agriculture, forestry, fisheries, and mines

4.2 Development of criteria for the establishment and/or integration of agricultural, forestry, fisheries, and mines schools
4.3 Impact of agricultural schools on the development of their respective regions
4.4 Organization and management of agricultural schools (including linkages)
4.5 Evaluation of various curricula of agricultural schools (including the MATEA program)
4.6 Evaluation of non-formal education programs in agriculture

5. Manpower Requirement for Agriculture and Natural Resources
   5.1 Manpower needs and resources in agriculture, forestry, fisheries, and mines
   5.2 Role of agricultural schools in training manpower replacement in agriculture (e.g. farmers)
   5.3 Training needs of rural out-of-school youth
   5.4 Placement of graduates of agricultural schools and non-formal training schools
6. Agricultural Financing
   6.1 Evaluation of financing institutions
   6.2 Socio-psychological and cultural factors associated with repayment of loans
   6.3 Correspondence between intended and actual use of agricultural credit
   6.4 Socio-psychological study of various agricultural financing systems
   6.5 Ownership structure of rural banks and its implication on policies and performance
   6.6 Development and testing of credit education program
7. Agrarian and Resettlement Systems
   7.1 Policy objectives
   7.2 Coordination in policy implementation of Operation Land Transfer
   7.3 Role of farmers' organization in agrarian reform
   7.4 Investment possibilities for ex-landlords
   7.5 Agrarian law administration and enforcement
   7.6 Tie-up of government projects with the agrarian reform program
   7.7 Impact of agrarian reform on small farmers and depressed sectors of the rural areas
   7.8 Role of women in agrarian reform
8. Decision-Making, Value System and Motivation in Relation to Agricultural Development
   8.1 Value systems of and differences in the perception by farmers, technicians and others of problems in the implementation of rural development programs

8.2 Decision-making processes among rural families (including income utilization)
8.3 Attitudes, motivation, and responsiveness of rural people to various monetary and non-monetary incentives
8.4 Entrepreneurial motivations of farmers, fishermen, and miners

9. Social Aspects of Land Use
   9.1 Studies on how to make tenant-beneficiaries economically viable farmers
   9.2 Land tenure studies of crops other than rice and corn
   9.3 Housing and homelot ownership of landless tenants and agricultural laborers
   9.4 Implications of urbanization on land use, employment and income
10. Ethno-Communities
   10.1 Social systems, values, and socio-economic studies of ethnic communities
11. Local Government
   11.1 The role of local government in rural development
12. Impact of infrastructure on Rural Development
   12.1 Implications of infrastructure programs on productivity, labor use, and economic viability of communities.

ITEM B

Research priority areas for Macro-Economics

1. Improvement of Data Base
   1.1 Development of information systems for socio-economic data base
   1.2 Longitudinal survey of a permanent panel of farmers
2. Manpower Resources and Employment
   2.1 Effects of wage rate policies on the labor absorption in agriculture (including fisheries, forestry, and mines) sector
   2.2 Labor absorption effects of farm mechanization
   2.3 Economic potentials of the unemployed/underemployed
3. Marketing and Prices
   3.1 Inter and Intra-regional commodity flow and transport facilities
   3.2 Market structure, conduct, and performance of marketing system for major crops and livestock
   3.3 Product loss in the marketing system
4. Resource Use and Management
   4.1 The economics of resource use patterns and potential
   4.2 Extraction/Exploitation of non-renewable resources

5. Equity and Income Distribution
   - 5.1 Baseline study of the distribution of income for non-labor factors of production
   - 5.2 Poverty study
   - 5.3 Distribution effects of technological change
6. Agricultural Financing and Credit
   - 6.1 Credit delivery systems: problems and prospects
   - 6.2 Farmers attitudes toward savings, credit, and repayment
   - 6.3 Feasibility of consumption credit
   - 6.4 Mobilization of savings in rural areas
7. Rural Institutions
   - 7.1 Factors that determine institutional effectiveness and viability
8. Investment Feasibilities
   - 8.1 Costs and returns studies
   - 8.2 Infrastructure feasibility studies
   - 8.3 Commodity feasibility studies
9. International Trade
   - 9.1 Policies for international/regional collaborations in the context of ASEAN and other regional alliances
   - 9.2 Effects of multinationals on exports
10. Land Transfer
    - 10.1 Socio-economic analysis of Operation Land Transfer
    - 10.2 Socio-economic conditions of landless rural workers
    - 10.3 Baseline study of agricultural land market.
11. Agribusiness
    - 11.1 Integrating subsistence farmers into the commercial food system
    - 11.2 Design and feasibility of institutional and physical infrastructures for agribusiness development
    - 11.3 Agribusiness entrepreneurship

ITEM C

Priority Research Program Rankings

Criterion I Relative Importance of the Commodity
Criterion II Research Needs

	Criterion I	*Criterion II*	*Total*
Priority I			
Aquaculture	3.5	4.0	7.5
Forage, Pasture and Grasslands	2.5	4.0	6.5
Corn and Sorghum	5.0	3.0	8.0
* Legumes (soybean, mungo and cowpea, peanut)	1.0	4.0	5.0
Sugarcane	4.5	4.0	8.5
Coconut	4.5	5.0	9.5
Reforestation and Forest Watersheds	2.5	5.0	7.5
*Timber Products (Silvi-cultural aspects)	4.5	5.0	9.5
Marine Fisheries	5.0	5.0	10.0
Carabeef	3.5	5.0	8.5
*Vegetable Crops (tomato, melons, garlic and onion)	3.5	3.0	6.5
*Root Crops (sweet potato, white potato, cassava)	3.5	4.0	7.5
*Fiber Crops (abaca, cotton)	2.0	3.0	5.0
*Non-timber Forest Products (bamboo, rattan, fuelwood, oleoresin, medicinal species**)	4.5	4.0	8.5
Metallic Minerals[1]) Agricultural Engineering[2])	Not yet determined		

	Criterion I	*Criterion II*	*Total*
Priority II			
Rice	5.0	1.0	6.0
Tobacco	1.5	4.0	5.5
Beef/Chevon	3.5	4.0	7.5
Fruit Crops (banana, mango, pineapple, papaya, citrus, cashew)	4.5	3.0	7.5
*Non-timber Forest Products (essential and seed oils, exudates and extractives, barks and bast fibers)	4.5	4.0	8.5
Farming Systems	3.0	4.0	7.0
Inland Waters	2.5	4.0	6.5
Water Resources	3.0	5.0	8.0
Soil Resources	3.0	4.0	7.0
Parks and Wildlife Management	2.5	5.0	7.5
*Timber Products (utilization aspects)	4.5	5.0	9.5
Non-metallic (ceramics, fertilizer, salt and other non-metallic)[3]	Not yet determined		

	Criterion I	*Criterion II*	*Total*
Priority III			
Swine	3.5	1.0	4.5
Poultry	3.5	1.0	4.5
Dairy	1.0	4.0	5.0
*Fiber Crops (ramie, jute, kenaf, sericulture)	2.0	3.0	5.0
Plantation Crops (rubber, coffee, cacao, sunflower, African oil palm, castor oil, spices)	1.5	4.0	5.5
Pulpwood, Fiberboards and Paper products	1.5	3.0	4.5
Ornamental Horticulture	1.0	4.0	5.0
*Vegetable Crops (eggplant, pepper, pechay, cabbage)	3.5	3.0	6.5
Root Crops (gabi, yams)	3.5	4.0	7.5
Legumes (beans, peas)	1.0	4.0	5.0

1. Approved as Priority I commodity during the Governing Council's 52nd meeting.
2. Approved as Priority I commodity during the Governing Council's 64th meeting.
3. Approved as Priority II commodity during the Governing Council's 52nd meeting.

*In cases where commodities appear in two groupings, the higher priority ranking determines the fund allocation.
**Preliminary screening for 3 or 4 species where breakthroughs are most likely.

N.B. It was agreed that the two research programs on Mines would be considered when their respective priority research areas have been finalized.

ANNEX 2

GUIDELINES ON COMPUTATION OF IMPUTED PROJECT COSTS

Research projects have so far been costed only on a direct costs basis such that the total project cost being considered consists merely of the accumulated *direct* changes for personal services, maintenance and operating expenses, and equipment and capital outlay. This, in effect, is understating the true cost of the projects, since other items like supportive technical and overhead costs are not being considered.

Hence, it is recommended that such additional costs be considered and added to the researchers' actual funded project cost, to arrive at the estimated true costs of the national agricultural research activities. The items that may be imputed to the research projects' cost are the following:

- *Imputed Technical Personnel Cost.* This is the cost allocated to specific projects based on percentage of actual time devoted to the project by the implementing stations' existing technical staff, consisting of researchers/scientists who conduct the project.
- *Imputed Supportive Overhead Cost.* This is part of the implementing research station's annual administrative/supportive technical staff expenses as well as the station's annual maintenance and operating expenses. While not all of these expenses should be considered since the station must have other activities not directly related to research project implementation, nevertheless a portion of these expenses should be allocated to all the research projects being implemented by the station. The supportive overhead rate may be derived by applying the following formula:

$$SOR = \frac{\% \times (ASTS + MO)}{DPS + DMO}$$

where

SOR = supportive overhead rate

$\%$ = percentage obtained by dividing the total imputed technical personnel cost for all projects by the total amount actually obligated for salaries/wages for the current year by the implementing research station covering existing technical personnel staff involved in the project.

$ASTS$ = administrative and supportive technical staff consisting of the station head and other supportive technical people of the station

MO = maintenance and operating expenses or the related expenses of the research station

DPS + DMO = the total of the direct personal services and the direct maintenance and operating expenses for all projects being implemented by the station.

This means that each project being implemented by the station would be charged (theoretically) with the supportive cost by simply applying the supportive overhead rate obtained through the above formula to every peso of the project's direct personal services and direct maintenance and operating costs.

Hence, the total additional cost imputed to the project would be the sum of the imputed technical and supportive overhead costs.

To arrive therefore at the estimated true cost of the research projects, the following steps are to be taken by the parties indicated:

A. *Research Leader* – furnishes the research station head the following information, together with his (leader's) research proposal:

- A.1 – List of existing station technical staff who will conduct the research project
- A.2 – Position title of each of the above staff
- A.3 – Annual Salary/Wage of each existing technical staff listed
- A.4 – Percentage of time to be spent for the project by each staff
- A.5 – Cost of project services of existing technical staff which is obtained by applying the percentage of time spent in A.4 to the annual individual salary/wage in A.3

B. *Research Station Head* – assisted by his supportive technical staff, prepares the Schedule of Imputed Technical Personnel Costs (PARRS E-2) in the following manner:

- B.1 – Lists down all on-going projects being implemented by his research station on a project-to-project basis
- B.2 – Lists down all existing station technical staff involved in project implementation on a project-to-project basis, based on actual records of on-going projects with a cursory check of research proposals corresponding thereto
- B.3 – Completes Form E-2 by deriving the imputed technical costs of projects on a project-to-project basis
- B.4 – Sends original Form E-2 to agency accountant on or before the 10th of December.

C. *Agency Accountant* – upon preparation of the *4th Quarter Financial Report* (PARRS Form E-4) for each project, prepares the Imputed Project Costs (*refer to sample computation shown in page to of Annex I*), by performing the following steps:

NOTES: 1. Refer to sample computations shown in pages 4 to 8 of ANNEX I. (based on assumed figures).

2. As indicated, the Imputed Project Cost will be reflected only in the 4th Quarter Financial Report, showing the total to-date figures as of the period being reported on.

C.1 – Prepares a list of projects being implemented by each research station during the current year, obtaining his inputs on imputed technical personnel costs from PARRS Form E-2 submitted earlier by the research station head

C.2 – Prepares a schedule to obtain the total budgeted direct personal services and maintenance/operating expenses for each of all projects being implemented by the research station

C.3 – Obtains the percentage of imputed technical personnel cost to total salaries/wages of existing personnel payroll for inclusion in the station's overhead distribution to research projects

C.4 – Obtains from accounting records the actual obligations incurred during the current year by the research station for expenses like salaries of station head and supportive technical staff, maintenance/operating expenses of the station.

C.5 – Computes the supportive overhead rate (SOR) chargeable to every peso of direct personal services (DPS) and direct maintenance/operating expenses (DMO) for charging to each project being implemented by the research station.

C.6 – Summarizes the total estimated true cost of each project by obtaining the sum of the total imputed costs and the budgeted direct costs, and reflects this in the 4th quarter Financial Report (PARRS Form E-4) on a project-to-project basis.

ANNEX 2 (4)

IMPUTED PROJECT COSTS
(PROCEDURE OF COMPUTATION – ASSUMED INPUTS)

I. PROJECTS BEING IMPLEMENTED BY X RESEARCH STATION FOR CURRENT YEAR

APPROVED BUDGET FOR CURRENT YEAR

Projects	*Salaries/Wages of Additional Hires (DPS)*	*Maintenance and Operating (DMO)*	*Total Budgeted Direct Personal Services and Maintenance/Operating Expenses*
A	₱ 3,000	₱25,000	₱28,000
B	2,000	15,000	17,000
C	2,500	20,000	22,500
D	1,800	10,000	11,800
TOTAL	₱ 9,300	₱70,000	₱79,300

(NOTE: ABOVE DO NOT INCLUDE DIRECT BUDGETS FOR EQUIPMENT/CAPITAL OUTLAYS.)

ANNEX 2 (5)

II. COMPUTATION OF IMPUTED TECHNICAL PERSONNEL COST BASED ON ACTUAL OBLIGATIONS INCURRED FOR SALARIES/ WAGES – CURRENT YEAR

Projects	*Existing Personnel* *Name*	*Amount Obligated*	*Percentage of Time Spent to Project*	*Imputed Technical Personnel Cost to Project*	*Balance of Payroll for Inclusion with Supportive Overhead Costs*
A	––	₱ 18,000	20%	₱ 3,600	₱ 14,400
	––	15,000	80%	12,000	3,000
	––	12,000	50%	6,000	6,000
		₱ 45,000		₱ 21,600	₱ 23,400
B	––	₱ 15,000	40%	₱ 6,000	₱ 9,000
	––	10,000	50%	5,000	5,000
		₱ 25,000		₱ 11,000	₱ 14,000
C	––	₱ 18,000	50%	₱ 9,000	₱ 9,000
		12,000	50%	6,000	6,000
		₱ 30,000		₱ 15,000	₱ 15,000
D	––	₱ 15,000	20%	3,000	₱ 12,000
		12,000	30%	3,600	8,400
		₱ 27,000		₱ 6,600	₱ 20,400
TOTAL		₱127,000		₱ 54,200	₱ 72,800

PERCENTAGE TO TOTAL SALARIES/WAGES . . . . . ₱ 54,200 or 43%
₱127,000

ANNEX 2 (6)

III. ACTUAL OBLIGATIONS INCURRED
FOR OVERHEAD EXPENSES CURRENT YEAR
BY IMPLEMENTING RESEARCH STATION

A. Administrative Staff/Technical Staff Payroll (ASTS) including balance of payroll for CY of staff listed in existing personnel:

-- Research Station Head, Clerical, etc.	₱ 27,200
-- Balance Payroll Existing Staff per No. II	72,800
ASTS	₱100,000
B. Maintenance/Operating Expenses	150,000
TOTAL	₱250,000

IV. FORMULA FOR COMPUTATION
SUPPORTIVE OVERHEAD COSTS (SOR)

A. The supportive overhead rate (SOR) may be obtained by the following formula:

$$SOR - \frac{\% \times (ASTS + MO}{DPS + DMO})$$

where:

SOR = Supportive Overhead Rate

% = Percentage of total imputed technical personnel cost to the total amount actually obligated for personal services for existing personnel implementing the projects

ASTS = Administrative and supportive technical staff. This will include, among others, the station head, clerical staff, utility personnel, and will also include the balance (last column, No. II).

MO = Maintenance and Operating expenses of the implementing research station

DPS = Direct personal services budgeted for the project – current year

DMO = Direct maintenance/operating expenses budgeted for the project – current year

B. Computation of Supportive Overhead Rate (SOR):

$$SOR = \frac{\% \times (ASTS + MO)}{DPS + DMO}$$

$$= \frac{.43\ (₱100{,}000 + ₱150{,}000)}{₱\ 9{,}300 + ₱70{,}000}$$

$$= \frac{₱107{,}500}{₱\ 79{,}300}$$

= ₱1.36 Chargeable for every ₱1.00 of direct personal services (DPS) and direct maintenance/operating expenses (DMO) of each projects.

V. COMPUTATION OF IMPUTED SUPPORTIVE OVERHEAD TO PROJECTS

Projects Being Implemented By Research Station	*Direct Maintenance/Operating Costs Current Year (No. 1)*	*SOR Per Peso of Direct Costs (No. IV)*	*Imported Supportive Overhead to Project*
Project A	₱23,000	₱1.36	₱ 38,080
Project B	17,000	1.36	23,120
Project C	22,500	1.36	30,600
Project D	11,800	1.36	16,048
TOTAL	₱79,300		₱107,848

VI. COMPUTATION OF TOTAL
ESTIMATED TRUE PROJECT COST

Project	*Imputed*			*Budgeted*	*Total Estimated*
	Technical Personnel Cost	*Supportive Overhead Cost*	*Total Imputed Costs*	*Direct Costs*	*True Cost*
A	₱ 21,600	₱ 38,080	₱ 59,680	₱ 28,000	₱ 87,680
B	11,000	23,120	23,120	34,120	51,120
C	15,000	30,600	45,600	22,500	68,100
D	6,600	16,048	22,648	11,800	34,448
TOTAL	₱ 54,200	₱107,848	₱162,048	₱ 79,300	₱241,348

CONCLUSION:

THE FOREGOING COMPUTATIONS SHOW THAT WHILE THE TOTAL APPROVED BUDGET FOR PERSONAL SERVICES AND MAINTENANCE/OPERATING EXPENSES FOR ALL PROJECTS BEING IMPLEMENTED BY X RESEARCH STATION FOR THE CURRENT YEAR AMOUNTS ONLY TO ₱79,300, YET WHEN THE IMPUTED COSTS (INDIRECT COSTS) OF ₱162,048 IS CONSIDERED, THE TOTAL ESTIMATED TRUE COST OF ALL PROJECTS (EXCLUSIVE OF DIRECT BUDGETED EQUIPMENT/CAPITAL OUTLAYS) IS ₱241,348. THE TOTAL IMPUTED COSTS WILL BE COMPUTED AND REFLECTED IN THE 4TH QUARTER FINANCIAL REPORT BY THE AGENCY ACCOUNTANT ON A PROJECT-TO-PROJECT BASIS.