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Resource Allocation to Agricultural Research

Proceedings of a Workshop held in Singapore 8-10 June 1981

Editors: Douglas Daniels and Barry Nestel

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Postal Address: Box 8500, Ottawa, Canada K1G 3H9
Head Office: 60 Queen Street, Ottawa

Daniels, W.D.
Nestel, B.L.

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The untimely death of Dr J.D. Drilon, who was to attend the workshop as a representative of IFARD, is a great loss to all concerned with improving the welfare of the rural poor. This publication is dedicated to his memory.

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Agricultural Research Resource Allocation in Nepal

Ramesh P. Sharma[1]

The objectives of this study were: to describe existing mechanisms for allocating research resources; to prepare an inventory of total agricultural research resources and their distribution over various commodities; and to assess the allocation pattern of resources relative to the importance of commodities in the country. The study is limited to a 5-year period from 1975/76 to 1979/80.

Nepal is predominantly an agricultural country, and agriculture has received top priority in successive plans, as indicated by the allocation of funds to this sector. In spite of considerable investments made in production-augmenting inputs and services during the last decade, the average annual growth rate of agricultural production has been less than 1%. Because the population growth rate is more than 2%, a rapid increase in food production has been the main objective of agricultural development in Nepal.

Agricultural Research in Nepal

The agricultural research system in Nepal was initiated three decades ago, however, research infrastructures have only been established since the early sixties. Agricultural research is conducted by national public institutions. A list of all research institutions and their respective areas of research is given in Table 1, which shows that 15 institutions under four ministries are involved in agricultural research. Due to data constraints, not all research areas could be included in this study. The bulk of agricultural research is conducted within the Ministry of Food and Agriculture. Experimental research farms are scattered in various parts of the country.

There is some amount of overlapping and duplication in research efforts both within institutions and among institutions. Furthermore, as there was no plan to guide establishment of experimental farms in different locations, duplication of work in similar ecological regions is common. A major factor behind this wastage of effort is the lack of an effective institution to decide on priorities and to coordinate research programs in the country. A proposal for creating an Agricultural Research Council has been submitted to His Majesty's Government because it appears that such an institution is urgently needed to guide the agricultural research system in Nepal.

The most important declared objective of agricultural development in Nepal is to increase food production. Agricultural research is expected to play a crucial role by promoting timely modernization, diversification, and continuous improvement. Research that contributes toward increasing production and productivity is to receive top priority.

Resource Allocation System

Financial resource allocation in agricultural research is not different from the budget allocation system of His Majesty's Government of Nepal. The steps followed in budget allocation to research units are: (1) research programs are identified at the national level and allocated to research farms; (2) based on the programs, the research farms prepare an annual budget and submit requests to their department; (3) the department reviews the request and forwards it to its ministry; (4) the ministry reviews and forwards it to the Finance Ministry; (5) the Finance Ministry makes a final review and necessary adjustments; and (6) a sequence of backward readjustments starting from the concerned ministry takes place until the budget at the lowest unit in the hierarchy is ascertained.

Thus the budget adjustment, which in most cases means deduction, occurs at several places. The Finance Ministry is more concerned with the aggregate

[1] Agricultural Projects Services Centre (APROSC), P.O. Box 1440, Lazimpat, Kathmandu.

Table 1. Institutions conducting agricultural research in Nepal (research areas are given in parentheses).

Ministry of Food and Agriculture
Department of Agriculture (Agricultural Crops, Horticulture, Fisheries)
Department of Livestock and Animal Health (Livestock)
Tea Development Corporation (Tea)
Food and Agriculture Marketing Services Department (Agroeconomics, Statistics, Marketing)
Agricultural Projects Services Centre (Agroeconomics)
Ministry of Industry and Commerce
Jute Development Corporation (Jute)
Tobacco Development Board (Tobacco)
Agricultural Tools Factory (Agricultural Tools)
Agricultural Lime Industry (Agricultural Lime)
Ministry of Forest
Botany Department, Department of Medicinal Herbs (Forest Products, Medicinal Herbs)
Forestry Survey and Research Department (Forestry)
Department of Soil and Water Conservation (Soil and Water)
Ministry of Education (University)
Centre for Economic Development and Administration (Agroeconomics)
Agricultural Campus (Agriculture Livestock)
Research Centre for Applied Science and Technology (Agricultural Technology)

ministerial budget; whereas, allocation to various research farms takes place mostly at the departmental level. At this level, research must compete with other areas like extension, as well as with various other programs. One important basis of budget allocation is the soundness of the research project. The fact that budget deduction is a very common feature indicates a failure on the part of individual research farms to produce sound research projects that strongly justify the budget request. It is likely that in such a situation informal procedures are more important.

It is suggested that for improvement either: (1) there should be an effective organization to bargain for research programs; or (2) the budget allocation process for research should be made more independent of the governmental budget allocation system.

Because agricultural research is entirely in the public sector, manpower allocation is the same as in other public sectors. A departmental request for a new post must be submitted to the Finance Ministry and the Administrative Management Department (AMD), the former for budget provision and the latter for the sanction of the post. A committee of representatives from these two organizations and the concerned ministry, reviews the case and forwards it to Cabinet. Once the Cabinet approves the post, the Public Service Commission advertises, selects, and recruits the staff. The whole process can take 6 months to more than 1 year. To a large extent the time required for the whole process depends upon how matters are expedited, both formally and informally. Recruitment to a new permanent post is a lengthy and cumbersome process.

Temporary recruitment is less stringent. After the approval of the committee, the concerned department can advertise and recruit its staff. But the motivation to work is low because the person will be released as soon as the Public Service Commission manages to select a candidate for the permanent post.

One prompt and efficient means of mitigating a temporary shortage of staff in a particular area is to send someone on deputation. As recruitment of new staff takes time and may be constrained by nonavailability of trained manpower, this system is very popular. However, improper influences are often used to secure transfers to attractive areas at the cost of continuity of involvement in the former post. Research suffers from this discontinuity.

Resource Allocation Trend

Financial Allocation

During 1975/76 to 1978/79[2] the average annual rate of increase in the agricultural research budget was 21%; food crops and agricultural engineering research recording the highest rates of increase. During 1975/76 to 1979/80, of the average total research budget of Rs. 26 million[3] per year, 68% was allocated to crops (about 53% to food crops and 16% to cash crops). When research areas like basic biology, agricultural engineering, and soil/water, which indirectly support crops research, are included, almost 83% of the research budget was allocated for crops. Horticulture and forestry research each claimed about 6% of the total budget, while 4% was spent on livestock and fishery research.

Over the years, the share of the research budget allocated to food crops has increased. It declined for cash crops, horticulture, and fisheries but remained constant in areas like biology, engineering, and soil/water (Tables 2 and 3).

During the study period, food crops received 77% of the crops research budget. Paddy, maize,

[2] Due to some exogenous reason that applied to all governmental programs, the budgets allocated to most sectors declined in 1979/80 relative to 1978/79.

[3] Rs. 12 = U.S.$1.

Table 2. Commodity-oriented agricultural research budget allocation (in thousands of rupees).

	1975/76	1976/77	1977/78	1978/79	1979/80
Cereal Crops	*8110*	*12470*	*14446*	*19042*	*14243*
Paddy	2374	4749	4879	6459	4699
Maize	3006	3770	4635	6428	5079
Wheat	2439	3656	4620	5770	4113
Millet	30	35	55	67	70
Barley	104	92	100	106	113
Pulses	48	68	71	95	103
Others	73	100	86	117	66
Cash Crops	*3970*	*3389*	*3413*	*4218*	*5342*
Potato	391	659	878	1021	2587
Sugarcane	959	509	441	527	435
Oilseeds	1062	835	454	808	505
Cotton	536	300	356	382	320
Jute	315	360	495	640	690
Tobacco	380	420	480	630	620
Cardamom	109	159	136	193	154
Ginger	218	147	173	17	31
Tea[a]	—	—	—	—	—
Livestock	549	658	738	757	795
Horticulture	1685	1516	1718	1879	1514
Fishery	291	530	382	381	290
Forestry	1088	1656	1466	1901	2109

[a]There are no research programs on tea.

Table 3. Budget allocation (in thousands of rupees) to research activities that are difficult to attribute to commodity categories.

	1975/76	1976/77	1977/78	1978/79	1979/80
Agri. botany	525	448	451	500	538
Plant pathology	484	500	564	600	542
Entomology	519	525	536	1187	739
Soil science and agri. chemistry	613	715	897	861	864
Agri. engineering	530	678	807	1245	1064
Soil and water resources	350	437	386	433	481

and wheat received 97.6% of the total food crops; whereas, only 2.4% was spent for research on millet, barley, and pulses. Cash crops research claimed 16% of the total agricultural research budget and 23% of the crops research budget. Of the total cash crops budget, potatoes received the largest share (27%) followed by oilseeds (18%), sugarcane (14%), tobacco and jute (each 12%), cotton (9%), cardamon (4%), and ginger (3%). Tea is an important cash crop for Nepal, but no research program has been initiated.

Manpower Allocation

Total agricultural research manpower (including nonresearch areas) increased from 352 (officers) and 1045 (assistants)[4] in 1970/71 to 773 (officers) and 2450 (assistants) in 1979/80. In terms of administrative division of officer level manpower, 7% are in

[4] Officer level: those with B.Sc. or above; assistant level: matriculation and 1–2 years training.

Class I, 22% in Class II, and 71% in Class III. Similarly, 2% have a Ph.D., 26% have a M.Sc., and 72% have a B.Sc. The vacancy rate is about 15% at the officer level and 9% at the assistant level. Of the total agricultural manpower, 29% at the officer level and 12% at the assistant level are engaged in research.

The total number of agricultural research scientists in Nepal is 226, which means that there are 17 research scientists for every 1 million people in the agricultural population. The distribution of research manpower in different research areas is shown in Tables 4 and 5. The highest concentration of manpower is in crops research, about 47% of all manpower. However, when noncommodity research areas indirectly supporting crops research are taken into account, crops research engages 80% of all research manpower. After crops, research on forestry, horticulture, livestock, and fisheries have received the remaining manpower (Table 4).

About 77% of all officer level crops research manpower is allocated to food crops, the rest goes to cash crops. Paddy, maize, and wheat have together claimed 95% of all food crops research manpower and 67% of all crops research manpower. Millet, pulses, and barley research programs received only 5% of all manpower engaged in research on food crops.

In cash crops, cotton research has engaged 35% of cash crops research manpower. Of the remainder, 19% are in the sugarcane program, 13% each in the potato, oilseeds, and tobacco programs, and the rest are in jute and cardamon.

Table 4. Distribution of manpower (in man-years) involved in agricultural research by commodity (1980).

	Scientists[a]	Assistants[b]
All Crops	*97.3*	*149.2*
Food Crops	*75*	*96*
Paddy	27	35
Maize	24	28
Wheat	20	29
Millet	0.5	1.5
Barley	1.1	0.7
Pulses	2.1	1.7
Cash Crops	*22.3*	*53.2*
Potato	3	5.4
Sugarcane	4.3	6.4
Oilseeds	3	5.4
Cotton	7	21
Jute	1	4
Tobacco	3	7
Cardamom	1	4
Horticulture	13.5	18
Livestock	10	6
Fishery	4	6
Forestry	21	22

[a]Those with the degree of B.Sc. or above.
[b]Junior technicians (JT) have matriculation and 2 years training; junior technical assistants (JTA) have matriculation and 1 year training.

Table 5. Distribution of manpower (in man-years) in research areas not attributable to commodities (1980).

Research area	Scientists	Assistants
Entomology	15	14
Soil science and agri. chemistry	19	18
Agri. botany	12	15
Plant pathology	15	13
Plant quarantine	6	8
Agronomy	3	1
Agri. engineering	8	13
Soil and water research	2	5

Assessment of Resource Allocation Pattern

Financial Resource

The average agricultural research expenditure between 1975/76 and 1979/80 was 0.15% of GDP and 0.23% of the agricultural GDP. Research expenditure relative to agricultural GDP appears to be somewhat higher than in countries like Indonesia and Bangladesh but considerably lower than in developed countries and some other Asian countries.

Research investment relative to the value of production is: 0.33% in crops, 0.24% in horticulture, 0.02% in livestock, 0.26% in fisheries, and 0.21% in forestry. Thus, investment in crops research in relative terms is higher than in other sectors. Relative investment in livestock research is very low (Table 6).

The annual rate of growth in research investment relative to value of production is highest in crops, constant in livestock, and fluctuates in horticulture, fisheries, and forestry. This shows that unless corrective steps are taken, only crops research investment is likely to move in accordance to its value of production.

The distribution of research investment as a percentage of production value for the various crops during 1975/76 to 1979/80 was: millet and pulses, 0.01–0.02%; paddy and barley, 0.19%; oilseeds and jute, 0.24–0.29%; maize and wheat, 0.42–0.49%; and sugarcane and tobacco, 0.60–0.67%. The value

Table 6. Agricultural research expenditure relative to agricultural GDP and total agricultural research expenditure (figures in millions of rupees).

	1975/76	1976/77	1977/78	1978/79	1979/80	Average
Total Agri. Res. Expend. (TARE)	17.778	22.816	25.053	32.295	27.950	25.178
Crops						
Agri. GDP	6746	6121	6168	6411	5743	6238
Res. expend.[a]	14.165	18.456	20.749	27.377	23.242	20.798
As % of agri. GDP	0.21	0.30	0.34	0.43	0.40	0.33
As % of TARE	79.7	80.9	82.8	84.8	83.2	82.6
Horticulture						
Agri. GDP	699	668	668	711	721	693
Res. expend.	1.685	1.516	1.718	1.879	1.514	1.662
As % of agri. GDP	0.24	0.23	0.26	0.26	0.21	0.24
As % of TARE	9.5	6.6	6.9	5.8	5.4	6.6
Livestock						
Agri. GDP	3482	3324	3358	3394	3421	3396
Res. expend.	0.549	0.658	0.738	0.757	0.795	0.699
As % of agri. GDP	0.02	0.02	0.02	0.02	0.02	0.02
As % of TARE	3.1	2.9	2.9	2.3	2.8	2.8
Fishery						
Agri. GDP	132	133	134	159	166	145
Res. expend.	0.291	0.530	0.382	0.381	0.290	0.375
As % of agri. GDP	0.22	0.40	0.28	0.24	0.17	0.26
As % of TARE	1.6	2.3	1.5	1.2	1.0	1.5
Forestry						
Agri. GDP	556	895	813	805	882	790
Res. expend.	1.088	1.656	1.466	1.901	2.109	1.644
As % of agri. GDP	0.20	0.18	0.18	0.25	0.24	0.21
As % of TARE	6.1	7.3	5.8	5.9	7.5	6.5

[a]Includes research areas like agricultural engineering, basic biological research, and soil/water research, which indirectly support crops research, but excludes some crops whose contribution to agricultural GDP is not available. They are some minor food crops, cotton, cardamom, and ginger.

for all food crops was 0.26% and for all cash crops was 0.33%. These figures show that all food crops, other than maize and wheat, seem underinvested in research; whereas, on the whole, cash crops research has received a high level of investment relative to its production value.

When the level of investment is compared to cultivated area, food crops appear underinvested (to the extent of 11%) and cash crops overinvested (to the extent of 50%). The millet and paddy research programs are especially underinvested (Table 7).

Relative to the importance of food crops in the consumption pattern in Nepal, all food crops except wheat have been underinvested. Millet and barley research show considerable underinvestment (Table 7).

The three criteria used here broadly confirm the imbalance in relative resource allocation in crops. With reference to these three criteria, rice and millet research is underinvested; maize and wheat research is overinvested.

Manpower Resource

The percentage distribution of agricultural research manpower and the value of production of the various sectors is:

	Crops	Horti-culture	Live-stock	Fish-eries	For-estry
Value	56	6	30	1	7
Manpower	66	9	7	3	14

These figures show a relatively uneven distribution in value of production and manpower (excluding noncommodity research manpower). The livestock sector appears grossly understaffed, whereas fisheries and forestry are relatively overstaffed. Relatively, the crops sector appears to be nearest to the optimal allocation pattern.

Table 7. Percentage distribution of research investment relative to area under crops and consumption pattern.

	Research		Cultivated area	Consumption levels
	Investment	Manpower		
Paddy	27	31	52	42
Maize	27	28	18	36
Wheat	24	23	14	12
Millet	0.3	0.6	5	10[a]
Oilseeds	4	3.2	5	—
Potato	7	3.2	2	—
Others[b]	10	11	4	—

[a]Out of this, 7% is millet and 3% is barley.
[b]Includes barley, sugarcane, tobacco, and jute.

A disproportionate distribution of manpower relative to the value of production of various crops was also observed. Research programs in millet, pulses, and paddy in food crops and potato, oilseeds, and jute in cash crops, appear understaffed. A wide deviation in manpower deployment relative to value is evident in millet, pulses, and jute.

When manpower is compared with the distribution of cultivated area, paddy, millet, and oilseeds seem understaffed. All the remaining crops are relatively overstaffed (Table 7). On the basis of consumption criteria, underinvestment in research manpower is evident in all food crops except wheat. However, the extent of underinvestment is negligible in paddy and maize (Table 7).

Some Other Issues

Agroeconomics Research

Due to a data problem, estimates of resources allocated to agroeconomics research were not included in the earlier analysis. In the year 1979/80 approximately Rs. 3.7 million was spent on agroeconomics research (mostly of a multicommodity nature) by the three public institutions involved in this area (Table 1). The Rs. 3.7 million is about 11% of the total agricultural research budget in 1979/80. It is estimated that there are 53 posts in agroeconomics and agristatistics within agriculture-related institutions, but none exclusively in research.

Integrated Cereals Project

This 5-year project was initiated in 1976 with assistance from USAID. The main components of the project are: (1) a strengthening of the existing research base of cereal crops by logistic and training supports; (2) an initiation of a research program in cropping systems; and (3) an introduction of a minikit program of improved cereal crop varieties, mainly rice, maize, and wheat, and other inputs for wider adoption of modern technology. The most significant aspect of the project is the initiation of a cropping systems research program, although the bulk of the total project budget of U.S.$9 million was spent on advanced level academic training abroad.

Locational Aspect of Research System

Geographical and regional imbalances in the distribution of research farms and stations exists in Nepal. Mountainous and hilly regions, which occupy two-thirds of the total land area, have the least concentration of research facilities and manpower. An exception to this is the Kathmandu Valley. Furthermore, there are many experimental farms where research facilities are poor, research staff very few, and budgets too small to operate effectively.

Future Manpower Scene

During 1980/81 to 1984/85 (Sixth Plan Period) there will be a surplus of professional manpower in agriculture; however, the livestock sector will face a manpower deficit. Ineffective use of existing manpower is considered more of a problem in Nepal than is its shortage. The ratio of expatriate agricultural research manpower to total manpower in Nepal is negligible.

Conclusions

(1) Agricultural research investment in Nepal is low relative to some other countries of Asia. Further investment in research seems necessary. The extent and the nature of further investment should be ascertained on the basis of cost-benefit studies.

(2) Examination of the resource allocation pattern to different subsections revealed an abysmally low level of financial and manpower resources in livestock research relative to its value of production. This serious imbalance should be corrected. Livestock rearing is an integral part of the Nepalese farming system. In general, agricultural development measures in Nepal have shown a bias toward the crops sector, and this is also the case for research.

(3) During the last 5 years, only research investment in the crops sector has been increasing relative to growth in its value of production. Unless investments in other sectors are also increased in proportion to the value of production, the existing misallocation of resources among agricultural subsectors will be prolonged.

(4) The most important objective of agricultural development in Nepal is to increase food grain production. Cash crops development is the next

most important objective. In view of this, relative allocation of resources between food and cash crops assumes importance. This study revealed that research on food crops is relatively underinvested and understaffed compared with cash crops research. Thus, the present allocation pattern contradicts the declared objectives of agricultural development. This misallocation should be corrected.

(5) Further disaggregation of crops showed that research on paddy, millet, and pulses is underinvested and understaffed. Maize and wheat research programs appear to have received larger resources than their importance would justify.

Inadequate resources for paddy research should be considered as a serious imbalance because paddy is the most important crop in Nepal in terms of area, production, value, consumption, and exports. Millet and pulses are important consumption crops. A commodity development program to look after these and other minor crops appears necessary in Nepal.

Maize is a staple crop in the hills and has a large production potential. In view of recurring food shortages in the hills and the suitability of maize farming to hilly terraces, the relatively high level of resources allocation for this crop should continue.

In recent years wheat has become the most important winter crop in Nepal. More than 90% of the total wheat area in Nepal is covered by modern varieties. This may partly be explained by a larger proportion of research resources allocated to wheat research. Although a switch from traditional to modern varieties has been accomplished, the productivity of wheat has not improved. It is suggested that future wheat reseach programs should concentrate mainly on factor research rather than varietal selection. Efficient use of soil, fertilizer, and conservation of soil fertility should be accorded top priority in this factor research.

(6) Cash crops research programs have received larger resources than their importance would justify. Given the fact that the stock of resources at a particular time is limited, transfer of some amount of resources from cash crops research to food crops would be beneficial to the economy.

(7) Initiation of the cropping systems research program in 1976 is a laudable step. This program should receive adequate resources and be continued in the future.

(8) Monitoring, evaluation, and special studies on agricultural research in particular and related agricultural policy issues in general are far from adequate in Nepal. Studies on productivity of agricultural research investment by commodity, continuous monitoring on research resources allocation, research resources and programs for minor crops, and development of an effective evaluation system appear rather urgent.