NATP
Task Force on Prioritization, Monitoring & Evaluation
PME notes
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Prioritization in agricultural research

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January, 1999

Since the beginning days of NATP we have been told to rationalize our resource allocation in terms of priorities. Most researchers are puzzled why we need new (and unfamiliar) methods of priority setting. What was wrong with our earlier approach based on researchers' knowledge and peer review? This mechanism was adequate; our agricultural performance over the last four decades testifies this.

To answer this, we must understand the changes in the context and environment confronting the agricultural sector. These forces necessitate reorientation in management and operation of public systems. More focussed prioritization is one of the instruments for this.

THE NEW CONTEXT

The objectives of agricultural research have changed greatly. In addition to increased production, we are now asking for increased efficiency (lower unit costs). Other themes like sustainability, income generation, balanced regional growth, exports, employment, etc. have also entered the research agenda. These goals are inter-related. Sometimes these are conflicting. A much larger research portfolio emerges in response to this expanded mandate and complexity. All this makes research project evaluation and resource allocation decisions difficult. Agro-biological scientists do not have the tools to relate constraints and resources to these multiple objectives. Formal analytical approaches are necessary to provide objective information to assist the managers and to bring about transparency.

Another feature of the new environment is financial stringency and the resulting insistence that each rupee must be spent in a way which maximizes expected benefits. It is no longer enough to say that the problem is `very` important. Research managers need to know how to choose between various `very` important projects.

They would need more quantitative information and analysis on expected impacts not only on production and incomes but also on other objectives of public policy such as poverty alleviation, resource conservation, export/ imports etc.

In short, in the past, technical merit and judgement of peers was considered adequate for prioritization and subsequent decisions on allocation of resources.

With a relatively small research portfolio (determined by few objectives), this approach served us well. These are still relevant and provide the first screening mechanism.

What is needed is more information and analysis to make the process objective and transparent. This requires joint work by agro-biological and social scientists. The NATP, therefore accords high priority to strengthening this interface. Insistence on more rigorous prioritization of production systems research is intended to ensure that NATP resource allocation decisions can stand public scrutiny, and that this approach is gradually institutionalized system-wide.

AN ILLUSTRATION

We provide a simple illustration of the rationale for formal prioritization approach based on a proposed research initiative for the rice-wheat system in the Indo-Gangetic plains. Five major research programmes have been identified for the system in the high-productivity zone comprising Punjab, Haryana and western Uttar Pradesh. These are:

(1) Improved rice and wheat cultivars, (2) Integrated plant nutrient management, (3) Tillage and crop establishment, (4) Water management, and (5) Weed management.

Detailed technical programmes were developed after extensive discussions covering the critical constraints as perceived by scientists, a thorough review of the state of art and on-going research efforts, and identification of gaps and potential research strategies. These were the priorities identified by the multi-disciplinary group. After this, detailed budgetary requirements were worked out. In this case, the total amounted to Rs. 83.8 million. The funding agency—ICAR or Planning Commission or Scientific Advisory Panel, usually does not have resources to cover the entire research portfolio. It organizes another review, usually peer-based, to recommend which programmes could be funded within the available funds, say Rs. 50 million. The review panel uses its collective judgement, considering factors like expected impact on production, sustainability etc, probability of research success, and so on and then arrives at a consensus. The process is essentially science-driven, and socioeconomic dimensions are intuitively considered.

The use of a simple formal approach for such discussions is illustrated below. This requires more specific and additional information for each proposal. For example, the exercise required information on: expected yield advantage over the existing technology if any; change in per hectare cost of cultivation; probability of research success; research lag; potential level of

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adoption; target area; supply and demand elasticities, and so on. In the present case, this was done by organizing a meeting of the concerned scientists and experts.

These parameters were used to estimate the expected economic benefits and rates of returns to the research investments. The Table below shows these calculations and illustrates how this approach helps the decision maker in making choices in a constrained funding environment.

Table 1 : Rates of returns to alternative rice-wheat system research programmes

Research programme	Research cost (Rs. Millions)	Net present value (NPV) of benefits (Rs. Millions)	Internal rate of return (Percent)	Rank
Rice cultivar	7.0	2784	109	I
Wheat cultivar	7.0	302	65	V
Tillage	8.6	987	79	II
Weed management	17.5	1558	74	III
Water management	22.5	468	48	VI
Nutrient management	21.2	902	68	IV

The internal rate of return combines the expected benefits with the investment (cost) needed and enables a balanced ranking of projects. All projects have high pay-offs. This implies that scientists are able to identify `important' themes. The problem for the decision maker is that he does not have enough funds to cover all six programmes. Based on economic efficiency, the last column ranks different projects. The decision maker goes down the rank till his budget limit is reached. For example, with a Rs. 50 million budget, he can cover rice varietal improvement, tillage, weed management and nutrient management. Fund limitation would not permit other projects (wheat varietal improvement, water management) to be undertaken.

The above example explains the decision rule when the objective is to maximize benefits from limited funds. The procedure is transparent—it uses information provided by the scientists and well established economic principles. The criterion is objective, transparent and non-controversial.

In reality, the decision is more complex. In addition to economic efficiency, there are other research objectives—let us say, sustainability and equity. There is no reason to believe that projects will be ranked similarly with respect to these objectives. More complex decision rules are required. We illustrate the simplest—the scoring approach. This approach assigns weights to different objectives (criteria) and scores to different projects on the basis of each criterion. A composite index for each project is then constructed and a final ranking emerges on the basis of the composite score. This scoring process is again based on judgement of knowledgeable people, including scientists, extension workers and farmers. In the illustration in the table below, we have used the weights of 0.4 each for the efficiency and sustainability objectives and 0.2 for equity. The peers or the screening committee can specify appropriate criteria, weights, and scores.

Table 2 : Prioritization with multiple objectives

Research Programme	Scores (least important=1: most important= 5)			Composite score	Rank
	Economic impact*	Sustainability	Equity		
Weights	(0.40)	(0.40)	(0.20)		
Rice cultivar	5.0	2	5	3.8	II
Wheat cultivar	3.0	2	5	3.0	VI
Tillage	3.6	4	2	3.4	V
Weed management	3.4	4	3	3.6	IV
Water management	2.2	5	4	3.7	III
Nutrient management	3.1	5	4	4.0	I

* Economic impact = $(IRR/IRR_{max.}) \times 5$

As the decision maker attempts to incorporate multiple objectives, he is confronted with trade-offs. In the table above, the ranking of programmes is different from those based on the criterion of efficiency. The new research portfolio includes nutrient management (Rs. 21.2 million), rice variety (Rs. 7 million) and water management (Rs. 22.5 million), involving a total outlay of about Rs.50.7 million. Other projects down the line cannot be accommodated within the budget constraint of Rs. 50 million. The merit of this approach is that the trade- offs can be quantified. For example, the total net present value (NPV) of benefits from the first allocation comes to Rs. 6231 million, in the second case it is Rs. 4154 millions. Including sustainability and equity as additional objectives of research implies foregoing some current gains for longer term economic security. The approach makes this choice explicit.

This note, we hope, makes it clear why we need more formal and analytical research prioritization approach. The illustration uses a very simple format—more complex tools are available for refined solutions. The bottom line is that while experienced scientists can certainly identify `important' research themes, they need more economic information and analysis when choice decisions have to be made.

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