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corner almost all the additional irrigated acreage of the region, the two exceptions being the cereal crops of wheat and bajra—the two relatively 'high valued' cereal crops. The brunt of the additional land for irrigation appears to be borne by the unirrigated bajra, jowar and groundnut crops.

Among farm sizes, irrigation tends to strengthen the tendencies of crop specialisation. For instance, small and large farms tend to strengthen the production of their specialised crop, cotton. Medium farms, however, tend to substitute *til* for groundnut.

CONCLUSIONS

In an arid region, the injection of irrigation input, particularly when developed from low erratic precipitation base, fails to make any major dent into the use intensity of its land and labour resources. However, by crop-mix manipulations it helps to raise the income of the region, particularly of the farmers, more so, medium sized farmers. The net consequence of these crop-mix manipulations is that investment in irrigation in the region is a profitable proposition, except on large farms where the returns per acre per annum fail to meet the cost of irrigation supplies.

The failure of irrigation investment to expand employment opportunities in the region suggests that this investment cannot serve the interest of landless labourers and, hence, special policies need to be envisaged to protect their interests.

FORMULATION AND APPRAISAL OF AGRICULTURAL PROJECTS: A CASE STUDY

A. K. Sinha*

Soon after the formation of the State of Haryana in late 1966, an increasing awareness of the necessity and desirability of augmenting irrigation facilities for agriculture, especially in the chronically drought affected areas of the State, was visible in public policy. The result of the enhanced emphasis and the reassigned priorities was the formulation and implementation of three sizeable lift irrigation projects in the district of Bhiwani. It is proposed to study the formulation and implementation of these projects, to examine the problems of their appraisal and evaluation and to raise therefrom issues as are relevant to agricultural economists.

PROJECT FORMULATION

The three projects of Jui, Loharu and Sewani canal systems were formulated by the State Department of Irrigation and also implemented by it. The basic objectives were socio-economic: to prevent frequent occurrence of

* Director of Agriculture, Government of Haryana, Chandigarh-17.

droughts by providing surface water irrigation facilities and to improve the levels of living of the people and the quality of their life. It was admitted that lifting water for irrigation, on account of adverse slope, was very costly, but it was also stated that this was essential to help the hitherto hapless people of the area. Water was proposed to be applied as an insurance against failure of crops, as also as an assurance of higher yields. In the process, the projects proposed an increase in the area under crops, an increase in the intensity of cultivation, an increase in the productivity of land and finally, an increase in the total agricultural production. While the changes proposed in these were quantified, there was no such attempt as regards the social objective of improving the quality of life.

The Jui, Loharu and Sewani canal systems provided for Canal Command Area (CCA) of 74,528, 2,63,703 and 1,81,780 acres with an effective irrigation of 46,207, 1,63,496 and 1,12,704 acres respectively. The estimated capital cost (revised) of the three projects was Rs. 58 million, Rs. 217 million and Rs. 19 million respectively, with a benefit-cost ratio (revised) of 2.86 : 1. They envisaged an incremental value of foodgrains production at Rs. 25 million, Rs. 44 million and Rs. 64 million per annum, but on account of high maintenance costs, they forecast net annual maintenance losses at Rs. 2.5 million, Rs. 2.6 million and Rs. 9.5 million per annum respectively. Jui was completed in 1970, Loharu in 1977 and Sewani in 1972.

In the process of benefit-cost analysis and the computation of net incremental benefits, the Project Reports made certain *assumptions* with regard to the intensity of irrigation, the intensity of cultivation, *rabi-kharif* ratio, cropping pattern and crop yields, in pre-and post-irrigation situations. They assumed that the intensity of irrigation would be 62 per cent, the intensity of cultivation would increase form 118 to 200 per cent (two crops in a year), the *rabi-kharif* ratio would be reversed to 40 : 60, the crops of wheat in *rabi* and hybrid bajra in *kharif* would enter in a big way, their share becoming 35 per cent and 50 per cent of season-sowings and the yields of wheat (at 16 quintals per acre) and of gram (at 10 quintals per acre) would mark dramatic increases. They also assumed certain costs and incomes at constant prices for each crop and the net returns thereby. All this was to happen on 'full development' of the potential of the projects, which stage was proposed to be reached after the State's share in the Ravi-Beas waters from the Punjab was fully available. No phasing was, however, indicated.

PROJECT EVALUATION

An enquiry into the *working results* of these projects indicated that the intensity of irrigation in 1976 was 25 per cent for Jui, 11 per cent for Loharu and 9 per cent for Sewani Canals and this also was found to be doubtful (since the absorption losses were not adequately provided for). The intensity of cultivation was erratic in the CCA but not crossing 140 per cent (increasing ordinarily with the timeliness of rains) and the *rabi-kharif* ratio was generally in favour of *rabi* at around 65 : 35 (again dependent on seasonal factors).

There was little change in the cropping pattern, with practically no hybrid bajra and only 4-10 per cent of wheat. No data on crop yields for these CCAs could be procured but from indications of crop yield averages of the district, the crop-cutting experiments conducted by the Agriculture Department and some Farm Studies conducted by the Economic and Statistical Adviser of the State, the yields were found to be nowhere near the assumptions made. Subsequently proved by other Project Reports such as Sutlej Yamuna Link Canal and Bhiwani Integrated Project based on the CCAs, many of these seemed to have been exaggerated.

DISCUSSION

An enquiry into *the process of formulation* showed that the objectives of the Projects *ab initio* lacked clarity and *inter se* priority. While the social objective was not even analysed, the economic objective, expressed in terms of quantification of incremental production, was based on questionable assumptions. Even though agricultural statistics may not be very reliable, there were some Farm Studies available, as also the results of crop-cutting experiments and the district averages of crop yields and crop patterns, but the formulators of the projects seemed to have been blissfully unaware of these. Thus, even as the projects were stated to be famine-protection oriented, they were projected to have a palpably exaggerated and an unbelievably high plus benefit-cost ratio (as high as 9 : 1 in the Jui I Original Project Report).

In fact, the Projects, even though they were primarily agricultural projects, were conceived as isolated irrigation projects, as ends in themselves, and they do not seem to have been conceived or formulated (or implemented) as inter-disciplinary exercises. No economist, agricultural economist or management expert participated in the process of formulation nor was any serious attempt made to collect (in the yield data, for example, there were even patent flaws inasmuch as both in pre-and-post irrigation conditions the yield of bajra was shown at 15 quintals per acre) or even to cross-check data or wherever collected to present a systematic interpretation. There was a virtual absence of application of management techniques such as Net Work Analysis (PERT/CPM), Project Evaluation, etc.

The projects also did not provide for irrigation canals and neither water-carrier system for bringing the Ravi-Beas waters from the Punjab State nor field channels for distributing water carried by these canals were provided for. No provision was made for such other land development works as land levelling, soil erosion, minor irrigation, etc., essential for proper utilization of water so provided. The projects also did not speak of any inputs and services such as credit, fertilizers, agricultural machinery, seeds, etc., that would be necessary for the proper utilization of the water brought by these projects and thus no linkages were provided for. Further, there was no concept of timeliness or adequacy of water cropwise nor any effort made to consider proper utilization of available water. Thus, while, on the one hand, the project formulation in the Department seemed to have been an *ad hoc* and water-tight exercise, the formulators were, on the other hand, found to be without any training

or expertise in the field.

A deeper investigation into the benefit-cost analysis showed that the knowledge of this concept was incomplete and the calculations made exhibited an untrained mind. Pricing was one area where this was glaring, for there was no indication of even rudimentary knowledge of shadow prices, annual price escalations, etc., to justify a rational price structure for farm inputs and outputs. There were also certain important omissions in costs (for example, the expenditure during construction and upto 'full development' was not capitalized) and incomes (for example, savings on account of periodic drought relief expenditure was not added). There was no attempt made at analysing the social, or even the economic cost, of the projects and only simple financial mathematical exercises were made to justify the benefit-cost calculations. The concept of optimization of water as a resource was also nowhere examined although it was admitted to be a costly input. And finally, no mention was made of the social benefits that would accrue, which was indeed an avowedly basic objective of these projects.

An enquiry into *the process of implementation* showed that while the irrigation canals were completed in record periods, which spoke of an excellent level of engineering skill, an integrated view of development was all along missing. It was noted that while the projects were completed in 1972, it was only in 1973 that an Integrated Development Project based on their CCAs (and that also by the Dy. Commissioner, Bhiwani) was prepared, and what to say of implementation, the Sutlej-Yamuna Link Carrier-Channel Project was prepared only in 1976. The programme of agricultural extension and services was left to remain a part of the general plan of the Agriculture Department, the supply and regulation of water in canals a part of the function of the Irrigation Department, credit and fertilizers largely left to the Co-operation Department and agricultural implements and machinery, seeds, storage, etc., by the State's numerous public undertakings.

Thus there was, and is, not only an absence of integrated approach at the formulation and the planning stage but also at the implementation stage. This was further complicated by the emergence of multiple specialised agencies, charting their own courses, determining their own schedules and deciding their own speed. The proliferation and multiplicity of agencies without a framework and a central objective was bound to create confusion. In a situation like this, the damage to any attempt at creating an infra-or a superstructure to utilize the water made available towards the furtherance of the anticipated agricultural changes, can be well imagined.

No attempt was made to co-ordinate the work of all the Departments/Agencies at the State level. An attempt at co-ordination at the district level by the Deputy Commissioner-cum-District Magistrate-cum-Collector in the once-a-month general meetings could, in the nature of the scheme, be only partially successful. It was obviously not possible to supervise, control or co-ordinate these activities, in the absence of a well-thought out concerted time-bound plan of action towards a well-understood central objective. Departmental jealousies and prejudices added grist to the mill.

The problem was aggravated by the non-conformity in the territorial jurisdiction of these Agencies and the lack of adequate delegation of powers to field officers. The boundaries of the irrigation 'diversion', the development 'block', the revenue 'tehsil', the banks' 'circle', and the Soil Conservation 'division' were, and continue to be, not co-terminus. Even if they were so, the extent of the delegation of powers to each differed so widely, and the vertical departmental control continued to be so strong that co-ordination was indeed a difficult exercise. The subsequent wishful linkage at the district level, under the leadership of the Deputy Commissioner, thus could provide mainly a psychological satisfaction of having tried.

An attempt *to appraise* the performance vis-a-vis the projections showed that the projects, inevitably perhaps, did not envisage a reporting system, an appraisal procedure, a review mechanism or an evaluation organization. No changes in the existing bureaucratic procedures of Governmental administration were conceived or proposed or attempted, except that the personal supervision was tightened in view of these projects falling in the then Chief Minister's Constituency. No format or proforma for reporting progress—failures, achievements, problems and bottlenecks—were devised nor any regular and comprehensive data feed-back system proposed, except that which was already existing in the individual Departments. Even for this particular study data had to be specifically tailored and collected from different Departments and Agencies, and with great difficulty. No centralised Data Centre, let alone a Processing or a Monitoring Centre, for the project performance was proposed to be set up and hence no special Review or Monitoring Agency created; the existing monthly meeting system at the district level had to take this also within its fold.

While appraisal of irrigation canal system was vigorous, perhaps due to the fact that the projects had serious political implications, no overall appraisal of the project projections and performance was ever attempted or made. Even a *post mortem* evaluation has not yet been attempted in a scientific manner (*i.e.*, through a controlled experiment with factorial causality-weightage) except on as yet unpublished sample study conducted by the Economic and Statistical Adviser of the State recently. In retrospect, the biggest difficulty in appraising these agricultural projects would seem to be the absence of a proper methodology and a correct mechanism to attribute factorial causality to the anticipated changes. And this seemed to be largely because of the non-participation of professional economists or management experts either at the formulation or the evaluation stage.

In the absence of a central objective, realistically quantified parameters, a concerted plan of implementation, and non-participation of agricultural economists at any stage, a meaningful appraisal or evaluation could hardly be considered feasible. This could be perhaps the story of many irrigation-oriented agricultural projects in the country and there seems to be an implicit agreement among administrators about not placing an adequate emphasis on the appraisal or evaluation of projects. This may be also partly due to the inadequacy of the knowledge of evaluation techniques in such cases and the

ready availability of the omnibus justification of the resultant unquantifiable social benefits. And yet, the inadequacies of methodology and technique and the deficiencies in quantification of socio-economic changes do not obviate the necessity and the desirability of appraisal and evaluation of agricultural projects.

THE ISSUES

The foregoing discussion brings to the fore certain important issues, relevant to the discipline of agricultural economics. The issues concern the formulation and implementation of all agricultural development projects. They especially reflect on the inadequacies of the appraisal or evaluation of such projects.

Thus the following *issues* are relevant for discussion in this forum:

1. What should be the basic objective of agricultural projects? Maximization of benefits of agricultural development or distribution of economic gains?
2. What should be the basic approach in agricultural projects? Area development, crop development, section development or an integrated development?
3. What should be the agency of formulation of agricultural projects? A single government department, a multi-disciplinary committee solely of government departments or a wide-base committee with agricultural economists as some of its members?
4. What should be the agency for the implementation of agricultural projects? A separate and new agency, separate existing departments and organizations or a composite committee of existing departments and organizations?
5. What should be the level and the agency of co-ordination of the activities of different branches/agencies of implementation? The State, the district, the project area, or some other?
6. What should be the mechanism for appraisal and evaluation? An in-built and automatic mechanism or need-based?
7. What should be the agency for appraisal and evaluation? Departmental, multi-departmental, professional or mixed?
8. What should be the level and the periodicity of appraisal and evaluation? State, departmental or district? Annual, quarterly or monthly?
9. What should be the nature and the composition of the feed-back data and the Data Centre? For storage, processing or monitoring?
10. What should be the factorial causality-weightage for anticipated change?

As the problems of project management increase, the necessity for making project formulation as an integral part of planning for agricultural development too increases. And with this should increase the use of sophisticated management techniques for appraisal and evaluation of project performance. The answers to these issues may provide answers to many of the unnecessary but seemingly insoluble problems of agricultural projects.