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SOME CONSTRAINTS ON GROWTH OF AGRICULTURAL OUTPUT IN PUNJAB

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Technological advances in land and water management have now shown that these natural resources are not as ultimate a constraint on output as classical economic theory assumed them to be. The availability and quality of land and water, as resources, can be augmented at a cost. This paper attempts to analyse some important policy constraints which operate on the augmentation of land and water resources in Punjab. The discussion is divided into five sections. Section I is devoted to the development and distribution of surface irrigation. Section II deals with groundwater resources and policy constraints. The development of land resources and policy constraints in the State are analysed in Section III. Section IV focuses on an important aspect of new technology, that is, seed multiplication and distribution. The conclusions are summed up in the last section.

I

SURFACE IRRIGATION DEVELOPMENT AND POLICY CONSTRAINTS

Irrigation, coupled with the High-Yielding Varieties (HYVs) of seeds and fertilizers, has been the key factor in enhancing agricultural production in the Punjab. Irrigation facilities in the State have increased tremendously and the sources of irrigation have undergone a change during the period of planned development. While canals were the main source of irrigation till the early sixties, tubewell irrigation has emerged as a dominant source in recent years. Thus the canal irrigated area increased from 12.10 lakh hectares in 1956-57 to 14.20 lakh hectares in 1981-82. On the other hand, the net irrigated area under the tubewells rose from 8 lakh hectares in 1956-57 to 19.76 lakh hectares in 1981-82. The share of tubewell irrigation which was about 40 per cent in the net irrigated area in 1956-57 rose to 58 per cent in 1981-82. Together the canal and tubewell irrigation accounts for 81 per cent of the net cultivated area under assured irrigation. Against this, the percentage area under assured irrigation in the whole country was 27 in 1978-79. As the demand for irrigation begins to exceed its availability, it poses a problem for the planner and the policy maker. More irrigation will now involve significant cost in the Punjab.

Potential

The Irrigation Commission and the National Commission on Agriculture (NCA) have estimated the Statewise potential of ground and surface

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The views expressed in the paper are the author's own and do not represent the views of the Punjab Government.

water for irrigation in India. The NCA has assessed that in the country as a whole the scope for future development of surface water for irrigation is almost twice that of the groundwater. However, the reverse of it is true in the case of Punjab. According to the Irrigation Commission, the total irrigation potential in Punjab, including 3.4 million hectares of net irrigated area in 1971, is of the order of 4 million hectares of net irrigated area and most of it lies in the groundwater. Similarly, the NCA estimated a total potential of 5 million hectares of gross irrigated area in Punjab. This includes 4.2 million hectares of gross irrigated area in 1971. Thus, according to NCA, 0.8 million hectares remain unexploited and out of it 0.2 million hectares (25 per cent) lie in the surface water, the remaining 0.6 million hectares (75 per cent) is in the form of groundwater.

The major issue, therefore, is as to how to exploit the known potential so that irrigation does not become a constraint on further development of agriculture.

While tubewell and canal irrigation have covered 81 per cent of the net sown area, about 8 lakh hectares of land are rainfed. Some of these areas lie in the sub-montane tract which gets comparatively high rainfall while others fall in the central plains and south-west canal command region with low annual rainfall. The harvesting of these waters also presents a problem for the State.

The Issue

In the above context, it can be stated that the policy for developing irrigation in Punjab in future should be of an integrated nature. While exploiting groundwater for irrigation, there should be no slackening of effort to augment the supply of surface water for irrigation. The two important aspects of such a policy are: (1) scientific management of surface water resources; and (2) a clear-cut social policy regarding the use of groundwater for supplementing the surface water.

Water Management

In Punjab the gap between the development and utilization of irrigation potential is not as wide as in other States. On-farm management of water, however, is still not what it should be even in Punjab.

In the alluvial plains of north India, about 45 per cent of the water released at the head of an unlined canal is lost through seepage. Of the remaining 55 per cent, another 17 per cent is lost from the field itself. Thus only 40 per cent of the water is ultimately used.

Lining of Channels in Punjab

Lining of channels has thus assumed an obvious importance in Punjab where waterlogging and salinity around big canals threaten to become a problem. Lining not only saves water, it also saves deterioration of soil and prevents weed growth in the unlined canals.

The total length of water courses in the Punjab is 60,000 km. of which the main channels and distributaries account for 14,482 km. The details are as below:

Items	Main channels	Distributaries and minors	Total
Total length of channels (km.)	2,206	12,276	14,482
Length of channels lined upto 1978-79	506	1,409	1,915
Balance	1,700	10,876	12,567

Lining of channels is by far the most important programme in major and medium irrigation systems of the State and is being financed under a World Bank Project. Under this project 16,735 km. of water courses are to be lined. In the first instance, the project is being executed in four districts of Punjab. On completion, the project is expected to save 1,568 cusecs of water capable of creating an irrigation potential of 1.64 lakh hectares. The total cost of the project is Rs. 118 crores.

Policy Constraints

The outlays for major and medium irrigation have to come out of the State Plans. But finances continue to be the main constraint on the execution of major irrigation projects and the modernization programme of the irrigation system. The criterion for judging the utility of an irrigation project during pre-Independence period was financial. This was replaced by the benefit-cost ratio criterion in the post-Independence period with an expected dilution of emphasis on securing an adequate return on investment. The annual loss on major and medium irrigation in Punjab amounted to Rs. 17 crores in 1982-83. The annual revenue from canal irrigation in Punjab is less than the annual pay bill of the staff engaged in the maintenance of the canals.

Assuming that irrigation investments have to be treated as a part of social infrastructure, its further expansion is constrained by the reduced capability of the State budget.

Water Rates

The irrigation rates in Punjab have lagged far behind the prices of output and are exceedingly low. The wholesale prices of wheat and rice increased by 169 and 118 per cent respectively during 1953-73. However, there was hardly any change in the water rates during the period. Canal irrigation charges were last raised in June 1974. Occupier's rates per acre were fixed at Rs. 5.50 for wheat and Rs. 19.50 for rice.

The National Commission on Agriculture (NCA) has recommended that water rates should range between 5 to 12 per cent of the gross income of a crop in the canal command areas. On the NCA's lowest norm, the irri-

gation charges for wheat in Punjab should have been 137 kg. of wheat per hectare and 147 kg. of rice per hectare irrigated by canals in 1981-82. However, the rates are many times lower than this.

A condition of the project for lining of water courses referred to above was that the cost of works was to be recovered from the beneficiaries. This condition is not likely to be fulfilled. Even though the intensity of irrigation in the project area has increased, there is no provision for a betterment levy.

However, benefits from lining the main systems would require a near simultaneous investment on the lining of water courses of the farm. The State finances, already inadequate for the major system, cannot pay for on-farm work on behalf of the farmers.

II

GROUNDWATER RESOURCES DEVELOPMENT AND POLICY CONSTRAINTS

Groundwater for Irrigation

Surface water, groundwater and precipitation are inter-related. The development of water resources from these sources has to be integrated and full utilization is possible only through proper estimation and development in a phased manner.

Potential

In the absence of sub-surface data, groundwater resource estimates in most areas of the country are based on semi-empirical formulae on limited surface information. In Punjab, almost 100 per cent of the potential area is covered by a hydro-geological survey. The Perspective Planning Division of the Planning Commission has estimated, on the basis of surveys and investigations carried out upto 1977, the availability of groundwater in India at the district level. The availability of groundwater in Punjab as on April 1, 1977 was placed at 1,210.6 thousand hectare-metres. Leaving out 56 thousand hectare-metres for non-agricultural sectors, the net availability in the State amounted to 1,154 million hectare-metres. Against this, the utilization of groundwater in 1977 was about 770 thousand hectare-metres, representing 64 per cent of utilization.

The exploitation of groundwater in Punjab picked up after the introduction of HYVs. The number of electrified tubewells rose from 25,361 in 1965-66 to 280 thousand in 1980-81 and is today 325 thousand. The consumption of electricity by the agricultural sector, therefore, increased from 5 per cent in 1965-66 to about 40 per cent in 1982-83. Although direct investment by the State Government in minor irrigation has been limited to deep tubewells to the extent of 52 thousand hectares (1977-80), it has promoted tubewell irrigation in the following ways: (*i*) investigation of groundwater resources; (*ii*) mobilization of institutional finance; and (*iii*) supply of power for energisation of tubewells.

Policy Constraints

The future course of development and use of groundwater for irrigation in Punjab would depend on the availability of electric power and the behaviour of the water table. In the first year of the Sixth Plan, 45 thousand tubewells were energised. This pace of energisation of tubewells cannot be maintained on account of increasing power shortage which will persist. The target for energising tubewells during the Sixth Plan has been reduced from 165 thousand to 120 thousand. Even this revised target may have to be further scaled down. Development of groundwater use has helped not only to provide assured irrigation but also checked waterlogging by lowering the water table. However, with the large scale installation of tubewells, there has been over-exploitation of groundwater in some areas since the seventies. This compels deepening of tubewells. As one tubewell is deepened it affects the neighbouring bore. The deepening of tubewells not only requires more capital from the farmers but also higher power consumption.

Power supply to the agricultural sector is highly subsidised. The cost of providing power to the agricultural sector per unit is 67 paise while the rate charged per unit is 13 paise. This cuts heavily into the State budget hampering further investment in the power sector as the loss on this account amounted to Rs. 118 crores during 1982-83.

Power supply is not metered but is charged at a flat rate according to the capacity of the electric motor. It is possible that such a system is resulting in the wastage of power and water. The farmer is opposed to enhancement of power rates.

III

LAND DEVELOPMENT AND POLICY CONSTRAINTS

The scope for further increase in cultivated area is negligible since 83 per cent of the total geographical area is already under cultivation. However, certain areas in the State are undulating and are, therefore, vulnerable to erosion. In addition, some land under cultivation is affected by alkalinity and salinity and is, therefore, reclaimable at a higher level of productivity. The cost of reclamation depends upon the nature and extent of deterioration. The important problem is that such lands are occupied generally by the poor.

Waterlogged Areas

Waterlogging became acute during the fifties when the affected areas rose from 1.2 million hectares (in 1955) to 1.6 million (in 1962). A combination of measures consisting of seepage drains, shallow tubewells and canal lining has helped in overcoming this problem over a large waterlogged area. The development of groundwater resources in the wake of the HYVs has brought down the water table since 1969-70. The problem still exists in the vicinity of unlined canals but is not as serious as it was in the early sixties.

Riverine Areas

Large areas of this type of land have been reclaimed by canalising the river flow. During 1962-65, embankments were constructed and the Sutlej river was canalised to confine its flow to a narrow channel. About one lakh hectares of land were brought under cultivation by narrowing the stream-bed of the Sutlej. Likewise, the construction of flood embankments on the Beas riverine land has led to reclamation of 25 thousand hectares. However, there still exists a margin for such reclamation. In the sub-montane districts of Ropar and Hoshiarpur there is scope for reclamation by training the seasonal but turbulent hill-streams called *Chos*.

Saline and Alkali Land

Estimates of saline and alkali land are available in the State. The NCA report has placed such land at 6.88 lakh hectares in 1971. The Sixth Plan estimates have confirmed these figures. Sixty-six per cent of such areas are estimated to be marginally or moderately affected. Much of the marginally affected area is under cultivation but the affected patches give low yield. The land reclamation programme has picked up only at the start of the Sixth Plan and already 2.20 lakh hectares have been reclaimed so far.

Any land improvement programme must substantially be based on irrigation extension and water management. In Punjab, the approach to land development has yet to be integrated.

Policy Constraints

The Punjab Land Development and Reclamation Corporation is carrying out the work of reclamation of alkaline areas and levelling of undulating land. Gypsum is the cheapest material for amendment and is being supplied to the cultivators at subsidised rates. The price is within the means of the beneficiary. But the constraint relates to irrigation.

Canal water is not available in sufficient quantity in many of the alkaline areas in the State. The Punjab State Electricity Board initially gave priority to tubewells being sunk on such lands but the power position has deteriorated so much that there is now no such priority for this programme. In the coming years, therefore, it appears that the land reclamation work may slow down.

Salt affliction owes itself to a variety of reasons. The reclamation methods, therefore, also vary. In addition to gypsum, other treatments like farmyard manure, molasses, pressmud, green manure and other weeds are recommended. Also, a specific crop rotation is suggested in the initial stages to prevent reversion but on both these accounts there are problems. The farmer is eager for quick returns and, therefore, is reluctant to adhere to the discipline of crop rotation. Further follow-up and infrastructural facilities for ensuring the package programme bear considerable strengthening. Reclamation work has, therefore, not proceeded as fast as may be expected.

Greater constraints operate in the case of land levelling. Land levelling is a costly operation particularly as the operational cost of bulldozers has

risen steeply. The subsidy on such land levelling is limited only to the sub-montane districts of Hoshiarpur, Gurdaspur and Ropar. The operating cost of the bulldozers is Rs. 230 per hour against the approved rate of Rs. 135. If the rates are revised to actuals, it is doubtful if the farmers would at all use the services of the Corporation. This has made the Corporation virtually to give up land levelling.

Apart from these sub-montane districts, the western districts of Faridkot, Bhatinda and Ferozepur offer considerable scope. Levelling of sand dunes for cultivation of such lands can be done but the cost involved is beyond the farmer to bear or for the Corporation to provide.

Another constraint is that the levelling of land on individual basis is not fruitful without this being taken up on an area basis. Levelling work done on one farm without covering the surrounding area is self-defeating as the shifting of sand dunes in summer is common. Without the incentive of subsidy, backed by compulsion, the operation is difficult. Another constraint is that in the off-season the demand for land levelling work exceeds the available bulldozers and tractors. On the other hand, in busy crop seasons, the unutilized capacity of machines reaches a peak level.

In the context of resource constraint, a comprehensive reclamation programme involving a plan of allotment of reclaimed land to marginal farmers and landless labourers does not appear to be a practical possibility. Further, ecological constraints require that the reclaimed areas be brought under forests of which there is only 5 per cent. Of this area, the bulk is confined to the sub-montane areas or to the road-side plantations.

IV

MULTIPLICATION OF SEEDS AND POLICY CONSTRAINTS

A distinctly new dimension to agricultural production has been added after the introduction of the HYVs. In the case of wheat and rice, the coverage by HYVs is more than 94 per cent. The replacement of HYVs of seeds periodically is essential. On the other hand, in Punjab the availability of certified seeds has been lower than the requirement. It appears that this situation is likely to continue for some years.

Policy Constraints

In the past, before the Seed Corporation was set up, the State had been selecting and sponsoring different varieties. Seed production has also been carried out on Departmental Farms. Because of high overhead expenditure on such efforts of the State Government, the cost of production of seeds has been high and the State had to resort to subsidy in one way or the other. The main problem is whether in future the quality seed multiplication programme can be pursued on commercial lines or has to be implemented on promotional considerations. With the heavy drafts on the State budget, it is not possible for the State Government through its Seed Corporation to supply quality seeds

at cheap rates. It is doubtful if the small and marginal farmers can be involved in the seed multiplication enterprise. The size of holding has an important bearing on the cost of seed production. The cost of seed production on small sized farms would be high. Isolation of the seed field from other cultivated land is also necessary. This is the basis for the Compact Area Approach (CAA) for seed production through participation of small and marginal farmers. But the CAA has also not emerged as a practical possibility.

Seed production, like any other field venture, is subject to losses on account of weather and the risk of rejection on account of seed being substandard for no fault of the growers, as this may be the result of poor quality of the foundation seed. The compulsions for a large sized seed farm on account of cultivation practices and the plant protection measures, the risk of weather and rejection are, therefore, insurmountable. On the other hand, in Punjab, the acute shortage of land makes it difficult even for the institutional producers of seeds such as the Seed Corporation or the University to raise seeds economically on large farms. The main question is whether the use and production of new varieties can periodically be subsidised at least in the case of small and marginal farmers. So far, a policy decision has not been possible mainly on account of sheer want of resources although aversion to the enlargement of the areas of subsidy has by itself been a distinct factor.

V

CONCLUSIONS

Increased agricultural production in Punjab is possible through further investments in irrigation, power, land reclamation, land improvement, seed multiplication, etc. Prevention of soil deterioration on account of water-logging is necessary and possible. However, it requires large provisions for the maintenance of the existing drainage network in the State and the filling of the gaps where necessary.

Larger investments for saving of water through lining and better on-farm management also are necessary. While thus the technological possibilities of reaching higher levels of agricultural production in various ways exist, the constraints on heavier and larger investments on agriculture arise out of the fact that in the context of rise in input prices and administered price of foodgrains the State budgets are developing heavy deficits. This is particularly true of the investments in generation and transmission of power and the provision of flow and lift irrigation. On irrigation and power alone the annual losses are Rs. 135 crores. Thus over the five-year period the resources gap on this account is Rs. 675 crores. Such a situation leads to a two-fold consequence: first, it severely limits the capacity of the State to invest in the very items which are contributory to accelerated agricultural production; and secondly, if heavy investments are somehow provided in the sectors of irrigation and power, the deficit is widened in direct proportion to the increase in power supply and irrigation at subsidised rates. This in turn puts a heavy squeeze

on other sectors of production and social services. If these are added to the direct losses, the magnitude is much larger. The alternatives are that the administered prices must fully pay for the rising price of inputs, particularly irrigation and electricity but this has its own consequences for the general price level, to say nothing of the fact that even after increased administered prices, the recovery of input costs may still be politically difficult. In such a situation it is a moot point whether the Government of India would prefer to subsidise the State Government at the stage of input provision of electricity and irrigation or let the price level for the consumer rise with attendant consequences for the weaker sections, salaried or self-employed, larger subsidies on food distribution to consumers and dearness allowance to the salaried classes.

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