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GROWTH OF AGRICULTURE IN THE PUNJAB DURING THE DECADE 1952-62*

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OBJECTIVE AND METHOD

An attempt is made in this paper to identify the factors responsible for the disparities in the growth of agricultural output between different groups of districts in the Punjab. This study was suggested by the need to enquire into the causes of the relatively slow rate of growth of the agricultural sector in India. In this context, the study of fast growing regions is as important as of those recording slow progress. Besides, the growth rate of a broad administrative unit such as State would very often conceal significant variations in growth between its constituent units. Punjab makes an interesting case study for this purpose, as the growth of agriculture in this State has been quite impressive during the last decade: the index of agricultural production with 1949-50 as base year was 176.6¹ in 1960-61 in the State as against 139.1² for the country as a whole.

The figures of output analysed in this paper represent eleven important crops³ and are arrived at on the basis of constant prices.⁴ These eleven crops together with fodder crops cover from 90 per cent to 95 per cent of total cropped area in each district. The estimates of production and yield per acre in the case of many important crops are based on crop-cutting experiments since 1952, which lend precision as well as comparability to the data during this period.⁵ Annual growth rates are worked out by fitting an exponential function :

$$Y = ab^{t-1}$$

to the series concerned.

GROWTH OF OUTPUT

Growth of crop output has been markedly uneven between different districts of Punjab. The 17 districts under study are classified broadly into three groups on the basis of the growth rates of output (Table I). This would facilitate the analysis of the patterns and forces of growth and would permit generalisations having a fair degree of validity over space. The first group of districts or the areas of highest change have grown at the rate of 8.1 per cent per annum between

* The author is grateful to Miss Har Bhajan Kanwar for her statistical assistance and helpful suggestions in preparing this paper.

1. Statistical Abstract of Punjab 1962, Government of Punjab, p. 73.

2. Economic Survey of Indian Agriculture 1960-61, Ministry of Food and Agriculture, Government of India 1962, p. 76.

3. They are : Wheat, Rice, Jowar, Bajra, Maize, Barley, Gram, Sugarcane, Cotton (*Desi*), Cotton (American) and Rape and Mustard.

4. The prices used relate to the year 1952-53. The values of output thus arrived at reflect also the changes in output due to the changes in the crop pattern.

5. The crops covered by this method are : Wheat, Gram, Bajra, Maize, Rice, Jowar and Barley. See Statistical Abstract of Punjab, *Op. cit.*, p. 32.

TABLE I—GROWTH OF CROP OUTPUT IN THE PUNJAB : 1952-62
(Annual per cent growth rates)

District (1)	Growth rate (2)
Patiala	10.5
Hissar	8.8
Mahendragarh	8.1
Karnal	7.3
Bhatinda	6.3
Group—I	8.1
Ambala	5.4
Sangrur	4.4
Jullundur	3.9
Ludhiana	3.8
Rohtak	3.7
Ferozepur	3.6
Group—II	4.1
Gurgaon	3.2
Hoshiarpur	3.0
Kapurthala	2.0
Kangra	1.2
Amritsar	1.1
Gurdaspur	0.7
Group—III	1.9
State	4.8

Source : Statistical Abstract of Punjab, 1959, 1960, 1961 and 1962, Economic and Statistical Organisation, Government of Punjab.

1952-53 and 1961-62. The performance of the areas of lowest change (Group III), on the other hand, amounted to only about 1.9 per cent per annum.

The same pattern is noticed in regard to the changes in output per agricultural worker and per acre of net sown area between the years 1952-53 and 1961-62⁶ (Table II). The districts constituting the areas of highest change had a relatively low level of output per worker in 1952-53 when compared to Group II and their

6. Time-series data are not available in regard to the number of agricultural workers. The decennial censuses of population are the only sources of data on this item. The census figures of agricultural workers for the years 1951 and 1961 are used to arrive at the figures of agricultural output per worker in 1952-53 and 1961-62 respectively.

TABLE II—OUTPUT PER ACRE AND PER WORKER

					Group I	Group II	Group III	State
					(1)	(2)	(3)	(4)
Output per acre (Rs.) :								
1952-53	..	..	..	..	77.0	109.2	116.7	100.00
1961-62	..	..	..	..	117.5	147.4	133.7	132.2
Per cent difference	..	..	..	..	52.8	35.0	14.5	32.2
Output per worker (Rs.) :								
1952-53	..	..	..	..	348.0	494.0	290.0	378.0
1961-62	..	..	..	..	609.0	635.0	379.0	546.0
Per cent difference	..	..	..	..	75.0	28.5	30.7	44.4

per acre output was the lowest. As a result of the relatively higher rate of growth during the decade, they made a considerable improvement in the levels of output per worker as well as per acre, although output per acre for this group is still the lowest.

The growth of livestock, *e.g.*, she-buffaloes, sheep and poultry in different groups of districts corresponds broadly to the growth of crop output. Although the increase in the number of cows (in milk) is relatively higher in Group II, their overall growth itself is not significant (Table III). Besides, the cow-buffalo ratio

TABLE III—GROWTH OF LIVESTOCK IN PUNJAB
(Per cent change in the number of animals between 1951 and 1961)

					Group I	Group II	Group III	State
					(1)	(2)	(3)	(4)
Cows (in milk)	..	..	..	..	-4.1	4.4	1.6	0.7
She-buffaloes	..	..	..	..	38.7	31.3	11.4	26.8
Sheep	..	..	..	..	89.9	8.6	-6.3	23.9
Goats	..	..	..	..	-34.3	-23.3	-20.3	-25.9
Poultry	..	..	..	..	155.0	22.1	20.4	45.8

Source : Quinquennial Livestock Censuses of India, 1951 and 1961, Government of India.

in Punjab is in favour of buffalo.⁷ Since buffaloes are relatively high milk-yielding, the much larger increase in their number indicates that the growth of milk output has followed the same spatial pattern as that of crop output. That this should be so stands to reason under the prevailing conditions of mixed farming with the predominance of crop production. For one thing, fodder needs of these animals

7. National Council of Applied Economic Research : Techno-Economic Survey of Punjab, New Delhi, 1962, p. 30.

are still met largely by the stalk-yield of crops. Secondly, the demand for animal or farmyard manure is also influenced by the fortunes of crop production.

The number of goats declined significantly in the State, the extent of decline being much higher in the districts constituting Group I. According to the National Council of Applied Economic Research, "the rearing of goats is beset with many serious consequences. These arise out of extremely poor forest resources in the State, and voracious eating habit of goats. Goat-rearing has led to soil erosion in the hills and de-vegetation in the plains. It has also contributed in no mean measure to the destruction of young avenue trees and failures of Village Panchayat afforestation programmes. It may, therefore, be said that goat-rearing, as it is practised in the State today, has no place in a developing economy."⁸ The decline in the number of goats itself may, therefore, be attributed partly to the afforestation programmes of Village Panchayats. It follows from the above reasoning that the decline in the number of goats must have had a good effect on the growth of crop output. In this respect too, the districts in Group I seem to have benefited more.

FACTORS OF GROWTH

The factors or components of growth studied here are : net sown area and productivity of net sown area with its three sub-components, *viz.*, crop pattern, multiple cropping index and physical yield per acre of gross sown area.⁹ If the productivity per acre were to remain constant, output would grow at the same rate as net sown area. Hence the rate of change in output that is attributable to changes in productivity per acre is given by the difference between the rate of growth of output and the growth rate of net sown area. The growth rate of output ascribable to changes in crop pattern is given by the difference between the actual growth rate of output and the growth rate that would have obtained if the crop pattern remained the same, *i.e.*, when the ratios of individual crop acreages to total cropped area are held constant at the level prevailing in 1952-53. The contribution of changes in the multiple cropping index to the growth rate of output is given by the difference between the growth rates of gross and net sown area. The contribution of changes in physical yield per acre (of gross sown area) to the growth rate of output is obtained as the residual by deducting the above three components from the growth rate of output. The last component gives a measure of the growth rate of output resulting from changes in inputs per acre such as water, fertilisers, improved seeds, etc.

It will be seen from Table IV that changes in crop pattern alone accounted for a little over one-third of increase in the output of the State. As is evident from Table V, high-valued and high-yielding crops like *Desi* cotton, rice, sugarcane and rape and mustard registered a relatively larger increase in their output in all the three groups of districts, whereas the output of millets, *e.g.*, barley, jowar and bajra declined significantly. Increase in net sown area accounted for another one-third of increase in output. The contribution of changes in physical yield

8. *Op. cit.* p. 35.

9. Contribution to the rate of growth of output from the changes in the factors of functional nature, *e.g.*, land, labour, capital and organisation is difficult to estimate as the time-series data are available in respect of only one factor, *viz.*, land.

TABLE IV—FACTORS OF GROWTH

Annual growth rate of crop output due to changes in :	Group I	Group II	Group III	State
	(1)	(2)	(3)	(4)
(a) Net sown area	2.91	0.59	0.02	1.41
(b) Crop pattern	2.22	1.50	0.66	1.67
(c) Multiple cropping index	1.43	0.79	1.22	1.00
(d) Yield per acre of gross cropped area ..	1.54	1.17	-0.04	0.72
Total ..	8.10	4.05	1.86	4.80

TABLE V—GROWTH OF INDIVIDUAL CROPS
(Per cent changes in output between 1952-55 and 1959-62)*

Crops	Group I	Group II	Group III	State
(1)	(2)	(3)	(4)	(5)
Cotton (<i>Desi</i>)	124.9	87.1	4.0	84.1
Rice	208.0	78.8	39.0	83.3
Sugarcane	107.9	53.8	33.8	58.4
Rape and Mustard	164.4	4.5	-1.4	53.2
Wheat	65.4	29.1	7.5	38.5
Maize	32.3	48.3	12.8	28.2
Gram	64.5	0.6	9.0	28.2
Cotton (American)	65.9	28.4	-21.7	18.4
Barley	-8.2	-14.3	-30.7	-20.0
Jowar	-15.7	-38.3	-20.4	-26.5
Bajra	-21.0	-48.3	-31.2	-31.5
All Crops	69.6	26.3	9.3	33.9

*Triennial averages are taken with a view to minimising the effect of changes in weather on output.

per acre (of gross sown area) is the lowest. Between different Groups, the contribution of net sown area and crop pattern is relatively more significant in the areas of highest change (Group I). In the remaining areas, the contribution of net sown area is relatively small, that of yield per acre being negative in the areas of lowest change (Group III).

CHANGES IN INPUTS

The districts constituting the Group of highest change recorded a growth rate of 2.9 per cent per annum in the net sown area between the years 1952-53 and 1961-62. They also showed an increase of 5.6 per cent per annum in the irrigated area. In the districts of lowest change, on the other hand, gross irrigated area showed a decline (Table VI). Among these areas land reclamation has been very slow despite the availability of culturable waste and fallow lands and a relatively higher labour-land ratio, with the result that the ratio of culturable waste and fallow lands to net sown area was comparatively higher for this Group in the year 1961-62. The number of agricultural workers in this Group declined significantly between 1951 and 1961, while there is an indication of considerable net immigration of workers in the areas of highest change as the increase in this Group is much above the State average. There is a phenomenal increase in the number of improved implements in all the Groups, whereas the increase in the

TABLE VI—CHANGES IN INPUTS

	Group I	Group II	Group III	State
	(1)	(2)	(3)	(4)
1. Annual per cent growth rate between 1952-62 in :				
(i) Net sown area	2.91	0.59	0.02	1.41
(ii) Gross sown area	4.34	1.38	1.24	2.41
(iii) Gross irrigated area	5.60	0.90	-0.78	2.10
2. Per cent change in culturable waste and fallow lands between 1952-53 and 1961-62 :	-74.78	-41.07	-28.20	-54.31
3. Per cent ratio of culturable waste and fallow lands to net sown area in:				
1952-53	54.17	24.52	29.85	36.12
1961-62	10.07	13.72	20.40	14.23
4. Number of agricultural workers per '000 acres in :				
1952-53	221	221	402	265
1961-62	193	232	353	242
5. Per cent change in (4) between 1952-53 and 1961-62 :	-12.67	4.98	-12.19	-8.68
6. Per cent change between 1951 and 1961 in the Number of :				
(i) Agricultural workers	18.5	10.6	-7.8	6.2
(ii) Draught animals	30.0	12.0	13.0	16.5
(iii) Iron ploughs	1,540.0	199.0	59.0	193.0
(iv) Tractors	504.2	490.2	269.9	461.8
(v) Oil engines with pumping sets..	299.3	452.3	319.7	389.7
(vi) Electric pumps for tube-wells ..	2,057.0	3,195.0	2,386.0	2,600.0

Sources : (1) Statistical Abstract of Punjab, 1959, 1960, 1961 and 1962, Economic and Statistical Organisation, Government of Punjab.

(2) Quinquennial Livestock Census of India, 1951, Government of India.

(3) Census of India 1951, Vol. VIII, Part II-A and II-B, Government of India.

$$\text{Log } Y = 0.40 \div 0.95^{***} \log X_1 + 0.15 \log X_2 \quad (\text{Group I})$$

(0.20) (0.12)

***Significant at 1 per cent level

$R^2 = 0.78$

$N = 15$

Apart from the provision of irrigation which was crucial in promoting growth, another major factor in the areas of highest change was the growth of large scale mechanised cultivation especially in areas belonging to the former Pepsu State, by the erstwhile landlords consequent upon land reforms which discouraged absentee landlordism.¹³ Also, owing to the readiness of these landlords to dispose of lands over and above the requirements of personal cultivation, lands were available at relatively lower prices which attracted the rich and experienced cultivators from the water-logged and densely populated areas.¹⁴

In the remaining districts especially in the areas of lowest change, although cultivation was relatively more intensive in the earlier period, considerable possibilities for growth existed through the provision of irrigation in areas where the proportion of area irrigated was very low¹⁵ and through the intensification of inputs like fertilisers, improved seeds, etc., in the irrigated areas. But soil erosion and water-logging have rendered cultivation relatively unprofitable for about 9 million acres out of 31 million acres of land in the State, the areas worst affected being the districts of lowest change.¹⁶ In 1960-61, Punjab accounted for only about 3 per cent of nitrogenous fertilisers and 0.5 per cent of phosphatic fertilisers consumed in the country as against her share of 11 per cent in the irrigated area.¹⁷ This discrepancy is explained partly by the predominance of wheat in the crop pattern of Punjab, as the output response to fertilisers is found to be generally lower for wheat when compared to rice.¹⁸ But even among wheat growing regions, the response to fertilisers is found to be very low in Punjab. The data relating to the three wheat growing districts of Northern India where intensive Agricultural District Programme has been in progress show that the per cent increase in yield per acre for farms using fertilisers over those not using is invariably lower in Ludhiana (Group II) as compared to other districts.¹⁹ (Table VII).

13. Economics of Tractor Cultivation in the Punjab for the Year 1956-57, The Board of Economic Inquiry, Punjab, p. 2.

14. Gurdev Singh Gosal, "Redistribution of Population in Punjab during 1951-61," Paper submitted to the All-India Seminar on Population, 1964 (unpublished).

15. The proportion of area irrigated in Gurgaon declined from 19.7 per cent in 1953-54 to 12 per cent in 1961-62, while it remained constant around 23 per cent in Kangra. It recorded a small increase from 13 per cent to 14 per cent in Hoshiarpur. See Statistical Abstract of Punjab, *Op. cit.*, 1959 and 1961-62.

16. Water-logging is caused in many of the old canal irrigated districts, e.g., Amritsar, Hoshiarpur, Sangrur, Jullundur, Gurdaspur and Ludhiana owing to the rise in water table through the seepage of canal water over several decades and due to the defective drainage system. Apart from water-logging, soil erosion through water and wind has affected greater part of Gurgaon, Ambala, Hoshiarpur, Kangra and Gurdaspur districts. The annual loss due to water-logging and soil erosion is estimated to exceed Rs. 30 crores. See Techno-Economic Survey of Punjab, *Op. cit.*, pp. 11-12 and 20.

17. Third Five-Year Plan, Government of India, 1961, p. 327. District-wise data on the consumption of fertilisers are not available.

18. The Use of Fertilisers on Foodgrains, Indian Council of Agricultural Research, New Delhi, 1963, pp. 14-15.

19. The recommended dose of fertilisers per hectare was nearly the same in the three districts. See Report on Intensive Agricultural District Programme (1961-63), Expert Committee on Assessment and Evaluation, Ministry of Food and Agriculture, Government of India, New Delhi, 1963.

TABLE VII—AVERAGE YIELDS OF WHEAT AND MAIZE CROPS ACCORDING TO DIFFERENT AGRONOMIC PRACTICES

District	Practices followed		Average yield in quintal per hectare (1961-62)	
	Manured (M) Not Manured (O)	Fertiliser Applied (F) Fertiliser not Applied (O)	Wheat	Maize
(1)	(2)	(3)	(4)	(5)
Ludhiana (Punjab)	M	F	23.2	22.7
	M	O	20.2	20.9
			(13.0)*	(9.0)
	O	F	20.5	19.4
	O	O	18.6	19.2
		(10.0)	(1.0)	
Aligarh (Uttar Pradesh)	M	F	19.0	10.9
	M	O	12.0	3.4
			(58.0)	(300.0)
	O	F	16.5	5.9
	O	O	12.6	4.9
		(32.0)	(20.0)	
Shahabad (Bihar)	M	F	9.7	—
	M	O	7.4	—
			(31.0)	—
	O	F	9.8	—
	O	O	6.2	—
		(58.0)	—	

Source : Report on Intensive Agricultural District Programme (1961-63), Expert Committee on Assessment and Evaluation, Government of India, *Op. cit.*

* Figures in brackets give the per cent differences between (O) and (F).

This tendency is common to both the categories of farms, *i.e.*, those served with farmyard manure and those not using them, the disparity in the case of the latter being much more glaring. The evaluation of the 1958-59 *Rabi* crop campaign in Punjab revealed that the response of output was much higher in Hissar district (Group I) as compared to Ludhiana (Group II) and Amritsar (Group III).²⁰ The increase in the amount of fertilisers demanded was also much higher in Hissar (Table VIII). In view of the known responsiveness of the Punjab cultivator to

20. Low response has been attributed to adverse natural factors by these two studies relating to different years. These areas are highly susceptible to adverse climatic conditions owing to the presence of excessive moisture in the soil, and the absence of effective drainage system.

function. The residuals for the 17 observations showed that ten districts which belong to Groups I and II had positive values while the remaining 7 districts had negative values. In view of this structural divergence between these two groups of districts, a separate function was tried for the first 10 observations which gave the following equation :

$$\text{Log } Y = 0.54 + 0.17 \log X_1 + 0.35^* \log X^2 + 0.48^{**} \log X_3$$

(0.08) (0.11) (0.10)

* Significant at 1 per cent level $R^2 = 0.97$
 ** Significant at 5 per cent level $N = 10$

Among these observations as much as 97 per cent of variation in output is explained by the economic variables included in the function and the coefficients for labour and capital are significant. Against the background of large increases in area under cultivation and the immigration of agricultural workers in these areas, it is understandable that there should be greater scope for the intensive cultivation of land through the application of more labour and capital inputs. The relatively lower coefficients for labour and capital and the relatively larger unexplained component in the total State function are, therefore, attributable to the inclusion of seven districts where land reclamation has been very slow and the number of agricultural workers per acre is much higher and where water-logging and soil erosion which have an adverse effect on output can be regarded as unaccounted explanatory variables.

Another growth inhibiting factor in addition to these natural constraints is the system of share-cropping tenancy called *Batai*, according to which the tenant gives a fixed proportion of gross produce as rent²³ to the landlord while the costs of production are almost entirely borne by the tenant. The 1961 Census revealed that the proportion of cultivated holdings under tenant farming in Punjab is one of the highest in the country.²⁴ According to the Farm Management Studies as much as 38 per cent of cultivated area in Amritsar and Ferozpur districts was under tenant farming, that under *Batai* alone being 28 per cent of cultivated area.²⁵ Whereas an owner-cultivator can be expected to increase the input up to a point where marginal revenue equals marginal cost, a share-cropper who gives out one-half of gross produce as rent would stop applying additional inputs at a point where the marginal revenue is twice the marginal cost, for, it is only then that he can cover his costs after meeting landlord's share.²⁶ The application of inputs

23. The *Batai* rent in vogue in Punjab is 50 per cent of gross produce. See Farm Accounts in Punjab for the Year 1959-60, *Op. cit.*, pp. 112-19.

24. P. S. Sharma, "A Study of the Structural and Tenorial Aspects of Rural Economy in the Light of 1961 Census," Paper submitted to the All-India Seminar on Population, 1964 (unpublished).

25. Studies in Economics of Farm Management in Punjab, 1956-57, Directorate of Economics and Statistics, Government of India, p. 12.

26. If this possibility (*i.e.*, marginal revenue at any level being at least twice the marginal cost) does not exist, the input in question will not be applied at all. In the case of abundant factors such as family labour, however, the inputs may be applied up to the point where the marginal product nears zero. So long as marginal product is positive for such 'free' resources, their application will add to the income of the share-cropper, albeit, at the rate of 50 per cent of marginal product.

like fertilisers would thus be discouraged under the *Batai* cultivation.²⁷ The available data for different types of farms (Table IX) indicate that inputs and outputs per acre are invariably lower for tenanted holdings. The increase in output and input per acre between the years 1954-55 and 1956-57 is much lower for these farms as compared to self-cultivated holdings. Since the proportion of area leased in is relatively higher among the small holdings²⁸ where the application of family labour and output per acre are generally higher, the figures in Table IX being the averages for all sizes, the per acre values of purchased inputs (including

TABLE IX—INPUT AND OUTPUT PER ACRE FOR SELF-CULTIVATED AND BATAI LANDS (Rs.)

	Input*			Output		
	Self-cultivated	<i>Batai</i>	Per cent difference	Self-cultivated	<i>Batai</i>	Per cent difference
	(1)	(2)	(3)	(4)	(5)	(6)
1954-55	171	145	—15·2	155	129	—16·8
1956-57	182	146	—19·8	189	146	—22·8
Per cent difference ..	6·4	0·7	—	21·9	13·2	—
1959-60	217	182	—16·1	249	237	—4·8

Sources : (1) For the data relating to 1954-55 and 1956-57 : Studies in Economics of Farm Management in Punjab, 1954-55, 1956-57, Directorate of Economics and Statistics, Government of India.

(2) For the data relating to 1959-60 : Farm Accounts in the Punjab for the Year 1959-60, Board of Economic Inquiry, Punjab, Government of Punjab.

* Values of input include apart from cash expenditure, the imputed values of family labour, rental values of own land and interest on the own capital invested.

the technologically new inputs like fertilisers,²⁹ insecticides, etc.) and output resulting therefrom for *Batai* holdings can be regarded as much lower than is indicated by these figures. Although the extent of tenant farming appears to be nearly the same in all the groups of districts, this factor must have affected the growth of output more adversely in Groups II and III, as the increase in output in these areas could be achieved mainly through the intensification of inputs per acre.

27. The disincentives will not operate if there are arrangements whereby the cost of such inputs is shared equally by the parties. But the available evidence does not suggest the effective prevalence of any such arrangements.

28. The proportion of area under *Batai* to the total holding ranged from 22 per cent to 35 per cent among holdings of below 10 acres as against 14 per cent to 19 per cent among the remaining holdings in Amritsar. The corresponding ranges for Ferozepur are : 33 per cent to 56 per cent and 23 per cent to 43 per cent. See Studies in Economics of Farm Management in Punjab, *Op. cit.*, pp. 12-15.

29. Separate figures of fertiliser input are not available for different types of holdings.

IMPLICATIONS

The above analysis suggests that in a region like Punjab where the requisite human factor for progress is not lacking, government should concentrate more on providing the necessary infra-structure, particularly irrigation, and on removing natural and institutional constraints such as soil erosion, water-logging and the disincentives associated with share-cropping tenancy which are beyond the means of individual farmers. In order to obtain maximum benefit from the use of scarce factor like fertilisers it is advisable to employ them in areas which are relatively free from natural constraints and where the yield response is likely to be higher. From this standpoint the districts in Group I, especially those where the proportion of area irrigated is quite high, are better suited at present for programmes of Intensive Agricultural Development. Also, it is necessary to encourage the use of fertilisers, pesticides, etc., on *Batai* holdings by ensuring in practice that landlords bear at least half the cost. Measures to combat soil erosion and water-logging through afforestation and drainage, etc., should be given the highest priority in Groups II and III. The schemes undertaken in this respect during the Second and the Third Five-Year Plans, when completed, are estimated to cover an area of only about 0.2 million acres,³⁰ which constitutes hardly 3 per cent of area affected and 10 per cent of area requiring early action.³¹ The temptation to postpone long-term projects which involve considerable costs³² and organisational effort in preference to the quick-maturing ones would indeed be very high in a situation where food requirements are pressing. But the cost of postponement is likely to be very high in this case because soil erosion and water-logging are accentuated every year due to the continuous run-off and to the seepage of canal water and thus add to the cost of their removal. It is, therefore, of utmost importance to overcome this vicious circle before the costs become prohibitive.

30. Third Five-Year Plan, *Op. cit.*, p. 325.

31. About 2 million acres are estimated to be requiring early action. See Techno-Economic Survey of Punjab, *Op. cit.*, p. 11.

32. According to the estimates made by the National Council of Applied Economic Research, the programme of removing water-logging and of soil conservation would cost roughly Rs. 25 crores for the areas needing early action. *Op. cit.*, pp. 20 and 24.