Chapter - VI

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The problem of uncertainty and low productivity has been recognized as an age-old experience under rainfed farming. The importance of irrigation has thus been realised since the beginning of the cultivation of crops. The basic purpose of creating irrigation facilities was to provide protective irrigation or life saving irrigation to the field crops to supplement the dependence of natural precipitation. The history of irrigation in India is a well documented proof for saving the crops from the vagaries of nature and thus obtain atleast the subsistence level of output. Later on, the concept of protective irrigation was gradually changed towards productive purpose of the artificial supply of water to the field crops. The National Five Year Plans and the National Commission on Agriculture (1976) conceived a comprehensive scheme for preparing a National Water Budget, devicing the measures for accumulation and scientific distribution of accumulated water and emphasis on the development of technology for water management to ultimately increase production and productivity of field crops.

The policies laid-down by the government included the tapping of natural water resources through construction of dams across the natural streams which gave birth to the idea

of command areas. The objective of the command area was to harness the natural water resource and optimise agricultural production within the command for its overall development. Water as such not only plays a significant role in agricultural production, but also serves as a carrier of other components of production technology such as improved seeds, use of chemical fertilizers and plant protection measures and scientific crop husbandry. In Madhya Pradesh, with less than 1/7th of the total cultivated areas as irrigated from different sources, ventured the Tawa and Chambal Irrigation Projects which now are serving the respective command areas under the Bysecut Department and Command Area Development Authorities. Since Tawa and Chambal commands were commissioned for over a decade, it is high time to see what has happened to the production of foodgrains in these areas. The foodgrains comprised of cereals and pulses are the dominating crops in the cropping system, therefore, the foodgrains were picked up to be examined in detail with the following specific objectives :-

(1) To measure the changes in the official estimates of foodgrains production in command areas of Madhya Pradesh and estimate the growth rates for pre and post-green revolution periods.

(2) To decompose foodgrain production into its components during pre and post-green revolution periods.

(3) To examine the variabilities associated with foodgrain production in command areas with reference to time periods under consideration.

(4) To measure the changes in the use of major production inputs and their association with the level of production.

For achieving the above objectives, Tawa command from Central part of the State (Hoshangabad division) and Chambal command from North-western part of the State (Bhind and Morena districts) were purposively selected since they happen to be the major command areas of the State. Tawa command represents heavy to medium soils with 1300 mm annual rainfall, traditionally called as 'Wheat Belt' along Narmada river. The Chambal command is characterised by deep alluvial soils with 900 to 1000 mm rainfall, traditionally called as 'Jowar-Wheat Belt' is spread over the area washed away by Chambal river. Thus, the two situations are available where irrigation water is no more a constraint in agricultural production, specially the production of foodgrains. For achieving the objectives, time series data from secondary sources were collected for a time span since 1956-57 to 1984-85 which was conveniently grouped as (a) pre-green revolution period (1956-57 to 1964-65) and (b) post-green revolution period (1965-66 to 1984-85). The analysis has been done covering the absolute and relative changes in acreage, production and yield of foodgrains, trends and growth rates of foodgrains, decomposition of cropwise

production into area, yield and interaction effects, and variability in production components. The correlations and regressions for examining the resource productivity were also attempted. The data pertained to macro level (district level), although the actual command area was not the same as of the districts involved in each command and this was the limitation in the data used for the present study. The analysis of trend and growth rates was attempted in the lines suggested by the earlier workers. The growth rates were estimated through log-linear equation to have intercrop comparisons within command and intracrop comparison between commands selected for the study.

The analytical results of the study were :-

1. Tawa command area witnessed decline in acreage and yield of foodgrains which ultimately affected the production during pre-green revolution period (1956-57 to 1964-65), whereas such reductions were not found for Chambal command. An absolute increase in the components of foodgrains production was remarkable during post-green revolution period in Tawa command when production increased by nearly 97 per cent with an increase of 10 per cent in acreage and more than 77 per cent increase in the yield. There was absolute decline of foodgrain acreage in Chambal command by 5.41 per cent, but the production and yield increased by more than 55 per cent. The increase in foodgrain production in Chambal command with

smaller acreage during post-green revolution period is a glaring example of intensive cultivation under irrigated conditions. During the same period, the acreage of foodgrains in Madhya Pradesh increased by 7.9 per cent with an increase in productivity by 7.72 per cent, resulting into an increase in production by a little over 16 per cent only. Thus, command areas have performed well in comparison to the foodgrain production in the entire state.

2. The position of crop categories of foodgrains namely, cereals and pulses with respect to their area, production and productivity was different. There was a decline in the acreage under cereals in Tawa command against an increase in Chambal command in both the time periods under consideration. The pulses gained importance in acreage and production in both the commands, irrespective of the time periods. The productivity of the cereals did reveal rising trend during post-green revolution period in Tawa command against rising yield trends of productivity of cereals in Chambal command during the entire period. The productivity of pulses which had declining trend during the earlier period, turned out to have rising trend during the post-green revolution period in both the commands. In other words, there was a substantial productivity gains in both the commands after the irrigation was made available to cereals and pulses.

3. The intercrop comparison within the command and intra-crop comparison between the commands during the periods under study, indicated that paddy and wheat gained in acreage during the post-green revolution period when the irrigation was made available. Similarly, jowar and bajra suffered in acreage in both the commands during the post-green revolution period. There was a substantial increase in the acreage of gram, tur and pea in Tawa command during the later period, while urd, moong and masoor occupied larger acreage in Chambal command. The production of paddy, wheat and maize in Tawa command increased gradually over time, whereas paddy, wheat and maize indicated higher production levels in Chambal command during the post-green revolution period. Among the pulses, production of gram and tur increased in Tawa command against the declining production of gram in Chambal command. The production of tur and masoor significantly increased in Chambal command during post-green revolution period. There was a drastic increase in the productivity of paddy, wheat, jowar and bajra in Chambal command during the post-green revolution period against the increase in productivity of paddy, wheat and jowar in Tawa command. Similarly, the productivity of all the pulses increased in Tawa command by over 75 per cent, ranging from 10.52 per cent in case of masoor to 82.69 per cent in case of tur during the post-green revolution period. In Chambal command, the productivity of pulses during post-green revolution period increased by 11.72

per cent, ranging from 12.55 per cent in case of urd to 178.40 per cent in case of tur. Moong was the only exception showing negative relative change in productivity during the later period.

4. The trend analysis of the foodgrains revealed significant and positive trends in case of paddy, wheat, maize, gram and pea in Tawa command during post-green revolution period. The overall trend of acreage, production and yield during the same period was also found to be positive and significant in both the commands. In Chambal command, significant positive trends were observed for paddy, wheat, maize, urd, tur, pea and moong during the post-green revolution period. The established trends of foodgrains in command area is a decisive element for upgrading their productivity and production levels to exploit their potentials within a specified period - say 2000 A.D. Considering the trends of foodgrains in both the commands, the projections were made for the year 2000 A.D. In Tawa command, the production of foodgrains is likely to go up from 320.23 thousand tonnes to 362.40 thousand tonnes by the year 2000 A.D. Similarly, the projected foodgrain production would go up from 745.86 thousand tonnes to 805.89 thousand tonnes by the end of current century in Chambal command.

5. The stability of acreage, production and productivity of foodgrains has been examined for both the periods. As

regards acreage variability of foodgrains, it ranged from 0.84 per cent to 3.05 per cent in Tawa command and from 3.21 per cent to 4.18 per cent in Chambal command. The post-green revolution period induced a slight increase in acreage variability due to expansion of irrigation facilities and extension of the area under the major crops like paddy, wheat, gram and tur. In general, the acreage variability was nominal in both the commands. The production variability was at higher levels in both the commands, ranging from 5.82 per cent to 16.94 per cent in Tawa command and from 8.07 per cent to 11.51 per cent in Chambal command during pre and post-green revolution periods, respectively. The higher magnitude of production variability was due to increased yield variability associated with nominal acreage variability of foodgrains. During the post-green revolution period, the production variability was higher in case of paddy, wheat, gram, urd, pea and teora in Tawa command, and paddy, wheat, jowar, maize, bajra, pea, moong, tur, urd and gram in Chambal command. In other words, the post-green revolution period appeared to be more susceptible to production risk in view of higher yield risk associated with new crop varieties responsive to fertilizer and plant protection applications. The higher risk associated with new agricultural strategy, if safeguarded, is bound to give more returns both in physical and monetary terms. The farmers will have to be educated to become risk-lovers rather than being risk-avertors.

The yield risk in terms of coefficients of variation during post-green revolution period was substantial, particularly in case of paddy, wheat, gram, tur in Tawa command and in case of paddy, wheat, jowar, maize, bajra, tur and pea in Chambal command. Rajkrishna's analysis for Punjab upto 1956-57 indicated that technical progress contributed to nearly 60 per cent of the output growth.

6. The decomposition of foodgrain production in the command area, particularly during the post-green revolution period indicated that the yield contributions were higher than the acreage contributions in case of paddy, wheat and tur in Tawa command, whereas percentage share of area was more in case of moong, teora, urd, kodo and maize. The interaction effect was found substantial in case of moong, teora, gram and urd. In Chambal command, during the post-green revolution period, percentage contribution of yield to the total production was higher in case of paddy, wheat, tur and pea, leaving the other crops where the acreage contribution exceeded the yield contribution. The decomposition analysis suggested that in future, efforts should be made to increase the yield contribution in the total production through intensive cultivation of crops and adoption of recommended production technology. Extensive cultivation indicated by dominant share of acreage in the total production needs to be discouraged. In other words, the production strategy will have to be directed towards increasing the productivity of foodgrains

for which the efforts are already being made. At the local level, the constraints of productivity need to be analysed, priortised and minimised gradually to achieve the basic objectives of the command area development programme.

7. The association of factors which influence foodgrain production revealed that there was significant correlation between foodgrain production and area under foodgrains (X_1), gross irrigated area (X_2) and number of agricultural labourers (X_3) during pre-green revolution period in both the commands. The additional factors namely, fertilizer consumption and area under high yielding varieties of foodgrains during the post-green revolution period were found to be significantly and directly associated with production of total foodgrains. The empirical evidence of such associations helps in taking policy decisions and implementation of the action programmes intended for enhancing the productivity and production of foodgrains, specially under irrigated conditions. Since the farming is being modernized on commercial lines, the association of the farm harvest prices with the production of foodgrains was also analysed and it was found to be significant and positive in case of wheat alone in Tawa command. The significant inverse correlation of farm harvest prices with production of bajra and moong was noted in Tawa command. In Chambal command, the production-price associations were significantly positive in case of wheat, tur and masoor against the inverse association in case of gram only.

Although these results do not substitute for supply response studies, however, the influence of harvest prices on production of foodgrains is certainly reflected. The farmers and the policy makers may decide on substitution of crops within command area for those crops which have revealed significant inverse price correlation with their production levels.

8. To find out the marginal productivity of resources engaged in foodgrain production in both the command districts, the regression analysis (Cobb Douglas) was done which, contrary to the belief, revealed insignificant regression coefficients for fertilizer consumption, gross irrigated area and area under high yielding varieties. The significant regression coefficients were only for the area under foodgrains and number of agricultural labourers available in Hoshangabad district, representing Tawa command. In Chambal command, only the agricultural labourers revealed significant response during the pre-green revolution period, whereas the coefficients for fertilizer consumption and gross irrigated area were significant at 10 per cent probability during the post-green revolution period. The macro level regression analysis did not give clear picture as the data for the districts deviated from the actual command for which the required information was not available. However, the insignificant regression coefficients for fertilizer, irrigated area and area under high yielding varieties may be due to low level of use in foodgrain production. The positive

response of these non-conventional inputs in Chambal command clearly indicated that fertilizer consumption will have to be increased along with an increase in the area under high yielding varieties to attain higher level of production and productivity of foodgrains. There has been a gradual increase in the consumption of fertilizers and area under high yielding varieties of crops in the command areas but the present rate will have to be stepped up to optimise food production. In fact, the Command Area Development Authority must focus on the optimum utilization of available irrigation water through remunerative cropping systems, scientific management of crops, scheduling of irrigation and identification of the limiting factors such as micronutrients etc. so that the present momentum of the crop productivity is further accelerated. There has been indications in the command areas that the irrigation water is misused due to over irrigation for want of water technology appropriate to the local soil crop conditions. The dangers of irrigation misuse have already been identified, particularly in Tawa command which has heavy black soils and they should be taken as the warning signals to save land and water so essential for the posterity.

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APPENDICES

Appendix - I

Average of area of important foodgrain crops in the study area

Unit : '000 ha

Crop	Tawa command		Chambal command	
	Pre-GR	Post-GR	Pre-GR	Post-GR
Cereals				
Paddy	10.30	11.37	12.33	16.62
Wheat	172.17	138.68	11.67	168.80
Jowar	49.22	37.80	76.80	61.78
Bajra	1.92	1.02	0.97	0.69
Maize	0.16	0.15	146.47	99.11
Barley	15.78	14.87	-	-
Total cereals	231.86	208.89	948.23	376.95
Pulses				
Gram	49.30	50.80	184.24	147.74
Urd	0.71	5.21	1.08	1.91
Tur	19.01	23.91	53.26	38.87
Moong	3.86	4.71	12.84	10.14
Lakh	1.11	1.86	1.73	0.59
Masoor	2.96	5.01	5.16	11.43
Peas	13.98	13.00	-	-
Total pulses	89.74	107.04	244.66	233.61
Total foodgrains	321.60	313.88	594.22	614.38

APPENDIX - II

Average of production of important foodgrain crops in the study area

Unit : '000 tonnes

Crop	Tawa command		Chambal command	
	Pre-GR	Post-GR	Pre-GR	Post-GR
CEREALS				
Paddy	8.06	9.89	14.56	20.56
Wheat	94.61	111.38	85.48	229.53
Jowar	19.26	81.69	55.87	44.73
Maize	1.76	2.23	0.44	0.60
Bajra	0.10	0.10	71.05	80.04
Kodo	2.04	2.50	-	-
Total cereals	133.25	148.36	249.29	393.11
PULSES				
Gram	20.12	28.88	138.67	124.44
Urd	0.27	1.25	0.26	0.51
Tur	21.07	27.71	16.66	26.62
Moong	0.46	0.79	4.63	3.31
Pea	0.30	0.46	0.72	22.73
Masoor	1.22	2.04	2.81	4.42
Teora	6.09	7.90	-	-
Total pulses	51.90	63.73	151.34	163.75
Total foodgrains	186.65	212.04	375.35	554.78

APPENDIX-III

Average of productivity (yield) of important foodgrain crops in the study area

Unit : kg/ha

Crop	Tawa command		Chambal command	
	Pre-GR	Post-GR	Pre-GR	Post-GR
CEREALS				
Paddy	843.57	950.95	1187.66	1229.27
Wheat	545.71	973.22	755.71	1297.92
Jowar	709.57	927.17	692.23	767.38
Maize	968.09	1116.55	756.00	804.11
Bajra	531.71	563.50	664.04	840.42
Kodo-kutki	132.33	170.44	-	-
Total cereals	575.19	715.72	713.62	1039.42
PULSES				
Gram	405.38	544.98	755.04	857.68
Urd	325.23	340.60	270.76	290.95
Tur	1103.19	1748.87	509.28	676.93
Moong	209.66	204.09	357.09	308.17
Pea	263.80	238.42	499.09	417.00
Masoor	395.43	357.71	528.38	380.39
Teora	369.14	448.74	-	-
Total pulses	577.90	595.63	621.85	730.13
Total foodgrains	500.04	673.79	631.38	910.20