

## CHAPTER – 9

### COMMAND AREA DEVELOPMENT

#### 9.1 General

As already discussed, three command areas are being covered under K-B link project. These are Enroute command, Ken command and Betwa command. The enroute command lies in Chhatarpur and Tikamgarh districts of Madhya Pradesh and Hamirpur and Jhansi districts of Uttar Pradesh. The culturable command area (CCA) of 47,000 ha is covered enroute of the link canal. The Ken command lies in Chhatarpur and Panna districts of Madhya Pradesh. The CCA under this command is 2.41 lakh ha. The Betwa command (i.e. four proposed projects command) in the upper reaches of Betwa basin lies in Vidisha and Raisen districts of Madhya Pradesh. The CCA under the four proposed projects namely Barari, Neemkheda, Richhan and Kesari is 1.02 lakh ha.

The participation of farmers and other water users in the process of managing and developing irrigation projects can play a vital role with immense benefits. The lessons of this line of research are that farmer involvement in planning, design, water allocation and conflict management has several positive effects on project outcomes. As per the novel thoughts of the social scientists, this will lead reduction in conflict and deviance in addition to improve water application efficiencies. These thoughts, based on the practical findings, are consistent with the research traditions of the sociology of organizations and national choice theory, which would suggest that worker or farmer satisfaction and productivity will be linked to the degree to which they as constituents are meaningfully involved in the decision making process.

A preoccupation with farmer participation may have obscured to some degree the fact that farmer behavior is partly a function of the organizational behavior of project and agency bureaucrats who interact directly or indirectly with farmers, implement or neglect project policy, and otherwise have a bearing on the outcomes of the irrigation enterprise. Irrigation bureaucracies have been faulted for reduced efficiency due to their “bloating”, failing to train and retain a qualified corps of agricultural scientists, underinvesting in management, not addressing the market value of water, corruption and not representing farmer concerns. Future attempts to improve project performance will need to address the problem of institutional reform more aggressively.

Nonetheless, researchers have recognized the importance of the interface between the farmers and the bureaucrats. For effective participation of the farmers in the management, there must be incentives for farmers and peasants. There must also be incentives for field level administrators to facilitate that participation”.

It is thus conclude that the active participation of farmers and other water users with the irrigation bureaucrats can minimize the future problems and increase productivity with smooth functioning and management of the project. It is proposed that small committees consisting of representatives of farmers, other water users of Enroute command, Ken command and Betwa command comprising of four proposed projects namely Richhan, Neemkheda, Kesari & Barari in upper Betwa basin and irrigation bureaucrats can be constituted to look after the management for smooth running of the project.

Beside the above, the detailed studies are proposed to be taken up at the time of preparation of DPR of the project for levelling & shaping of undulating land in the command area and construction of network of watercourses & field channels in the command scientifically, so that farmers could apply their share of water uniformly over the farms. Substantial provision is also proposed to be kept for educating the farmers & water users for adaption of water conservative methods of irrigation, new cropping pattern and application of appropriate depth of water for the growth of various crops.

## **9.2 Command area**

### **9.2.1 Enroute command**

The districts and tehsils benefitted under this command is given in Table-9.1.

<b>Table – 9.1</b>		
<b>Districts and tehsils benefitted</b>		
<b>Sl.No.</b>	<b>District</b>	<b>Tehsil</b>
1.	Chhatarpur	(i) Chhatarpur
		(ii) Nowgong
2.	Tikamgarh	(i) Jatara
		(ii) Tikamgarh
3.	Jhansi	Mauranipur
4.	Hamirpur	Mahoba

Districtwise classification of land falling in the enroute command area of K-B link is given in Table-9.2.

<b>Type of land</b>	<b>Tikamgarh district</b>	<b>Chhatarpur district</b>	<b>Jhansi district</b>	<b>Hamirpur districts</b>
Gross command area	21210.0 ha (4.20% of total geographical area of the district)	22220.0 ha (2.55% of total geographical area of the district)	4990.0 ha (0.99% of total geographical area of the district)	3090.0 ha (0.43% of total geographical area of the district)
Forest land	1229.0	41.0	24.0	62.0
Land under non-agricultural use	1608.0	1327.0	311.0	222.0
Barren land	2254.0	2954.0	148.0	128.0
Grass land	2345.0	2614.0	3.0	6.0
Culturable waste land	1013.0	2940.0	303.0	128.0
Fallow land	842.0	1043.0	235.0	187.0
Net sown area	11145.0	9910.0	3745.0	2150.0
Other lands	774.0	1391.0	221.0	207.0

The details of existing irrigation facilities in the enroute command are given in Table-8.1 of Chapter-8 'Irrigation Planning'.

### 9.2.2 Ken command

The tehsilwise breakup of command area to be irrigated by different canals as planned under Ken command is given in Table-9.3.

<b>District</b>	<b>Tehsil</b>	<b>Name of canal</b>	<b>G.C.A.</b>	<b>C.C.A</b>
1. Chhatarpur	(i) Chhatarpur	(a) Ken L.B.C.	67801	42203
		(b) Kukuna lift	3988	2492
		(c) Kuraha lift	24154	18275
		(d) Lugasi and Satna lift	25298	19751
	(ii) Laundi	Urmil L.B.C.	110441	90132
	(iii) Laundi and Chhatarpur	Bariarpur L.B.C.	58291	46269
	2. Panna	(i) Ajaygarh	(a) Bariarpur RBC	21989
(b) From existing Ken			9307	7077
		<b>Total</b>	<b>221269</b>	<b>241306</b>

### 9.2.3 Betwa command

The indicative master plan of Betwa basin prepared by the department of irrigation, Madhya Pradesh, presents the list of projects in 'B' category, which includes Barari barrage, Neemkheda, Richhan and Kesari dams. The details of command area under these projects are given in Table-8.18 of Chapter-8 'Irrigation Planning'.

## 9.3 Climate of the command area

### 9.3.1 Enroute command and Ken command

Climate of Enroute command and Ken command is as given below:

**(a) Rainfall:** Average annual rainfall and seasonal distribution of rainfall (monsoon and non-monsoon) are given in para-8.5.4 of Chapter-8 'Irrigation Planning'.

**(b) Temperature:** Moderate heat is experienced during summer. The climate is quite cold in winter. Maximum temperature recorded in Tikamgarh district is 46°C and the minimum as 1°C. The minimum winter temperature was recorded as low as 0°C at Nowgong meteorological observatory.

**(c) Relative humidity:** The maximum and minimum relative humidity recorded in five different IMD stations in and around the command are 95% and 9% respectively.

**(d) Evaporation:** The monthly mean evaporation in the command area varies between 8 cm to 25 cm.

### 9.3.2 Betwa command

Climate of Betwa command is as given below:

**(a) Rainfall:** The command area receives most of its rainfall during the monsoon from July to September from the southwest monsoons. The coefficient of variation in annual rainfall is appreciable i.e. 22.05. The maximum and minimum annual rainfall in the area is 1700 mm to 600 mm respectively.

**(b) Temperature:** The climate of the area is characterized by a hot summer and a mild winter. The climate is hot during summer with the temperature as high as 45°C.

**(c) Relative humidity:** The mean monthly relative humidity observed at Bhopal observatory, which is close to the command area varies between 20% to 82%.

**(d) Wind velocity:** The monthly mean wind velocity observed at Bhopal varies between 4.3 km/hr to 13.2 km/hr.

## **9.4 Irrigation facilities**

### **9.4.1 Enroute command**

#### **(a) Present sources of irrigation in the command**

The present sources of irrigation in the proposed command area are mainly the age-old tanks and ponds, which collect the rainwater during the monsoon season. Besides these, some privately owned open wells and deep tube wells also provide water for irrigation to very small areas.

#### **(b) Methods of irrigation followed**

At present the conventional method of applying water through minor irrigation channels, distributaries and water courses is being followed in these areas. However, sometimes electric/diesel pump sets are also used to lift water from the wells.

#### **(c) Status of land development in irrigated area**

**(i) Condition of channels:** The conditions of existing irrigation channels in the command are generally satisfactory except in some reaches where proper maintenance is required. Most of the channels are unlined, hence susceptible to loss of water through seepage.

**(ii) Longitudinal slope of the field:** The slopes in the agricultural fields where irrigation channels are located, are adequate and irrigation water reaches almost every nook and corner of the fields.

**(iii) Status of field channels:** Before providing water for irrigation to the areas under existing irrigation system, the existing canal system will need to be reviewed and resectioning, repairing and realigning may be called for wherever necessary.

### **9.4.2 Ken command**

#### **(a) Present sources of irrigation in the command**

The area covered by the existing irrigation system in the command is 0.26 lakh ha. The present sources of irrigation are mainly the age old tanks from where water is being carried through canals. There are 9 such tanks in the command area. The names of these tanks and the areas covered under irrigation are given in Table-9.4.

<b>Table – 9.4 Present sources of irrigation in Ken command</b>				
<b>Sl. No.</b>	<b>Name of the scheme</b>	<b>Catchment area (sq km)</b>	<b>Yield (Mm3)</b>	<b>Proposed irrigation (ha)</b>
1.	Nawalgarh Regulator	8.28	1.81	101.17
2.	Monoriya tank	2.79	0.61	111.29
3.	Loharuk anicut	56.31	12.31	161.88
4.	Sohai anicut	3.78	0.83	80.94
5.	Pathargawan Regulator	19.42	4.25	101.17
6.	Beriganj dam	77.62	16.98	5706.27
7.	Rangawan dam	828.48	181.12	18720.61
8.	Bahori Purwa	352.10	76.97	303.52
9.	Boodha dam	36.25	7.924	607.05
			<b>Total :</b>	<b>25893.90</b>

#### **(b) Methods of irrigation followed**

Conventional method of irrigating the field through canals and distributaries are followed in this command. Electric and diesel pumps are also being used in some places.

#### **(c) Status of land development in irrigated area**

**(i) Condition of channels:** The conditions of existing canals and distributaries will have to be improved in some reaches for providing irrigation to the proposed command area.

**(ii) Slope of the field:** The difference of levels between the first and the last contours of the command area is 76 m, which is distributed over the vast command area. Nevertheless, the command area would need land shaping and levelling as the approximate undulation of different places in command ranges from 1 to 6%. With such slopes and soil conditions much precaution for distribution of irrigation water will be necessary.

**(iii) Status of field channels:** Looking to the general condition and topography of the command area, the following development works would need to be taken up:

- (a) Consolidation of holdings,
- (b) Levelling and land shaping,
- (c) Construction of water courses, and
- (d) Drainage planning of the command area.

In addition to these, the existing field channels need to be resectioned, repaired and realigned, wherever required to provide full benefit of the irrigation to the farmers of the command.

### **9.5 Socio-economic aspects**

The Ken command lies in Chhatarpur and Panna districts of Madhya Pradesh bordering Uttar Pradesh. The economic conditions of the cultivators of Uttar Pradesh particularly of Banda and Jhansi districts are relatively better due to availability of irrigation facilities. Irrigation and power development in Chhatarpur and Panna districts will definitely improve the socio-economic conditions of the farmers of this backward area.

NWDA sponsored a study on Agro-economic, Socio-economic and Environmental survey of Ken-Betwa link project to National Council of Applied Economic Research (NCAER), New Delhi in 1991-92. The report of the study has since been submitted by them. Sample survey was conducted by them in 9 villages comprising 872 families of different villages and household strata. Information on area cultivated by each family, source of irrigation to their field and major occupation of each family were collected through their trained personnel. It was found by them that the improvement of agricultural technology has not been taken place in the proposed command areas of this project. Therefore, the level of input used is quite low. Persistent extension efforts will, therefore, be needed before irrigation water is made available to this area. Farmers have to be imparted knowledge about new agricultural technology so that the intended level of increase in production of agricultural goods is achieved.

The study also reveals that the overwhelming majority of the cultivating households own land and the average size of the operational holding is 3.5 ha. Crop farming activity is the major activity of the people of the area. Farm wage activity comes next to it. Self-employment activity is the least important with less than 6% of the total per household employment. It is, therefore, clear that there is enough scope for further development of the crop farming activity with availability of irrigation water in the proposed command area.

Average annual household income of the people of the proposed command area is from the crop farming. The ownership structure of animals per household reveals that about 30% to 50% of the households own milk animals either cow or buffalo. About 35% to 60% of the households own the animal motive power. Poultry ownership is almost nil in the area as it is not popular among the people. Income from livestock (mainly milk) per household is around Rs. 2222 per annum.

Average annual expenditure per household on food and non-food items are about Rs. 8394 and Rs. 3591 respectively. Thus, the total consumer expenditure

is about Rs. 11986 per annum. Per household savings in the area is very small and most of the households are reported to have savings through personal possessions.

As per the survey, about 50 to 60 percent households reported borrowings. Among the various sources providing credit, the co-operative societies are in the forefront in the proposed command area. Out of the total value of assets owned, 20 to 40 percent are in the form of agricultural implements and livestock and the remaining are the house and household durables. It has been observed that the average holding of assets is showing increasing trend among the cultivating households. The extension of irrigation to new areas is likely to bring a quantum change in the assets holding structure, especially in agricultural implements with the increase in income from crop farming activities.

Study of the present educational status of the persons living in the area of the proposed command reveals that about 60% of the heads of households are illiterate and the literate heads of households without formal education varies from 2 to 29 percent. Percentage of illiteracy among the females is higher. Analysis of the data collected during the survey in respect of incidence of disease and the cost of treatment shows that most of the people in the area are affected by Malaria and T.B. and the average per capita expenditure incurred for treatment is around Rs. 35.

Source of drinking water in the area is generally from the well. Although some areas have piped water supply but the water seems to be not chemically tested. Hygienic habits among the people of the area are not generally seen. About 45 to 60 percent of the people in the area have better living condition and maintenance of livestock.

Availability of communication facilities indicates that villages connected by pucca road are about 33%. More than 80% of the villages have post office and about 45% villages have banking facilities within 5 km range. As regards the marketing and medical facilities in the area, only 30% villages have marketing facilities for household goods within the area and more than 50% villages within 10 km range, whereas only 10% to 20% villages have good medical facilities.

## **9.6 Infrastructural facilities**

### **9.6.1 Enroute command**

#### **(a) Roads and Railways (Based on 1989-90 statistics)**

Details of roads and railways of the districts falling in the enroute command are as given in Table-9.5.



<b>District</b>	<b>Tehsil &amp; block</b>	<b>Total length (km)</b>	<b>Length of all weather road (km)</b>	<b>Railway station (No.)</b>	<b>Bus station/ stop (No.)</b>
1.Hamirpur	Mahoba tehsil, Kabroi block	174	54	3	16
2.Jhansi	Mauranipur tehsil	129	N.A.	2	13
3.Chhatarpur	Chhatarpur and Nowgong tehsils	521	360	Nil	N.A.
4.Tikamgarh	Issanagar block and Tikamgarh & Jatara tehsil	523	79	Nil	N.A.

### **(b) Marketing facilities**

**(i) Jhansi district:** Almost all the villages falling under the proposed command within Mauranipur tehsil are dependent on the marketing facilities available in the Mauranipur and Ranipur towns. These include about 83 co-operative marketing societies available in this tehsil.

**(ii) Hamirpur district:** The nearest marketing place for the people residing in Kabroi block in the enroute command is at Mahoba. Besides this, about 13 co-operative societies take care of marketing of various agricultural as well as household goods.

**(iii) Chhatarpur district:** Good marketing facilities are available for the people of the command areas in Chhatarpur, Nowgong and Issanagar towns through weekly markets spread over the entire command under Chhatarpur district. In addition, numerous fair price shops, within reasonable distances, are available in all villages.

**(iv) Tikamgarh district:** In the two tehsils viz. Tikamgarh and Jatara of Tikamgarh district, good marketing facilities are available.

### **(c) Agro-industries**

**(i) Hamirpur district:** No agro-based industry is located in the area falling under the enroute command within this district.

**(ii) Jhansi district:** Agro based industries are not located in the area under the enroute command falling in Mauranipur tehsil of this district. However, numerous weaving related industries are located in this area.

**(iii) Chhatarpur district:** No major agro based industry is located in this district. However, some oil mills and flour mills are there within the command, which cater to the needs of common people.

**(iv) Tikamgarh district:**No agro based industry is located in this district.

**(d) Banks/credit societies etc.**

**(i) Hamirpur district:** One nationalized bank and four rural banks are located in the Kabroi block of this district falling under the command area.

**(ii) Jhansi district:** Three nationalized commercial banks have their branches in Mauraipur tehsil coming under the enroute command.

**(iii) Chhatarpur district:** About 15 commercial banks have their branches spread over the area under the enroute command falling in this district. Moreover a number of branches of land development banks and central co-operative banks are also located in these areas.

**(iv) Tikamgarh district:** As per 1991-92 statistical records, there are 80 branches of commercial banks in this district, out of which 66 branches are located in the rural areas. In addition to these, land development banks and central co-operative banks also have 17 and 7 branches respectively in this district.

**9.6.2 Ken command  
Infrastructural facilities**

**(a) Roads and Railways:** The command area will have as much as 100% extra production over and above the present level. Therefore connection of the command area with the main roads is an integral part of the project. The command area network planning will have to be done in co-ordination with PWD (B&R) and other development agencies.

**(b) Marketing facilities:** A mandi is located at Laundi with sub-mandi at Chandla. The mandis at Rajnagar and Ajaigarh have also been started by Agriculture Produce and Marketing Board of Madhya Pradesh Agriculture Department. These institutions are in initial stages and require strengthening at an approximate cost of about Rs. 5.0 lakh per mandi and sub-mandi. These proposals are suggestive and are to be implemented from the funds outside the project estimate.

**(c) Agro industries:** No agro-based industry is located in the command area.

**(d) Banks, Credit societies etc.:** Branches of some nationalized banks and Rural Development Banks are located in the nearest towns of the command

area, which provide credit facilities to the farmers. Moreover some co-operative societies are also there to provide financial help to the farmers of the proposed command area.

## **9.7 Topography and soils**

### **9.7.1 Enroute command**

Topographical features of the command area include isolated hilltops, valleys, reserve forests, nallas, streams and rivers. The geological formations include predominant archaean quartzite rocks. Coarse-grained Bundelkhand formations are predominantly found in the command area. The slopes of the lands in the command are generally moderate i.e. neither steep nor flat. A short description on the type of soil has been given in para-8.3.1 of Chapter-8 'Irrigation Planning'.

### **9.7.2 Ken command**

The command area is gently undulating and has moderate slopes. The soils of the command area are formed out of parent rock such as quartzite, granite and sand stone. The soils are pale red and light red. The major portion of the command area is covered with sandy loam to sandy clay loam and rest of it is under clay loam and clay. Soil exhibits slight erosion with signs of severe erosion only in small patches.

### **9.7.3 Betwa command**

Topography of the command of four projects proposed in the upper Betwa basin consists of the Vindhyan ranges running east-west around 500 m elevation and the Malwa Plateau in the middle and lower reaches consisting of scrap lands, barren land and cultivated land. The area generally has a gentle slope and the soils are fine loamy to coarse loamy in texture, grayish brown to dark reddish brown in colour and shallow to very shallow in depths. These soils are highly erodible, excessively drained and slightly acidic to neutral in reaction.

## **9.8 Ground water and drainage**

The soils of the command area are characterized with good surface drainage and sub-surface drainage, the water holding capacity being low to medium except in clay patches. With the network of a number of tributaries namely Urmil, Kutri, Kusjar, Khurar, Kali etc., the command area has quite good draining facilities.

To watch the fluctuation of water levels, regular well observations were done for two years viz. 1974 and 1975 in selected wells of the command area. About 22 wells in the command area were examined for pre-monsoon and post-monsoon periods to measure the water levels below the ground surface. The maximum fluctuation of 12 m between the pre-monsoon and post-monsoon water levels was observed in village Dhabari in 1975.

**9.9 Agriculture**  
**9.9.1 Enroute command**  
**9.9.1.1 Present land use**

The classification of lands and the present land use has already been discussed under para-9.2.1 of this chapter.

**9.9.1.2 Cropping pattern**

The existing cropping patterns in the command area falling in the four districts of Uttar Pradesh and Madhya Pradesh are described in detail under para-8.5.1 of Chapter-8 'Irrigation Planning'.

**9.9.2 Ken command**  
**9.9.2.1 Present land use**

Districtwise land utilization in percentage of total geographical area is given in Table-9.6.

<b>Table – 9.6</b>		
<b>Present land use in Ken command</b>		
<b>Type of land</b>	<b>Chhatarpur district</b>	<b>Panna district</b>
Forest land	0.18%	16.39%
Land under non agriculture use	5.98%	7.8%
Barren land	13.31%	8.0%
Grass land	11.78%	2.8%
Culturable waste land	13.25%	13.73%
Other fallow land	6.09%	3.38%
Current fallow land	4.69%	4.24%
Net sown area	44.65%	43.52%
Miscellaneous	0.07%	0.14%
Total	100%	100%

**9.10 Agriculture practices adopted**

- (a) **Use of improved implements and seeds:** The use of bullock power for ploughing of land is common in the areas of proposed command. The use of tractor is also done in these areas but the percentage is very low i.e. 10%. Likewise the use of traditional types of seeds is also very common among majority of the farmers.
- (b) **Use of fertilizers, insecticides, pesticides etc.:** Although about 25% of the farmers use fertilizers and manures for increasing the crop yield, very few of

them are particular about use of insecticides/pesticides for control of plant diseases.

- (c) **Extension services:** Occasional extension services are provided by the State Agriculture Department to educate the farmers about the use of improved and modern agricultural technology and cultivation of high value crops viz. groundnut, soyabean, sunflower, chillies etc. But due to various reasons including inadequate financial resources, the extension services are yet to become popular among the farmers of proposed command areas.

### **9.11 Farmers' attitude towards improved agricultural practices**

This has been discussed in detail in Para 8.8 (c) of Chapter-8 'Irrigation Planning'.

### **9.12 Identification of problems in command area**

#### **9.12.1 Physical problems**

**(a) Land slopes:** The land is generally undulating, therefore canal distribution system has to be aligned accordingly.

**(b) Soil depth:** There should be no problem on this account as sufficient soil depth is available in the area for providing canal irrigation.

**(c) Salinity/alkalinity:** Since the Ken river water that is to be used for irrigation in these areas does not have salinity problem, it need not be a cause of concern. However, slight alkaline nature of the soils of the region is considered rather suitable for crops like jowar, soyabean, wheat and moong.

In general, the soils in these areas are stable and not prone to erosion. However, in certain areas, the soils may be prone to erosion due to their coarse texture. Such soils can be stabilized by putting them under permanent pastures and grazing lands.

**(d) Water logging:** No water logging problem of serious nature has been reported from the area.

**(e) Drainage:** Looking to the general condition and topography of the command special care should be taken for construction of field channels and drainage which can be managed by the State Agricultural Department at farmers' cost or finances from the various land development banks.

### **9.12.2 Financial aspect**

This aspect has been broadly discussed in para 9.5 under the heads of Agro-economic and socio-economic aspects reported by the NCAER.

### **9.13 Proposed cropping pattern, land irrigability classification, agro-climatic conditions etc.**

These aspects have been covered in Chapter-8 'Irrigation Planning' in the paras 8.4, 8.6 and 8.8.

### **9.14 Land development works (Proposals)**

#### **9.14.1 Field channel, field drainage and land shaping measures proposed**

The difference of height between the first and last contours of the command area is about 30 m. In order to negotiate this difference the command area will need treatment for land levelling/shaping. With the existing slopes, soil conditions and undulating topography of the area proper precautionary measures for developing irrigation distribution system are to be taken.

The following land development requirements are considered to be suitable for the area:

- (i) Consolidation of land holdings
- (ii) Land levelling and shaping wherever necessary
- (iii) Construction of water courses, and
- (iv) Drainage planning of the command area

#### **9.14.2 Agency responsible for the work**

These works can be well managed by the State Agriculture Department as well as the Rural Development Department with finances from the farmers or the various land development banks under Rural Development Schemes, etc.

#### **9.14.3 Status of existing extension services, credit agencies etc.**

Fairly good extension services exist in the command area and a number of commercial banks and co-operative banks also have their branches there. Branches of land development banks are also located in some rural areas of the command. Moreover, the agricultural materials like seeds, fertilizers, insecticides, pesticides etc. are provided to the farmers by the concerned Government Department at subsidized rates through different sale booths or fair price shops. However, due to numerous reasons, especially, inadequacy of financial resources, extension services have not yet become very popular.

### **9.15 Cropwise increase in yield per hectare of some major crop in the command**

Table no. 9.7 and 9.8 show the yearwise production of some major crops in the proposed command areas of enroute command and Ken command in quintals per hectare. It is observed that except for the few crops, the production trend is in ascending order. It gives an encouraging indication that if more areas in the command are covered by irrigation the yield of the crops would increase substantially, say at least 1.5 times of the present yields.

The study has generated information at household level on various aspects of crops cultivation, pattern of employment, income, consumption and assets, demographic characteristics, access to various amenities and economic benefits from the proposed project etc. The study has highlighted the difference between the income from various sources with and without irrigation, which are presented in the Tables 9.9 and 9.10.

**Table – 9.7**  
**Yearwise production of some major crops in the enroute command**

												Unit : Quintals/hectare			
Name of district and area	Name of tehsil & area under command	Year	Rice	Wheat	Jowar	Maize	Gram	Ground - nut	Rape & mustard oilseed	Soya-bean	Sun-flower	Cotton	Bajra	Barley	Sugar-cane
1. Tikamgarh	Tikamgarh and	1987-88	7.41	20.86	12.26	7.07	8.43	12.07	4.38	9.08	-	-	7.5	13.77	-
	Jatara	1988-89	9.49	19.57	12.34	12.68	10.33	15.7	4.93	13.79	-	-	10.0	13.65	-
Area=504800 hectares	Command area 21210 hectares	1989-90	4.94	17.64	10.0	11.08	9.81	10.4	4.02	9.17	-	-	4.58	16.36	-
		1990-91	9.78	25.17	11.30	7.68	10.08	11.3	3.81	11.66	-	-	-	14.73	-
		1991-92	7.81	23.29	8.68	8.01	12.92	11.19	5.12	10.42	3.31	-	-	18.53	-
2. Chhatarpur	Chhatarpur and Nowgong	1987-88	7.89	15.14	9.47	8.18	9.74	8.76	3.6	5.55	-	-	5.94	10.55	-
		1988-89	7.62	13.49	8.93	9.60	7.57	9.9	2.87	7.62	-	-	5.15	9.15	-
Area=868700 hectares	Command area 22220 hectares	1989-90	7.37	12.66	8.89	10.13	9.36	6.56	3.06	6.52	-	-	9.32	10.68	-
		1990-91	9.87	14.38	8.81	7.60	8.64	7.15	3.43	7.74	-	-	5.0	11.85	-
		1991-92	6.82	14.13	5.21	5.83	9.0	5.89	3.44	5.43	3.83	-	3.86	12.27	-

**Source : Agricultural Statistics of Madhya Pradesh, 1987-88 to 1991-92**  
**Figures are worked out from the district figures.**



Name of district and area	Name of tehsil & area under command	Year	Rice	Wheat	Jowar	Maize	Gram	Ground-nut	Rape & mustard oilseed	Soya-bean	Sun-flower	Cotton	Bajra	Barley	Sugar-cane
3. Hamirpur	Mahoba	1987-88	7.94	13.82	7.10	8.76	6.32	6.51	5.0	4.45	-	-	5.95	15.51	363.38
Area=716600 hectares	Command area 3090 hectares	1988-89	9.75	13.25	9.30	10.54	6.76	9.24	3.68	5.66	-	-	7.18	16.55	346.25
		1989-90	6.76	12.04	9.45	16.25	5.94	7.20	4.39	5.12	-	-	9.46	11.58	445.79
4. Jhansi	Mauranipur	1982-83	6.13	15.63	2.68	5.03	8.52	6.22	4.71	-	-	-	3.77	13.77	289.84
		1983-84	9.64	16.86	8.24	10.04	6.68	6.48	5.03	-	-	-	7.87	10.63	396.46
Area=502400 hectares	Command area 4990 hectares	1984-85	5.29	14.86	8.25	15.21	8.06	4.78	4.22	-	-	-	6.02	9.21	409.08

**Source : Agricultural Statistics of Madhya Pradesh, 1987-88 to 1991-92**  
**Figures are worked out from the district figures.**

<b>Table – 9.8 Yearwise production of some major crops in the proposed command of Ken command</b>													
													<b>Unit : Quintals/hectare</b>
Name of district of area	Name of tehsil & area under command	Year	Rice	Wheat	Jowar	Maize	Gram	Ground-nut	Rape & mustard oilseed	Sugar-cane	Sun-flower	Bajra	Barley
1. Chhatarpur	Chhatarpur and	1987-88	2.22	4.26	2.66	2.30	2.74	2.46	1.01	1.56	-	1.67	2.96
	Laundi	1988-89	2.14	3.79	2.51	2.70	2.13	2.78	0.80	2.14	-	1.45	2.57
Area= 778560 hectares	Command area 219122 hectares	1989-90	2.07	3.56	2.50	2.85	2.63	1.84	1.01	1.83	-	2.62	3.00
		1990-91	2.78	4.04	2.47	2.13	2.43	2.01	0.96	2.17	-	1.40	3.33
		1991-92	1.91	3.97	1.47	1.64	2.53	1.65	0.96	1.52	0.93	1.08	3.45
2. Panna	Ajaigarh	1987-88	0.299	0.41	0.44	0.36	0.24	0.37	0.17	0.22	-	0.45	0.40
		1988-89	0.27	0.45	0.41	0.45	0.27	0.39	0.17	0.32	-	0.39	0.37
Area= 507419 hectares	Command area 22084 hectares	1989-90	0.26	0.46	0.46	0.54	0.29	0.29	0.17	0.27	-	-	0.45
		1990-91	0.36	0.48	0.45	0.41	0.28	0.27	0.18	0.36	-	0.39	0.51
		1991-92	0.19	0.44	0.25	0.15	0.28	0.22	0.15	0.17	-	0.24	0.39

**Source : Agricultural Statistics of Madhya Pradesh, 1987-88 to 1991-92**  
**Figures are worked out from the district figures.**

<b>Table – 9.9</b>			
<b>Average annual household income from various sources and total employment</b>			
<b>(Rupees/Man-days)</b>			
<b>Sl. No.</b>	<b>Description</b>	<b>With irrigation</b>	<b>Without irrigation</b>
1.	Income from crop farming	25652	6399
2.	Livestock and allied activities	3020	1815
3.	Farm wages	678	3585
4.	Non-farm wages and salary	1212	1550
5.	Other activities	133	923
6.	Total income (Rupees)	30695	14272
7.	Total employment (Man-days)	351	325

It has been observed that the income from crop farming and livestock is higher for households with irrigation facilities and this has resulted in higher total income with irrigation. It gives a good indication of likely beneficial effect of irrigation in the proposed command areas.

Table-9.10 presents the changes of income for various sources and total employment corresponding to the increase in agricultural income. These coefficients can be utilized to estimate overall impact of the proposed project from the estimated benefits from increase in agricultural production. Although, these coefficients are based on single year information whereas the effect due to forward and backward linkages of increased activities in agriculture to other economic activities will take considerable time to stabilize. It can be expected that with the availability of better irrigation facilities through this project, the household income will rise sufficiently and cause increased activities in non-farm sectors and the future scenario will definitely become bright.

<b>Table – 9.10</b>			
<b>Changes in income and employment with respect to increase in agricultural income</b>			
<b>(Rupees/Man-days)</b>			
<b>Sl. No</b>	<b>Description</b>		
1.	Changes in income (Rupees)	Livestock and allied activities	6.26
		Farm wages	-15.01
		Non-farm wages and salary	-1.76
		Other activities	-4.10
2.	Changes in total employment (Man-days)		0.135

**N.B. :** Changes are worked out for every increase of Rs.100.00 in crop farming income.