

Chapter 9

Command area development

9.1 Command Area Assessment

The culturable command area under the link canal is 294795 ha, out of which the land proposed for irrigation is 258334 ha. Details are as given in Table 9.1.

Table 9.1
Details of irrigation in the command area

Sub-basin	CCA (ha)	Area proposed for irrigation (ha)
Middle Krishna sub-basin	17015	16334
Tungabhadra sub-basin	51360	46224
Vedavathi sub-basin	93045	83741
Upper Pennar sub-basin	133375	112035
Total	294795	258334

Presently the major portion of the command area is fully dependent only on rainfall. Crops like groundnut, bajra, jowar, ragi, pulses and chillies are grown from which the yield is very limited.

9.1.1 Climate of Command Area

The climate of the command area is characterized by oppressive hot weather in the summer season extending from the middle of February to middle of June. The entire command area is practically dry and the interior of the command especially Bellary and Anantapur districts experiences severe heat. The south-west monsoon season which follows the hot weather season extends from the middle of June to middle of October. The major part of the command area receives its rainfall from the south-west monsoon followed by retreating monsoon during October and November. The period from December to February is dry and is comparatively cool.

There are three IMD observatories in command area located at Raichur, Bellary and Anantapur.

9.1.2 Land Use

The existing land use details indicate that the resources in the command area have not been put to intensive use and the area sown more than once is very limited. The land use pattern of the command area under the link canal as furnished by Andhra Pradesh State Remote Sensing Application Centre (APSRAC) is shown in Table 9.2.

Table 9.2
Classification of Land Use and Land Cover of the Command Area
Unit: Area in 'ha'

Sl. No.	Land use / Land cover Classes	Karnataka	Andhra Pradesh	Total
1	Settlement	2006	2507	4513
2	Kharif - unirrigated	88703	241291	329994
3	Kharif - irrigated	119	2229	2348
4	Rabi crop	39964	-	39964
5	Double crop	12340	41833	54173
6	Fallow	1764	18	1782
7	Plantation	150	3	153
8	Scrub forest	2095	3008	5103
9	Forest plantation	10	7	17
10	Salt affected land	3757	3362	7119
11	Gullied land	47	-	47
12	Land with scrub	8818	5179	13997
13	Land without scrub	1604	2393	3997
14	Barren rocky	5624	13207	18831
15	Mining / Quarrying	25	83	108
16	Fuel - Wood	954	4385	5339
17	Sandy area	-	171	171
18	Tank / Reservoir	1470	7439	8909
19	River / Stream	886	4264	5150
	Total area	170336	331379	501715

Source: Andhra Pradesh State Remote Sensing Application Centre, Hyderabad.

The food crops usually grown in the command area are paddy, jowar, maize, ragi, millets and groundnut. Cotton and tobacco are also grown.

There are two main crop seasons, the kharif and the rabi. The kharif crops are paddy, millets, pulses, groundnut, cotton and chillies. Rabi crops are garlic, onion, groundnut, ragi, korra and other oil seeds.

Besides these seasonal crops, annual crops like sugar cane, vegetables and turmeric are also grown.

9.1.3 Present Sources of Irrigation

Irrigation is practiced in the command area from wells and tanks. Most of the wells and some of the tanks are owned by individual farmers. Some tanks were built from time to time by Government or through the co-operative efforts of the people. Tanks are the source of water supply for domestic use for villages in the vicinity. They also provide irrigation to areas varying from a few hectares to a few hundred hectares. Irrigation from the tanks is largely confined to the beds of nallas and streams or other low-lying areas in small isolated patches. Most of these tanks are under the control of the civil authorities and maintained by PWD.

Adjacent areas of link canal command are being irrigated by the Right Bank Canal of Almatti dam and Left Bank Canal, Right Bank Canal and High Level Canal of Tungabhadra project.

9.1.4 Soils

No systematic soil survey of the command area has been carried out so far. The general data on soils of command area indicate that the command area consists mainly of red, black, sand and mixed soils.

The soils in the command area may be broadly classified as follows:

i) Red Loamy Soil

These soils have developed from granite-gneissic complex and at times from quartzite and coarse grained sandstone. Depth of these soils generally ranges from 8 to 75 cm. These soils are coarse to medium textured with fine loamy to clayey sub-soil and are rapidly permeable and well drained. These soils are generally neutral to alkaline, pH value ranging from 7 to 8.5. These soils are poor in nitrogen and phosphate contents.

ii) Black Cotton Soils

These soils are gray to dark brown in colour. The texture is usually clay through out the profile. These soils are alkaline in reaction. The pH

value of these soil ranges from 7 to 8.5. These soils are moderately permeable and well drained. These soils are low in nitrogen, very low in phosphate and medium in potash. These soils are suitable for raising irrigated crops like paddy and sugarcane and rainfed crops like jowar, bajra, pulses and groundnut.

9.1.5 Ground Water

The predominant rock groups found in command area are the Archeans and Dharwars. The Archeans consist of peninsular gneisses and closepet granites. The Dharwar system is composed mainly of a complex series of crystalline schists, igneous rocks and their altered forms and some sedimentary rocks like conglomerates, limestone, etc.

Systematic investigations and studies of the ground water potential of the command area have not been made so far. Only in some parts of Anantapur, Central Ground Water Board has done some investigations and studies.

Geological investigations over an area of 11000 km² in Anantapur district indicate that ground water is being developed from granites, gneisses and schists. In general, there is wide variation in yields of wells as well as the depth of water table. The data indicates that the ground water potential in the area is generally poor and highly variable. Development on a limited scale can take place only in selected localities by means of open wells under favourable geological and topographical conditions. The quality of ground water is generally good and fit for irrigation. Deterioration in quality does, however, occur in areas underlain with black cotton soil.

In the command area of Krishna (Almatti) – Pennar link, the thickness of weathered zone varies from 10 to 15 m and depth of water table varies from near surface to 25 m below ground level.

The ground water potential and net draft in the Almatti – Pennar link command area is worked out from the district-wise ground water potential and net draft estimated by CGWB in respect of Raichur, Bellary and Anantapur districts. Details are presented in Table 9.3.

Table 9.3
Ground water potential in the command area (Mm³)

District	Geo-graph-ical area (ha)	Estimated potential	Provisi- ons for drink- ing and other uses	Utilisable ground water resources for irrigation	Net draft	Balance ground water available for exploitation
i) District as a whole						
1. Raichur	1401700	1071.7	160.80	910.90	133.0	777.9
2. Bellary	988500	701.2	105.20	596.00	145.0	451.0
3. Anantapur	91300	1249.0		1061.60	391.2	670.4
			187.40			
ii) In Almatti - Pennar link canal command						
1. Raichur	59780	73.23	6.86	38.85	5.67	33.18
2. Bellary	21116	14.98	2.25	12.73	3.10	9.63
3. Anantapur	187155	122.19	18.33	103.86	38.27	65.59

Once the irrigation is introduced after the construction of the canal system percolation from the irrigated area and the canal distributory system will contribute considerable amount of recharge to the ground water. As such the scope for ground water development under the command of the link canal appears to be reasonably good.

Ground water quality in the command area is generally within the permissible limits for irrigation. Florides vary from 0.25 to 1.75 ppm. However, it appears that the crops in these areas have not been affected by the presence of rare elements.

9.2 Socio-Economic Aspect

The proposed link canal passes through the states of Karnataka and Andhra Pradesh. As village level Census data of 2001 is not available yet, the baseline socio-economic characteristics have been described based on the Census of India data, 1991. The proposed link canal passes through the Jurisdiction of four districts of Karnataka namely Bijapur, Raichur, Bellary and Chitradurga and one district of Andhra Pradesh namely Anantapur.

The socio-economic parameters have been studied separately for:

- i) Villages on the alignment
- ii) Villages in the command area

9.2.1 Socio-Economics of Villages in the Alignment of the link canal

As per 1991 census, the proposed link canal passes through the Jurisdiction of four districts of Karnataka namely Bijapur, Raichur, Bellary and Chitradurga and one district of Andhra Pradesh namely Anantapur. There are 178 villages on the alignment of the canal.

9.2.1.1 Demographic Profile

The baseline socio-economic characteristics have been described based on the Primary Census Abstract, 1991. The proposed canal falls under 10 taluks in 4 districts namely Bijapur, Raichur, Bellary and Chitradurga in the state of Karnataka and 10 Mandal in 3 revenue divisions, namely, Anantapur, Dharmavaram and Penukonda in district Anantapur in the state of Andhra Pradesh.

9.2.1.2 Population and Households

Total population is about 3,11,555. The population occupies about 57,118 houses and 57380 households distributed in 178 villages. Total area of the villages is about 4,404.80 km².

9.2.1.3 Population Density

Population density is about 111 persons/ km². This low density could be attributed to the rural and hilly nature of the area. This parameter is lowest in Ramagiri, Kalyandurg Mandal and Kushtogi taluk (about 64 persons/ km²) and highest in Gangawati taluk (about 193 persons/ km²) with significant variation among various taluks/Mandals.

9.2.1.4 Family Size

Average family size or size of the household (persons/per household) is about 5.4.

9.2.1.5 Scheduled Caste and Schedules Tribe

Percentage of schedules caste (SC) to overall population is 16.90% (about 1/6th of the total population) and percentage of scheduled tribe (ST) population is low, only 6.66% of the overall population. Among various taluks/mandals, SC percentage is lowest (10.12%) in Chennekothapalle Mandal and highest (22.09%) in Lingsugur taluk with significant variation. ST percentage is lowest in D.Hirehal Mandal (0.18%) and highest in Molakalmuru mandal (26.22%) with significant variation among various taluks/mandals.

9.2.1.6 Sex Ratio

Sex ratio (females per 1000 males) is about 968. Sex ratios among scheduled caste (SC), schedules tribe (ST) and general caste are about 991,964 and 944 respectively. Among various taluks/mandals, sex ratio is lowest (916) in Atmakur mandal and highest (1018) in Hungund taluk.

9.2.1.7 Literacy Ratio

Overall literacy rate (able to read and write with understanding with children of the age of 7 years or less treated as illiterate) is found to be satisfactory, only 39.47% of the total population being literate. Among males 54.71% is literate, and among females 23.73% is literate. As usual in India, the male literacy rate is much higher than the female literacy rate that indicates a certain lack of awareness and drive in female education in the area. Among the taluks/mandals, the literacy rate is lowest in Kushtogi taluk (16.90%) and highest in Hungund taluk (57.33%).

9.2.1.8 Work Participation

Main workers comprise of 1,41,130 persons (45.30%) of the total population. Percentage of non-workers is observed to be 50.96% of the total population. Marginal workers are only 3.91% of the total population. Total workers (main plus marginal) are about 49.21% of the total population with the evident clear majority of main workers (92.06%) leaving few marginal workers (7.94%). Main workers include cultivators, agricultural labourers, workers engaged in farming, trade and commerce, transport construction and government and other services.

9.2.1.9 Work Participation among Females

It could be observed that, 38.67% of the main workers are females that account for 35.62% of the total female population. This is also reflected in the high percentage (55.26%) of females among the non-workers and the high percentage of female non-workers (57.26%) to the total female population. All such figures clearly indicate moderate work participation rate among females. However, marginal workers are mostly (93.91% of the total marginal workers) females.

9.2.1.10 Category-wise Main Workers

The Primary Census Abstract (PCA) contain distribution of main workers into nine categories namely 1) Cultivators, 2) Agricultural labourers, 3) Livestock, forestry, fishing, hunting and plantation, orchards and allied activities, 4) Mining and quarrying, 5) Manufacturing, processing, servicing and repairs in household industry and other than household industry, 6) Construction, 7) Trade and commerce, 8) Transport, storage and communications and 9) other services.

It could be observed that the majority of the main workers are cultivators (40.40%) while agricultural labourers contribute 43.43% (totaling 83.83% in works related to agriculture). Contribution of category 9 (other services) is little (4.52%). The contributions of rest of the categories are negligible. This correlates with the rural nature of the area for which the economy of the area is based on agriculture.

While majority of the male main workers are in category 1 (cultivators, 48.18%), most of the female main workers are in category 2 (agricultural labourers, 63.44%).

9.2.1.11 Sector-wise Main Workers

Sector wise, almost all (86.41%) of the main workers are in the primary (agricultural) sector. The secondary (industry) and tertiary (business & service) sectors comprise 4.9% and 8.69% respectively of the main workers.

9.2.1.12 Summary of Socio-economic Status

The alignment is entirely rural in nature. The summary of the socio-economic features of the villages on the alignment is presented in Table 9.4.

Table 9.4
Summary of Socio-economic Features of Alignment Villages

Area	2815.22 sq.km (distributed over 178 villages)
Total population	Male: 1,58,321, Female: 1,53,234, Total: 3,11,555
No. of households	57,380 (No of occupied residential houses: 57,118)
Population density	111 per sq.km
Family size	5.4 persons per household
Sex ratio	968 females per 1000 males
SC-ST population	SC: (16.9%), ST: (6.7%), Others: (76.4%)
Literacy	Male: 54.7% of total male, Female: 23.7% of total female, Total: 39.5% of total population
Worker	Main: 1,41,130 (45.3%), Marginal: (3.7%), Non-worker: 1,58,766 (51%)
Main worker	Male: [61.3%], Female: [38.7%] Cultivators: [40.4%], Agricultural labourers: [43.4%], Others: [16.2%] Primary: [86.4%], Secondary: [4.9%], Tertiary: [8.7%]

Note: 1) If otherwise not mentioned, the figures with in () indicates % of total population.

2) If otherwise not mentioned, the figures with in [] indicates % of main worker.

Total population within the 178 villages is about 3,11,555 occupying about 57,118 houses and 57,380 households. Population density is low (111 persons/ km²). Average family size or size of household (persons/per household) is about 5.4. Percentage of scheduled caste (SC) to overall population is 17% and percentage of scheduled tribe (ST) population is about 7% of the overall population. Sex ratio (females per 1000 males) is about 968. Overall literacy rate is about 39%, literates among males being about 55% and among females being about 24%.

Working population or main workers comprise about 45% of the total population. Marginal workers and non-workers are observed to be about 4% and 51% of the total population respectively. Work participation among females is moderate, about 39% of the main workers being

females that account for about 36% of the total female population. Majority of the main workers are cultivators (about 40%) and agricultural labourers (about 43%). Sector wise, majority (about 86%) of the main workers are in primary (agricultural) sector, while about 5% in secondary (industry) sector and 9% in tertiary (business & service) sector.

The principal language is Kannada and Telugu. The principal staple food is rice. The primary source of drinking water is well and hand pump.

9.2.1.13 Amenities Available in the Villages

Educational medical, drinking water, post & telegraph, market, communication, and power supply amenities/facilities available in the villages have been presented in Table 9.5.

Table 9.5
Summary of Amenities Available in the Alignment Villages

Amenity / Facility	% of villages having the amenities/facilities			
	Within village	Within 5 km	Within 5-10 km	Beyond 10 km
Educational	97	2	-	-
Medical	30	43	21	6
Drinking water	99	-	-	-
Post & telegraph	51	44	4	-
Market	4	26	27	18
Communication	85	19	-	-
Power supply	99	-	-	-
No. of educational institutions	Primary school (310), Middle school (81), High school (34), Pre-University (2), Graduate College (1), Adult literacy Centre (38), Training School (1), Other Educational Institutions (66)			
No. of medical institutions	Primary health center (15), Primary health Sub-centre (25), Dispensary (10), Family Planning Centre (11).			
% of villages having	Tap (15%), Well (77%), Tube Well (20%) Hand pump (82%)			
% of villages having	Post office (46%), Telegraph office (7.3%), Telephone (19%)			
% of villages having	Bus stop (85%), Railway station (3%)			
% of villages having	Pucca road (69%), Kuccha road (31%)			
% of villages having power for	All purpose (79%)			

9.2.2 Socio-economic of All Command Area Villages

Demographic Profile

9.2.2.1 Population and Households

Total population is about 449,831. The population occupies about 83,086 houses and 83,478 households distributed in 188 villages. Total area of the villages is about 4,404.80 km².

9.2.2.2 Population Density

Population density is about 112 persons/ km². This low density could be attributed to the rural and hilly nature of the area. This parameter is lowest in D.Hirehal Mandal (about 70 persons/ km²) and highest in Sandur taluka (about 263 persons/ km²) with significant variation among various talukas/mandals.

9.2.2.3 Family Size

Average family size or size of the household (persons/per household) is about 5.4 with little variation (between 4.8 in Bukkapatnam Mandal and 6.4 in Kushtagi taluka) among various talukas/mandals.

9.2.2.4 Scheduled Caste and Scheduled Tribe

Percentage of scheduled caste (SC) to overall population is 15.53% (about 1/6th of the total population) and percentage of scheduled tribe (ST) population is low, only 5.74% of the overall population. Among various talukas, SC percentage is lowest (23) in Garladinne Mandal and highest (6845) in Kanekal Mandal with significant variation. ST percentage is lowest in Kalyandurg Mandal (0.02%) and highest in Sindhur taluka (13.11%) with significant variation among various talukas/mandals.

9.2.2.5 Sex Ratio

Sex Ratio (females per 1000 males) is about 950. Sex ratios among scheduled caste (SC), scheduled tribe (ST) and general caste are about 962, 945 and 949 respectively. Among various talukas/mandals, sex ratio is lowest (905) in Raptadu mandal and highest (1018) in Rayadurg mandal.

9.2.2.6 Literacy Rate

Overall literacy rate (able to read and write with understanding with children of the age of 7 years or less treated as illiterate) is found to be satisfactory, only 37.09% of the total population being literate. Among males 51.08% is literate, and among females 22.34% is literate. As usual in India, the male literacy rate is much higher than the female literacy rate that indicates a certain lack of awareness and drive in female education in the area. Among the talukas/mandals, the literacy rate is lowest in Rayadurg mandal (25.37%) and highest in Anantapur mandal (48.52%).

9.2.2.7 Work Participation

Main workers comprise of 2,13,375 persons (47.43% of the total population). Percentage of non-workers is observed to be 50.27% of the total population. Marginal workers are only 2.3% of the total population. Total workers (main plus marginal) is about 49.73% of the total population with the evident clear majority of main workers (95.38%) leaving few marginal workers (4.62%). Main workers include cultivators, agricultural laborers, workers in industries and other workers including workers engaged in farming, trade and commerce, transport, construction and government and other services.

9.2.2.8 Work Participation among Females

It could be observed that, 39.31% of the main workers are females that account for 38.26% of the total female population. This is also reflected in the high percentage (55.53%) of females among the non-workers and the high percentage of female non-workers (57.28%) to the total female population. All such figures clearly indicate moderate work participation rate among females. However, marginal workers are mostly (94.53% of the total marginal workers) females.

9.2.2.9 Category-wise Main Workers

The Primary Census Abstract (PCA) contain distribution of main workers into nine categories namely 1) Cultivators, 2) Agricultural laborers, 3) Livestock, forestry, fishing, hunting, and plantation, orchards and allied activities, 4) Mining and quarrying, 5) Manufacturing, processing, servicing and repairs in household industry and other than household

industry, 6) Construction, 7) Trade and commerce, 8) Transport, storage and communications, and 9) other services.

It could be observed that the majority of the main workers are cultivators (38.85%) while agricultural laborers contribute 45.04% (totaling 83.89% in works related to agriculture). Contribution of category 9 (other services) is significant (4.98%). This correlates with the rural nature of the area for which the economy of the area is based on agriculture. The contributions of rest of the categories are negligible.

Majority of the male main workers are distributed in category 1 (cultivators 71.72%) and category 3 (Livestock, forestry, fishing, hunting and plantation, orchards and allied activities, 93.67%). Similarly, most of the female main workers are in category 2 (agricultural laborers, 55.74%) and category 4 (Mining and quarrying 41.14%).

9.2.2.10 Sector-wise Main Workers

Sector wise, almost all (85.81%) of the main workers are in the primary (agricultural) sector. The secondary (industry) and tertiary (business & service) sectors comprise 4.7% and 9.49% respectively of the main workers.

9.2.2.11 Summary of Socio-economic Features of All command Area Villages

The summary of socio-economic features of command area villages as per 1991 census is shown in the Table 9.6.

Table 9.6
Summary of Socio-economic Features of
All Command Area Villages (Census 1991)

No. of Villages	188 Command Villages
Total population	Male: 230630, Female: 219201, Total: 449831
No. of households	83478
Population Density	112 persons/ km ²
Family size	5.4 persons per household
Sex ratio	950 females per 1000 males
Social stratification	SC: 15.53%, ST: 5.74%, Others: 78.73% of total population
Literacy	Total: 30.26% of total population
Work participation	Main: 47.43%, Marginal: 2.29%, Non-worker: 50.26% of total population
Main Worker	Male: 61%, Female: 39% of main worker Cultivators: 38.9%, Agricultural Laborers: 45%, Others: 16.1% of main worker Primary: 85.81%, Secondary: 4.70%, Tertiary: 9.49% of main worker

Total population within the 188 villages is about 4,49,831 with 83,086 houses and 83,478 households. Population density is low (112 persons/ km²). Average family size is about 5.4 persons/household. Scheduled castes (SC) constitute 15.53% and Scheduled Tribes (ST) constitutes 5.74% of the total population. Sex ratio (females per 1000 males) is about 950. Overall literacy rate is about 30.36% of the total population.

Working population or main workers comprise about 48% of the total population. Marginal workers and non-workers are observed to be about 2% and 50% of the total population respectively. Work participation among females is moderate, about 39% of the main workers being females that account for about 38% of the total female population. Majority of the main workers are cultivators (about 39%) and agricultural laborers (about 45%). Sector wise, majority (about 86%) of the main workers are in primary (agricultural) sector, while about 5% in secondary (industry) sector and 9% in tertiary (business & service) sector. The

principal language is Kannada and Telugu. The principal staple food is rice. The primary source of drinking water is well and hand pump.

9.2.2.12 Amenities Available in the Command Area Villages

Educational, medical, drinking water, post & telegraph market, communication, and power supply amenities/facilities available in the villages have been presented in Table 9.7.

Table 9.7
Summary of Amenities Available in the Command Area Villages

Amenity/ Facility	% of Villages Having the Amenities/Facilities			
	Within Village	Within 5 km	Within 5-10 km	Beyond 10 km
Educational	97	2	-	-
Medical	37	32	25	5
Drinking water	99	-	-	-
Post & telegraph	67	26	6	-
Market	2	10	10	1
Communication	79	17	4	-
Power Supply	99	-	-	-
No. of educational institutions	Primary school (376), Middle school (71), High school (38), Pre-University (2), Graduate College (1), Adult literacy Centre (164), Training School (1), Other Educational Institutions (176)			
No. of medical institutions	Primary health center (14), Primary health Sub-centre (61), Dispensary (20), Family Planning Centre (9), Registered Private Practitioner (17)			
% of villages having	Tap (32%), Well (58%), Tube Well (13%), Hand pump (74%)			
% of villages having	Post Office (58%), telegraph office (3%), telephone (23%)			
% of villages having	Bus stop (79%), Railway station (3%)			
% of villages having	Pucca road (66%), Kuccha road (34%)			
% of villages having power for	All purpose (65%)			