Chapter 9
Command area development

9.1 General

It is proposed to serve the culturable command area to an extent of 445299 ha under the Godavari (Inchampalli) – Krishna (Pulichintala) link canal with annual utilisation of 4370 Mm^3. The status and the developmental aspects of the proposed command area are discussed in the following sections.

9.1.1 Location of the command area

The proposed command area under the Godavari (Inchampalli) – Krishna (Pulichintala) link canal lies in the basin areas covered by the Godavari and Krishna and is spread in the following mandals of Warangal, Khammam, Guntur, Prakasam, Krishna and West Godavari districts in Andhra Pradesh as detailed in Table 9.1.

Table 9.1
Mandals falling in the command area

Sl. No.	Areas proposed to be served by	Districts served	Mandals falling in command area
1	Inchampalli Right Bank Canal command	Warangal	1. Eturunagaram 2.Mangapet
		Khammam	1. Pinapaka 2. Manugur 3. Aswapuram 4. Burgampad 5. Kunavaram 6. Mulkalpalli 7. Kothagudem 8. Palwancha.
2	Part command of NSLBC		
a	by gravity (Existing)	Krishna	1. Jaggaiahpeta 2. Vatsavai 3. Penuganchiprolu 4. Nandigama 5. Kanchikacherla 6. Veerullapadu 7. Ibrahimpatnam 8. Mailavaram 9. Agiripalli 10.Vijayawada
		Khammam	1. Bonakallu 2. Madhira 3. Yerrupalem
b	by lift upto Tammileru (Existing)	Khammam	1. Tallada 2. Wyra 3. Kallur 4. Vemsoor 5. Penuballe
		Krishna	1. Gampalagudem 2. Tiruvuru 3. A.Konduru 4. Chatrai 5. Reddygudem 6. Mailavaram 7. Vijayawada 8. Agiripalli 9. Nuzividu 10. Musunuru 11. Gannavaram 12. Bapulapadu 13. Vissannapeta
c	by lift beyond Tammileru	West Godavari	1. Pedavegi 2. Lingapalem 3. Kamavarapukota
3	Part command of NSRBC (Existing)	Guntur	1. Atchampeta 2. Amaravathi 3. Thullur 4. Mangalagiri 5. Tadepalli 6. Krosuru 7. Pedakurapadu 8. Tadikonda 9. Pedakakani 10. Medikonduru 11. Guntur 12. Chebrolu 13. Vatticherukuru 14. prathipadu 15. Edlapadu 16. Nadendla 17. Chilakaluripet 18. Pedanandipadu 19. Kakumanu
		Prakasam	1. Ballikurava 2. Martur 3. Yeddanapudi 4. Parchuru

9.1.2 Climate of the proposed command area

Like part of the basin areas the command area receives about 86.8% of rainfall during S-W monsoon and 7.4% during N-E monsoon season. The mean annual temperature various from 37.20^{o} to 18.80^{o} with maximum & minimum recorded being 45.0^{o} and 11.4^{o}C respectively. The mean wind velocity various from 17.6 km / hr to 4.0 km / hr. The average annual relative humidity varies from 76% to 44% with maximum of 81% to minimum 24%. The average annual cloud cover varies from 4.4 oktas to 3.5 oktas with maximum of 7.0 oktas to 1.6 oktas.

9.1.3 Topography and soils

The Godavari (Inchampalli) - Krishna (Pulichintala) link canal forms the upper boundary on the western side of the proposed command area. The FSL of the 312.20 km long link canal running from north to south is 106.680 m at its entry at the proposed Inchampalli dam and finally reduces to 55.442 m at its exit at the proposed Pulichintala reservoir. For a few kilometers adjacent to the link canal in the upper portion of the proposed command area, the topography is generally undulating and slopes down towards north and thereafter it gradually slopes down to the east coast. The undulating part of the command area is occupied in patches by forest areas. The entire area is criss-crossed by many small and medium natural drains.

The forest soils, black cotton soils and red earths are found in the Inchampalli right bank canal command area. The soils in the NSLBC command are predominantly black cotton and red loamy. On the right bank of the river Krishna, in the NSRBC command the soils are mostly of black cotton. The soils are shallow on the hill slopes of the undulating upper part of the command, while they are moderately deep to deep in the lower portions of the command area. The lands in the area are generally fertile and the crop yield is likely to increase substantially under irrigation.

9.1.4 Existing land use

Agriculture is the main occupation of the people in the command area. The forest and culturable area in the districts lying in the command comprises 22.2% and 58.9% of the geographical area.

9.1.5 Cropping practices

The agriculture in the command area is mainly rainfed at present except for the areas that are taken over by the link canal. The principal crops grown in the area are paddy, jowar, maize, bajra, groundnut, cotton, sugarcane, pulses and vegetables.

Taking into consideration, the prevailing agricultural practices, type of soil, slope, demand in the market, export value etc. the cropping pattern for the each proposed command area has been suitably devised and considered in the study.

9.1.6 Present sources of irrigation

Small patches of the proposed command area are currently irrigated mainly through wells and tanks. The IRBC command is proposed to be irrigated through Inchampalli joint project.

The predominant irrigated crop is paddy, the other major crops being groundnut, chillies and bajra. The suggested cropping pattern for irrigation in the command area has been devised to consist of all these crops traditionally grown in the area.

9.1.7 Groundwater resources

The proposed command area falls in the districts of Warangal, Khammam, Krishna, West Godavari, Guntur and Prakasam of Andhra Pradesh under the areas lying in Godavari and Krishna basins. The groundwater potential of the geographical area of the command is estimated on pro rata basis from the district-wise groundwater resources -1995, published by CGWB is furnished in Table 9.2.

Table 9.2
Groundwater (GW) potential in the proposed command area

Unit: Mm^3

District	Area Km^2	GCA Km^2	Estimated potential	Provision for drinking & other uses	Utilised GW for irrigation	Net draft	Balance GW for exploitation
Warangal	12836	364	237	36	181	68	133
Khammam	15809	1400	244	37	186	21	186
Krishna	8797	850	140	21	107	19	100
Guntur	11328	1724	431	65	330	24	342
Prakasam	17141	575	61	9	47	7	45
West Godavari	7795	444	305	46	234	62	197
Total	**73706**	**5357**	**1418**	**214**	**1085**	**201**	**1003**

The Central Ground Water Board has done a pilot study on the hydro geological surveys on the Godavari (Polavaram)-Krishna (Vijayawada) link canal project proposed by NWDA for assessing the possible changes/effects on groundwater scenario in the command area due to introduction of surface water irrigation. As per their recommendations, 20% of the transmission losses and 40% of the water applied will add to the groundwater regime in the proposed command area by way of infiltration, canal seepage and return flow from irrigation. In case of Godavari (Inchampalli)-Krishna (Pulichintala) link canal, the transmission losses are worked out to be 292 Mm^3 and the utilization for the irrigation is 3665 Mm^3. Since the rock formations in the present link are (hard rock) different from those of Polavaram-Vijayawada link (alluvial), the percentage for return flow needs to be modified. Ground Water Estimation Methodology (1997) suggests 30% of water applied as recharge for non-paddy areas where ground water level is less than 10m and 50% for paddy areas. Since the link canal traverses through hard rock it is considered that 25% of the water applied for paddy areas and 15% for non-paddy areas may be taken for preliminary assessment for ground water recharge. The command wise groundwater recharge values are worked out accordingly and furnished in Table 9.3.

Table 9.3
Command wise ground water recharge values

Units: Mm^3

Sl. No.	Particulars of command	Utili-sation	Recharge from		Total
			Paddy @25%	Non paddy @15%	
1.	Inchampalli right bank canal	470	82.00	21.21	103.21
2.	Nagarjunasagar left bank canal (gravity)	491	73.00	29.87	102.87
3.	NSLBC upto Tammileru (lift)	891	132.75	54.00	186.75
4.	NSLBC beyond Tammileru (lift)	190	25.62	13.08	38.70
5.	NSRBC through PRBC (lift)	1623	185.50	132.15	317.65
6.	Municipal & Industrial uses	413	-	-	
7.	Transmission losses	292	-	-	58.40
	Total		**498.87**	**250.31**	**807.58**

Further refinement on assessment of recharge may be done at the time of preparation of the Detailed Project Report of the link project.

9.2 Socio-economic aspects

The socio-economic aspects of the command area discussed here under are based on the mandal-wise statistics of the Warangal, Khammam, Krishna, West Godavari, Guntur, and Prakasam districts falling in the command area.

9.2.1 Population and major occupations

The command area is spread over 6 districts of Andhra Pradesh. The population of the command area as worked out on proportionate area basis from the mandal-wise population census 2001 is 29.34 lakh of which the urban population is 7.48 lakh. Thus the proposed command area is predominantly rural. The occupational distribution of the population for the above districts is furnished in Table 9.4.

Table 9.4
Occupational distribution of the population

Occupational Category	Percentage of population					
	Warangal	Khammam	Krishna	West Godavari	Guntur	Prakasam
Main workers	45.26	46.09	41.82	38.16	45.75	48.60
Marginal workers	2.48	-	1.47	8.15	2.12	2.40
Non-workers	52.22	53.90	56.70	49.10	52.13	51.36
Cultivators	14.69	11.69	6.58	6.63	9.35	12.21
Agricultural labour	19.05	20.77	20.32	29.20	23.54	35.74
Number of cultivators (lakh)	4.14	2.59	2.43	2.02	3.84	3.37
Number of agricultural labour (Lakh)	5.37	4.60	7.51	8.90	9.67	9.86

9.2.2 Land holdings

The classification of the farmers of the command area according to the landholdings is presented in Table 9.5.

Table 9.5
Classification of farmers based on land holdings

Category of farmers	Size of land holding	Percentage
Marginal	Below 2 ha	74.93
Small	2 to 4 ha	15.55
Medium	4 to 10 ha	7.91
Large	Above 10 ha	1.61

9.2.3 Land tenure

Agriculture is the mainstay of the population of the districts falling in the command area. The land ownership status of the households of the six districts is furnished in Table 9.6.

Table 9.6
Land ownership status of households

Sl.No	District	No. of households (lakh)	No. of land holdings (lakh)	Percentage
1	Warangal	5.87	4.99	85
2	Khammam	NA	3.16	NA
3	Krishna	8.43	5.24	62
4	Guntur	9.40	6.60	70
5	Prakasam	5.76	4.75	82
6	West Godavari	NA	5.35	NA

9.2.4 Household income

Major portion of the population of the command is dependent on agriculture. Among the population engaged on agriculture, about 70 % are agricultural labour. Among the cultivators owning lands, the marginal farmers holding less than 2 ha are in majority. From the above, it is clear that the present levels of household income are marginal in case of many households. The introduction of irrigation in the command area could be expected to boost the household income.

9.2.5 Availability of agricultural labour

About 55% the workforce available in the proposed command area are agricultural labourers, which would be adequate even after introduction of irrigation.

9.3 Identification of problems in the new command area

a) Physical problems

There are no significant physical problems in the command area. The soils in the command area are suitable for growing the crops proposed. As the area is well drained by the existing natural drainages and the ground water table fluctuates sufficiently below the root zone of the crops, the drainage and water logging problems are anticipated to be minimal.

b) Financial problems

No financial problems could be foreseen. The farmers are already in the field of agriculture. With the introduction of assured irrigation supplies under the link project, more inputs have to be put in to achieve greater

yields. This may call for more finances. Since the present policy of the government both at central and state level is aimed at growing more food and achieving self-sufficiency by providing every conceivable assistance to the farmers, the locally available banks and other financial institutions could be expected to be geared-up to provide the increased timely financial assistance to the farmers.

9.4 Infrastructure facilities

a) Railways and roadways

The command area is well connected by roads and railways except for the Inchampalli right bank canal command where the communication facilities are a bit low**.** The National highway No. 9 and a broad gauge railway line connecting the Khammam – Vijayawada, passes through the North eastern part of the proposed command area. A good network of major district and other roads connecting the mandal headquarters and other smaller towns is already available in the command area.

b) Marketing facilities

There are 17 big towns including Khammam, Guntur, Eluru which are district headquarters having good marketing facilities with communication network for transport. These places do have enough facilities to sell their agricultural food and non-food produce. Besides this, good number of outlets for the supply of the agricultural inputs like seeds, fertilizers and pesticides to the farmers to meet their requirements are already in existence in the command area.

c) Financial institutions

There are 462 financial institutions in and around the command area, which include the nationalized banks, rural, and commercial banks and co-operative banks. These institutions provide the financial assistance to the farmers for meeting their agricultural expenses, purchase of livestock, acquisition of new lands, improvement of land and drainage and other necessities.

d) Medical facilities

There are 104 public health centers in and around the proposed command area.

9.5 Command area development works

a) Land development

The terrain of the proposed new command area is mostly plane with small undulations, except in minor areas in the upper portion of the command area. The land levelling and its preparation to receive the irrigation supplies may have to be taken up with active participation of beneficiary farmers. The cost of levelling and the preparation of land could be made to be borne by the farmers themselves, and for land development banks can provide the required loans, which will be recovered in easy installments.

b) Field channels

Field channels will have to be constructed through the newly proposed ayacut of the canals to carry the irrigation supplies to the fields. Again, active participation of the farmers for the work is called for, which could be planned simultaneously with the land levelling works.

c) Field drainage to prevent water logging

The newly proposed commands are far away from seacoast and the groundwater table is safely placed even after the monsoon thus making it safe against posing any problem of water logging. However, to avoid the possibility of water logging in the command, it is necessary to resort to conjunctive use of surface and groundwater to enhance the irrigation intensity and also to maintain the groundwater level well below the root zone of the crops.

d) Farm roads

The existing road network to reach various parts of the command is sufficient. However, after introduction of irrigation, some new farm roads will be required to be constructed and old village roads will have to be realigned for better accessibility to the villages and agricultural fields.

e) Other facilities

In addition to the above development works, marketing and ware housing facilities, credit facilities from banks, easy availability of agriculture inputs, and consolidation of land holdings will have to be thoroughly planned and developed / organized for proper command area development. It is also pertinent to develop other facilities concerning

the health, education, protected drinking water supply, communications etc. for the general betterment of the living standards of the population of the command area.

9.6 Assessment of likely economic impact

With the introduction of irrigation in the command area, the total produce is expected to increase from 775 thousand to 2755 thousand metric tonnes. A direct benefit of Rs. 30323 per ha of the proposed command area is estimated against Rs. 12841 per ha in the present un-irrigated condition. The increase in income is Rs. 17482 per ha. of CCA.

Due to increase in production of food grains and oil seeds, more rice mills and oil mills are likely to come up in the area. Further, higher production of fodder crops will result in an increase in livestock. As a result of this, dairy farms are likely to come up, which will further increase the income of the households in this area. Smallscale agro-industries under self-employment scheme will have brighter prospects due to the increase in agricultural activities.

After introduction of irrigation, the income from agricultural and allied industries will increase and living standard of people in the area is expected to improve substantially with the anticipated increase in the per capita income. Tremendous socio-economic development with improvement in literacy, communications, economic activities, public health, protected drinking water, employment potential etc. in the area could be foreseen. In short, the link scheme could be a boon to the people of the command area.