# Chapter 8
# Water and irrigation planning

## 8.1 Existing Irrigation Facilities in the Proposed Command Area

The 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 crops usually grown in the command area are paddy, jowar, maize, ragi, groundnut, cotton etc.

There are two main crop seasons, the kharif and the rabi. The kharif crops are paddy, pulses and groundnut. Cotton is grown in black soils. Rabi crops are chillies, garlic, onion, cotton, groundnut, ragi, korra and other oil seeds. Besides these seasonal crops, garden crops like vegetables and turmeric are also grown throughout the year.

Irrigation is practiced in the command area from the wells and tanks. Most of the wells and some of the tanks are owned by individual farmers. Some tanks have been built from time to time by Government or through the co-operative efforts of the people. The tanks are the source of water supply for domestic use for villages in the vicinity. Tanks also provide irrigation to areas varying from a few hectares to a few hundred hectares. Irrigation from these 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 Public Works Department.

The general pattern of these tanks is the earthen embankments of varying heights put across valleys, natural nallas or small streams.

Adjacent areas of link canal is irrigated by Left Bank Canal, Right Bank Canal and HLC of Tungabhadra Project.

## 8.2 Existing Cropping Pattern and Land Irrigability Classification

No detailed soil surveys for land irrigability classifications have been conducted so far in the area under consideration. The soil classification map of the districts falling in the command area along with brief descriptions were obtained from the National Bureau of Soil Survey and

Land Use Planning and the soil classification maps of the command area were obtained from the district maps. The soils in the area may broadly be classified as deep black soil, red sandy soil and mixed red and black soils. Deep black soils occur in gently sloping to nearly level lands of Deccan trap and limestone regions. Deep black soils are also found occurring on a variety of (geological) parent materials. These soils are very deep (more than 100 cm) and dark grayish brown to very dark grey and black in colour. The crops grown in these soils under rainfed conditions are jowar, chillies, wheat, cotton, sunflower, tobacco, groundnut, linseed, gram and pulses. While proposing the cropping pattern the soils available in the command area, the existing cropping pattern and the local practices prevailing in the area are taken into account.

The red sandy soils occur on undulating lands on acidic rocks, viz., granites and granite gneiss. These soils are deep to very deep, reddish brown to dark reddish brown, loamy sandy loam or sandy clay loam as the surface with well developed argillic (clayrish) horizon. They are neutral to acidic in reaction and low to medium in a cation exchange capacity and base saturation with medium to high water holding capacity. These soils are well drained with moderate permeability. They respond well to irrigation, manuring and the other water and land management practices. The yields obtained on these lands are generally good when moisture is not a limiting factor. The crops grown in these soils under rainfed condition are jowar, castor, groundnut, pulses and potatoes, vegetables, chillies and plantains.

Mixed red and black soils usually occur as gently undulating plain or complex geological materials. The red and black soils are found in association with each other in these areas. Usually the red soils resemble the red sandy soils of mid-land region and the black soils resemble the medium and deep black soils in their physio-chemical characteristics. Patches of problematic soils such as saline, alkaline and waterlogged areas are also seen at various places. Both the soils are productive when moisture is not a limiting factor. These soils are moderately susceptible to erosion, crops usually suffer on these soils due to lack of moisture during the growing period in the absence of irrigation facilities. The red soils are comparatively of coarser texture and have moderate drainage and slow permeability. The crops grown under rain fed conditions are jowar, cotton, groundnut, chillies, wheat and pulses. The crops grown under irrigation are cotton, pulses, paddy, sugarcane,

maize, wheat and tobacco. In addition, appropriate soil and water management practices have to be adopted to make irrigation a success.

Agriculture is the predominant occupation in the command area. Important crops are paddy, ragi, jowar, bajra, maize, wheat, pulses, groundnut, sugarcane and cotton. Table 8.1 shows details of crops and the area covered by them in different districts of the command area.

**Table 8.1**
**Important crops and the areas (ha) covered**

| District | Paddy | Ragi | Jowar | Bajra | Maize |
|---|---|---|---|---|---|
| **1** | **2** | **3** | **4** | **5** | **6** |
| Bellary | 68854 | 6547 | 94463 | 27215 | 32090 |
| Raichur | 117347 | - | 174386 | 65722 | 249 |
| Anantapur | 65982 | 42668 | 352093 | 90541 | 204 |
| **Total** | **252183** | **49215** | **620942** | **183478** | **32543** |

| District | Wheat | Pulses | Ground nut | Sugar cane | Cotton |
|---|---|---|---|---|---|
| **1** | **7** | **8** | **9** | **10** | **11** |
| Bellary | 2382 | 39090 | 93803 | 7834 | 66412 |
| Raichur | 4158 | 47030 | 50040 | 134 | 49208 |
| Anantapur | - | 173613 | 260759 | 3735 | 72659 |
| **Total** | **6540** | **259733** | **404602** | **11703** | **188279** |

Among important crops, jowar covers 620942 hectares, which forms 30.90% of the total area covered by crops followed by groundnut, which makes 20.14%, pulses cover 12.93% and paddy 12.55%. Cotton is grown in 9.37% area while bajra and ragi are grown in 9.13% and 2.45% area respectively. Maize, sugarcane and wheat grown in small areas, which form 1.62%, 0.58% and 0.33% of the total cropped area.

Amongst important crops sugarcane production is the highest i.e., 911761 tonnes which is 34.0% of the total agriculture production followed by paddy and groundnut which is 701594 and 299764 tonnes. The details of crop production are given in Table 8.2.

**Table 8.2**
**Production of important crops (Tonnes) in the command area**

| District | Paddy | Ragi | Jowar | Bajra | Maize |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| Bellary | 224687 | 5840 | 119499 | 25148 | 99860 |
| Raichur | 395453 | - | 130587 | 42536 | 816 |
| Anantapur | 81454 | 53892 | 126389 | 42158 | 277 |
| **Total** | **701594** | **59732** | **256976** | **109842** | **100953** |

| District | Wheat | Pulses | Groundnut | Sugarcane | Cotton |
|---|---|---|---|---|---|
| 1 | 7 | 8 | 9 | 10 | 11 |
| Bellary | 2193 | 15851 | 86799 | 654922 | 85696 |
| Raichur | 1772 | 16588 | 29015 | 13748 | 58496 |
| Anantapur | - | 35677 | 183950 | 243091 | 23729 |
| **Total** | **3965** | **68116** | **299764** | **911761** | **167921** |

## 8.3 Proposed Irrigation in the Command Area

### 8.3.1 Irrigation through Link Canal

The total annual irrigation proposed through the Krishna (Almatti) - Pennar link is 258334 ha, out of which 1,46,299 ha in Krishna basin and 1,12,035 ha in Upper Pennar sub-basin of Pennar basin. The NWDA has carried out the water balance studies of all these four sub-basins. The deltas for assessing the water requirement have been computed from the cropping pattern proposed and GIR values worked out for various crops proposed to be grown from the respective water balance study of each sub-basin. The details of the areas which are proposed to be irrigated by this link and corresponding water requirement are given in Table 8.3.

**Table 8.3**
**Annual irrigation and corresponding utilisation by link canal**

| Particulars/ sub-basin | CCA (ha) | Annual irrigation (ha) | Intensity of irrigation (%) | Delta (m) | Annual utilisation ($Mm^3$) |
|---|---|---|---|---|---|
| Middle Krishna | 17015 | 16334 | 96 | 0.52 | 85 |
| Tungabhadra | 51360 | 46224 | 90 | 0.55 | 253 |
| Vedavathi | 93045 | 83741 | 90 | 0.60 | 505 |
| **Sub-total** | **161420** | **146299** | | | |
| Upper Pennar | 133375 | 112035 | 84 | 0.78 | 871 |
| Domestic and industrial uses | | | | | 56 |
| Transmission losses | | | | | 210 |
| **Total** | **294795** | **258334** | | | **1980** |

The month-wise total water requirements of the link canal considering the demands for enroute irrigation in the Middle Krishna sub-basin, the Tungabhadra sub-basin, the Vedavathi sub-basin and the Upper Pennar sub-basin and transmission losses are given in **Table 8.4.**

**Table 8.4**
**Monthly requirements by command area under the link canal**

Unit: $Mm^3$

| Month | Requirement for Irrigation | | | | | Domestic and Industrial requirement | Trans-mission losses | Total |
|---|---|---|---|---|---|---|---|---|
| | Name of sub-basins | | | | Total for irrigation | | | |
| | Middle Krishna | Tunga-bhadra | Veda-vathi | Upper Pennar | | | | |
| June | 6.70 | 11.20 | 73.30 | 12.75 | 103.95 | 4.60 | 26.00 | 134.55 |
| July | 22.80 | 74.20 | 153.20 | 190.44 | 440.64 | 4.60 | 36.00 | 481.24 |
| August | 23.20 | 89.90 | 150.60 | 254.50 | 518.20 | 4.60 | 40.00 | 562.80 |
| September | 17.00 | 64.80 | 101.20 | 202.93 | 385.93 | 4.60 | 37.00 | 427.53 |
| October | 10.60 | 8.10 | 12.60 | 145.49 | 176.79 | 4.60 | 33.00 | 214.39 |
| November | 4.70 | 4.80 | 14.10 | 64.89 | 88.49 | 4.60 | 30.00 | 123.09 |
| December | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.70 | 1.35 | 6.05 |
| January | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.80 | 1.35 | 6.15 |
| February | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.60 | 1.30 | 5.90 |
| March | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.80 | 1.35 | 6.15 |
| April | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.70 | 1.30 | 6.00 |
| May | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.80 | 1.35 | 6.15 |
| Total | 85.00 | 253.00 | 505.00 | 871.00 | 1714.00 | 56.00 | 210.00 | 1980.00 |

### 8.3.2 Layout of Branch Canals / Distributaries and their Commands

The toposheets of Survey of India in 1:50,000 scale at 20 m contour interval were used for layout of branch canals / tributaries and their command. Considering the information on ground elevation available on these maps, the branch canal/distributaries net work was drawn with the branch canals/distributaries running mostly along the ridges between the local streams with their commands on both the sides extending up to the streams, which in turn form the exterior boundaries of the command under each of the branch canal and distributaries. The command area, so finalized was then transposed to the land irrigability maps of the same area of 1:50000 scale. The irrigable area under each of the branch canal was planimetered. The area under each of the branch canal was adjusted to match with the gross irrigable area of 294795 ha so as to

finally arrive at the branch wise irrigable areas. After deducting the forest scrub and barren land, the net irrigable area is arrived at as 258334 ha. In all, the total irrigable area is divided into 46 branch canals.

### 8.3.3. Proposed Cropping Pattern

The crops have been suggested taking into account the type of soils available in the command area and considering the local practice to grow paddy and other allied crops on the irrigated land. The main crops suggested are paddy, jowar/fodder, maize, bajra, groundnut, vegetables, cotton, ragi, chillies and pulses. The proposed cropping pattern is given in Table 8.5.

**Table 8.5**
**Proposed cropping pattern under the link canal.**

| Crops | % of CCA |
|---|---|
| Paddy | 27 |
| Jowar | 24 |
| Maize | 4 |
| Groundnut | 14 |
| Chillies | 6 |
| Cotton | 11 |
| Fodder | 2 |
| Ragi | 1 |
| Bajra | 10 |
| Vegetables | 1 |

### 8.3.4 Crop Water Requirement

The water requirements for irrigating the proposed areas have been computed on climatological basis. The data of four IMD observatories located at Bijapur, Raichur, Bellary and Anantapur are considered. Normal monthly values of potential evapo-transpiration of IMD observatories computed by Penman's method are given in the IMD publication "Potential Evapo-transpiration (PE) over India" (Scientific report No.136 Feb.1971). These have been used in estimating the net water requirements of different crops considered in the suggested cropping pattern. The gross irrigation requirements for different crops have been worked out considering an irrigation efficiency of 55% for the crops other than paddy and in case of paddy an irrigation efficiency of 65% is considered.

## 8.4 Domestic and Industrial Requirements of the Proposed Command Area

The requirement of water for domestic consumption in the rural and urban areas and for livestock has been computed by projecting the rural and urban human population and livestock of the proposed command area and to the towns situated outside the command area to the right side of the link canal alignment within a distance of 20 km and not involving lifts more than 100m, to 2050 AD by considering the per capita daily requirement of 70, 200 and 50 litres for the rural, urban and livestock population respectively.

The rural and urban population of the command area for the year 1991 have been estimated on proportionate area basis from the Taluk / Mandal-wise census data of 1991. The total population of the command area in 1991 was 6.14 lakh and has been projected to 2050 AD using compound growth rates as suggested by UNO in their 1994 publication.

The existing urban population is deducted from the projected urban population presuming that its domestic requirement is already being met by existing sources and only the remaining urban population is considered for working out the urban domestic requirement to be provided by the link canal.

The total livestock in the command area as estimated on proportionate area basis from census data is 0.8 lakh and it was projected to 2050 AD assuming an annual compound growth rate of 1%.

The water requirement for the entire urban and 50% of the rural population is proposed to be met from the surface water resources, which works out to 22 $Mm^3$.

In the absence of relevant data to estimate the industrial water needs, the industrial requirement has been assumed to be the same as the domestic water requirement, i.e., total of urban, rural and livestock requirements, which is 34 $Mm^3$. Thus the total domestic and industrial water requirement of the en route area to be supplied from the Krishna (Almatti) – Pennar link canal is estimated to be 56 $Mm^3$.

## 8.5 Month-wise Distribution Pattern of Water for Various Demands

The month-wise distribution pattern for the link is given in Table 8.6.

**Table 8.6**
**Month-wise Distribution Pattern of Water for Various Demands from the link**

Unit: $Mm^3$

| Month | Irrigation use | Domestic and Industrial uses | Transmission losses | Total |
|---|---|---|---|---|
| June | 103.95 | 4.60 | 26.00 | 134.55 |
| July | 440.64 | 4.60 | 36.00 | 481.24 |
| August | 518.20 | 4.60 | 40.00 | 562.80 |
| September | 385.93 | 4.60 | 37.00 | 427.53 |
| October | 176.79 | 4.60 | 33.00 | 214.39 |
| November | 88.49 | 4.60 | 30.00 | 123.09 |
| December | 0.00 | 4.70 | 1.35 | 6.05 |
| January | 0.00 | 4.80 | 1.35 | 6.15 |
| February | 0.00 | 4.60 | 1.30 | 5.90 |
| March | 0.00 | 4.80 | 1.35 | 6.15 |
| April | 0.00 | 4.70 | 1.30 | 6.00 |
| May | 0.00 | 4.80 | 1.35 | 6.15 |
| **Total** | **1714.00** | **56.00** | **210.00** | **1980** |