# Chinnatekur Model Watershed
# Kurnool District
# Andhra Pradesh

ICAR-Indian Institute of Soil and Water Conservation (IISWC)
Research Centre, Hospet Road, Ballari 583 104, Karnataka

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## Project Implementation Team

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# FOREWORD

**ICAR- Indian Institute of Soil &Water Conservation (IISWC)**
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ICAR-IISWC, Research Centre Ballari, Karnataka took up Chinnatekur Watershed, Kurnool District, Andhra Pradesh sponsored by Government of Andhra Pradesh during 1983-84. The watershed is located at Kallur block at $14^0$ 15' N Latitude and $76^0$ 58' E Longitude at 390 m above mean sea level with 653.9 mm average annual rainfall. Total area of watershed is 1120 ha which falls under Hot arid Eco-region with red and black soil. Majority of inhabitants of the watershed depend on agriculture as their main source of income and occupation. But, agriculture in the area suffered mostly post rainy season from high variability in yield and low productivity. There was low income generation from livestock due to lack of quality fodder availability in the watershed. The average milk production per annum was only 321 liters per cattle which was extremely low due to lack of green fodder availability. Inhabitants lack knowledge on new varieties and advance management practices resulting in extremely low yields. The problems of water logging and salinity were associated in command area of the watershed which limited irrigated area to 93 ha only. Due to hill slope and absence of proper soil and water conservation(SWC) measures, many farmlands in the low lying fringe area were susceptible to soil and water erosion, causing rill erosion and gullies in the watershed. Flash floods were common in Hundri river in the watershed causing a serious stream bank erosion. The major interventions taken up by the Institute comprised graded bunds , stone check dams, land leveling and graded border strips to arrest soil erosion and conserve rain water. Four farm ponds were constructed for runoff collection to use for supplemental irrigation. Apart from plantation on banks of Hundri river, afforestation was carried out at large scale on the sides of the roads, canals, railway lines and gully banks with appropriate species for the purpose of bio-mass production to meet fodder and fuel needs. Across the pre-project (1983-84) and post-project period (1992-93), there has been an increase in per capita holding of irrigated land from 0.12 ha to 0.14 ha while dryland decreased from 0.32 ha to 0.23 ha. Consequent to improvement in fodder supply, milk production and sale improved considerably. Due to watershed interventions, the run-off percentage decreased from 5.2 to 3.5 Further, soil loss also showed reduction from 2.2 t/ha/year to 1.2 t/ha/year. There is tremendous increase in ground water recharge in Chinnatekur watershed of Andhra Pradesh through adoption of soil and water conservation measures. Due to watershed development, in spite of increase in population over time, the per capita net income (net returns from agriculture) increased by 123 percent over pre project period.

# CONTENTS

## 1.0 Watershed Details

1.1 Name: Chinnatekur watershed
Villages covered: Chinnatekur and Bastipadu

1.2 Location: Latitude: $14^0$ 15' N Longitude: $76^0$ 58' E

1.3 State: Andhra Pradesh District: Kurnool Block/Tehsil: Kallur

1.4 Agro ecological region: 3-Hot Arid Eco -region with Red and Black soils

1.5 Area (ha): 1120.11
Average Annual Rainfall (mm): 653.9 mm (Av. 23 years)
Elevation range (m amsl): 390 m above Mean Sea Level

1.6 Average slope (%): 3.22 (0.5-3% in agricultural lands and 5-20% in hilly regions)

1.7 Implementation Period: 1983-84 supported till 1992

1.8 Sponsored by: Govt. of Andhra Pradesh (DRDA, Kurnool, under technical guidance of CSWCTRI, RC, Ballari)

1.9 Total Budget (in Rs lakh): Approx. Rs. 49,49,157

1.10 Problems identified for interventions

- Majority of inhabitants of the watershed depend on agriculture as their main source of income and occupation. But, agriculture in the area suffered from high variability in yields and low productivity.
- Low income generation from livestock due to lack of quality fodder availability in the watershed. The average milk production per cattle per annum was only 321 liters which was extremely low due to lack of green fodder availability.
- Lack of knowledge on new varieties and poor management practices resulted in extremely low yields.
- The problems of water logging and salinity in command area of the watershed limits irrigated area to only 93 ha.
- Due to hill slope and absence of proper soil and water conservation(SWC) measures, many farmlands in the low lying fringe area was susceptible to soil and water erosion.
- Due to absence of SWC measures, high run-off causing rill erosion and gullies was common in the watershed.
- Flash floods were common in Hundri river in the watershed causing a serious stream bank erosion.

## 2.0 Demographic Details

2.1 Total Population (number): 648 SC/ST (%): 59.4
Total number of families: 101
Number of farm families: 83 Number of landless families: 5

2.2 General Socio-Economic Status: (Average landholding size, Major occupations, Outmigration *etc*.)

- Majority (82.2%) of the families were agriculture based, while rest depended on other occupations with agriculture as secondary occupation.
- Literacy level in the watershed was poor accounting for 68.2% illiterates.
- Average size of the households was about 6.4.
- SC/ST population was 59.4% while rest of 40.6% families belonged to other categories.
- Majority of farmers, about 63.4% were marginal and small farmers (upto 2 ha).
- Major phase of income of the farm families was contributed by agriculture *i.e.* about 72% of the total family income.
- Total livestock population of the village was 514. Out of which 30% were milch cattles yielding 321.04 liters/animal/year which is very low.

2.3 General Agricultural Status: (Total cultivable area, Rainfed area, Irrigated area, Forest land, other land uses)

- Total geographical area of the watershed was 1120.11 ha, out of which total cultivable area was 815.19 ha accounting for 72.8% of the watershed area. Forest and other hilly area with river bed accounted for 227.45 ha.
- Rainfed area was about 571.43 ha and irrigated land was about 243.6 ha.
- Groundnut, Korra (*Setaria italica*) and rabi jowar were the major crops grown under rainfed and Paddy was the major crop under irrigated situation.

## 3.0 Technological Interventions (NRM and Livelihood Activities)

### Arable land

- Graded bunds were provided over an area of 304.55 ha connected to 717m long waterways with 159 stone checks at appropriate places to arrest soil erosion and conserve rain water.
- Land leveling was done in 11 ha area and graded border strips were formed in 2.13 ha area for conservation of moisture and to facilitate efficient on-farm irrigation.
- Four farm ponds were constructed for runoff collection to use for supplemental irrigation.
- Land smoothening was carried out over an area of 138.59 ha to remove local undulations.
- High-level canal was constructed for development of minor irrigation to create an additional irrigation potential of 124 ha.
- Fisheries were promoted to improve the livelihood of the landless poor.

### Non-arable land

- Staggered contour trenches of 4 x 1.0 x 0.5 m were constructed at 10 m horizontal intervals with equalizers of 0.25m. On the downstream of contour trenches, plantation was done with appropriate plant species.

- Afforestation was carried out in 135.7 ha, apart from plantation on banks of Hundri river, sides of the roads, canals, railway lines and gully banks, covering a length of 11 km with appropriate species for the purpose of bio-mass production to meet fodder and fuel needs.

- Gully banks were protected by easing side slopes and dry revetment was provided.

- To prevent excess runoff draining from the hill slopes into low lying agricultural lands, a combination of 1936 m long diversion drain with a cross-section of 0.84 sqm and 670 m long diversion *bund* having a cross-section of 0.36 sqm with a gradient of 0.3% was provided for safe disposal of runoff into natural drains.

- Fourteen rock fill dams, one arch weir, one *nala* bund and gabions were constructed across the gully at different places to enhance water storage and ground water recharge and arrest gully expansion.

## 4.0 Impacts

- Across the pre-project period (1983-84) and post-project period (1992-93), there has been an increase in the population and number of families' dependant on agriculture. Literacy rate also changed over the period.

- Per capita holding of irrigated land increased from 0.12 ha to 0.14 ha while dryland decreased from 0.32 ha to 0.23 ha.

- Due to watershed development, in spite of increase in population over time, the per capita net income (net returns from agriculture based on 1998-99 prices) increased from ₹2822 to₹6292 per annum indicating an increase of 123 percent over pre-project (1983-84).

- The extent of liability of different land categories of farm families during this period decreased from 69.78 percent to 37.25 percent of their net income generated from agriculture which indicated that the economic status of the people in the watershed has improved over time

- Consequent to improvement in fodder supply, milk production improved considerably and sale of milk improved by 100%.

- Economic viability of the project was assessed by calculating BCR(Benefit cost ratio) at 15 % Discount Rate for a period of 15 years which came out to be 1.88 and Net Present Value of the project was estimated to be ₹. 18.5 indicating that the project is attractive and worth to invest.

- Due to watershed interventions, the run-off percentage decreased from 5.2 (pre-project) to 3.5 (post project). Further, soil loss also showed reduction from 2.2 t/ha/year (pre-project) to 1.2 t/ha/year (post-project period).

- Samra (1997) has shown that there is tremendous increase in ground water recharge in Chinnatekur watershed of Andhra Pradesh through adoption of soil and water conservation measures like contour bunding, gully plugs, trenching, and cattle proof trenches *etc*.

## 4.1 Productivity indicators

| S. No | Indicators | Unit | Before (Year 1982-83) | After (Year 1990-91) | Change (%) |
|---|---|---|---|---|---|
| **1** | **Change in land use** | | | | |
| **i** | Net sown area | ha | 283.89 | 290.45 | 2.31 |
| **a.** | Rainfed | ha | 208.12 | 180.55 | -13.25 |
| **b.** | Irrigated | ha | 75.77 | 109.9 | 45.04 |
| **ii** | Area sown more than once | ha | 336 | 319.62 | 5.26 |
| **iii** | Gross cropped area | ha | 1016 | NA | NA |
| **iv** | Current fallow | ha | NA | NA | NA |
| **v** | Cultivable waste land | ha | 262.89 | 231.05 | -12.11 |
| **vi** | Area covered under afforestration (Non arable land) | ha | 227.45 | 363.15 | 59.66 |
| **vii** | Area put under agroforestry orchards (arable land) | ha | 35.44 | 94.13 | 165.6 |
| **viii** | Number of tube-wells | No | NA | NA | NA |
| **ix** | Number of functional dug/open wells | No | 47 | 99 | 110.64 |
| **2** | **Area under crops** | | | | |
| **i** | *Kharif* | ha | 815.19 | 668.98 | -17.94 |
| **ii** | *Rabi* | ha | 12.55 | 129.95 | 195.46 |
| **iii** | **Change in area under major crops** | | **1982-83** | **1990-91** | |
| **a.** | Paddy (irrigated) | ha | 37.31 | 82.81 | 121.95 |
| **b.** | Jasmine (irrigated) | ha | 14.86 | 60.19 | 305.05 |
| **c.** | Vegetables (irrigated) | ha | 10.40 | 76.63 | 636.83 |
| **d.** | Groundnut (rainfed) | ha | 52.22 | 147.63 | 182.71 |
| **e.** | Setaria (rainfed) | ha | 68.20 | 87 | 27.57 |
| **f.** | Jowar (rainfed) | ha | 47.47 | 83.62 | 76.05 |
| **3** | **Impact on yield of major crops** | | **1982-83** | **1990-91** | |
| **i** | Paddy (irrigated) | q/ha | 48.31 | 46.0 | -4.78 |
| **ii** | Sorghum (irrigated) | q/ha | 4.2 | 6.9 | 64.29 |
| **iii** | Setaria (rainfed) | q/ha | 3.75 | 0.56 | -85.07 |
| **iv** | Ground nut (rainfed) | q/ha | 3.99 | 6.0 | 50.38 |
| **v** | Sorghum (rainfed) | q/ha | 25.45 | 30.0 | 17.88 |
| **vi** | Ground nut (irrigated) | q/ha | 11.25 | 20.6 | 83.11 |

| 4 | **Productivity indices** | | **1982-83** | **1990-91** | |
|---|---|---|---|---|---|
| **i** | Crop Diversification Index (CDI) Or Crops/Cropping systems before & after | | Groundnut, soybean and setaria | Oilseed (new intro. Caster)+ Commercial crops (Tobacco) | |
| **ii** | Water productivity | kg/cum | NA | NA | NA |
| **iii** | Area under cultivation (total cultivable area) | ha | 815.19 | 850.64 | 4.35 |
| **iv** | Cropping intensity (rainfed crops) | % | 106.4 | 120.3 | 13.06 |
| **v** | Change in milk production | litres/yr | 40130 | 109500 | 172.86 |

## 4.2 Environmental impact indicators

| S. No | Indicators | Unit | Before (Year 1982-83) | After (Year 1990-91) | Change (%) |
|---|---|---|---|---|---|
| **1** | Hydrology and water resources | | | | |
| **i** | Surface runoff | % | 9.8 | 5.27 | -46.22 |
| **ii** | Surface water storage | ha-m | 97 | 102.6 | 5.77 |
| **iii** | Surface water resources (Number of water bodies) | | 1 | 7 | 600 |
| **iv** | Perenniality of streams | cum | - | - | - |
| **v** | Average water table depth in well | m | 7.05 | 7.85 | 11.35 |
| **vi** | Increase in ground water contribution | % or ha-m | NA | NA | NA |
| **vii** | Reduction in soil loss | tons/ha/year | 2.2 | 1.2 | -45.45 |
| **2** | Soil fertility improvement in the watershed | | | 1982-83 1990-91 | |
| **i** | Organic carbon | % | 0.60 | NA | - |
| **ii** | Nitrogen | kg/ha | 10 | 24 | 140 |
| **iii** | Phosphorus | kg/ha | 15 | 40.7 | 171.33 |
| **iv** | Potash | kg/ha | 196 | NA | - |

## 4.3 Socio-economic impact indicators

| S. No. | Indicators | Unit | Before (Year 1982-83) | After (Year 1990-91) | Change % |
|---|---|---|---|---|---|
| 1 | **Overall People's Participation Index** | % | NA | | |
| | **Total contribution (Rs) or percent of total budget expenditure (%)** | Rs or % | NA | | |
| 2 | **Av. Family income (net returns)** | (Rs/yr) | 14640 | 48903 | 234.04 |
| i | Large | | 17122.2 | NA | NA |
| ii | Medium | | 5205 | NA | NA |
| iii | Small | | 3725.9 | NA | NA |
| iv | Marginal | | 3111.6 | NA | NA |
| 3 | **Av. Family expenditure** | (Rs/yr) | 753.25 | NA | NA |
| i | Large | | 852 | NA | NA |
| ii | Medium | | 737.87 | NA | NA |
| iii | Small | | 700.41 | NA | NA |
| iv | Marginal | | 723 | NA | NA |
| 4 | **Non-Farm income** | | NA | NA | NA |
| i | Large | | NIL | NA | NA |
| ii | Medium | | NIL | NA | NA |
| iii | Small | | NIL | NA | NA |
| iv | Marginal | | 10400 | NA | NA |
| 5 | **Employment generation** | Man days | 117804 | | |
| i. | Temporary | | 0 | 22523 | NA |
| ii. | Permanent (based on cropping pattern) | | 20100 | 24478 | 21.78 |
| 6 | **IGAs** (Annual income per SHG) | | NA | | |
| 7 i. | **Change in livestock population** | | 514 | 1161 | 125.8 |
| ii. | **Fodder production** | tons | 15757 | 20416 | 29.56 |
| 8 | **Amount in WDF account after financial withdrawal** | Rs. | NA | | |
| 9 | **Economic viability of the project** | | | | |
| i | BCR at Discount Rate 15 % for 15 years of analysis | | 1.88 | | |
| ii | IRR (%) | | NA | | |
| iii | NPV | | 18.5 | | |

## 5.0 Award/ Appreciation/ Recognition

## 6.0 Project Implementation Team

**Planning Team**:
MS Rama Mohan Rao (Soil Science)
S Chittaranjan (Engineering)
AK Srivastava (Agronomy)

**Technical Assistance:**
B Ramanath (T-5)
M Chandrappa (T-4)
NS Murthy (T-4)
Muralidhar

## 7.0 Photographs

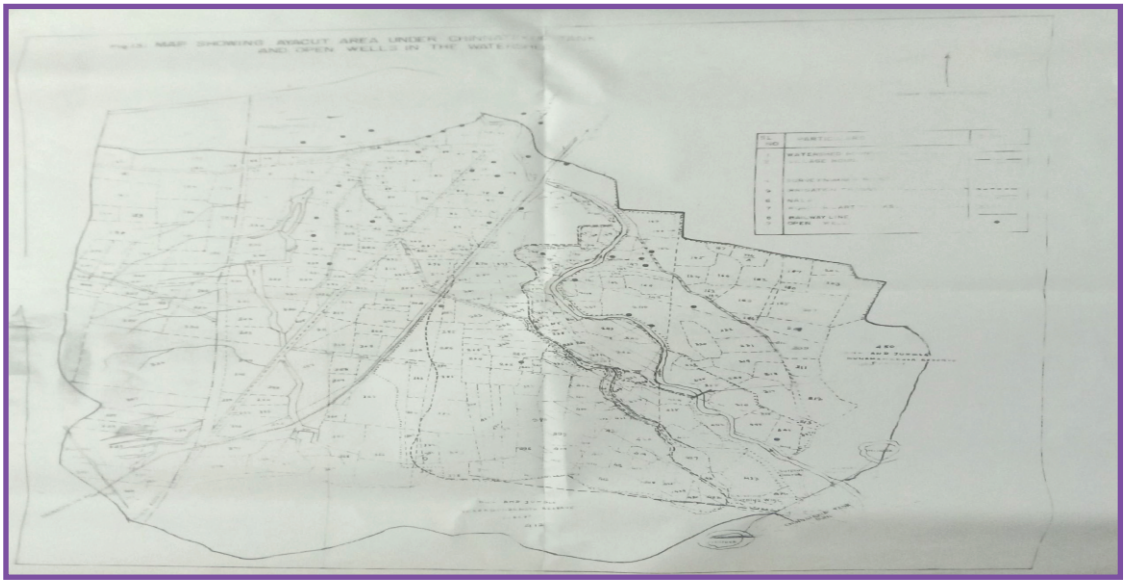

**Fig. Map of Chinnatekur watershed**

## 8.0 Other Relevant Details

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