IRRIGATION: AN AID TO AGRICULTURE

- HINJILI BLOCK
- KHALILKOTE BLOCK
- KODOLA BLOCK
- POLOSARA BLOCK
- PURUSOTTAMPUR BLOCK
- GANJAM BLOCK
- KAVISURYANAGAR BLOCK
- CHATRAPUR BLOCK
IRRIGATION:  
AN AID TO AGRICULTURE

Irrigation is one of the non-physical bases of terrain evaluation for agricultural land utilisation which lays stress upon the potential conditioning of the other related geographical factors contributing to an improvement in the agricultural growth. Therefore, irrigation needs as much similar treatment as any physical component of terrain evaluation for terrain utilisation in terms of agriculture because 'in the study of agricultural landuse the impact of the vast multiplicity of interrelated physical and non-physical factors cannot be ignored, nevertheless the fact that all of them are not equally significant in influencing regional variation of agricultural phenomena' (Singh and Dhillon, 1987, p.110). In the light of the preceding observations the author feels it quite desirable and essential
to choose irrigation component as one of the decisive factors in the creation of different agricultural situations from place to place and from one crop season to another crop season. Moreover, in the Chhatrapur Subdivision where the regional distribution of rainfall is uneven (Ch.4) and inadequate, the amount of soil moisture is deficient because of excessive run-off, and where underground water is brackish and unfit for raising crops it is imperative to make an all-out effort to harness water resources to irrigate large areas of parched lands before they go waste on a permanent basis.

At present the Subdivision of Chhatrapur sets an example of regional imbalance in terms of area under irrigation and in the level of its irrigation facilities. In other words, the spatial differences in irrigation development over the terrain of the Chhatrapur Subdivision and their distribution patterns (Appendix II) have been regulated by a number of factors which guide the present study of irrigation in different blocks of the Chhatrapur Subdivision.

It is but natural that irrigation availability would not be uniform throughout the study area as the different means of irrigation are seemingly guided by the stimulating physical conditions of the terrain. For example, the canal irrigation is confined to the alluvial flat lands of Hinjili, Purusottampur, Chatrapur and Ganjam blocks, and nearly level
lands in parts of Polosara, Kodola and Kavisuryanagar blocks. The well-irrigation is an important indigenous source of irrigation used in those areas where irrigation by canals throughout the year or for a part of the year is not possible. The importance of irrigation tanks, ponds and wells would be seen mostly in the hill tracts. In the hill tracts of Kodola, Polosara and Khalli kote, availability of mechanically usable water is meagre, therefore, the agricultural landuse in these parts depends on either panchayat tanks or shallow wells and rainfed ponds locally called Haja.

As the distribution pattern of irrigation is not uniform in the Chhatrapur Subdivision the present author feels that it is essential to map (Figs.15.1, 15.2) and measure the range of differences in regional distribution of area under irrigation with a view to assimilate the same with the range of differences in panchayatwise terrain and social characteristics. In fact, the level of irrigation development and extent of area under irrigation in the Chhatrapur Subdivision have been observed to be controlled by various factors such as sources of irrigation, quantity and quality of available water for irrigation, density and perenniality of water channels per unit area, cropping seasonal requirement of irrigation during kharif and rabi seasons and types of crops grown. It may be noted that the major cropping seasons in the study area show two distinct periods in the official
Since some parts of the study area have been identified as cultivable waste lands (Ch.14.3.2), for ensuring success of development planning, it is essential to make a thorough study of its irrigation potential besides other morphological and pedological factors.

It may be noted that while dealing with the various surface conditions relating to terrain utilisation and available irrigation use of terrains, the hills and forests, notably reserve and protected, have been considered separately in respect of each panchayat and/or block and/or the Subdivision of Chhatrapur at large. Therefore, the spatial distribution with regard to availability and coverage of area under irrigation in the present study has been put to regional interpretation in terms of panchayat area and never in terms of geographical area which includes panchayat area, hills, reserve and protected forests and so on. For instance, the total geographical area of the Polosara block is 34657.81 hectares (Ch.14 & Table 14.8) while its total panchayat area is 19883.81 hectares. Thus, all information of agricultural land utilisation including the extent of irrigated area have been computed for analysis with respect to the panchayat area in respect of each panchayat and/or each block of the Chhatrapur Subdivision (Table 15.1).
## TABLE 15.1 - IRRIGATION IN CHHATRAPUR SUBDIVISION

| Name of Blocks | Gram panchayat area | Kharif | | Rabi | | | | | | | | |
|---------------|--------------------|-------|---|-----|---|---|---|---|---|---|---|
|               | Total cultivated area | Total irrigated area | % of 4 to 2 | % of 4 to 3 | Total cultivated area | Total irrigated area | % of 8 to 2 | % of 8 to 7 | % of 8 to 3 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| Hinjili | 15587.45 | 12382.76 | 9857.40 | 63.24 | 79.61 | 1979.00 | 1681.60 | 10.79 | 84.97 | 15.98 |
| Khallikote | 28127.13 | 19992.34 | 8295.32 | 29.49 | 41.49 | 850.90 | 776.30 | 2.76 | 91.23 | 4.26 |
| Kodola | 22055.06 | 17170.96 | 7513.57 | 34.07 | 43.76 | 2188.59 | 1326.50 | 6.01 | 60.61 | 12.75 |
| Polosara | 19883.81 | 14891.15 | 5548.43 | 27.90 | 37.26 | 7238.00 | 1022.90 | 5.14 | 14.13 | 48.61 |
| Purusottampur | 24696.76 | 19394.13 | 13006.90 | 52.67 | 67.07 | 10330.00 | 2070.00 | 8.38 | 20.04 | 53.26 |
| Ganjam | 21853.04 | 12573.52 | 7192.36 | 32.91 | 57.20 | 1679.78 | 1214.70 | 5.56 | 72.31 | 13.36 |
| Kavisuryanagar | 16704.05 | 14467.70 | 5181.15 | 31.02 | 35.81 | 9898.34 | 538.20 | 3.22 | 5.44 | 68.42 |
| Chatrapur | 24052.23 | 11531.00 | 8125.00 | 33.78 | 70.46 | 439.00 | 232.00 | 0.96 | 52.85 | 3.81 |
| TOTAL (Chhatrapur Subdivision) | 172959.53 | 122403.56 | 64720.13 | 37.42 | 52.87 | 34603.61 | 8862.20 | 5.12 | 25.61 | 7.24 |
From area under the irrigation point of view, the Chhatrapur Subdivision has been classified into the following irrigation intensity zones both in kharif and rabi seasons in accordance with the frequency of available irrigation informations (Figs. 15.1, 15.2 & 15.3).

**Kharif**
(Figures in percentage)

1) **Irrigated area in per cent to panchayat area** (Fig. 15.1)

<table>
<thead>
<tr>
<th>Irrigation zones</th>
<th>Irrigation zonal class (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) No irrigation zone</td>
<td>0</td>
</tr>
<tr>
<td>b) Low irrigation zone</td>
<td>&lt; 25</td>
</tr>
<tr>
<td>c) Moderate irrigation zone</td>
<td>26-50</td>
</tr>
<tr>
<td>d) Moderately high irrigation zone</td>
<td>51-75</td>
</tr>
<tr>
<td>e) High irrigation zone</td>
<td>Above 75</td>
</tr>
</tbody>
</table>

2) **Irrigated area in per cent to the kharif Cultivated area** (Fig. 15.2)

<table>
<thead>
<tr>
<th>Irrigation zones</th>
<th>Irrigation zonal class (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) No irrigation zone</td>
<td>0</td>
</tr>
<tr>
<td>b) Low irrigation zone</td>
<td>&lt; 25</td>
</tr>
<tr>
<td>c) Moderate irrigation zone</td>
<td>26-50</td>
</tr>
<tr>
<td>d) Moderately high irrigation zone</td>
<td>51-75</td>
</tr>
<tr>
<td>e) High irrigation zone</td>
<td>Above 75</td>
</tr>
</tbody>
</table>

**Rabi**
(Figures in percentage)

3) **Irrigated area in per cent to panchayat area**

<table>
<thead>
<tr>
<th>Irrigation zones</th>
<th>Irrigation zonal class (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) No irrigation zone</td>
<td>0</td>
</tr>
<tr>
<td>b) Low irrigation zone</td>
<td>&lt; 25</td>
</tr>
<tr>
<td>c) Moderately low irrigation zone</td>
<td>26-30</td>
</tr>
<tr>
<td>d) Moderate irrigation zone</td>
<td>Above 30</td>
</tr>
</tbody>
</table>
% OF IRRIGATED AREA TO PANCHAYAT AREA

- **RICH** (>75)
- **MODERATELY RICH** (51-75)
- **MODERATE** (26-50)
- **POOR** (≤25)
- **NO IRRIGATION** (0%)
- **NEGATIVE AREA**

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FIG. 15.1
<table>
<thead>
<tr>
<th>Irrigation zones</th>
<th>Irrigation zonal class (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4) Irrigated area in per cent to rabi cultivated area</td>
<td></td>
</tr>
<tr>
<td>a) No irrigation zone</td>
<td>0</td>
</tr>
<tr>
<td>b) Low irrigation zone</td>
<td>≤ 25</td>
</tr>
<tr>
<td>c) Moderate irrigation zone</td>
<td>26-50</td>
</tr>
<tr>
<td>d) Moderately high irrigation zone</td>
<td>51-75</td>
</tr>
<tr>
<td>e) High irrigation zone</td>
<td>Above 75</td>
</tr>
</tbody>
</table>

15.1. **IRRIGATION IN HINJILI BLOCK**

In terms of resourceful water for an efficient agricultural land use, Hinjili block is an exemplary administrative unit of the Chhatrapur Subdivision to present favourable terrain conditions in relation to the agricultural land utilisation. It has been observed in the Fig. 3.1 (Ch. 3) that most of the Hinjili block constitutes flat level terrain. A very minor part, comprising the panchayats of Makarjhol and Sasanambagan, constitutes rugged land segment while an insignificant part of Darubhadra panchayat represents a nearly level lowland terrain. The average surface elevation is 15.25 metres or less above the sea-level. The surface and underground drainage conditions are more or less stable with varying soil textural surfaces.

Owing to an exclusive regional economic dependence on the paddy growing, the intensity of irrigation is high especially during the **kharif** six months in Hinjili block. Out of the
total cultivated area of 12382.76 hectares (Table 15.1) about 9857.40 hectares (79.61\%) are irrigated through several means of irrigation. The irrigated area in per cent to the panchayat area is 63.24\%. About 10.70\% of the gram panchayat area of the Hinjili block is also irrigated during the rabi season which is 84.97\% of the total rabi cultivated area. The chief means of irrigation at present consist of Rushikulya canal and Jaymangala canal, M.I.P. tanks, Government and Private lift irrigation points, energized dugwells and other dugwells with tenda and various other sources including the panchayat tanks.

The irrigation data of the Hinjili block show considerable variation at the panchayat levels (Appendix-II) owing to minor terrain and major social constraints.

15.1.1. Terrain Bases and Irrigation Zones:

As already mentioned, the level terrain of the Hinjili block has been constituted by almost all gram panchayats except Makarjhol, Sasanambagan and parts of Darubhadra panchayats. While Makarjhol and Sasanambagan represent a rugged terrain, an insignificant portion of Darubhadra gram panchayat has been represented by the nearly level lowland terrain.

15.1.2. Kharif Irrigation Zones:

Irrigation zones in relation to the gram panchayat area - The high irrigation intensity zone (> 75\%) consists of the panchayats
of Sikiri, Putiapadar, Nandika, Gandala, Durubandha and Makarjhol (Fig.15.1 & Appendix-II). The zone of moderately high irrigation intensity (51-75%) has been observed in Sahapur, Kharida, Bellagam, Bhabandha, Saru, the Hinjili town's hinterlands, Konchuru, Sasmanambagan, Darubhadra and Badakhandi. The panchayats of Burupada and Ralaba constitute the moderate zone (26.50%) while Chanduli gram panchayat has been grouped under the low irrigation intensity zone (< 25%).

**Irrigation zones in relation to the kharif cultivated area** -

The zone of high irrigation intensity has been constituted (Fig.15.2) by the panchayats of Sahapur, Sasmanambagan, Sikiri, Nandika, Putiapadar, Gandala, Durubandha and Makarjhol. In a similar manner Chanduli, Kharida, Ralaba, Bhabandha, Darubhadra and Badakhandi panchayats constitute the conspicuous zones of moderately high irrigation intensity (51-75%) while the panchayat of Burupada is a singular instance of moderate irrigation intensity.

15.1.3. **Rabi Irrigation Zones** :

**Irrigation zones in relation to the panchayat area** - The zone of moderate irrigation intensity (Fig.15.3) above 30% concentrated in the Ralaba panchayat only, where, about 97% of the rabi cultivated area is irrigated for growing commercial betel leaves on its sandy loam soil surfaces. The zone of moderately
0.45E

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FIG.15.2
low irrigation intensity (26-30%) covers the rabi irrigated tracts of Putiapadar and Durubandha panchayats. Rest of the panchayats of Hinjili block seemingly fall under the low irrigation intensity zone (Fig.15.3).

Irrigation zones in relation to the rabi cultivated area - Despite the low figures relating to rabi irrigated area in per cent to the panchayat area, the available area under rabi cultivation shows an intimate relationship with the available irrigation intensity during the rabi season. In this respect the high intensity zone above 75% has been observed (Fig.15.3) to be distributed almost uniformly in Burupada, Chanduli, Sahapur, Sikiri, Kharida, Nandika, Putiapadar, Ralaba, Gandala, Belagam, Bhabandha, Durubandha, Saru, Hinjili town's hinterland, Darubhādra, Konchuru and Makarjhol panchayats at a time when Sasanambagan and Badakhandi panchayats constitute the moderately high zone of rabi irrigation intensity in relation to the rabi cultivated area. The conspicuous break in the uniformity in the distribution of rabi irrigation data with regard to Sasanambagan and Badakhandi is obviously due to a corresponding change in the terrain characteristics from the level lands to the nearly level and rugged lands.
15.2. **IRRIGATION IN KHALLIKOTE BLOCK**

The feasibility of all available means of irrigation seems to maintain an utmost causal relationship with the peculiar terrain-make of the Khallikote block. The block of Khallikote has been observed to constitute almost all terrain facets of different orders (Fig.12.1). The basement (Fig.2.1) and surface expressions (Fig.7.1) have been defined by the extra-ordinary hardness of rocks. The quality and availability of ground water are a far cry. The expressions of surface drainage are transitory against the agricultural needs. Soil and water loss are considerable. The chief means of irrigation in the Khallikote block consists of a very large number of dugwells of which more than 75% are dry during the later part of rabi and early kharif. There are M.I.P. tanks, energized dugwells and medium irrigation means offered by the river Kharkhari and Nitikajor.

At present the Khallikote block accounts for 41.49% of its kharif cultivated area constituting 29.49% of the panchayat area as irrigated. A meagre 2.76% of the panchayat area of the block is irrigated during the rabi season which is 91.23% of the rabi cultivated area. A detailed analysis of terrain bases and irrigation status at the panchayat levels presents an obvious link between the available terrain base and available irrigation. Moreover, the problems relating to social
concern towards land degradation may be put to further research in future before any detailed irrigation plan of the Khallikote block is made starting from the grass-root levels (gram panchayats).

15.2.1. **Terrain Bases and Irrigation Zones** :

The hilly terrain units of the Khallikote block need no discussion as their presence either in continuous or disjointed or residual forms have been unassessed (Ch.13). The rugged terrain of the Khallikote block, with all its compositional and structural limitations relating to the irrigation development, covers the whole of Bhikapada, Langaleswar, Koirasi, Kanheipur, Pathara, Bikrampur, Keshpur, Aitipur, Talapada, the northern tip of Chikili, and the lacustrine tracts of Kanka panchayats. The most significant level lands of the Khallikote block have been observed to be distributed in the panchayats of Kanchana, Naikanipali, Danapur, B.N.Pur, southwestern Kumondo, Dimiria and northern Kanka. The monotony of these flat lands of Khallikote block is often broken by the non-level facets of a specific terrain type. Irrespective of the type of terrain, the resistant structural basement is made up of the hard Khondalites playing a crucial role in the irrigation use of the land in Khallikote block.
% of irrigated Rabi area to total Rabi area (panchayat-wise)

- Rich (>75)
- Moderately Rich (51-75)
- Moderate (26-50)
- Poor Ately Poor (≤25)
- No Irrigation (0%)
- Negative Area

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FIG.15.3
15.2.2. Kharif Irrigation Zones:

Irrigation zone in relation to the panchayat area - The high irrigation intensity zone above 75% consists of Aitipur panchayat area only. The moderately high zone (51-75%) covers the B.N.Pur panchayat. The panchayat area of Kanchana, Naikanipali, Mathura, Danapur, Subulia, Bhikapada, Koirasi, Langleswar, Kanheipur, B.N.Pali, Tulasipur, Kumondo, Dimiria and Talapada together constitute the largest zonal area of moderate irrigation intensity (26-50%). The low irrigation intensity zone of the Khallikote block comprises the panchayats of Keshpur, Pathara, Badapalli, Bikrampur, Chikili and Kanka and Khallikote town area.

Irrigation zone in relation to the Kharif cultivated area - The high intensity zone above 75% (Fig.15.1) covers the two panchayats of B.N.Pur and Aitipur. The moderately high irrigation intensity zone (51-75%) consists of Naikanipali, Danapur, Subulia, Bhikapada, Kanheipur, Badapalli and Tulasipur panchayats. Similarly the panchayats of Kanchana, Koirasi, Langleswar, B.N.Pali, Kumondo, Chikili, Dimiria and Talapada fall under the moderate irrigation intensity zone, while Keshpur, Pathara, Bikrampur, Khallikote and Kanka panchayats constitute the low irrigation intensity zone of 25% and less. The panchayats of the last category show a categorical association with the adverse
terrain characteristics of hilly, rugged, upland and undulating lands around the rocky shores of the Chilka lake (Fig.15.1).

15.2.3. **Rabi Irrigation Zones**:

**Irrigation zones in relation to panchayat area** - All gram-panchayats of the Khallikote block have been grouped under the low irrigation intensity zone of 25% and less. Except the Aitipur panchayat (22.71%) no other panchayat registers a record more than 11% (Appendix II).

**Irrigation zones in relation to rabi cultivated area** - The high irrigation intensity zone centres around the panchayat areas of Naikanipali, Mathura, Danapur, B.N.Pur, Subulia, Bhikapada, Koirasi, Keshpur, Langaleswar, Pathara, Kanheipur, B.N.Pali, Aitipur, Badapali, Bikrampur, Tulasipur, Kumondo, Chikili, Dimiria, Talapada and Khallikote NAC. The other panchayats namely Kanchana and Kanka have been represented by the moderately high rabi irrigation intensity zone (51-75%).

The relevant figures in respect of rabi irrigation conclude that the available irrigation during rabi determines the land available for cultivation during rabi season in Khallikote block.

15.3. **IRRIGATION IN KODOLA BLOCK**:

During our field work in Kodola block we have come across
the instances of irrigation failures over most of the block. The causes thereof have been directly understood from the study of terrain peculiarities in the same manner as has been done in Khallikote and Polosara blocks. It has been observed that the Kodola block of the Chhatrapur Subdivision constitutes all types of terrain segments except the nearly level lands (Fig.12.1 & Ch.12). The structural lithology (Chs.2 & 7) is non-congenial for irrigation particularly through the dugwells though the dugwells constitute the primary means of irrigation in Kodola block. The ground water table over most of Kodola block is brackish. Therefore, the surface irrigation is purely seasonal in nature. The canal irrigation in both kharif and rabi is, however, confined to the favoured tracts.

At present the Kodola block accounts for 43.76% of its kharif cultivated area as irrigated. This is 34.07% of the total panchayat area. During the rabi months about 6.01% of the panchayat area is irrigated which is 60.61% of the total cultivated area under rabi (Table 15.1). The available means of irrigation in Kodola block consist of canals of Salia and Jagati reservoirs (of Boriasahi and Maridipali villages), lift irrigation points, tank irrigation, energized and ordinary dug-wells. The irrigation figures of the Kodola block have further variation at the panchayat levels (Appendix II) in accordance with the regional variation in the terrain characteristics.
15.3.1. **Terrain Bases and Irrigation Zones**:

The hilly terrain units of the Kodola block cover a part of eastern Angargam, southeastern Burujhari and northern Kalimeghi panchayats. Each one of the these partly hilly panchayats is conspicuous by its water deficit during the rainless months. A similar position of instability with regard to the ground and surface irrigation has been taken note of in the rugged terrain of the Kodola block which covers the western part of Talasara, Badakhairakham, northwestern Chingudikhol, northeastern Mardakote, Mathasarsing, northwestern Digapada and northeastern Beruanbadi panchayats. The structurally hard basemented Kodola upland moderately sloping terrains having more or less brackish underground water table and low surface irrigation water availability cover a major part of the non-hilly Burujhari, Saurachachina and K.Barida panchayats. The level terrain units of Kodola block cover a major part of Angargam, central Talasara, western half of Sandhamul, most of Sumandal, parts of Saurachachina, southeastern half of Chingudikhol, southwestern K.Barida, Khandianai, southeastern half of Mardakote, Beguniapada, Maradamekha, southeastern three quarters of Kodola, Phasi and southeastern Digapada panchayats. Except the panchayats of Phasi and Sumandal, no panchayat of the level terrain presents any positive instance of optimum use of available irrigation water owing to the structural strains and stresses.
15.3.2. **Kharif Irrigation Zones:**

**Irrigation zones in relation to the panchayat area** - The high irrigation intensity zone above 75% of the Kodola block extends into the Sumandal panchayat only covering the Salia water-shed area of the northeastern Kodola. During our field work in Angargam-Sumandal belt it is learnt that the command area of the **Salia Irrigation Project**, though located in the Boriasahi village of the Angargam panchayat, the panchayat of Angargam has been deprived of any potential influence of the Salia irrigation water. This is owing to the relatively high altitudinal situations of the villages of Angargam panchayat.

The moderately high irrigation intensity zone covers parts of Sandhamul, Beruanbadi, Phasi and Badakhairkhamata panchayats. The panchayats of Beguniapada, Chingudikhol, Mardamekha, Digapada, Burujhari, Mardakote, Saurachachina, K.Barida and Kodola constitute the moderate irrigation intensity zone of the Kodola block. All these panchayats have been served by the canals of the **Jagati Irrigation Project** and partly by the Kharkhari river irrigation.

The low irrigation intensity zone of the block covers parts of the panchayats of Angargam and Mathasarsing at the insistence of their altitudinal and structural constraints.
Irrigation zones in relation to kharif cultivated area - The high irrigation intensity zones in relation to the Kharif cultivated area in Kodola block includes the panchayats of Sumandal, Sandhamul, Beruanbadi and Badakhairkham. The moderately high irrigation zone covers the panchayat areas of Beguniapada, Chingudikhol, Digapada, Phasi, Burujhari, Mardakote and Saurachachina, while Angargam, Mardamekha, Mathasarsing, K.Barida and Kodola town constitute the moderate zone. The low irrigation intensity zone of Kodola block covers the panchayats of Khandianai, Talasara and Kalimeghi.

15.3.3. Rabi Irrigation Zones:

Irrigation zones in relation to the panchayat area - In terms of rabi irrigation, the moderate zone over 30% is noticed only in Badakhairkhama panchayat whereas rest of the panchayats fall under the low rabi irrigation intensity zone. Beguniapada, Sumandal, Angargam, Mathasarsing, Phasi, Khandianai, Mardakote, Kalimeghi panchayats and Kodola town present no recorded information regarding rabi irrigation.

Irrigation zones in relation to the rabi cultivated area - In terms of rabi irrigated area in percent to rabi cultivated area the high irrigation intensity zone has been observed to cover the panchayats of Sandhamul, Badakhairakhama, Talasara and K.Barida. The Moderately high irrigation zone includes
Chingudikhol, Mardamekha and Burujhari panchayats, while moderate irrigation intensity zone includes Beruanbadi panchayat only, and the category of low irrigation intensity zone in relation to the rabi cultivated area covers the panchayat area of Digapada only. Rest of the panchayats of the Kodola block show no recorded information in this regard though these panchayats namely Phasi, Sumandal and Angargam grow vegetables extensively during the rabi season by means of their available dugwell irrigation points.

15.4. IRRIGATION IN POLOSARA BLOCK

The Polosara block represents one of the problem blocks of the Chhatrapur Subdivision so far as the irrigation status is concerned. This is in conformity with Polosara's adverse terrain characteristics. As regards the diversity and adversity of terrain, the Polosara constitutes a vast expanse of hilly terrain of which the panchayats of Gochhabadi and Pandiripara are integral parts. There are also wide stretches of rugged, upland moderately sloping and nearly level lands. A very small part of the Polosara block consists of level plains. Irrespective of the extent of diversity in terrain type, the structural basement is more or less same. The hard pyroxenated and basic granulites form the basement complex and act as natural constraints against infiltration. Therefore, the underground water
is brackish and unusable for any potential practice in the Polosara block. Similarly water-logging is another problem against the efficiency and potentiality of surface irrigation in the block.

So far as the irrigation status of Polosara is concerned, the irrigated area in percent to the panchayat area is 27.90% which is 37.26% of the total kharif cultivated area. About 5.14% of the panchayat area has also been irrigated during rabi season which constitutes 48.61% of the total rabi cultivated area of the Polosara block. These figures are still much more varied at the panchayat levels. The relevant means of irrigation in the Polosara block include the canals of Dhanei Irrigation Project and Bhaguva river, energized and ordinary dugwells, private and government L.I.Points.

15.4.1. Terrain Bases and Irrigation Zones:

In addition to the panchayats of Gochhabadi and Pandiripada in the hilly terrain, the hilly and non-hilly rugged terrains of the Polosara block cover Sodoka, Hatiota, northwestern Khonduru, northwestern Balichai, southern half of Rumagada and northern Ghodapalan and the southern three quarters of Mathura panchayat. These panchayats of the rugged terrain present frequent instances of residual hills.
The upland moderately sloping terrains of Polosara are represented by the southwestern Rumagad, Mathatentulia, Chirikipadasasan, Badapankalabadi, Madhupali, Bellagam, Polosara town, northeast Mathura, southeastern Khonduru and eastern half of Jakkora panchayats. The panchayats under the preceding category are represented by more or less stable dug well irrigation especially during the occasional rainless kharif season. The panchayats of Dhunkapa­ pada, northern Kanochai, northern Rumagad, southeastern Balichai, southern Ghodapalan and western half of Jokkoro have been included in the nearly level terrain. A part that represents the conspicuous flat terrain of Polosara block is the southeastern Mathura panchayat. In fact Mathura panchayat, Mathatentulia and parts of Chirikipadasasan panchayats have been observed to have rich agricultural tracts of Polosara block in terms of irrigation.

15.4.2. Kharif Irrigation Zones:

Irrigation zones in relation to the panchayat area - No panchayat of the Polosara block shows a high irrigation intensity above 75% (Fig.15.1). The moderately high intensity zones (51-75%) have been observed to constitute the panchayats of Madhupali, Ghodapalan, Chirikipadasasan and Mathatentulia. The moderate zone (26-50%) in this respect includes Badapankalabadi, Hatioto, Kalambo, Sadoka, Khonduru,
Mathura and Jakkoro panchayats. The panchayats of Dhunkapada, Kanochai, Bellagam, Gochhabadi, Balichai, Polosara and Pandiripada constitute the low irrigation intensity zones. The only panchayat that registers no recorded irrigation information is Rumagad.

Irrigation zones in relation to kharif cultivated area. In terms of kharif irrigated area in per cent to kharif cultivated area, the high irrigation intensity zone has been distributed in Ghodapalan and Kalambo panchayats, while the zone of moderately high intensity (31.75%) has been recorded by Madhupali, Hatioto, Chirikipadasasan and Mathatentulia panchayats. Similarly the panchayats of Badapankalabadi, Bellagam, Sodoka, Khonduru, Polosara, Mathura and Jokkoro constitute the moderate zone between 26% and 50%. The last zone of 25% and less extends into Dhunkapada, Kanochai, Gochhabadi, Balichai and Pandiripada panchayats.

15.4.3. Rabi Irrigation Zones:

Irrigation zones in relation to the panchayat area. The moderate irrigation intensity zone (above 30%) includes Chirikipadasasan and Kalambo panchayats. The rest of the panchayats in this regard have been grouped under the low irrigation intensity zone (≤ 25%).
Irrigation zone in relation to rabi area – The Kalambo is the only panchayat to record 83.74% (Appendix II) while the panchayats of Ghodapalan, Balichai and Polosara constitute the moderately high irrigation intensity zone (51-75%). The moderate zone has been found to be distributed in the panchayat of Chirikipadasasan and Mathatentulia panchayat. The rest other panchayats of the Polosara block constitute the low irrigation intensity zone (≤ 25%). It is interesting to note that the panchayat of Rumagad which had no kharif irrigation informations, registers itself in the moderate irrigation intensity zone (26-50%) in terms of rabi cultivated area (Appendix II). The panchayats of Hatioto and Sodoko, however, present no informations in this regard.

15.5. IRRIGATION IN PURUSOTTAMPUR BLOCK

As one of the lead blocks in terms of agricultural landuse and irrigation water use in the Chhatrapur Subdivision, the Purusottampur block presents a variety of terrains and terrain conditions differing in degrees of response to the potential means of available irrigation. The agro-geomorphological significance of the terrain of Purusottampur block lies in its vast stretch of level land offering natural suitability (Ch.12) for the potential operations of both irrigation and agricultural land utilisation. Its varying geo-lithological conditions present a more or less stable
and usable ground water and surface water potentiality in
abundance particularly in the panchayats in the south of the
Rushikulya river.

At present the Purusottampur block accounts for 67.07% of its kharif cultivated area irrigated which is 52.67% (Table 15.1) of the panchayat area. During the rabi season about 8.38% of the panchayat area covering 20.04% of the rabi cultivated area is irrigated. The average figures in respect of rabi irrigation are low due to the negative role of socio-culture in most of the northern panchayats of Purusottampur block besides their structural constraints. The chief means of irrigation in Purusottampur block consist of the river irrigation through diversion weirs, canals, government lift irrigation points, private lift irrigation points, panchayat tanks, energized and ordinary dugwells. Most of the northern panchayats north of Rushikulya are seemingly deprived of Rushikulya irrigation water owing to high altitudes (Fig.3.1) and steep slopes (Fig.10.1).

15.5.1. Terrain Bases and Irrigation Zones:

The hilly terrain in Purusottampur covers a wide area of Bhutasarsing panchayat and parts of Sikula and Arakhpur. The low to moderate gradient rugged lands partly stretch into the panchayats of Arakhpur, Jaganathpur and parts of
Sikula. The northern half of Badakharida panchayat presents an upland moderately sloping terrain while a part of the northeastern Bhutasarsing constitutes a nearly level terrain. The most favourable tracts relating to irrigation are the level lands consisting of Tankachai, Jhadabai, Antrigam, parts of southeastern Bhutasarsing, parts of Badakharida, Ch.Nuagam, Pandia, Purusottampur town, Bhimpur, Soma, Badabargam, Handighar, Pratapur, K.N.Pur, Jamuni, Baghala and Sunadhara panchayats. The significant variation in the irrigation statistics at the panchayat levels (Appendix II) of the block may be attributed to either elevational and/or structural or social and cultural causes (Appendix II).

15.5.2. **Kharif Irrigation Zones:**

Irrigation zones in relation to the panchayat area - The panchayats of Baghala, Handighar and Gangadeuni constitute the high irrigation intensity zone above 75%. The zone of moderately high intensity covers the panchayats of Sikula, Pandia, Pratapur, Raipur, K.N.Pur, Bhatakumarada, Soma, Sunadhara, Jamuni, Badabargam, Bhimpur, Jaganathpur and Purusottampur town. The panchayats of Antrigam, Badakharida, Ranajhali, Jhadabai, Ch.Nuagam and Tankachai constitute the moderate irrigation intensity zone of Purusottampur block. The zone of low irrigation intensity includes most of the
panchayat of Bhutasarsing with all its complex terrain characteristics consisting of fairly high surface elevation, undulating gullied uplands, residual hills, denuded vegetation, granite-gneiss rock basement, and deep water table. The agricultural plots in this panchayat have been supplied with gradient water of the Jharan hills channelled through the field channels during the monsoons.

Irrigation zones in relation to kharif cultivated area - In terms of irrigated area in per cent to the kharif cultivated area, the zone of high irrigation intensity above 75% (Appendix II) consists of the panchayats of Sikula, Pandia, Pratapur, Handighar, Raipur, Bhatakumarada, Sunadhara, Baghala, Bhimpur, Jaganathpur and Gangadeuni. The moderately high zone in this respect covers the panchayat areas of Antrigam, Soma, Jamuni, Badabargam, Arakhpur, Ch.Nuagam, Tankachai and Purusottampur town. The panchayats of Bhutasarsing, Ranajhali, Jhadabai and Badakharida constitute the moderate irrigation intensity zone of the Purusottampur block.

15.5.3. Rabi Irrigation Zones:

Irrigation zones in relation to the panchayat area - All panchayats of the Purusottampur block are under the zone of low rabi irrigation intensity, i.e., below 25% (Appendix II). The conspicuously low availability of land under rabi
irrigation is undeniably due to the negative attitudes of agricultural land owners in all these panchayats of Purusottampur block.

**Irrigation zones in relation to the rabi cultivated area** -

The high irrigation intensity zone above 75% is unknown at present in the Purusottampur block. The panchayat of Raipur (64.84%) singularly constitutes a moderately high irrigation intensity zone in relation to the rabi cultivated area of the Purusottampur block. The moderate irrigation intensity zone, however, includes the panchayats of Bhutasarsing, Sikula, Baghala, Jamuni, Arakhpur, Bhimpur, Gangadeuni and Tankachai. The rest of the panchayats fall under the low irrigation intensity zone of the Purusottampur block during the rabi season.

It has been, therefore, felt that any potential irrigation plan in respect of the Purusottampur block may be put to practice with due considerations of the conspicuous social attitude towards agricultural land utilisation apart from assessment of available water resource in proper regional perspectives.

15.6. **IRRIGATION IN GANJAM BLOCK**

The present state of irrigation in Ganjam block is aptly reflected in its response to the complex terrain surface
configurations, vast expanse of saline water bodies and littoral and lacustrine tracts. So far as the terrain is concerned, the terrain of Ganjam block consists of large rugged and level terrain units that are punctuated by the small-sized upland moderately sloping and nearly level terrain units. The landscape is defined by a variety in the range of soil textures and depths. The underground water level is more or less stable irrespective of its usability standard. Soil erosion and water loss through surface run-off are not uncommon terrain phenomena in Ganjam block.

At present the kharif irrigated area accounts for 32.9% (Table 15.1) of the total panchayat area of the Ganjam block. The kharif irrigated area in per cent to the total cultivated area is 57.20%. During the rabi season the relevant figures are 5.56% and 72.31% respectively. The existing trend of irrigation is much more varied at the panchayat levels (Appendix II) in response to terrain differentiation and varying socio-cultural practices. The available means of irrigation in both kharif and rabi seasons include canals, M.I.P. tanks, panchayat tanks, dugwells, energized dugwells, government and private lift irrigation points.

15.6.1. Terrain Bases and Irrigation Zones:

The rugged terrain units of the Ganjam block cover the portions of Poirasi panchayat, northwestern Humma and Khandadeuli
panchayats. The Khandadeuli panchayat is conspicuous by its residual hills. The overall landscape of Ganjam block has been characterised by the lateritic surface expressions underlain by the hard rock basement. The position of ground water, though more or less stable, is seemingly of low irrigation potentiality owing to the subterranean salinity especially in the littoral and lacustrine tracts.

The flat lands of the Ganjam block, on the other hand, include the non-rugged panchayats. The advantage of low surface gradient and low surface elevation of these flat terrains are marred often by the salinity of the soil water in parts of Sanaramchandrapur, Rambha, Humma and Ganjam town.

15.6.2. Kharif Irrigation Zones:

Irrigation zones in relation to panchayat area - The high irrigation intensity zone (above 75%) covers the panchayat areas of Humma, Karapada, and Malado. The moderate zone (26-50%) includes parts of Ganjam town and Santoshpur, Poirasi, Khandadeuli, and Rambha panchayats. The low irrigation intensity zone (≤ 25%) is constituted by the panchayats of Pallibandha, Sanaramchandrapur and Ramgad. The panchayats of the low irrigation intensity are located in either littoral or lacustrine situations of Ganjam block. Similarly the panchayats of Khandadeuli, Humma and Ganjam town are observably more exposed to the residual hills and saline Chilka waters in contrary
to the efficient functioning of irrigation means available to these parts of the Ganjam block.

**Irrigation zones in relation to kharif cultivated area** - The high irrigation intensity zone above 75% has been represented by Kainchpur, Humma, Rajapur, Karapada, and Malado panchayats, of which Kainchpur and Karapada are most advanced blocks owing to their flat terrains and dependable and perennial surface irrigation through the Jaymangala and Rushikulya canals. The moderately high irrigation intensity zone (51-75%) centres around the panchayat of Poirasi and Ganjam town. The moderate zone (26-50%) includes the panchayats of Sanaramchandrapur, Santoshpur, Khandadeuli, Ramgad and Rambha while the panchayat of Pallibandha is grouped under the zone of low irrigation intensity.

15.6.3. Rabi Irrigation Zones:

**Irrigation zones in relation to panchayat area** - All panchayats excepting Pallibandha, Rambha and Poirasi, have been grouped under the low irrigation intensity zone (< 25%). The panchayats of Poirasi, Rambha and Pallibandha show no recorded contribution in this respect (Appendix II).

**Irrigation zones in relation to rabi cultivated area** - The high intensity zone above 75% includes the panchayats of Humma,
Sanramchandrapur, Khandadeuli and Karapada. The moderately high irrigation intensity zone covers the panchayat areas of Kainchpur, Rajapur, Santoshpur and Malado. The Ramgad panchayat and Ganjam town are included in moderate and low irrigation intensity zones respectively. The panchayats of Poirasi, Pallibandha and Rambha, as usual, present no account in this regard.

Therefore, it has been felt that the vast saline tracts of Ganjam block need desalination through consistent and forceful flow irrigation in addition to necessary land legislation against uneconomic social practices, and the overall feasibility study of the terrain in terms of various means of irrigation.

15.7. IRRIGATION IN KAVISURYANAGAR BLOCK

The Kavisuryanagar block has been observed to possess more or less rich water potential though the use of which is regulated to a greater extent by the nature of the terrain. This block in the western central part of the Chhatrapur Subdivision consists of all five terrain types (Fig.12.1) of varying size and importance. The terrain of Kavisuryanagar is characterised predominantly by the nearly level terrain units. The texture of soil ranges from coarse to medium and light soils. The availability of underground water over most
of the block is stable under varying lithology and structure. The seasonal loss of soil and water are common in the marginal upland and rugged tracts of the Kavisuryanagar block.

At present the irrigated area under kharif in per cent to the panchayat area, the Kavisuryanagar block accounts for 31.02% (Table 15.1). Irrigated area in per cent to the cultivated area is 35.81. About 3.22% of the panchayat area of the Kavisuryanagar block is irrigated during the rabi season which is 5.44% of the total area under rabi cultivation. The block-wise statistics relating to kharif and rabi irrigation (Table 15.1) show further variations at the panchayat levels (Appendix II). The several means of irrigation in Kavisuryanagar block consist of lift irrigation points, dug wells, energized dug-wells, private lift irrigation points and other natural sources of irrigation importance.

15.7.1. Terrain Bases and Irrigation Zones:

The rugged terrain of the Kavisuryanagar block covers the panchayats of Subulia, and Jharada, while Athgarhpatna, Budhambo and Badamahuri represent an upland moderately sloping landscape dotted with innumerable residual hills. A significantly small patch of level land is located in the Belasara panchayat on the left bank of the river Rushikulya. The rest of the panchayats exhibit nearly level landscapes with stable surface and underground water and fertile soil surfaces.
15.7.2. Kharif Irrigation Zones:

Irrigation zones in relation to panchayat area - The high irrigation intensity zones of the Kavisuryanagar block over 75% covers the panchayats of Ambapua, Nandigoda and Baliasara, while the panchayats of Paikajamuna and Borasingi have been grouped under the moderately high category (51-75%). The moderate zone constitutes Ganganpur, Barida, Sialia, Jharada, Gudiali, Belasara, Kaniari and Kavisuryanagar town. The rest of the panchayats fall under the low irrigation intensity zone (< 25%).

Irrigation zones in relation to kharif cultivated area - The zone above 75% consists of Ambapua, Nandigoda and Baliasara while the moderately high intensity zone (51-75%) covers the panchayats of Paikajamuna, Borasingi and Belasara. The panchayats of Ganganpur, Barida, Subulia, Sialia, Jharada, Gudiali, Kaniari and Kavisuryanagar constitute the moderate irrigation intensity zone (26-50%) of the Kavisuryanagar block. The low irrigation intensity zone (< 25%) consists of Athgarhpatna, Badamahuri, Baunsia, Sunapali and Budhambo panchayats.

15.7.3. Rabi Irrigation Zone:

Irrigation zones in relation to panchayat area - All panchayats of the Kavisuryanagar block, excepting Badamahuri panchayat, constitute the low irrigation intensity zone (< 25%), while
Badamahuri registers no recorded information (Appendix II) regarding rabi irrigation. The reality in respect of the low rabi irrigation intensity in the Kavisuryanagar block strongly emphasizes upon its litho-structural strain of the terrain. Therefore, an effective agricultural landuse during rabi season necessitates the need of winter rain water conservation in the local depressions.

Irrigation zones in relation to rabi cultivated area - The low irrigation intensity zone below 25% also includes all panchayats of the Kavisuryanagar block except, however, the Badamahuri panchayat which presents no information regarding irrigation in relation to rabi cultivated area. The conspicuous causes of the preceding truth are obviously litho-structural besides other social attitudes towards land management and agricultural use during the rabi season.

15.8. Irrigation in Chatrapur Block

Whatever may be the irrigation intensity manually available to its total panchayat area, the simple terrain of Chatrapur block is speculatively and observably very complex in response to the various available means of irrigation. The conspicuous complexity of this terrain lies in sharp differences in structure, lithology and imperceptible natural processes. The nearly level and level terrain segments over
a wide area of the block have been observed to have been separated occasionally by the low upland and very rugged patches of different sizes and shapes. The Subdivisional headquarters, i.e., Chatrapur, is situated on a low upland moderately sloping terrain.

So far as the intensity of irrigation is concerned, the Chatrapur block at present accounts for 33.78% of its panchayat area and 70.46% of its kharif cultivated area. During the rabi season the respective figures are 0.96% and 52.85%. The general picture of irrigation is still more complex and variable at the panchayat levels. The available means of irrigation in the Chatrapur block include canals, panchayat tanks, swamps, government and private lift irrigation points, energized dug-wells and ordinary dug wells. It has been observed during the field investigation, the segment canals of the Rushikulya irrigation system fail to meet the irrigation needs of many panchayats. The Rushikulya segment canal nos.12, 13, 14 and 15 remain more or less dry throughout the year. Owing to considerable amount of siltation these tail-end canals have failed to maintain the planned water levels. It has been felt, therefore, that these canals should be afforested on both sides to check the superficial evaporation and siltation. Owing to the hard substratum and erosion prone soil surfaces, many irrigation points of the block have been found to be defunct.
15.8.1. **Terrain Bases and Irrigation Zones**:

The nearly level lands of the Chatrapur block extends through the panchayats of Kaliabali east, Laxmipur and Bhikaripali and into the eastern parts of the Chamakhandi panchayat. The imperceptible rugged patches are frequent in the nearly level and even in the level lands of the Chatrapur block covering the panchayats of Badamadhopur, Patlampur, Belagam, Bipulingi, Chikalkhandi, Podapadar, Tanganapali, Kanomona, northern Kaliabali, western half of Chamakhandi, Narendrapur and Sundarpur. These flat terrain segments have been observed by the author as punctuated often by the dry or swampy depressions.

15.8.2. **Kharif Irrigation Zones**:

*Irrigation zones in relation to panchayat area* - The high intensity zone (above 75%) has been found to concentrate in the Baulgam panchayat only, while the moderately high zone constitutes the grampanchayats of Bipulingi, Laximpur and Patlampur. The panchayats of Tanganapali, Chikalkhandi, Podapadar, Narendrapur, Chamakhandi constitute the moderate irrigation zone in relation to the panchayat area. The low irrigation intensity zone consists of Sundarpur, Kanomona, Kaliabali, Badamadhopur, Bhikaripali panchayats and Chatrapur municipality.
Irrigation zones in relation to the kharif cultivated area -
The high irrigation intensity zone over 75% covers the panchayats of Kanomona, Bipulingi, Chikalkhandi, Podapadar, Narendraipur, Patlampur and Baulagam, while the moderately high zone (51-75%) constitutes the panchayats of Sundarpur, Tanganapali, Laxmipur, Chamakhandi and Kaliabali. Similarly the moderate zone includes the panchayats of Badamadhopur, Bhikaripali and Chatrapur municipality.

15.8.3. Rabi Irrigation Zones:

Irrigation zones in relation to panchayat area - All the fourteen panchayats (Serial No.1-14, Appendix I) have been grouped under the low irrigation intensity zone below 25%. The Chatrapur Municipality (Sl.No.15) presents no account relating to the rabi irrigated area in per cent to the panchayat area.

Irrigation zones in relation to rabi cultivated area - The high irrigation intensity zone above 75% is seemingly concentrated in the potential water deficit panchayats of Sundarpur, Podapadar, Kaliabali and Bhikaripali. The moderately high zone (51-75%) has been observed to cover the panchayats of Tanganapali, Kanomona, Chikalkhandi, Patlampur and Badamadhopur. The moderate zone (26-50%) in this respect has been constituted by Bipulingi, Laxmipur and Baulagam panchayats
while Narendrapur and Chamakhandi constitute the low irrigation intensity zone. The hinterland of Chatrapur town, as usual shows no recorded information in this respect.

To sum up, in respect of the irrigation status of the Chhatrapur Subdivision, it has been felt by the author that the recorded irrigation figures panchayatwise (Appendix II), block and subdivisionwise (Table 15.1) are sometimes quite unconvincingly low. In the larger interest of agriculture, the terrain of the Chhatrapur Subdivision needs further scrutiny and field investigation from time to time to realise the ground relations with special emphasis on the existing social impact in optimising the capacity with regard to the availability of irrigation in both kharif and rabi seasons.