CHAPTER: 6

SPATIAL PATTERN

OF IRRIGATED AREA
6.1 Irrigation and agricultural development

Irrigation is the watch and war of Indian agriculture. It plays the key role to explain levels of agricultural development. Within the agricultural land use irrigation seems to be the fulcrum or pivot. Farmers bring all other technological inputs if they are assured about irrigation. Therefore, irrigation has both direct and indirect benefits on the primary, secondary and tertiary sectors of economy. In other words, irrigation plays the key role to uphold the entire economic condition both of the rural and urban areas of the region. Therefore, from this point of view it is utmost necessary to study the spatial pattern of irrigation in the study area.

Map:2

In the present study in Sriniketan – Santiniketan Planning Area there are altogether 42 villages. Out of which there are some, villages where 96.45% of the total cultivated areas are irrigated area. However, it is surprising to know that there are as low as 1.96% of the net
sown area which is irrigated. Therefore, these are the extreme two ends within which all the villages have their percentages of net irrigated area. The spatial pattern of net irrigated area indicates that larger proportion of net irrigated area to net sown area ranges between 64.96% and 96.45% of the net sown area. There are 15 or 35.7% of the total villages exist within this range. These villages are spread on the northern, north-western, western, south-eastern and southern parts of the Sriniketan-Santiniketan Planning Area, making a semi-circle on the western part.

Set against this, moderate extent of net irrigated area ranges between 33.46% and 64.96% of the net sown area. Here only 7% or 16.67% of the total villages are located. These villages stretch on the eastern and south-eastern flanks of the left bank of the river Ajoy. In other words, these villages are located on the flood plain area of the River Ajoy, whereas, the villages located at the high net irrigated area rarely can be found on the Kopai river basin on the north and Ajoy river basin on the south. Small proportion of the net irrigated area to net sown area that ranges between 1.96% and 33.46%. There are 12% or 28.5% of the total villages located within this range. These villages are confined to the entire eastern part of the planning area. However, there are 8 villages which are completely dry or no irrigation schemes prevail over there. This constitutes 19.05% of the total villages. These dry villages are located at the central part and extreme eastern part of the planning area.
It is interesting to note that the large irrigated areas and the dry areas co-exist side by side on the northern and western part of the area. However, on the eastern half these drier villages are located very close to the villages with small proportion of net irrigated area.
The villages which have larger proportion of net irrigated area have moderate extent of absolute and relative relief and dissection index indicating the area is neither abrupt nor monotonous here and the general slope is also of moderate order. That means it has neither very steep slope nor very much plain topography.
The villages with high net irrigated area have low to moderate depth of water table and these villages have considerable proportion of red and lateritic soil as well as sandy soil. Apart from these, loamy, clayey and sandy-loam soils are intensively found in these villages with high irrigated area.

Source: Schematic diagram drawn from the data obtained from field survey
These villages with high net irrigated area are largely favoured for the canal irrigation; however, small proportion of tank irrigated area predominates in these villages.

### RELATIONSHIP BETWEEN LARGE % OF NET IRRIGATED AREA AND CROPPING PATTERN

N.B. Numeric figures in the graph show number of villages

Source: Schematic diagram drawn from the data obtained from field survey

The same villages have considerable proportions of net sown area to total area where moderate to low proportion of Aus paddy but either high or low proportions of Aman paddy and high proportion of Boro paddy is cultivated subject to the availability of water resources. In the same villages wheat, potato, mustard seeds and pulses crops are cultivated either in moderate or low proportions. Altogether, large number of villages do not cultivate vegetable crops; however, in some villages vegetables crops are extensively cultivated. The most

INDEX

NSA = Net Sown Area

Mod. = Moderate

GC = Gini Co-efficient
astonishing fact is that in these villages the high net irrigated area and the land concentration ratio is either high or moderate. In these villages small number of farmers with large amount of land holdings cultivate this land. These small numbers of big farmers have captured the socio-economic and politico administrative power in their hands so that they have wide control on developmental planning including irrigation in these villages.

RELATIONSHIP BETWEEN MODERATE % OF NET IRRIGATED AREA AND MORPHOLOGICAL INDICATORS

N.B. Numeric figures in the graph show number of villages

INDEX
H CON = High Contour
L CON = Low Contour
M CON = Medium Contour
AV CON = Average Contour
AR = Absolute Relief
RR = Relative Relief
DI = Dissection Index
AV Slope = Average Slope
Mod = Moderate

Diagram: 5
Source: Schematic diagram drawn from the data obtained from field survey
There are 7 out of 42 villages where moderate proportion of net irrigated area are found. These villages have more or less either low or high amount of average contour height. Besides, these villages have low to moderate absolute relief, moderate relative relief and dissection index. Average slope is also moderate to low indicating almost plain topography with some small undulations in between.

These villages have low water table and well spread of Gondwana and red soils. Apart from this clayey, loam soils and sandy loam soils are moderately spread over these villages.
These villages have moderate to low proportion of canal irrigated area. However, in some villages canal irrigation is not available. These villages have small proportion of tank irrigation.
RELATIONSHIP BETWEEN MODERATE % OF NET IRRIGATED AREA AND CROPPING PATTERN

N.B. Numeric figures in the graph show number of villages

Source: Schematic diagram drawn from the data obtained from field survey

The villages with moderate proportion of net irrigated area have by and large smaller proportion of net sown area where either high proportion or small proportion of Aus paddy and moderate proportion or small proportion of Aman paddy and small proportion of Boro paddy is cultivated where irrigation is available. Wheat is cultivated there in either small or large proportion, potato is either moderately or high proportion and mustard seed is cultivated in small and large proportion. However, vegetables and pulses crops are largely cultivated in some villages and in rest cases these crops are not cultivated. Land concentration are either high or moderate indicating very few number of big farmers accumulate large amount of land.
ownership and these farmers captured all sorts of power in their hands by which they influence on the developmental planning implementations in the villages.

There are some villages where small proportion of net irrigated area is found. In these villages the contour height is low to moderate. Likewise, absolute relief and dissection index

N.B. Numeric figures in the graph show number of villages

INDEX
H CON = High Contour
L CON = Low Contour
M CON = Medium Contour
AV CON = Average Contour
AR = Absolute Relief
RR = Relative Relief
DI = Dissection Index
AV Slope = Average Slope
Mod = Moderate

Source: Schematic diagram drawn from the data obtained from field survey
are also low to moderate. That means these villages although having levelled topography, however, some undulations are also found. But the relative relief and absolute slope are high to moderate which indicate relatively larger amount of difference between highest and lowest points in one hand and the slope is also quite considerable on the other.

**RELATIONSHIP BETWEEN SMALL % OF NET IRRIGATED AREA AND GEOLOGY AND TEXTURE OF SOIL**

<table>
<thead>
<tr>
<th>Small % of Net Irrigated Area</th>
<th>12 villages</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 villages with large % of depth water table</td>
<td></td>
</tr>
<tr>
<td>1 village with laterite soil</td>
<td></td>
</tr>
<tr>
<td>9 villages with sandy soil</td>
<td></td>
</tr>
<tr>
<td>2 villages with mod % of depth water table</td>
<td></td>
</tr>
<tr>
<td>7 villages with red soil</td>
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<tr>
<td>10 villages with loamy soil</td>
<td></td>
</tr>
<tr>
<td>11 villages with clay soil</td>
<td></td>
</tr>
<tr>
<td>12 villages with sandy loam soil</td>
<td></td>
</tr>
<tr>
<td>8 villages with small % of depth water table</td>
<td></td>
</tr>
<tr>
<td>3 villages with loam soil</td>
<td></td>
</tr>
<tr>
<td>2 villages with Rajmahal soil</td>
<td></td>
</tr>
<tr>
<td>2 villages with Gondwana soil</td>
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</tbody>
</table>

N.B. Numeric figures in the graph show number of villages

**Diagram : 10**

Source: Schematic diagram drawn from the data obtained from field survey

These villages with small proportion of net irrigated area mostly have low depth of water table and these villages are covered largely by red and Rajmahal Hill soils in one hand and on the other hand, are extensively covered by moram, loamy, clayey and sandy-loamy soils.
RELATIONSHIP BETWEEN SMALL % OF NET IRRIGATED AREA AND SOURCE WISE IRRIGATED AREA

These villages have moderate proportion of canal irrigated area to net irrigated area and either large or very small proportion of tank irrigated area. Although in some villages tank irrigation is not found.

INDEX
NSA = Net Sown Area  
Mod. = Moderate  
GC = Gini Co-efficient

Source: Schematic diagram drawn from the data obtained from field survey
In the above mentioned villages low to moderate proportion of net sown area predominates where moderate proportion of Aus paddy and large or small proportion of aman paddy are cultivated and due to scarcity of water resources Boro paddy is not cultivated. Wheat, vegetables and pulses are cultivated in small amount subject to the availability of irrigation. These villages possess high to moderate land concentration ratio which indicate that small number of big farmers accumulate large amount of land holding and also have control over the socio-cultural, economic and politico-administrative power of the villages. Hence, have well grip over the various planning implementations of the villages.

RELATIONSHIP BETWEEN SMALL % OF UNIRRIGATED AREA AND MORPHOLOGICAL INDICATORS

N.B. Numeric figures in the graph show number of villages

INDEX
H CON = High Contour
L CON = Low Contour
M CON = Medium Contour
AV CON = Average Contour
AR = Absolute Relief
RR = Relative Relief
DI = Dissection Index
AV Slope = Average Slope
Mod = Moderate

Diagram: 13

Source: Schematic diagram drawn from the data obtained from field survey
RELATIONSHIP BETWEEN SMALL % OF NET IRRIGATED AREA AND GEOLOGY AND TEXTURE OF SOIL

N.B. Numeric figures in the graph show number of villages

Diagram: 14
Source: Schematic diagram drawn from the data obtained from field survey

RELATIONSHIP BETWEEN MODERATE % OF UNIRRIGATED AREA AND SOURCE WISE IRRIGATED AREA

N.B. numeric figures in the graph show number of villages

Diagram: 15
Source: Schematic diagram drawn from the data obtained from field survey
6.2 Canal: irrigation
Canal is the main source of irrigation work which is cheap and adds smaller cost of production. Canal is constructed over the elevated part of the region because water can easily slope down to the last part of its command area. In the present study it is found that in some villages there are as low as 54.96% of the gross irrigated area is irrigated by canal, whereas, in some villages 100% of the gross irrigated area are irrigated by this source. However, there are 6% or 14.2% of the total villages where canal irrigation is not found at all. This may be because, that here canal is aligned over the low land, so, irrigation water can not climb up. Here, 35.8% of 15 villages have the highest proportion of canal irrigated area which ranges between 94.13% and 100%. These 15 high canal irrigated areas are by and large located on the southern part of the planning area and in the left bank of the Ajoy River. There are 9 or 21.4% of the total villages having moderate proportion of canal irrigated area which ranges between 88.25% and 94.13%.
These villages are located in some pockets on the south surrounded by high canal irrigated areas. Some area spread haphazardly in small pockets on the west, north and south-eastern flank of the planning area. Small proportion of the canal irrigated area is found in 12 or 28.6% of the villages which are located particularly on the entire southern and south-eastern part of the region. Although small patches of high and moderate spatial extent of canal irrigated areas are also prevalent over there. Canal irrigated areas can not be found on the
The eastern part of the planning area may be due to presence of some physical and social problems.

The villages with larger proportion of canal irrigated areas have high to moderate extent of height of contour where moderate to low extent of absolute relief, high to moderate extent of relative relief and low extent of dissection index are observed. Average slope is also very small indicating almost plain terrain.
The above mentioned villages have low depth of water table which has well spread by red soil and also by loam, sandy, clayey-loam soil extensively.

These villages have extensively high irrigated area where almost half of the villages have smaller spatial extent of tank irrigated area although most of the villages do not have this facility.
Villages with large proportion of canal irrigated area have also considerable proportion of net sown area where aus and aman paddy are cultivated either in large or moderate proportion of the area. Boro paddy is cultivated in very small pockets where irrigation is available, wheat potato are either cultivated on small pieces of land or these are not cultivated at all. Same things are applicable for mustard, vegetable and pulses crops where most of the villages do not cultivate those crops and few villages cultivate these crops either large or small proportions. These villages have either high or moderate or small land concentration ratio. That means the big farmers in some villages have concentrated large amount of land ownership, in some villages moderate amount of landholdings and in some areas small amount of land holdings.
There are some villages where moderate proportion of canal irrigated area is available. These villages have either high or low height of contour where absolute relief is either moderate or low, relative relief is moderate and dissection is low. The average slope of this region is very low indicating almost plain topography.
RELATIONSHIP BETWEEN MODERATE % OF CANAL IRRIGATED AREA AND GEOLOGY AND TEXTURE OF SOIL

N.B. Numeric figures in the graph show number of villages

Diagram: 22
Source: Schematic diagram drawn from the data obtained from field survey

The above mentioned villages have either high or low depth of water table. These are extensively covered by Gondwana, lateritic and red soils. Besides, according to texture of the entire region of this kind is covered by sandy loam, loam, moram and clayey soils extensively.

RELATIONSHIP BETWEEN MODERATE % OF CANAL IRRIGATED AREA AND SOURCE WISE IRRIGATED AREA

N.B. Numeric figures in the graph show number of villages

Diagram: 23
Source: Schematic diagram drawn from the data obtained from field survey

These villages either have higher proportion of net irrigated area or have smaller proportion of the same. These are partially and minutely irrigated by the tanks.
The above mentioned villages have either larger or smaller proportion of net sown area where aus paddy is cultivated in smaller amount; aman paddy is cultivated in some villages in larger, moderate and smaller amount of land. Boro paddy is cultivated either on larger or smaller amount of land provided where water is available. Wheat and mustard seeds are cultivated on either larger or smaller proportion of land. However, potato is cultivated on either moderate or small proportion of land. Vegetable and pulses crops are cultivated in some pockets or areas. The land concentration ratio in the villages is either on the high or moderate side indicating that small number of big farmers having larger amount of land ownership hence capturing all sorts of power in the village so that they can influence on the implementation of developmental planning at the villages.
RELATIONSHIP BETWEEN SMALL % OF CANAL IRRIGATED AREA AND MORPHOLOGICAL INDICATORS

There are some villages which have smaller proportion of canal irrigated area. These villages have larger height in respect of contours and have higher absolute relief, relative relief and low dissection index. But in one third of the villages the average slope is either steeper moderate or low.
The village have low depth of water and the villages are covered extensively by red soil in one hand and sandy loam, loam, clayey and moram soils on the other hand.

In some villages larger proportion of net irrigated area is found where moderate proportion of tank irrigated area is found.
In the above mentioned villages moderate proportion of net sown area is prevalent on which aus paddy crop is cultivated largely, moderately or in smaller proportion. Set against this, aman paddy covers moderate and smaller proportion of area. Boro covers larger or smaller proportion of area. As far as rabi crops area is concerned, wheat are cultivated over moderate or small proportion of land, potato is not cultivated in most of the villages. However, in some villages it is cultivated in larger amount of area. Mustard seed is cultivated over smaller proportion of area.

Vegetable crops cover high to moderate proportion of area where pulses crops are not cultivated by most of the villages. However, a few of them cultivate it in smaller amount. Land concentration ratio is high indicating that a few big farmers consume large amount of land ownership. So that the powerful big farmers occupy the socio-cultural, economic and...
politico-administrative powers which they use to get lion share of the benefit from the implementation of developmental planning.

\[ \text{RELATIONSHIP BETWEEN NON-CANAL IRRIGATED AREA AND MORPHOLOGICAL INDICATORS} \]

N.B. Numeric figures in the graph show number of villages

Diagram: 29
Source: Schematic diagram drawn from the data obtained from field survey

\[ \text{RELATIONSHIP BETWEEN NON-CANAL IRRIGATED AREA AND GEOLOGY AND TEXTURE OF SOIL} \]

N.B. Numeric figures in the graph show number of villages

Diagram: 30
Source: Schematic diagram drawn from the data obtained from field survey
6.3 Tank Irrigation:

Tank irrigation in India is one of the artificial ways of increasing the crop production in the country. Tank irrigation is comparatively costlier than the other sources of irrigation. Tank is
a reservoir of any specific size. Tanks are an integral part of the ancient tradition of yielding and storing the water from rainfall and from stream or rivers. Water is stored for later use mainly in agriculture. Basically tanks are constructed across slopes for collecting and preserving water.

However, tank irrigation is less economical than other methods of irrigation. There are some major drawbacks of tank irrigation - firstly, evaporation of water is a bit rapid because of the huge usage of shallow water of the tanks, secondly, tanks occupy a huge area of the cultivable field and thirdly, tank irrigation do not ensure perennial supply of water. Moreover, at times of drought it also happens that the tanks go dry during the hot summer season when it is urgently required. Thus, by considering large area that is made useless by the tanks and the great amount of water loss by evaporation, the procedure of tank irrigation is moderately costlier.

Map: 5
In Sriniketan–Santiniketan Planning Area agricultural fields are irrigated by the second important source that is tank. In some villages there area 66% of the total irrigated area is irrigated by tank. On the other hand, there area 100% of the gross irrigated area is irrigated by this source. In some villages tank becomes the alternative use of water resources that means whenever the canal is not providing irrigation tank comes to rescue the crops with the help of its irrigation. There are 16.67% of the total villages of this region where such percentage ranges between 22.82% and 100%. Apart from that there are 11.90% of the total villages where moderate extent of tank irrigated area is found. This range is in between 11.74% and 22.82%. Set against this, there area as large as 38.10% of the total villages where tank irrigated area is available inn relatively smaller proportion which ranges between 0.66% and 11.74%. Apart from this, there are 33.33% of the total villages of Sriniketan – Santiniketan Planning Area where tank irrigation is not at all available. The spatial pattern of percentage of tank irrigated area to gross irrigated area indicates that larger proportion of irrigated area prevails on the eastern part of this region. It is interesting to note that canal irrigation is very much rare on this area. This high tank irrigated area is surrounded by the villages which have moderate proportion of tank irrigated area. Besides the entire northern part of the region where moderate proportion of tank irrigated area is observed. However, in the entire south and western parts of this region tank irrigation is available in smaller proportion. It is again interesting to note that in this region where smaller proportion of tank irrigated area is observed there larger proportion of canal irrigated area is also found. Besides, at the central part of this region tank irrigation is absent. Therefore, the spatial pattern of source wise irrigated area indicate that the proportion of canal irrigated area and percentage of tank irrigated area are inversely correlated with each other.
RELATIONSHIP BETWEEN LARGE % OF TANK IRRIGATED AREA AND MORPHOLOGICAL INDICATORS

There are 16.67% of the total villages where larger proportion of tank irrigated area is observed. These villages have higher average contours. Absolute relief and relative relief of these villages are also quite high. However, the dissection index is considerably low and the average slope of the villages is considerably high.

RELATIONSHIP BETWEEN LARGE % OF TANK IRRIGATED AREA AND GEOLOGY AND TEXTURE OF SOIL

N.B. Numeric figures in the graph show number of villages

Diagram: 33
Source: Schematic diagram drawn from the data obtained from field survey

Diagram: 34
Source: Schematic diagram drawn from the data obtained from field survey
The village with larger proportion of tank irrigated area have more or less low depth of red soil basically. From the texture point of view these villages are largely covered by sandy, loam, clayey and sandy loam soils.

**RELATIONSHIP BETWEEN LARGE % OF TANK IRRIGATED AREA AND SOURCE WISE IRRIGATED AREA**

- **Large % of tank irrigated area**
  - 7 villages
  - 2 villages with moderate % of net irrigated area
  - 1 village with moderate % of net irrigated area
  - 3 villages with small % of net irrigated area
  - 1 village with unirrigated area
  - 4 villages with large % of tank irrigated area
  - 2 villages with small % of tank irrigated area
  - 4 villages without tank irrigation

N.B. numeric figures in the graph show number of villages

Diagram: 35

Source: Schematic diagram drawn from the data obtained from field survey

The above mentioned villages have smaller proportion of net irrigated area and most of these villages are deprived of the availability of canal irrigation. In few villages smaller proportion of canal irrigated area are found.
These large tank irrigated villages have however larger to moderate proportion of net sown area. Considerable proportion of net sown area is devoted under aus and aman variety of paddy crops. But here boro paddy is very rarely cultivated and as far as winter crop is concerned, these villages have large tank irrigated area and hence have moderate proportion of wheat, potato and smaller proportion of mustard seed and vegetable crops are cultivated there. Besides small proportion of pulses crops are grown in the same villages. These villages with large proportion of tank irrigated area have considerable proportion of land concentration ratio. That means in most of the villages of this kind few big farmers own larger amount of landholdings and vice versa.

INDEX
NSA = Net Sown Area
Mod. = Moderate
GC = Gini Co-efficient
RELATIONSHIP BETWEEN MODERATE % OF TANK IRRIGATED AREA AND MORPHOLOGICAL INDICATORS

N.B. Numeric figures in the graph show number of villages

Diagram: 37
Source: Schematic diagram drawn from the data obtained from field survey

There are 5% to 11.9% of the total villages of this region are moderately irrigated by the source tank. These moderately tank irrigated area have more or less higher average contour height followed by high absolute relief, moderate relative relief and low dissection index. However, the average slope of these villages varies from low to moderate extent.

RELATIONSHIP BETWEEN MODERATE % OF IRRIGATED AREA AND GEOLOGY AND TEXTURE OF SOIL

Diagram: 38
Source: Schematic diagram drawn from the data obtained from field survey
These moderate tank irrigated areas have relatively lower depth of water table and these villages are basically covered by red and sandy soil. However, considerable amount of loamy, clayey and sandy soils spread over the region.

**RELATIONSHIP BETWEEN MODERATE % OF TANK IRRIGATED AREA AND SOURCE WISE IRRIGATED AREA**

N.B. numeric figures in the graph show number of villages

Source: Schematic diagram drawn from the data obtained from field survey

The above mentioned five villages with smaller proportion of tank irrigated area have considerable areas as net irrigation. However, in all these five villages very small proportion of canal irrigated area is prevalent.

**RELATIONSHIP BETWEEN MODERATE % OF TANK IRRIGATED AREA AND CROPPING PATTERN**

N.B. Numeric figures in the graph show number of villages

Source: Schematic diagram drawn from the data obtained from field survey

INDEX
NSA = Net Sown Area
Mod. = Moderate
GC = Gini Co-efficient
These particular villages have either larger or moderate proportion of net sown area. The farmers of these villages devote moderate proportion of their land under aus paddy and high to moderate proportion under aman paddy and small proportion of land under boro paddy. As far as the cultivation of rabi crops are concerned the farmers of these villages cultivate very small proportion of area under wheat and mustard seed. However, high to low proportion of area is devoted under vegetable and pulses crops indicating that in these villages only kharif crops are largely grown, whereas, non-kharif crops are either grown in small proportion or area not cultivated at all. It is also observed that land concentration ratio are considerably high in these villages where larger amount of area is owned by the smaller number of rich farmers so that they control over the village level developmental planning, particularly, in respect of water management and agriculture.

Relationship between small % of tank irrigated area and morphological indicators

N.B. Numeric figures in the graph show number of villages

Diagram: 41

Source: Schematic diagram drawn from the data obtained from field survey

Already discussed above that there are 38.10% of the villages are irrigated in low proportion by the tank source. Out of these 16 villages considerable proportion of area have either high or low contour heights with high and low absolute relief, moderate and high relative relief but low dissection index. These villages have smaller slope on the terrain.
RELATIONSHIP BETWEEN SMALL % OF IRRIGATED AREA AND GEOLOGY AND TEXTURE OF SOIL

The above mentioned villages with small proportion of tank irrigated area have mostly low depth of water table and geologically these villages are covered either by lateritic or Gondwana or red soils. These villages are considerably covered by the loamy, clayey and sandy-loamy soils.

RELATIONSHIP BETWEEN SMALL % OF TANK IRRIGATED AREA AND SOURCE WISE IRRIGATED AREA

In the same villages moderate to larger proportion of net irrigated area is found which are largely or moderately irrigated by the canal source.
RELATIONSHIP BETWEEN SMALL % OF TANK IRRIGATED AREA AND CROPPING PATTERN

The villages with small coverage under tank irrigation have either moderate or high proportion of net sown area where very small proportion of land is devoted under aus paddy crop but aman paddy crop is cultivated either low, moderate or high proportion. There, however, most of the villages do not cultivate boro paddy or some villages cultivate in small proportion on land. Wheat crop is cultivated in small proportion, potato in moderate proportion, mustard seed in high proportion and very small proportion of land is devoted under the cultivation of vegetable crops and pulses. These villages have larger to moderate extent of land concentration ratio indicating that very small number of big farmers own and accumulate larger amount of landholdings, hence they possess economic and politico-administrative power in their hands and control over village level developmental planning to a significant extent.

INDEX
NSA = Net Sown Area
Mod. = Moderate
GC = Gini Co-efficient

N.B. Numeric figures in the graph show number of villages

Source: Schematic diagram drawn from the data obtained from field survey
RELATIONSHIP BETWEEN NON-TANK IRRIGATED AREA AND MORPHOLOGICAL INDICATORS

N.B. Numeric figures in the graph show number of villages

Diagram: 45

Source: Schematic diagram drawn from the data obtained from field survey

INDEX
H CON = High Contour
L CON = Low Contour
M CON = Medium Contour
AV CON = Average Contour
AR = Absolute Relief
RR = Relative Relief
DI = Dissection Index
AV Slope = Average Slope
Mod = Moderate

RELATIONSHIP BETWEEN NON-TANK IRRIGATED AREA AND GEOLOGY AND TEXTURE OF SOIL

N.B. Numeric figures in the graph show number of villages

Diagram: 46

Source: Schematic diagram drawn from the data obtained from field survey
RELATIONSHIP BETWEEN NON-TANK IRRIGATED AREA AND SOURCE WISE IRRIGATED AREA

N.B. numeric figures in the graph show number of villages

Diagram: 47

Source: Schematic diagram drawn from the data obtained from field survey

RELATIONSHIP BETWEEN NON-TANK IRRIGATED AREA AND CROPPING PATTERN

N.B. Numeric figures in the graph show number of villages

Diagram: 48

Source: Schematic diagram drawn from the data obtained from field survey

INDEX
NSA = Net Sown Area
Mod. = Moderate
GC = Gini Co-efficient
6.4 Surface-Irrigation System through Canal:

In the surface irrigation system, water is directly applied to the surface of the soil and is spread by gravity flow incidental to the slope of the land. There are several methods in this system, the commonest being flooding from a ditch, check basin, ring and basin, border strip and furrow. For irrigation with the surface system, fields are laid out every time before the crops are sown, since these layouts are destroyed during preparatory tillage. In order to achieve a higher water application efficiency in the surface system of irrigation, the fields may be levelled well.

The check-basin method of irrigation is widely practiced as it is well suited to all irrigable soils and to a variety of crops. Checks, rectangular or square, with sixes, varying from about 10 to 100 square metres or even more are used. The basin is levelled in both directions, slopes up to two or three percent can be irrigated by using this method with a good control on irrigated water and high water application efficiency. On steeper slopes, this method can be used after proper terracing. The limitations of this method are that it has too many ridges which not only occupy the land but also hinder interculture and harvesting with mechanical means.

In case of the border strip irrigation method, the field is divided into long narrow strips, with small parallel ridges on the sides. These strips are 3 to 10 metres wide and across the width the strip is levelled perfectly. The length of a strip ranges from 50 to 300 metres or more depending upon the slope, the rate of water intake of the soil and the stream size. This method is also suited well to all irrigable soils and to closely spread row crops and even to pasture crops. Slopes up to seven percent can be irrigated when the pasture crops are grown. On steeper slopes, this method can be used by proper terracing or trenching along the contours. For laying out border strips, the land needs to be graded uniformly to achieve a high water-application efficiency. Larger flows are required for irrigating border strips than those in the case of other layouts.

In furrow irrigation water is applied to the field in furrow between the two ridges and the top of the ridge is not directly wetted. Crops such as sugar cane, potato, some vegetables and other widely spaced row crops are irrigated by using the furrow method. The furrows can be along the slope when the level of the land is sloping gently up to about three percent. When the slope exceeds 3% and is up to about 15%, the furrows are laid out on graded contours. Water distribution can be controlled well to achieve uniform application and with consequent high efficiency. In these villages the length of the furrows varies with the soil
type, the slope and the quality of water to be applied, and may vary from 10 metres to 1000 metres for different situations. In this study area there are some villages where water resources are limited where furrow irrigation is adopted to save water. Small furrows known as corrugations are sometimes prepared in the case of the border strip method to increase the efficiency and uniformity of over flooding from the ditch method. Corrugations can be made by using an implement called ‘corrugators’. This implement is suited to close growing crops grown on a medium type of soil with rather uneven topography.