CHAPTER - VII

LAND UTILISATION
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Introduction

Land-use is any kind of permanent or cyclic human intervention on the environment to satisfy human needs. Among all the types of uses to which the land is put, utilization for agricultural activities by man is of supreme importance. Unlike in the past it is becoming inevitable at present and it would be so in future as well to use the more or less limited land to meet the needs of increasing population. As it is important to convert those potential areas which are not being used now, into agricultural tracts, it is equally important to use the already cultivated lands up to their best suitability according to a plan. The planning and development of land requires an intimate knowledge of land, its physical characteristics, present biological productivity capacity and limitations. It has been observed in the previous chapters relating to the nature of association of the agricultural activity with the drainage, climate, soil etc. that the physical environment is quite conducive for agrarian economy. In addition to it the social-infrastructural facilities viz. irrigated water, nearness to Calcutta, a vast market for agricultural commodities have also contributed much to its development agriculturally.
A close examination of landuse pattern of the district will highlight the nature of agricultural development as it is closely associated with the relative increase or decrease in gross sown area as a result of decrease or increase in area in the extensive or intensive margin. It has been observed earlier that the gross area under crops which is an important indicator of condition of agriculture has been increasing with a variable rate with slight fluctuation since 1944-45. This increase may partly be attributed to an actual extension of the margin of agriculture and partly to an increasing intensity of cultivated land. Along with changes in net and gross cropped area significant changes are also observable in the pattern of cropping. The crop combination has been increasingly diversified mainly in response to infrastructural opportunities and partly to market incentives. The rate of change in these attributes has not been uniform over space; large inter-tractal differences are observable and can only be accounted for by the spatial unevenness of infrastructural development.

General Landuse

According to the settlement records of 1944-45 the total area of the district was 310010 hectares of which cultivated or net sown area consisted of 227960 hectares, cultivated or current than current fallow 21730 hectares, current fallow 6690 hectares
and the area not available for cultivation 73640 hectares. Excluding the area not available for cultivation consisting of homestead sites, roads, railways, water bodies, barren and unculturable lands, the balance of the area available for cultivation comes to 256,380 hectares. Of this total area available for cultivation 91.58 per cent consisting of cultivated and current follow was usually under plough of which again 2.7 per cent was current follow. Of the total area 6.42 per cent consisted of area not available for cultivation.

Against this background obtaining in 1944-45 the following table gives an idea of land utilisation in the district during 1944-45 to 1976-77.

Table 1. Land Utilization: 1944-45 to 1976-77

<table>
<thead>
<tr>
<th>Area in 000s hectares</th>
<th>1944-45</th>
<th>1960-61</th>
<th>1976-77</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total area of the district</td>
<td>310.01</td>
<td>313.9</td>
<td>314.48</td>
</tr>
<tr>
<td>Area under forest</td>
<td>-</td>
<td>0.2</td>
<td>0.3</td>
</tr>
<tr>
<td>Area not available for cultivation</td>
<td>53.64</td>
<td>62.5</td>
<td>62.5</td>
</tr>
</tbody>
</table>

(17.30) (19.91) (19.92)

Contd...
Table 1 (Contd.) - Land Utilization

<table>
<thead>
<tr>
<th></th>
<th>1944-45</th>
<th>1960-61</th>
<th>1976-77</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other uncultivated land</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>excluding current falls</td>
<td>21.73</td>
<td>10.0</td>
<td>17.80</td>
</tr>
<tr>
<td></td>
<td>(7.01)</td>
<td>(3.18)</td>
<td>(5.66)</td>
</tr>
<tr>
<td>Current fallows</td>
<td>6.69</td>
<td>3.0</td>
<td>1.31</td>
</tr>
<tr>
<td></td>
<td>(2.15)</td>
<td>(0.95)</td>
<td>(0.42)</td>
</tr>
<tr>
<td>Net area sown</td>
<td>227.96</td>
<td>238.2</td>
<td>232.43</td>
</tr>
<tr>
<td></td>
<td>(73.53)</td>
<td>(75.88)</td>
<td>(73.90)</td>
</tr>
<tr>
<td>Area sown more than once</td>
<td>27.66</td>
<td>41.2</td>
<td>117.47</td>
</tr>
<tr>
<td>Total cropped area</td>
<td>255.62</td>
<td>279.4</td>
<td>349.9</td>
</tr>
</tbody>
</table>

N.B. Figures in the bracket indicate percentage to total area.

         2) Ishaque Report (1944-45) Part III, Govt. of West Bengal.

It will be seen from the above table that in 1976-77 area not available for cultivation constituted 62.650 hectares i.e. 19.92 per cent of total area. It reveals that as compared to the figure of 1944-45 there has been an increase of this category
Plate 2. Conversion of agricultural land to non-agricultural one due to setting up of brick fields
of land to the tune of 9010 hectares. As compared to the condition of 1960-61 this type of land remained almost the same. The table 23 in appendix shows that there is a marked increasing tendency of such land of course with slight fluctuation. Upto the middle part of fifties of the present century the average figure was about 55000 hectares but since 1955 there has been an increase in such land to the extent of 62000 hectares on an average. Such an increase was due to the building of new roads, waterbodies and setting up of new brick fields and sand quarries.

Uncultivated land excluding current fallow in 1976-77 accounted for 5.66 per cent of total area. As compared to the condition of 1960-61 this category of land has also showed a increasing trend. Such an increasing trend in area not available for cultivation and other uncultivated land excluding current fallow has resulted in reduction in net sown area in 1976-77 as compared to both 1944-45 and 1960-61. Net sown area in 1976-77 accounted for 73.90 per cent of total area as compared to 75.78 per cent in 1960-61. The table 23 in appendix shows that net sown area increased to a certain extent since 1950 as a result of reclamation of culturable waste and such trend continued upto 1955. Thereafter a declining trend was observed because of increasing use of land for nonagricultural uses.
In 1976-77 fallow accounted for 0.42 per cent of total area. Table 23 in appendix shows that current fallow greatly fluctuate from year to year because of monsoonal uncertainty.

An examination of the statistic relating to landuse brings out the fact very clearly that there is little margin left for extension of cultivation in this district. Rather cultivated land is being lost through non-agricultural use. The continuous increase in pressure on land brought about by the large increase in population which are revealed at every census cannot be abated only by more intensive cultivation of the existing area by taking advantage of the result of agricultural research, irrigated water, by the use of chemical manures and by judicious selection of seeds. For this reason the district of Roogly has showed a considerable increase in area sown more than once. In 1944-45 this type of area was only 27660 hectares but in 1976-77 it was 11,747 hectares.

Spatial Variation

Landuse pattern in the district in 1971 shows a wide spatial variation¹. Area not available for cultivation² contributes greater percentage to total area in the blocks which are in
close proximity to the Greater Calcutta Industrial belt. In
serampore-Uttarpura the percentage is the highest (63.83 per
cent). Next ranking blocks are Chinsurah-Norga and Singur. In
all these blocks much of the area is included in urban areas
dominated by nonagricultural uses. The percentage is moderately
low varying from 25 to 31 per cent in Jangipara, Haripal,
Tarakeswar, Pursurah, Kanchuk arambagh and Soghat (Table 24
Appendix). The percentage is lowest in (18-21 per cent) in
the remaining blocks namely Dhaniakhali, Panduah, Balagarh,
Polba- Dadpur and Chanditala (Fig. 34).

Land in the category of cultivable waste reveals a great
spatial variation ranging from a nothing to 12.91 per cent.
Highest percentage (12.91) occurs in Chanditala block. The
percentage is moderately high (5-6 per cent) in Soghat and
Chinsurah-Nogra, blocks. In Kanchuk, Pursurah, Dhaniakhali,
Panduah, Balagarh and Polba- Dadpur cultivable waste accounts
for 1 to 3 per cent of total area. In the remaining blocks viz.
Arambagh, Tarakeswar, Haripal, Singur, Serampore-Uttarpura and
Jangipara the percentage figure is considerably low varying
from 0 to 0.86 per cent (Fig. 34).
Fig. 34

HOOGHLY
LAND USE (1971)

NET AREA SOWN
CULTIVABLE WASTE
AREA NOT AVAILABLE FOR CULTIVATION

1 GOGHAT
2 ARAMBAGH
3 PURSURAH
4 TARAKESWAR
5 DHANI AKHALI
6 PANDUH
7 BALAGAR
8 MAGRA - CHINSURAH
9 DADPUR-PALBA
10 HARIPAL
11 SINGUR
12 SERAMPORE - UTTARPARA
13 CHANDITALA
14 JANGIPARA
15 KHANAKUL

Fig. 34
Net area sown accounts for 35.69 to 51.97 per cent of total area in different blocks. In Polba-Dadpur the percentage is the highest (91.97) followed by Salagurah (78.60) Pandush (73.33) Dhanickhali (77.0). Moderately high percentage (68.53 to 73.13) occurs in Arambagh, Khanakul, Pursurah, Tarakeswar, Naripal and Jangipara. The blocks of Gojhat, Chinsurah-Hooghly, Singur and Chanditala record a moderately low percentage varying from 54.79 to 65.28. Only one block i.e. Serampore-Uttarpara records the lowest percentage (35.69) of net area sown. The Fig. 34 reveals that the percentage of net area sown is lower in all those blocks where the percentage of either cultivable waste or of area not available for cultivation is considerably high and vice versa. Spatial variation in general landuse reveals that in almost all the blocks agricultural extension has reached its limit as the cultivable waste land accounts a very small percentage to total area. In some of the blocks namely Chinsurah-Hoogra, Singur, Tarakeswar, Naripal, Arambagh and Serampore-Uttarpara much of the cultivated area is being converted into non agricultural land mainly for its increasing use for sand quarry and brick fields.

**Gross Cropped area**

During the period of 31 years from 1944-45 to 1976-77 gross cropped area in the district has experienced a considerable
Some indicates of agricultural growth

HOOGHLY
1945-1976

Fig. 35

AREA IN 000' HECTARE

--- TOTAL CROPPED AREA

--- NET CROPPED AREA

--- AREA SOWN MORE THAN ONCE

YEARS

1945

1976

1947

1950

1954

1958

1962

1966

1970

1974

1976
increase (Fig. 35). In 1976-77 the gross cropped area accounted for 349,900 hectares as compared to 255,620 hectares in 1944-45. Thus there was an increase of 86,300 hectares in gross cropped area i.e. 33.76 per cent (Table 23 Appendix). It does not mean that there was an uniform increase in gross cropped area during the said period. Perhaps certain years during the period experienced decrease in gross cropped area as compared to the acreage of the previous year.

During the four years between 1944-45 and 1948-49 the gross sown area recorded a decrease of 10,650 hectares decreasing the total to 244,960 hectares from 255,620 hectares in 1944-45. After the initial decrease there was increase in crop acreage to the extent of 27,800 hectares during the period between 1948-49 and 1953-54. During this five years the average growth was 5560 hectares. Thereafter the crop acreage recorded negative growth with the decline in crop acreage to the extent of 21370 hectares i.e. 10685 hectares per year. Again in 1956-57 it rose to 264400 hectares as compared to 252,300 hectares in 1955-56. Next two years recorded negative growth to the tune of 5500 hectares per year. From 1959-60 there was a relatively steady rise of gross cropped area upto 1961-62. This three years recorded an increase of 36700 hectares i.e. 12,233 hectares per year on an average. Next two years recorded negative growth in
gross sown area to the extent of 6900 hectares. The period between 1963-64 and 1964-65 experienced a little gain in gross cropped area. Next year showed a remarkable decrease to the tune of 16600 hectares. The period between 1966-67 and 1967-68 recorded a spectacular increase in gross cropped area to the extent of 34800 hectares. In the next year there was a fall of 13600 hectares in gross sown area. Considerable positive growth in crop acreage was noticed during the six years' period from 1968-69 to 1974-75. There was adding of 72770 hectares resulting in 14554 hectares per year on an average which was the highest ever noticed during the period under observation. Next two years recorded a negative growth of 11,560 hectares averaging 5780 hectares per year.

**Extension of Cultivation Vs Multiple Cropping**

Such increase in gross cropped area as discussed above between 1944-45 and 1976-77 was achieved due to interplay of three factors namely:

a) an actual extension of geographical margin of cultivation,

b) a considerable reduction in the land that remains fallow from year to year, and

c) an increase in the crop intensity on lands i.e. the conversion of single cropped land into double cropped or
double cropped into triple cropped land or triple cropped lands into a land producing more than three crops.

It is interesting to point out that although the three factors mentioned above have been jointly responsible for the growth of the gross cropped area each has contributed differently at different period.

Between 1944-45 and 1948-49 sizable gains were recorded in the geographical limit of cultivation mainly through land reclamation. The total acreage added through reclamation was to the tune of 9150 hectares. About 6380 hectares of the addition did not however come under actual use and only increased the amount under current fallow. Thus 2770 hectares were actually the gain in the extensive margin. In spite of such gain there was loss of 13420 hectares due to decrease in acreage of multiple cropping. Thus a net loss of 10650 hectare was the result (Fig. 36 and Table 26 Appendix).

Between 1948-49 and 1953-54, there was very little addition through reclamation and it was only 440 hectares. But there was considerable addition to the gross cropped area as 12060 hectares current fallow land was brought to cultivation, thus resulting 12500 hectares net gain in extensive margin. Whereas the double and multiple cropping had a larger contribution to the gross
HOOGHLY
GAIN AND LOSS IN CROPACREAGE
EXTENSIVE VS INTENSIVE
(1944-45 TO 1976-77)

Fig. 36
cropped area. Area sown more than once accounted for 15,300 hectares out of the total gain of 27,800 hectares over the 1944-45/1948-49 level.

Between 1953-54 and 1955-56 there was much loss of gross cropped area because of the loss both in the extensive and intensive margin. In that period about 3340 hectares were put to nonagricultural uses and current fallow increased to the tune of 12,790 hectares. There was reduction in area sown more than once to the extent of 5240 hectares. Thus a net loss of 21,370 hectares in gross cropped area was recorded.

In the year 1956-57 there was considerable gain in the extensive margin through the reduction in current fallow to the tune of 10,600 hectares. But the increase of nonagricultural use to the extent of 800 hectares ultimately resulted a net gain of 9,800 hectares. In the intensive margin there was adding of only 500 hectares.

Between 1956-57 and 1958-59 there was net loss of 9,700 hectares in the extensive margin out of which 9,300 hectares were contributed by increased fallowing and the remaining by increase in nonagricultural use. There was total loss of 13,000 hectare due to decrease in area sown more than once.
Between 1958-59 and 1961-62 there was again a gain of 11,100 hectares in the extensive margin because of decrease in area for nonagricultural use to the tune of 1500 hectares and reduction in fallowing to the extent of 11,100 hectares. In the intensive margin there was addition of 25600 hectares and thus a net gain of 36700 hectares was achieved.

In the next period of two years a very little loss in the extensive margin was noticed but somewhat higher loss in the intensive margin caused total loss to the extent of 6900 hectares.

Between 1963-64 and 1965-66 both the extensive and intensive margins a very little gain to the tune of 2400 hectares was achieved. A gain of 900 hectares was resulted due to decrease in fallowing and 1300 hectares through increase in intensity of agricultural use.

The period between 1965-66 and 1966-67 recorded remarkable loss in cropped area due to increased fallowing to the tune of 15000 hectares and decrease in areas sown more than once to the extent of 1400 hectares, thus resulting in total loss of 16600 hectares.

Between 1966-67 and 1967-68 a spectacular increase in gross cropped area was achieved. There was net gain of
15400 hectares in the extensive margin out of which 1500 hectares were contributed by the reduction in fallowing and the rest by reduction of the land for nonagricultural purpose. About 19400 hectares were added through increase in area sown more than once.

Between 1967-68 and 1968-69 there was again reduction in gross cropped area as a result of loss of 20600 hectares in the extensive margin out of which 18400 hectares accounted for increase/current fallow and the rest for nonagricultural uses. In the intensive margin there was a gain of 7000 hectares and thus the net loss was to the extent of 13600 hectares.

During the period between 1968-69 and 1974-75 considerable gain in gross cropped area was achieved. In the intensive margin there was adding of 60220 hectares. In the extensive margin there was both the loss and gain but ultimately resulting in net gain of 12,550 hectares. There was a loss of about 7000 hectare due to increase in nonagricultural uses. But 20300 hectares were added through the use of current fallow for agricultural purpose. As a result there was an adding of 12550 hectares in the extensive margin.

Between 1974-75 and 1976-77 there was again a loss of 11560 hectares in gross cropped area as a result of very much reduction in intensive margin to the extent of 11650
hectares. Whereas in the extensive margin a gain of 90 hectares was achieved through the decrease in land for non-agricultural use to the tune of 510 hectares, current fallow recorded an increase for 420 hectares.

It reveals from the above analysis that increase or decrease in gross cropped area in the district is either due to loss or gain in the intensive margin or due to decrease or increase in current fallow. Net gain or loss through reclamation of land for agriculture or increase of acreage for nonagricultural use has very little effect on loss or gain in gross cropped area. Greater importance of the fluctuation in current fallow is greatly due to socio-economic and climatic factors. In the year of drought or flood both of which are very much associated with a monsoon climate much of the cultivated land is forced to be kept fallow. Bad pecuniary condition of the marginal farmers is also somewhat responsible for such increased fallowing. Fluctuation in the intensive margin is due also to climatic and socio-economic factors. In the year of drought a marked reduction in this sector is due to shortage of irrigated water from almost every source. The inability of the marginal farmers to afford expenses required for fertilizer, seeds etc. for growing of second or third crop in a plot due to their bad pecuniary condition is also responsible to a certain extent for decrease or increase in
the intensive margin. The profit and loss out of the cultivation of a particular crop has also some influence in this respect.

**Pressure of Population Vs intensity of cropping**

It would be revealing to examine the population - land ratio in order to make out a case for an intensive use of agricultural land. There seems to be a close relationship between population numbers and the carrying capacity of the land, particularly in an agrarian society where land is almost the sole support of a growing population. While the agricultural land is almost fixed in areal extent as discussed above, over and above as there is a rather diminishing tendency of the net sown area due to increase in non agricultural uses, population is relentlessly increasing and the growing numbers can be supported only if there is a proportionate increase in agricultural production by means of a more intensive utilization of land as also by taking advantage of scientific methods in agriculture. This necessitates a constant process of adjustment and readjustment in the pattern of utilization for providing the barest standard of living to the people. A marked contrast between the growth rate of population and on increase in the area under cultivation without any proportionate rise in irrigated and multiple-cropped land or of total production is bound to reduce the per capita availability of cereals. A study made in the national context by Prof Dayal has demonstrated
how the population rise has affected per capita availability of the land as well as agricultural production.

As increase in population has led to a diminution in the average size of the holdings, per capita cultivated land and a diminished supply of cereals to each person resulting in a wide gap between the available and the needed calories. According to late Prof Radha Kamal Mukherjee one acre (0.4047 hectare) of crop land is assumed to be indispensable for the nourishment of a person. Using this as a criterion the author has divided the unit 0.40469 of a hectare (equivalent to one acre) by per capita total sown acreage. The quotient thus obtained gives the relative co-efficient of over-population. Thus greater the co-efficient, the higher would be the pressure of population on land. It has been found out that in some parts of the region the yield from 0.40469 of a hectare (equivalent to one acre) of total cropped area is roughly adequate for one person so that a relative co-efficient of 1.10 may be considered as more or less marginal. It is only where this figure exceeds 1.10 that the area may be said to be over-populated.

The author has used the population figure of the blocks in 1971 and gross cropped area for the year 1981-82 in order to show the co-efficient of over-population. From the analysis of the Table 27 in Appendix it reveals that per capita
HOOGHLY
PRESSURE OF POPULATION
(1971)

Fig. 37

COEFFICIENT OF
OVER-POPULATION

\[
\begin{array}{c|c}
\text{Coefficient} & \text{Area} \\
\hline
< 1.5 & \text{Light gray} \\
1.5 - 2.5 & \text{Medium gray} \\
2.5 - 3.5 & \text{Dark gray} \\
> 3.5 & \text{Darkest gray} \\
\end{array}
\]
gross cropped area in all the blocks varies from 0.09 to 0.28 hectare. Thus it indicates that in all the blocks per capita gross cropped area is considerably lower as compared to the requirement as suggested by Prof Radha Komal Mukherjee. As a result the co-efficient of over population is extremely high in all the blocks. The co-efficient of over-population varies from 1.44 to 5.05. With the help of these values it is now possible to recognise four tracts viz. very high (3.5 and over), high (2.5-3.49), medium (1.5-2.49) and low (less than 1.5) of over-population in the district. The coefficient is very high in Chinsurah-Mogra, Serampore-Uttarpura and Chanditala. Co-efficient is high only in one block namely Singur. In most of the blocks the figure is medium viz. Arambagh, Khanakul, Pursurah, Dhaniaxhali, Panduah, Balagarh, Polba-Dadpur, Tarakeswar, Haripal, Jangipara. The co-efficient is low in Goghat only (Fig. 37).

Intensity of Cropping

With these broad facts in mind we may now pass on to examine how the pressure of population in the district has created conditions for intensification in cropping pattern so that the increased farm production would take care of increasing human numbers. It has been emphasised that population pressure
HOOGHLY
INTENSITY OF CROPPING
(1981-82)

INDEX OF INTENSITY
OF CROPPING

< 150
150 - 175
175 - 200
> 200

Fig. 38a
has resulted in a decrease in per capita net sown area and is sought to be compensated by multiple cropping. The area sown more than once as per cent to net sown area has increased from 12.13 during 1944-45 to 50.54 during 1976-77. While the net sown area has recorded a very insignificant increase during the period from 1944-45 to 1976-77. In 1944-45 net sown area accounted 227,960 hectares while in 1976-77 the figure was 232,430 hectares thus recording an increase of only 1.96 per cent (Table 23 Appendix & Fig. 35). We have already seen that intensification rather than extension is the real solution to the problem in this area.

In order to show the degree of intensity of cropping the author has considered the index of cropping intensity which is the ratio between the gross cropped and net cropped area expressed as percentage (Index of cropping intensity = \( \frac{\text{Gross cropped area}}{\text{Net cropped area}} \times 100 \)). An analysis of the Table 28 in Appendix and the Fig. 38 indicates a very high intensity of cropping all over the district. Cropping intensity index was highest in Pursurah and Tarakeswar recording 270.28 and 256.25 respectively. The index was high averaging 175 to 200 in major part of the district constituting Balagarh, Chinsurah- Mogra, Singur, Haripal, Jangipara, Khanakul and Goghat. Medium cropping intensity (150-175) was found in Arambagh and Panduah. The index
HOOGHLY
AREA SOWN MORE THAN ONCE
(1981-82)

PERCENTAGE TO
NET CROPPED AREA

<50  70-90
50-70 >90

Fig. 38b
was comparatively low (150) in only one block namely Polba-Dadpur.

Area sown more than once as percentage to net cropped area also expresses the degree of intensity of cropping. Higher the percentage is higher the cropping intensity. The district in 1981-82 recorded this percentage varying from 37.00 to 96.66. The percentage was again highest in Pursurah and Tarakeswar. Percentage was high (70-90) in Dhaniakhali, Haripal, Singur, Balagarh, Panduah, Chinsurah-Mogra, Jangipara, Chanditala, Serampore-Uttarpara and Khanakul recorded medium percentage (50-70). The remaining blocks recorded comparatively low percentage (below 50). (Fig 38b)

Double Cropped area.

Greater intensity of cropping in the district has been achieved by converting the mono cropped land into a double cropped one. In the district as a whole double cropped area accounted 46.29 per cent of the net cropped area in 1981-82. Spatial variation in double cropped area in the district vide Fig. 39 reveals that double cropped area is highest in Haripal (61.32 percent). The figure is also considerably high in Dhaniakhali (60-70) and Serampore-Uttarpara blocks (55.11). Comparatively higher percentage (45-55) was recorded in Khanakul,
Fig. 39
Jangipara, Singur, Panduah, and Balagarh. In all these blocks tripple cropped land accounts for more than that of double cropped land. In Pursurah, Serampore-Uttarpara and Tarakeswar the percentage varied from 35 to 45. The percentage was lowest in Goghat. In the double cropped land the usual crop combination is either jute and aman; aman and boro; jute and pulses; or jute and potato.

**Tripple Cropped area**

In the district as a whole tripple cropped area accounted for 18.33 per cent of net sown area in 1981-82. Fig. 40 reveals that the blocks having less double cropped area showed a higher percentage of tripple cropped area. Tarakeswar recorded the highest percentage (54.16) in respect of tripple cropped area followed by Pursurah (41.79 percent). Goghat, Arambagh, Jangipara, Dhanialkhal and Singur showed medium percentages averaging 15 to 35. In the remaining blocks like Panduah, Balagarh, Chinsurah-Mogra, Polba-Dadpur, Serampore-Uttarpara and Chanditala the percentage was below 15. In the tripple cropped area the usual practice is to follow the crop combination like jute, aman, boro; jute, potato, vegetables; jute, potato, oil seeds; jute, pulses, aman etc.
Fig. 40
Correlation between population pressure and intensity of cropping.

It is imperative in the light of above discussion that the pressure of population has to some extent induced the farmers to increase the yield of crops by intensive cultivation, so that as the per square kilometre density of rural population increases there is a tendency for the percentage of land cropped more than once in net sown area to increase simultaneously. Table 29 in appendix shows that Pursurah having a population density of 936.30 recorded the highest percentage of area sown more than once in 1981-82 succeeded by Tarakeswar accounting 93.75 per cent with a population density of 863.37 persons per square km. Polba-Dadpur with a density of 501.31 persons per square km. recorded the lowest percentage of area sown more than once. Thus it appears that with a relative fall in density there is a corresponding drop in the proportion of area sown more than once. There are, however, exception too. This is particularly true in the case of Chanditala block which having the highest density recorded 51.91 per cent of area sown more than once as compared to the highest percentage of 96.66. In spite of such exceptional cases there is a positive correlation between the pressure of population and the area sown more than once. The Pearsonian product-moment co-efficient between the two
variables viz. density of rural population per sq. km. and area sown more than once as a percentage to net sown area has been found to be $+0.25$ while the spearman's rank correlation coefficient has been found to be $+0.36$. Both the coefficient figures are significant almost at 5 per cent level. The scatter diagram (Fig. 41) also reveals such positive correlation between the two variables.

Lower correlation coefficient figures in both the methods indicate that in addition to pressure of population on land other factors like favourable ecological conditions i.e. good soils, immunity from floods and water logging and infrastructural facilities particularly the availability of irrigated water, nearness to ready market and employment scope in nonagricultural sectors have certain impact on intensity of cropping. As for example in Chanditala, Serampore-Uttarpara and Chinsurah-Mogra blocks the percentage of area sown more than once is somewhat low in spite of their being densely populated resulting higher co-efficient of over-population. This is because these blocks being situated near the urban fringe can relieve their pressure of population through the employment in nonagricultural activities. At the same time less development of irrigation facilities is also the cause of such lower intensity of cropping as compared to their higher density of rural population.
Diversification of Cropping

Degree of intensity of agricultural landuse in the intensive subsistence farming can be ascertained through such study as the intensity of cropping, diversification of cropping etc. In this respect diversification of cropping has an important bearing. Diversification of cropping signifies the utilization of the net sown area for the cultivation of a number of crops rather than a crop or two. Greater the diversification of cropping greater is the intensity of agricultural landuse and vice versa. Diversification of cropping can be achieved through the proper utilisation of the existing environmental condition and the available infra-structural facilities. Of course, diversification of cropping is not a sign of agrarian growth since total output coming out of a single cropping pattern may in certain cases surpass that of a varied crop combination. Yet a diversified crop combination is ordinarily a sign of a healthier agricultural economy than a monoculture for more than one reason.

Firstly monoculture during a period of time indicates the farmer's inability to overcome the dictates of nature with their limited strength of economy. It also indicates that the utilization of social infra-structural facilities to tide over the dictates of nature for the growing of other crops involves a cost which is too high for the farmers under the given socio-economic
circumstances. If the same farmer at a later period of time grow a number of crops within the same environmental framework it suggests that the country has been able to adopt by this time an economy which is guided more by human motivation rather than by natural constraints.

Secondly the process of diversification of cropping pattern is an indicative of significant breakthrough in the technology of production. The decision to switch over from one crop to another may not solely be the result of the additional facilities in terms of infrastructural or technical support but may in part due to the price difference between the two. Relative profit and loss in terms of money requirement involved in the cultivation of two crops may also play an important role in any change in the diversification of cropping unless of course the economy is entirely one of the family subsistence type. An increasing diversification therefore suggests an increasing degree of participation of market economy and may also be conceived as a process of integration of the regional economy with the national pattern of commodity exchange.
As diversity of cropping signifies utilization of net cropped area for the cultivation of a number of crops, degree of crop diversity is the function of relative percentage of area under individual crop to total cropped area. As for example if in an area single crop covers 100 per cent of total cropped area the condition reflects that of minimum crop diversification. Alternately if all the crops occupy equal share of total cropped area the condition is of maximum diversification. Thus the degree of crop diversity can be measured considering deviation of percentage share of individual crop from the percentage figure to the total cropped area shared equally by the number of crops grown. The square root of the average deviation gives rise to an index called diversification index which can be expressed by the following equation.

\[ d = \sqrt{\frac{(X - \frac{100}{N})^2}{N}} \]

Where \( X \) represents the percentage of area under a crop to total cropped area in a particular year. \( N \) represents total number of crops. \( N \) should be constant for all the units of time or space irrespective of whether all the crops are present or not. A particular crop at a particular unit may be represented by even 0.00 per cent share.
In the present study acreage under 10 crops namely aman, aus, boro, wheat, fibre (jute), vegetables, oilseeds, pulses, sugarcane, potato as percentage to the total cropped area during the period from 1944-45 to 1980-81 has been taken into consideration to show the temporal changes in crop diversification of the district as a whole. In order to show its spatial variation blockwise acreage under different crops as percentage to the total cropped area has been taken for the years of 1944-45 and 1982-83.

In this case the maximum diversification index will be zero representing the condition when all the crops equally share the total cropped area and minimum diversification index will be 30 indicating that a single crop occupies 100 per cent of total cropped area.

The above methodology is a slight modification of the methods as proposed by John C. Weaver in his "Crop combination regions in the Middle East" and S.C. Chakraborty in his "On identifying a multifunctional mix".

Temporal variation in crop diversity

An analysis of the diversification index during the period from 1944-45 to 1980-81 (Appendix Table 30) reveals that Hooghly agriculture shows a clear tendency towards
increasing diversification of its crop pattern. This was attained mainly through changes in the relative share of various crops in the total cropped area and not so much by introduction of new crop. From 1944-45 to 1950-51 the crop cultivation was dominated by aman which accounted for 70 per cent of the gross cropped area on average. The next crop in importance was either jute or pulses which together accounted for about 15 per cent of total cropped area. All other crops like aus, boro, oilseed potato etc. accounted for the remaining 15 per cent (Figs. 42 & 43). Index value during that period varied between 21.36 to 19.99. The next seven years (1951-52 to 1957-58) saw a slight reduction in the dominance of aman which on an average accounted for 64.81 per cent of gross acreage. The reduction in importance of aman was compensated by the increase in importance to pulses with an average acreage of 9.8 per cent. There was also increase in acreage of jute which accounted for 12.60 per cent of gross cropped area on an average. The condition of the other crops remained almost unchanged. Thus the index values during the period varied between 17.54 to 19.68. Between 1958-59 and 1966-67 the aman acreage showed further reduction resulting in 63 per cent of total cropped area on an average. While there was further increase in acreage of jute which accounted for 13.04 per cent
HOOGHLY
AREA UNDER DIFFERENT CROPS
(1944-45 TO 1980-81)

Fig. 42
of gross cropped area on an average. The importance of pulses was slightly reduced as it accounted for 8.68 per cent of total acreage during this period compared to 9.8 per cent in the previous seven years. Potato also showed remarkable increase in its acreage averaging 7.18 per cent compared to 4.78 per cent in previous seven years. Thus the relative reduction in dominance of aman and pulses was mainly due to the rising share of jute and potato. The relative share of other crops remained almost unchanged. The index value during this period varied from 11.44 to 18.80. The higher index value (18.80) during 1963-64 was due to increased percentage of aman. The economy during these sixteen years reflects a transition from the three crop combination (aman, pulses, jute) of 1944-45 to 1950-51 and 1951-52 to 1957-58 to a four crop combination of aman, pulses, jute and potato of 1958-59 to 1966-67.

During the next seven years from 1967-68 to 1973-74 the diversification index was reduced to round about 17. Such reduction was achieved through further decrease in percentage share of aman which on an average accounted for 54.55 per cent of gross cropped area and remarkable increase in acreage of boro and wheat which accounted for 10.81 and 4.74 and respectively. In the previous nine years from
HOOGHLY
AREA UNDER CROPS AS PERCENT TO TOTAL CROPPED AREA
(1944-45 TO 1980-81)

Fig. 43
1958-59 to 1966-67 boro and wheat were quite insignificant crops as they covered only 0.59 and 0.12 per cent of total cropped area respectively. On an average the percentage of potato declined to 6.4 during the period from 1967-68 to 1973-74 compared to 7.18 per cent of previous nine years' period. Thus during 1967-68 to 1973-74 boro and wheat were added to the aman, pulses, jute and potato combination of 1958-59 to 1966-67. Such change was achieved through the increase in irrigated acreage caused by tapping of underground water by shallow and deep tubewells.

During the next seven years from 1974-75 to 1980-81 the index value ranged from 13.16 to 14.81 indicating its further decline to the extent of 3.00. Thus greater diversification was achieved through further decrease in percentage of aman acreage accounting 49.9 per cent on an average and increase in acreage of boro and wheat which accounted 13.48 and 5.27 per cent respectively on an average. The corresponding percentages during previous seven years were 10.81 and 4.74 respectively. Oilseed also showed considerable increase in percentage. During this period it accounted for 3.04 percent compared to 1.22 per cent of previous seven years. The percentage share of potato increased again to 8 per cent compared to
7.18 per cent of previous seven years period. Situation of jute remained unchanged. Thus during this period oilseed was added to the six crop combination of aman, pulses, jute potato, boro and wheat of previous seven years' period.

**Spatial variation in crop diversity**

It has been observed that the district as a whole showed a considerable change in the diversification of cropping pattern over time. But different parts of the district did not show uniform changes and thus revealed a spatial variation. In order to show the relative change in the degree of diversification of cropping in the spatial units the years of 1944-45 and 1982-83 have been taken into consideration. Such temporal and spatial variation in crop diversity also reveals whether the situational advantages has anything to do with the degree of its intensity. As a whole all the spatial units show a remarkable decrease in diversification index indicating higher crop diversity in 1982-83 as compared to the condition of 1944-45. This was due to the non-availability of the modern infrastructures of agricultural production in 1944-45.

In 1944-45 the highest index recorded was 25.99 in Arambagh while the lowest value of 14.31 was in Balagarh (Fig. 44 & Appendix Table 31). In order of crop diversity the
HOOGHLY
DIVERSIFICATION OF CROP PATTERN
(1944 - 45)

DIVERSIFICATION INDEX

- 14.00-15.99
- 16.00-17.99
- 18.00-19.99
- 20.00-21.99
- 22.00-23.99
- > 24.00

FIG-3.

Fig. 44
blocks could be ranked as Balagarh (14.31), Pursurah (15.21), Khanakul (196.27), Tarakeswar (17.77), Chanditala (19.09), Haripal (19.93), Dhaniakhali (20.02), Singur (20.52), Serampore-Uttarpara (21.66), Jangipara (22.18), Panduah (24.01), Goghat (24.22), Chinsurah-Mogra (24.39), Polba-Dadpur (24.93), Arambag (25.99).

During this period very high diversity index averaging more than 24.00 was recorded in Arambag, Polba-Dadpur, Goghat and Panduah. These blocks were then dominated by aman cultivation which accounted for 80.92 to 87.93 per cent of gross cropped area. Aus was second crop accounting for 5.24 to 7.91 per cent. Crops other than aus and aman occupied 5 to 10 per cent of gross cropped area.

Moderately high index varying from 20.0 to 23.99 occurred in Singur, Serampore-Uttarpara, Dhaniakhali and Jangipara blocks. In all these blocks aman was not as dominant as in the blocks where very high diversity index was recorded. Aman occupied 69.31 to 76.24 per cent of total cropped area. Other important crops were potato in Singur and Dhaniakhali, aus in Jangipara and vegetables in Serampore-Uttarpara. Higher percentage of irrigated crops like potato vegetables was due to the availability of irrigated water in all these blocks. Aus and
jute requiring no irrigation also occupied considerable percentage of total cropped area.

Low diversity index ranging from 16.00 to 19.99 was recorded in Khanakul, Tarakeswar, Haripal and Chanditala which was due to low percentage of aman averaging 57.24 to 68.88. Nonirrigated crops like aus and jute together occupied 10 to 16 20 per cent of crop acreage. Potato and pulse were also important to some extent.

Lowest diversity index was recorded in two blocks namely, Pursurah and Balagarh in which aman occupied 53.63 and 48.70 per cent of crop acreage respectively. While aus, jute, pulses, potato occupied considerable percentage of total acreage which together accounted for more than 35 percent. Vegetables also occupied significant percentage.

In 1982-83 the situation was completely different from that of 1944-45. Not only the level of diversity in the crop pattern for the district as a whole was considerably higher than what it was in 1944-45 but also there was a remarkable degree of alteration in the spatial trend of the index value (Fig. 45). In 1982-83 all the blocks recorded lower index values compared to those of the 1944-45 indicating increasing crop diversity (Appendix Table 32). Highest index value of
HOOGHLY
DIVERSIFICATION OF CROP PATTERN
(1982-83)

DIVERSIFICATION INDEX

- 10.00 - 11.99
- 12.00 - 13.99
- 14.00 - 15.99
- 16.00 - 23.99
- 18.00 - 19.99

Fig. 45
19.61 was recorded in Goghat compared to 25.99 of 1944-45 in Arambagh. Lowest value of 10.07 was recorded in Pursurah compared to 14.31 of 1944-45 in Balagarh. Highest change was recorded in Chinsurah - Mogra and Arambagh. In these two blocks there was significant decrease in acreage of aman in 1982-83 compared to that of 1944-45 while acreage of such crops as boro, potato increased considerably due to increasing availability of irrigated water, thus causing greater diversity of cropping.

Next in importance were the blocks of Panduah, Tarakeswar, Singur, Jangipara and Serampore - Uttarpara where moderate change in crop diversity occurred. Again in all these blocks the percentage of aman acreage decreased considerably due to relative increase in percentage of other crops like boro, oilseed, wheat in 1982-83 as compared to that of 1944-45.

Least change in crop diversity in 1982-83 was recorded in Balagarh, Polba-Dadpur, Dhaniskhali, Haripal, Chanditala, Pursurah, Khanakul, and Goghat indicating no significant alteration of aman, jute, aus, acreage. But there was significant rise in percentage of boro.
The gradually increasing diversity in the crop pattern of the district over thirty eight years period under study was associated with some major change in importance of some crops grown in the district as noted below:

1) Since 1948 the relative importance of aman decreased considerably from more than seventy per cent of the gross cropped area to less than fifty per cent. This is primarily due to an increment in the acreage of the other crops including second crops on rice field of which boro is the significant. It is quite significant to note that the average aman acreage during this period almost remained the same indicating that the economy is still in subsistence level and cultivation of no other crop is rather possible on the aman lands.

2) Aus acreage remained almost unchanged with the exception of slight fluctuation during the period from 1944-45 to 1963-64. Since 1963-64 there was appreciable increase in acreage of aus up to 1976-77. Thereafter there has been a slight decreasing tendency. The over all increase in acreage of aus was due to the preference of high yielding variety of paddy during the Bhadoi period by the farmers till 1962-63. The percentage of aus acreage did not show of course an appreciable change because of the use of the aus land for the cultivation of other crops during the rabi period.
3) Among the cereals wheat acreage remained unchanged during the period from 1944-45 to 1966-67 occupying a quite insignificant percentage of total cropped area. Since 1966-67 there has been appreciable increase both in acreage and percentage share of wheat. This was due to cultivation of wheat on the jute or aus land as second crop utilizing increased irrigated water.

4) The cultivation of summer rice (Boro) was quite insignificant till 1958-59. Since 1960-61 boro recorded appreciable increase both in acreage and percentage of gross cropped area. Such increase in importance of boro was achieved through the increase in assured irrigated water chiefly from ground water or perennial canals.

5) The increasing tendency both in acreage and percentage share of pulses was recorded during the period from 1944-45 to 1955-56. Thereafter there was gradual decline in importance of pulses. Such declining trend of pulses was due to the fact that wheat, oilseed and potato were preferred to pulse as second or third crop because of their higher return as compared to pulses.
Among the cash crops potato showed a gradual increase both in acreage and percentage over the period. Oil seed recorded remarkable increase in percentage and acreage since 1968-69 before which it was quite insignificant. Such increase was associated with the increased demand of edible oil in the state since that year. An increasing tendency in acreage and percentage of jute was recorded up to 1962-63. Thereafter jute showed a gradual decrease in acreage and percentage. Increasing tendency in acreage and percentage is also visible in case of vegetables.

Remarks:

An examination of the statistic relating to landuse brings out the fact very clearly that there is little margin left for extension of cultivation in the district. Rather cultivated land is being lost through such non-agricultural uses as the construction of roads, sand quarries, brick fields etc. As a result pressure on land brought about by large increase in population which is revealed at every census. Co-efficient of over-population is considerably high in all the blocks. As such increased population pressure under the situation as mentioned, can be abated only by more intensive cultivation of the existing sown area by taking advantage of agricultural research, irrigated water, by the use of
chemical manures and by judicious selection of seeds, there has been considerable increase in gross cropped area by converting the monocropped land into land sown more than once. Such efforts of the farmers to relief the pressure on land has resulted in considerably high intensity of cropping and such trend will continue in future provided there is further increase in infrastructural facilities particularly the irrigation, improved seeds and fertilizers. Simultaneously there has been greater diversification of cropping which has been achieved through cultivation of increasing number of crops utilizing technical breakthrough, improved seeds and fertilizers, electricity etc. in different cropping seasons.

The continued increasing trend in gross cropped area resulted by increase in intensive margin with the application of irrigated water, improved seeds and fertilizers will not only relieve the pressure on land but also improve the economic condition of the farmers fetching much profit out of it. The continued diversification of cropping will give relief of the farmers from the economic strain resulted by the failure of a crop and it would also help them to avail themselves the benefit of market economy.
References


