DISCUSSION

The preceding chapters encompass the situation of Serampore subdivision, the study area - its component administrative units, physical background, social background, landuse character, their spatial and temporal changes, etc. Moreover, the sample villages have been studied and described with a view to pin-point the causes of change and impact of urbanisation as well as industrialisation on the spatial variation of agro-economy.

The study area is a part of the interfluve of the Hooghly and the Damodar. The tract is a land of dead and dying rivers covered with recent alluvial formation. The marked topographical variations of this vast aggradational surface are associated with shifts and diversions of the rivers. Unequal aggradations rendering some surface liable to flood and others not. The Damodar is much more responsible for the present physiography of the area by shifting its course in different times. The narrow silted channel of the Damodar often causes flood during the rainy season. It is fordable in summer and winter whereas the Hooghly is navigable throughout the years. The interfluve is drained by the Kana Damodar, the Kausiki, the Saraswati, etc. and they remain almost derelict throughout the year except in the rainy season. During the monsoon the derelict channels of the rivers become a succession of stagnant pools and the surrounding lands become water logged. Thus it may be
said that the physiography of this area is a product of drainage and rainfall.

Monsoon is the dominating element of climate of the study area. The agricultural calendar of this area as well as in Gangetic West Bengal is the product of its climate.

The Hooghly and the Damodar are the prime sources of alluvium. Vindhyan alluvium was deposited by the Damodar and Ganga alluvium was deposited by the Ganges or the Hooghly, as it is known in this area. Areas near the Damodar have sandy loam and lands bordering the Hooghly river have clayey loam to clay. All the profiles display good drainage conditions except in the marshy areas where clayey soil predominates. The nitrogen, phosphorous and potassium status of soils is rather low. The organic matter content is also low as it is usual in cultivated land in general.

The changing population structure within this physical limit are greatly responsible for the agro-economic changes of the study area. The highest decadal growth of population of the subdivision in last 40 years was observed in the fifties of this century. The highest increase in population was in Uttarpura and Serampore followed by Jangipara and Chanditala police stations. Serampore and Uttarpura police stations had high density of population in 1941 and it remained so in 1981. On the other hand, the rural areas/Serampore (block area) had the lowest density in 1941 and 1951. This distinction was attained by Jangipara police station from 1961. This growth of population rendered a change in socio-cultural environment of the area. Chanditala and Jangipara had the
higher number of females per 1000 males in this subdivision throughout the period of study. In other two police stations, the number of females per 1000 males were and still are comparatively low than that of Chanditala and Jangipara police stations since 1941.

The over all literacy rate was quite low in 1951. It has improved in 1981 but there was a bias towards urban areas. The urban areas expanded and reclassified. New urban areas came into existence. Many industries came into existence in urban areas of Hooghly industrial belt. Jute textile industries decreased and the increase in other textile industries have sufficiently compensated the decrease in jute textile. The employment opportunity in Hindmotor Workshop increased more than ten fold during the period of present study. The growth of cold storages has an impact on agricultural scenerio. The newer urban areas of Uttarpara police station and extended urban areas of Serampore police station were mostly occupied by refugee population and most of the newer inhabitants are engaged in secondary and tertiary sectors of occupation. When the settlement pattern is considered, it is observed that earlier settlement pattern was of linear type. In areas, near railway stations and newer roads, some amorphous to agglomerated settlements have grown up. The caste based stratification of settlement sites of villages are not found near the urban areas.

A great change is observed in general landuse as well as in agricultural landuse of the subdivision within the limit of those physical and socio-cultural environment. The changing pattern
of the landuse in the study area shows a steady increase of the net sown area in Chanditala and Jangipara police stations. A greater part of increase has been at the cost of culturable but not yet cultivated category of land and a less amount was at the cost of the land under miscellaneous trees and orchards. On the other hand, decrease of the net sown area is found in Serampore and Uttarpara police stations with a great increase in the percentage of area under not available for cultivation. Area under miscellaneous trees and orchards as well as culturable but not yet cultivated land also have largely been converted into area not available for cultivation category in the same two police stations. A significant feature emerging from this changing trend is that total involvement in landuse change was highest in Serampore and Uttarpara between 1944-45 and 1954-57 as well as between 1954-57 and 1980-81 and was lowest in Jangipara during both the periods (appendix No.5.1).*

When agricultural landuse is considered, Serampore and Uttarpara as well as Jangipara show an increasing trend in area sown more than once but the cumulative index for gross cropped area does not show a significant change in Serampore and Uttarpara police stations (table - 3.2). But it is very significant in Jangipara and to some extent in Chanditala also.

A good amount of change in cropping pattern is found in the year 1980-81 from that of 1944-45. The appendix (No.5.2) shows

that largest volume of change in cropped area was in Serampore and Uttarpara and lowest was in Jangipara between 1944-45 and 1954-57. The highest change in cropped area is observed in Jangipara and lowest in Serampore and Uttarpara police stations between 1954-57 and 1980-81. Jute area greatly increased in 1954-57 at the cost of aus area and it declined in all the three police stations in the later period. Previously, jute and aus were grown in higher lands (guna) but now jute is also cultivated in the lower lands (ghali). Roy (1972) noticed the same character in the Damodar-Saraswati Doab area. Total area under paddy has increased gradually from the base year (1944-45) in the subdivision as a whole. But percentage of paddy area to the gross cropped area has decreased from the same base year. A conspicuous change in paddy cultivation is observed in its variety with the use of high yielding variety of seeds which is greatly favoured by the cultivators of Jangipara and less favoured by the cultivators of Serampore and Uttarpara police stations. Wheat was a negligible crop during 1944-45 and 1954-57, but now, an appreciable area is covered by wheat. Area under potato has increased in Jangipara and decreased in Serampore and Uttarpara as well as in Chanditala police station from the base year. Area under vegetables had decreased in all police stations in 1954-57 and increased again in 1980-81 period. Chanditala leads in the percentage of area under vegetables to the gross cropped area followed by Serampore, Uttarpara and Jangipara respectively. Area under pulses had increased in all the police stations during 1954-57 which was also noted by Banerji (1964). But area under pulses decreased during 1980-81, and the
decrease was greater in Jangipara. A decreasing trend is also found in the area under oilseeds during 1954-57 an increasing trend is noted in all police stations during 1980-81. Boro was a negligible crop in 1944-45 and was absent in 1954-57. Now it is an important crop in Jangipara police station. Area under sugarcane emaciated in 1954-57 in all police stations and it remained so in 1980-81 in Serampore and Uttarpara as well as in Chanditala but a very negligible increase is noticed in Jangipara. Diversified character of cropping pattern is much more prominent in Serampore and Uttarpara as well as in Chanditala than that of Jangipara in 1980-81.

The yield rate of paddy, wheat, jute and potato has increased to a great extent. The subdivision as a whole was a deficit area in the production of cereals in 1944-45 and remained so in 1980-81. It is found that the deficit has been slightly reduced. But Jangipara police station was a surplus area in cereals in 1944-45 and the surplus has increased noticeably in 1980-81.

It is generally accepted that improvement in agriculture and yield rate are dependent on the use of improved implements, better seeds, use of fertilisers, insecticides, pesticides and increasing area under irrigation and spread of modern irrigation system.

The technology of agriculture in the study area is marked by the use of modern implements. Though most of the cultivators are still using traditional plough, some are using and acquiring power tillers and a few people prefer tractors. Threshers are widely
used by the farmers of Jangipara. Among the other modern implements that farmers very much want to possess are plant protection and the irrigation implements, e.g. sprayers, pumpsets, etc. Jangipara ranks first in the possession and use of modern agricultural implements followed by Chanditala, Serampore and Uttarpara respectively. Change is noticeable in the use of manures. Cultivators are using more of inorganic fertilisers than traditional organic manures. In this respect, Jangipara ranks first in the use of chemical fertilisers followed by Chanditala, Serampore and Uttarpara in decreasing order. Cultivators now use insecticides and pesticides to save their crops from insects and pests instead of helplessly looking on. There is also a net work of soil testing facility for analysing the soils for determining the proper amount and type of fertilisers to be applied. Simultaneously, area under irrigation has increased to a great extent. The increase in irrigated land is greater in Jangipara followed by Chanditala, Serampore and Uttarpara police stations. As far as the infrastructure of irrigation is concerned, the most noticeable change is the replacement of manual power by inanimate power, i.e. lifting of water from tanks or rivers by labourers has been replaced by pumps. Another aspect of change in irrigation is the widespread development of canal irrigation as well as introduction of shallow and deep tube-wells. It is observed that the second preference of cultivators of canal command area is for shallow tubewells. Whereas in deep tubewell command area second preference is for ponds or tanks.
Construction of highways (both state and national) with consequent increase in road density, improvement of road surface and electrification of railways are important changes in the infrastructure. Increasing number of markets as well as their changing character, introduction of cold storages are the other infrastructural changes.

Various activities of agricultural department and other agencies have played a significant role in the remodelling of agricultural system. At present, institutional loan at subsidised rate of interest are provided to farmers.

A great change is also found in the landholding pattern with the increase in the number of marginal owners followed by the decrease in the number of small and big owners. Per capita net sown area has decreased in all the police stations from the base year (1944-45). On the other hand, difference between density of population per square kilometre of net sown area and per square kilometre of gross cropped area are increasing in all the police stations of the subdivision.

The occupation pattern in the study area reveals that a constant decline in agricultural sector has occurred in Serampore police station. Though the percentage of workers of Uttarpara police station in agricultural sector shows an increase, it is still substantially low. Chanditala police station displays slight decrease in the agricultural sector in 1980. A general increase in agricultural sector is revealed in the census figures of 1971. The highest dependency on agricultural sector is evident in Jangipara till 1981.
The foregoing observations are based on meso level (police stations/blocks) survey. The micro level survey of sample villages shows a spatial variation similar to the meso level study in respect of growth of population, literacy, landuse pattern, cropping pattern, agricultural practices with newer technology, infrastructures, different size classes of agricultural land holdings, dependency on agriculture, etc. Average land holding size and attitude of farmers towards agriculture were studied only in micro level survey. Lastly, level of agricultural development of those villages were assessed according to their adoption of advanced agricultural practice and technology.

Population study in the micro level survey shows that population of most of the villages has increased more than double which is also found in the study of block areas of Serampore subdivision. Exception is observed at Raghunathpur of 'fringe' villages, Thero, Alipur and Ichhapasar of 'transition' part and Kasipur of 'distant' area. The median value of fringe villages shows the highest growth index whereas median value of transition villages shows the lowest growth index of population (Appendix No.5.3). This trend has a similarity with the meso level study.

The growth indices of Serampore-Uttarpara (fringe) as well as Chanditala (transition) blocks are comparatively higher than the median values of village level studies. It may be due to the inclusion of urban areas in those blocks (because non-municipal urban areas have been included in the block areas). Whereas the growth index of Jangipara is identical to the median value of 'distant' sample villages.
Most of the sample villages of 'fringe' area are characterised by high density of population since 1951 followed by 'transition' and 'distant' villages. The median value showing number of females per 1000 males is lowest in fringe sample villages and highest in distant villages (Appendix No. 5.4). The trend of density and male-female ratio of 1981 are very nearly identical with the situation at the subdivision level.

The age structure of the population of sample households of 15 villages shows that the highest percentage of population belong to 0-14 age group whereas the highest percentage of workers belong to 15-34 age group (based on sample survey). Similar data at subdivision level was not available at the time of investigation.

The literacy character of the areas shows the highest percentage variation of literacy in the fringe areas and it has a similarity with the block level study. Median value of literacy percentage for these areas is more or less similar (Appendix No. 5.4) whereas such value for literacy among the families totally dependent on cultivation is high in 'transition' and 'fringe' areas and low in 'distant' area (Appendix No. 5.5). The families partially dependent on agriculture show a significant variation. High median values of non-agricultural families are observed in 'fringe' and 'distant' areas and low in 'transition' area. When the level of literacy (Appendix No. 5.6) above primary education of the different occupation groups is considered, distant and transition areas show comparatively higher median value for the families totally dependent on agriculture than that of 'fringe' area. When the families, partially dependent on agriculture is
considered, 'distant' area shows the highest median value followed by 'fringe' and 'transition' areas respectively. Families of 'fringe' villages not dependent on agriculture show the highest median value for the level of literacy above primary level followed by 'distant' and 'transition' respectively.

Agro-economic study of this micro level survey shows that agriculture is the dominating aspect of the rural landuse in transition and distant areas. Whereas most of the villages of 'fringe' area are characterised by relatively low percentage of agricultural land and high percentage of non-agricultural land. This trend has a similarity with the subdivision level study. But percentage of area under agriculture in Serampore and Uttarpara police stations is lower and percentage of area not available for cultivation is much higher than the sample villages, due to the inclusion of urban areas in those police stations to make the data comparable with the previous available data. Higher percentage of area under miscellaneous trees and orchards are found in the villages near the urban areas and are decreasing away from it. This trend has also some similarity with the subdivision level study.

Another feature that is very much clear in this micro level analysis, is that more land (of all kinds) of fringe villages have been involved in change than that of transition and distant villages, whereas more agricultural land have been involved in change in distant part than that of transition and fringe villages respectively. These features have a similarity with that of police station level analysis. Changes in the cropping pattern is evident in all the
villages of three areas. The intensity of cropping has also a similarity with the police station level records.

The kharif season is generally devoted to the cultivation of aman paddy and jute. It is corroborated by the findings at the police station level. Boro is the first ranking crop of the distant villages in the rabi season which is in accordance with the police station level study (Jangipara). Potato is the most important crop in most of the transition villages, whereas vegetables are most important rabi crops of Chanditala police station. Pulses are the dominant rabi crop of most of the villages of fringe areas, which is also evident from the police station level records of Serampore and Uttarpara. The dissimilarity in the cropping pattern between transition villages and Chanditala police station may be due to the exaggerated area under wheat shown in the police station level data. The fact that came out from the field survey is, wheat is the fourth ranking crop of the rabi season in fringe area (which is shown as second for Serampore and Uttarpara police stations in the records), fourth ranking crop of the rabi season in transition part (second for Chanditala police station's records) and fifth ranking crop of the rabi season in distant area (fourth ranking crop for Jangipara police station's records). Paddy and vegetables are of increasing importance in most of the villages of fringe and transition areas whereas paddy and potato are of increasing importance in distant villages. Pulse is the common decreasing crop in all the three areas. Sugarcane is another decreasing crop of fringe and transition areas. All of these findings have a similarity with the findings of police station level study.
Highest preference for the cultivation of high yielding variety of paddy is noticed in the villages of distant part and lowest in the fringe area.

Greater amount of irrigational facilities are available in the sample villages of Jangipara police station (i.e., distant part) and least amount in the fringe villages. Canal is the main source of irrigation in three out of five distant villages. Though one village in transition area i.e., in Chanditala police station is located within D.V.C. canal command area, cultivators cannot enjoy the facility properly because of its uncertainty. Cultivators of fringe area do not get any canal irrigation facilities. Use of chemical fertilisers, insecticides and pesticides are found to be greater in the distant area and these are used in less quantity in transition area and still less in fringe villages. All of these findings have some parity with the subdivisional level study.

The greater number of cultivators of the distant sample villages own plough and improved implements. The figures of the sample villages of this part also show the leading position in the use of improved implements followed by transition and fringe area respectively. There is a similarity with the subdivisional level study in regards to the possession of implements. The data regarding the use of improved implements was not available at the police station level.

By situation, the villages of the fringe areas enjoy greater accessibility to the urban centres of Hooghly industrial belt as well as the market facilities followed by transition and distant
villages. This fact is also supported by the subdivisional level study.

Average holding size of agricultural land also shows some spatial variations (Table 4.17, 4.37 & 4.57). The distant area shows the highest percentage of small and big owners households and the lowest percentage of marginal owners households. Whereas percentage of marginal, small and big owners households are nearly identical in fringe and transition zones. When agricultural land holding size is considered, it is found that average holding size of marginal owners households does not show a significant spatial variation. Little variation is observed for holding size of small owners households though it is nearly identical in transition and distant areas and slightly low in fringe area. Holding size of big owners households is highest in distant villages followed by transition and fringe villages.

Pressure of total population on agricultural land are also varied in nature from urban fringe to distant areas. High pressure is found near the urban areas and pressure on agricultural land decreases from fringe to distant areas; transition area has maintained the transition character in this respect. This character is also reflected at subdivision level.

The occupation pattern of the total working population of the area, as well as the data from household level survey show that people of distant villages are highly dependent on agricultural activities whereas working people of fringe villages are highly dependent on non-agricultural activities. The transition villages
have intermediate character in between these two situations.
Another very interesting feature, emerges from this study, is
the high percentage of non-agricultural workers of fringe villages
get their job mostly in different industries of Hooghly industrial
belt. Whereas a high percentage of non-agricultural workers of
distant part are engaged in different jobs in the city of Calcutta.

The working population in non-agricultural activities
in fringe area are daily commuters, whereas such working population
of distant villages come to the village once in a fortnight or
in a month. Such group of workers in transition area are partly
commuters and partly visit their villages once in a week or in a
fortnight and this feature increases as one, proceeds further
to the distant area. It appears that the people of fringe area
have shifted from agriculture to other avocations earlier than
the people of transition area and they in turn changed their
occupation earlier than the distant area.

The attitude of farmers towards agriculture also differs
with the distance from the urban areas. Cultivators of urban
fringe area as well as in a part of transition area prefer to
produce perishable commodities like vegetables, fruits, etc.
whereas cultivators away from the urban areas like to cultivate
paddy (non-perishable) in the kharif as well as in the rabi (i.e.
boro) seasons and potato (it can be stored in cold storage) in
the rabi season. Paddy is the surplus crop of about 3 per cent
cultivating households of fringe villages, of about 8 per cent
cultivating households of transition villages and of about 29 per
cent cultivating households of distant villages. It : the surplus
crop of big owner households of the fringe area, big and some small owner households of transition area and big, small as well as marginal owners of distant villages. Marginal owners and small owners cultivate their land more intensively than the big owners in general but big owners of fringe areas who are totally dependent on land also use their land intensively like marginal and small owners. Whereas small and marginal owners of fringe villages who are partially dependent on land are less interested in agriculture. Big owners of fringe villages generally apply modern technologies to till the land whereas big, small and part of marginal owners of distant area apply the same. On the other hand, marginal owners of transition part rank second after big owners of the same area in the use of tractor or power tiller. Cultivation of high-yielding variety of paddy, use of fertilizers, insecticides and pesticides, irrespective of holding size, are the common practices of distant villages, whereas big owners of transition area are less interested to use those things; its use is mostly restricted among small and marginal owners. High-yielding variety of seeds for paddy are not favoured by cultivators of fringe area. Cultivators of fringe and transition villages do not prefer to take loan from Government or other agencies like Co-operative Credit Societies, Banks, etc. They themselves finance or resort to private sources for finance. It appears that there is a decreasing aptitude for agricultural work and its acceptance as an occupation in fringe area with the increasing level of education. This attitude also exists among those educated young group of people in transition villages, whereas the educated young persons of distant villages are the leaders in the adoption of modern agricultural techniques to make surplus
When the level of agricultural development is considered, it is observed that the sample villages of fringe area show low development, the sample villages of distant area show high development whereas transition sample villages show moderate development with a mixture of high, low and very low characteristics of development.

It may be assumed from the foregoing discussion that changes have occurred in every sphere of life, specially in the field of agriculture in Serampore subdivision. The causes of those changes are interrelated.

The highest increase of population in Serampore and Uttarpara police stations including the sample villages of the fringe area is largely due to its increasing accessibility to Calcutta, electrification of railway lines, establishment of various industries along the banks of the river Hooghly, reclamation of marshes by Dankuni and Rajapur drainage schemes and immigration of refugee population from erstwhile East Pakistan. On the contrary, the lowest growth of population in Chanditala police station, the transition area is related to the fact that the area was originally inhabited by a fairly large population in the base year owing to the presence of Martin Light railway (now defunct) and Howrah - Burdwan chord line, two good communication network for the workers of Calcutta and Howrah; some low lying tract also deterred the agricultural development of the area. Moreover, lack of secondary and tertiary occupations in the area is responsible for lower growth rate. Still there is higher density of population in Chanditala than the fringe area of Serampore and Uttarpara. The reason may be
ascribed to the presence of centripetal force of the municipal urban areas which has shadowed the peripheral zone of urban areas in the initial period of urban development. In spite of high growth rate, the rural area of Serampore could not overcome Chanditala till 1981 in respect of density of population.

Lower female ratio in Serampore and Uttarpara, including the sample villages of the fringe area, is a typical Indian urban character caused by selective immigration of male population to the towns. Establishment of new educational institutions in urban areas as well as in rural areas and the development of communication are the reasons behind increasing literacy of the subdivision in general and fringe area in particular. Migration of literate people from rural to urban areas to avail of job opportunity may be one of the causes for low increase in literacy percentage in Jangipara. Refugee rehabilitation has also raised the literacy percentage of the fringe villages which is evident from the literacy figure of Naopara.

It is revealed from the household survey of the sample villages that the old cultivators of the fringe area are still unwilling to send their children to high schools due to aversion of the literate people towards agriculture. But the situation is different in the distant area.

A high growth rate of population in the fringe area due to location of industries and various developmental work led to the increase of area under not available for cultivation in Serampore and Uttarpara police stations, including the sample villages, at
the cost of arable and other uses of land. The findings have a similarity with the hypothesis of Asia (1968) as well as of Gowda and Mahadev (1977). As a result of conversion of land from different categories to area not available for cultivation led to the highest involvement of land of this area in change in respect of general landuse.

Increasing area under agriculture and very high involvement of agricultural land in change (Appendix No. 5.2) in respect of crop landuse reflect that agriculture is the prime occupation of the distant area. Chanditala, the transition part shows an in-between character in respect of general and crop landuses. There was high involvement of agricultural land in change in respect of crop landuse between 1944-45 and 1954-57 in Serampore and Uttarpara. The phenomenon can be ascribed to nearness of the market and high dependency of cultivators on agriculture during that period. But with the opening of new roads and the development of other infrastructures like irrigation system, market, cold-storages, etc., the phenomenon began to shift towards the distant part. The dramatic increase in jute area after independence (1947) was due to partition of Bengal and encouragement by the government. But ultimately the jute area depleted due to its inability to compete with paddy (Sengupta, 1961), sesamum, etc.

The total paddy area of the subdivision has increased as a whole with appreciable increase in area under aman and boro due to high demand for cereal crops with the increasing population. Changed outlook of cultivators and the success of the agencies for propagation of new ideas and technologies in farming are responsible
for increased cultivation of boro and wheat. Area under paddy in Serampore and Uttarpara has decreased due to conversion of arable land (N.S.A.) to the uses other than agriculture.

Extension of quality and quantity of irrigation system and absolute necessity of the farmers led to the extensive use of high yielding paddy seeds in Jangipara. On the contrary, poor development of irrigation led to the less use of high yielding variety of paddy seeds in Uttarpara and Serampore. Reporting this phenomenon, Hussain (1979) observed that the high yielding varieties and diffusion of agricultural innovations in India are severely limited in the irrigated areas. Cultivators producing paddy for their own consumption do not like high yielding variety. This psychological attitude of the farmers was observed during household survey in the sample villages. Increasing area under wheat can be correlated with the increasing area under irrigation. Edaphic factors, like sandy loam soil, increased irrigated area and development of other infrastructures, like roads, cold storages, etc. and high dependency on agriculture are responsible for extension of potato areas in Jangipara. Lack of above mentioned factors make potato cultivation less remunerative in Uttarpara, Serampore and Chanditala. Decrease in area under vegetables in the year 1954-57 from that of 1944-45 was due to wide spread introduction of pulses which was befitting after jute to adjust the agricultural calendar and to replenish the land with nitrogen. But with the opening of new roads, the accessibility of interior places to the urban market increased and the area under vegetables and potato increased at the cost of pulses, as farmers earn more from
vegetables and potato than pulses. Decrease of pulse area in Jangipara is spectacular. Leading position of Chanditala in the production of vegetables may be explained by two factors - (a) nearness to the market and (b) dependency on agriculture. The first factor is most favourable for the fringe area and very closely simulates the models of Von Thunen (1826) and Chisholm (1962). The second factor is most favourable for the distant area and least for the fringe. Hence a moderate dependency on agriculture and easy accessibility make the transition part more suitable for vegetable cultivation.

The increasing price for edible oil encouraged the farmers to increase area under oil seeds. Sugarcane, being unable to compete with other crops, lost its area to a great extent.

The yield rate of different crops increased due to the introduction of high yielding variety of seeds, expansion of irrigated area and use of fertilisers. The increased yield rate has minimised the gap between requirements and availability of cereals in the subdivision as a whole. Deficiency in cereal crops continue in Serampore and Uttarpara, the fringe area, due to rapid growth of population, want of irrigation water and marginal dependency on agriculture. The range of deficit has slightly been reduced in Chanditala. But Jangipara shows a marked surplus in the production of cereal crops.

Irrigation water is *sine qua non* for the development and intensification of agriculture. The highest response to the modern agricultural innovations are found in the areas having good
irrigation facilities i.e. Jangipara, the distant area whereas least adoption of the modern technology is observed in areas having poor irrigation i.e. Uttarpara and Serampore, the fringe area. Intensive use of chemical fertilisers is also related to the dependency on agriculture and availability of irrigation facility. Yield rate diminishes with the repeated use of chemical fertilisers. Thus the farmers have to increase the amount of fertiliser to maintain the rate of production. Chisholm (1962) found that productivity of land decreases with the continuous use of chemical fertiliser. Farmers of this area also support the view. They are, to some extent, trying to go back to their traditional manures like pond mud, cow-dung, etc. Inadequate soil testing arrangement also is responsible for the unsatisfactory return-from-different crops with chemical fertilisers. Insecticides and pesticides are essential for high-yielding variety of crops.

The use of modern agro-implements is the other aspect of development in farming. Farmers prefer power tiller to tractor as the plots are small. Cultivators of the subdivision, in general, prefer traditional implements to modern implements like tractor, power tiller, threshing, weeder, etc. But people of Jangipara possess and use more improved implements than the farmers of Serampore, Uttarpara and Chanditala due to higher dependency of the distant people on agriculture. Use of irrigation implements depend upon the availability of irrigation water. Irrigation water, high yielding variety of seeds, chemical fertilisers, pesticides and insecticides have a chain relationship.
Tho urban fringe areas have more road density than the distant areas due to nearness to the towns. Higher production of agricultural commodities as well as their demand led to the formation of a good number of markets, especially at the nodal points of the new transport network. Higher production of potato led to the construction of cold-storages or vice versa.

The decreasing amount of per capita land is the reflection of fast growing population. The law of inheritance as well as different acts of tenancy and land reformation have accentuated the smallness of holding and plot size. In these circumstances, the growing percentage variation between population/net sown area and population/gross cropped area can, to some extent, mitigate the problem.

Ellefsen (1962) said that traditionally, the shift of an economy from emphasis on primary industries to non-agricultural activities has been considered as a sensitive indicator of progress in underdeveloped countries. The changing agro-economy of the area is greatly related to its changing occupation pattern. The low involvement of working population of Uttarpara police station in agricultural sector since 1940s and decreasing percentage of workers of Serampore police station involved in agriculture are the reflection of industrialisation and urbanisation. Moreover, the emaciating trend of agricultural class of Chanditala police station also proves that this area has also come under urbanisation process. On the contrary, the highest involvement of workers of distant area in agriculture, i.e. Jangipara police station indicates its rurality.
Absorption of non-agricultural workers only of fringe area and its adjacent areas of transition zone in the secondary and tertiary sectors of Hooghly industrial belt indicates that a small urban area has its small command area or hinterland. Whereas, absorption of such people of distant area in similar work in Calcutta denotes that the bigger an urban area the bigger is its hinterland.

Nearness to the urban markets induces the cultivators of rural area of urban fringe to produce perishable commodities like vegetables, fruits, etc. Distant parts, on the contrary, are not attracted to produce perishable commodities. Paddy (non-perishable) and potato (can be stored in cold storages) are profitably grown in this area. The condition very much resembles Von Thunen's idealised landuse character. As a result paddy is the surplus crop even of marginal owners and potato is the cash crop for all the cultivators of distant area.

Marginal and small owners of distant areas cultivate their land quite intensively because they are to sustain on their small holdings. Other sources of income from industries and other services in Hooghly industrial belt make big, small and marginal cultivators, near the urban areas less interested in agriculture because agriculture is not their mainstay. They may be termed as 'pseudo farmers' as coined by Higbee (1967). Comparatively smaller holding size compelled the big owners of fringe villages (who are totally dependent on agriculture) to intensify the use of land. The contrast is found in transition and distant areas where the big owners have bigger holding size and they use their land less intensively.
Aversion of cultivators of fringe area for taking agricultural loan from government or semi-government agencies may be due to their other sources of income from industrial or tertiary sectors. The same cause also led to the cultivation of cereal crops only for domestic consumption, whereas lack of such source of income compelled the cultivators of distant part to produce surplus paddy and potato. Cultivators of transition villages also follow, more or less, the same technique of fringe cultivators. Cultivators having big holdings in transition areas also do not like to produce H.Y.V. paddy as they produce the crop for their own consumption.

Since the educated people of urban fringe and adjoining transition areas can avail of more lucrative job opportunities in industrial and tertiary sectors, they have little interest to accept cultivation as avocation. On the contrary, young educated people of distant part, having no other alternative occupation, accept agricultural pursuits with great interest. They take leading part in adopting new agricultural techniques.

Therefore, it may be said that the adoption of new technology is highly correlated to distance from the urban areas, dependency on agriculture as well as pressure of population on agricultural land. Pressure of population on agricultural land is negatively correlated with the level of agricultural development i.e. as the pressure of population increases, the level of agricultural development decreases while the former two are positively correlated (Appendix No.5.8). Other correlations were observed between distance
and dependency on agriculture, distance and irrigated area, distance and pressure of population on agricultural land. From the values of correlation, it has been proved that dependency on agriculture and percentage of area under irrigation are positively correlated with distance from urban areas, whereas pressure of population on net sown area is negatively correlated with distance from the urban areas (Appendix No.5.7).

REFERENCES


