INTRODUCTION

Development is always based on research. In our country, the importance of research in every field is great; but in the field of agriculture, it is greater, if one considers the proportion of population dependent on agriculture. Pioneer work in this field has been done by Baker (1926), Jonasson (1925-26), Taylor (1930), etc. They have studied the agricultural regions of the world and their emphasis has been on the deterministic role of physical environment on regionalisation. Reeds (1964) observed that agricultural geography had not yet advanced beyond a primitive stage of development simply because many studies had been superficial investigations of extensive areas. The past work was often limited by a shortage of published data (Henshall, 1967). The later workers, Losch (1954), Dunn (1954), Isard (1956) and others have emphasised on the locational aspects within the frame work of Von Thunen (1826). Von Thunen had two basic models: (1) the intensity of production of a particular crop will decline with the distance from the market. Greater the amount of money, labour and fertilisers, etc. greater the intensity of agricultural production. (2) The type of landuse will vary with the distance from the market. His models have been discarded by most of the later workers. Chisholm (1962) said that in the majority of cases, location in respect of agricultural supplies has very little influence on the location of the major urban areas. Losch and Isard developed a general theory embracing all the important factors adequate to explain all the main features of spatial distributions. This approach tends to concentrate attention upon what patterns ought to be rather what they are. Losch, in
particular, develops his theories regarding the nature of the ideal distributions and then seeks evidence to confirm. Isard has attempted to integrate industrial and agricultural aspects of location through landuse and, Dunn has applied locational theory, specifically, to agriculture.

With the rapid changes in the sphere of agricultural economy, a few research workers attempted to locate the causes behind this. Bartlett (1957) said that the changes of agricultural landuse pattern from typical *ladung* cultivation (i.e. long fallow cultivation) to permanent cultivation of dry fields were caused by the excessive increase of population in Java. Thomas C. Smith (1959) attributed that the increase of population seemed to have caused a reduction of the average size of agricultural holdings and thorough change of methods. Ester Boserup (1965) regarded that the growth of population as the autonomous factor making for a steady - intensification in agriculture, which in turn brings a whole host of economic and sociological changes in its train.

The changing agro-economy also drew attention of research workers on diffusion of technological development in agriculture. Hagerstrand (1953) was the first geographer who studied the acceptance of various new agricultural practices in an area of Central Sweden and showed how the innovation spreaded outwards from an initial centre. He developed a model from this study to describe the diffusion of an innovation over a space.

A good number of papers also have been published in India on agricultural landuse, its change and diffusion of technological development in agriculture. Shafi (1951) put an emphasis on land utilization survey. He
said that the aim of landuse survey is to ensure that every available piece of land in a region is used to the best advantage in relation to its intrinsic qualities that springs from its natural and cultural environments. He also made an attempt to show the volume of change in crop landuse pattern in the Ganga - Yamuna Doab (1965). Bhatia (1965) showed how a particular crop has changed its importance in the overall cropping pattern and fails to give a measure of the total change in the cropping pattern. Mukherjee (1971) showed the pattern of change in agricultural wasteland in Uttar Pradesh. Jasbir Singh (1972) showed the spatiotemporal variation in landuse efficiency in Haryana. Das (1973) studied cropping intensity and population pattern in a river basin of Bihar. The all India regional picture on different aspects of agriculture was given by Jasbir Singh (1974). Hussain attempted to delimit crop concentration regions in the Ganga-Yamuna Doab (1975) and agricultural productivity regions in the Sutlej- Ganga plain (1975). Except these regional studies, some micro-level surveys were also carried out to show the changes in agricultural landuse in a North Indian village (K. Z. Amani, 1968), and in a village of U.P. (Noor Mohammad, 1973).

For the rapid development of agriculture, innovations in agricultural sector were introduced with the hope that these will be adopted widely. But its adoption varies from region to region due to the socio-economic factors of the farmers (Bennet, 1953). To find out the variations, Noor Mohammad made a study on diffusion of fertilisers in the districts of Gurgaon and Ambala of Haryana State (1974). Shinde and Jadhav (1978) made an attempt to examine the availability of energy in terms of horse power and horse power hours and their
spatial distribution in Sangli district of southern Maharashtra. Myrdal (1968) said that a speedy and extensive change could be brought about by bringing technological changes and adoption of innovations and by formulating labour intensive schemes in various sectors. The diffusion of agricultural innovation is influenced by physical, social, economic and psychological factors to a considerable extent (Noor Mohammad, 1978).

Many descriptive studies of agricultural practices in the urban fringe - rural areas have been conducted outside India. Wibberly (1959) made an attempt to present a factual account of how the land surface of Great Britain is being used and the real effects of the competition of expanding towns for agricultural land. Higbee (1967) analysed the types of agriculture in the fringe areas. In India, Muley and Ray (1973) have concluded that urbanisation has a significant impact on farm size, pattern of farming and adoption of new farm technology. Contrary to the view, some sociologists viz., Lambert (1962), Hoselitz (1962), Mukherjee (1964) and Sen (1973) felt that cultural impact exerted by cities on villages is very small and most of the changes in the rural society in India are not influenced by urbanisation. Gowda and Mahadev (1977) examined the changing nature of agricultural practices that exist in the rural-urban fringes of Bangalore. The main focus was on the transfer of land from agriculture to urban uses, employment opportunities available for the fringe people and the distinguishing characteristics of agriculture. But the study did not discuss the diffusion of technology. Joshi (1977) made an attempt to judge the impact of urbanisation quantitatively on some characteristics of agriculture around the city of Indore in Madhya Pradesh. The present worker has come across a
very few studies in India dealing with urban influence on agricultural economy. Most of the Indian geographical studies were devoted to regionalisation of agricultural practices in a macro level. Micro level studies of agricultural scene are very much limited.

Some studies on agricultural practices in West Bengal were also carried out. Banerjee (1964) surveyed the changing crop land of West Bengal. Aparna Roy (1972) studied the landuse and major agricultural characteristics of the Damodar-Saraswati Doab. But the study suffers from lack of contemporary data. Thus the data used in the study fails to project the real picture after green-revolution in India. Bhattacharyya and De (1972) studied the agriculture in south-eastern part of Hooghly district. Chatterjee and Jana (1975) made an attempt to show the current landuse pattern of an area in and around Tarakeswar town. Datta and Datta (1980) pointed out a variation of agricultural practices with the altitudinal variation in a case study of three villages in Darjeeling Himalaya. Very few studies attempted to show the changing agricultural practices that occurred with the introduction of green revolution in West Bengal and causes of the differentiation of changes in different areas or the factors influencing the changes. These lacunae in the field of agricultural geography of West Bengal induced the author to take up the challenge in her own humble way.

Objective

With almost 80 per cent of its population living in the villages, India is basically an agricultural country. The vast rural mass tries to earn their livelihood from the land. Population of the country is increasing
very fast. It was 309,019,062 in 1941 and became about 658,140,676 in 1981. Thus, the increase was more than double in 40 years. A few big metropolitan cities have also come up in this country. Demand for agricultural products grew with the growth of population in the rural as well as in the urban areas. Thus, the old method and technique could not cope with the growing demand. In these circumstances, the technology of production had undergone gradual change. The change is evident both temporally and spatially. The temporal change tries to keep pace with the growing needs of the country and the spatial change has a close relationship with the big urban areas. Calcutta is one of the greatest metropolis of the world. The urban areas of Serampore subdivision is a small part of Calcutta conurbation of Hooghly industrial belt with an elongated rural area spreaded to the west (Fig. 0.1). Conspicuous temporal and spatial changes in the sphere of agriculture are observed in rural areas of Serampore subdivision.

With the preceding situation, the object of the study may be summarised as follows:

1. to find out the spatio-temporal changes in the inherent characteristics of agro-economy of the area,
2. to find out the factors responsible for the changes,
3. to find out the impact of urbanisation as well as industrialization on the spatial variation of agro-economy.

The survey has been conducted with the following hypothesis in mind:
more land will be involved in change near the urban areas than that of distant rural areas when general landuse is considered;

more land will be involved in change in distant rural areas than that of the areas near the urban centres when agricultural landuse is considered;

net sown area will decrease near the urban areas;

area under vegetable increases significantly near the urban areas whereas area under cereal crops increases appreciably in the distant part of the rural areas;

the adoption of developed agricultural technologies is highly related to the dependency on agriculture;

dependency on agriculture is closely related to the distance from the urban areas:

(i) people of urban-fringe villages are marginally dependent on agriculture;

(ii) people of transition villages are partially dependent on agriculture;

(iii) people of distant part of rural areas are greatly dependent on agricultural economy.

Methodology

With the preceding objectives and hypothesis in mind field-work had been under-taken in Serampore subdivision and the following methodology has been pursued.
Serampore subdivision was selected for the present study as expansion of urban areas of this subdivision is far more rapid than in other parts of Hooghly district. Setting up of industries and its expansion are the main causes for this urbanisation. The choice of administrative unit for study area was guided by the consideration of data availability and spatial comparability. In the present study of changing agro-economy in Serampore subdivision, changes have been viewed from temporal and spatial aspects. The dissertation has been divided into five chapters.

The first chapter describes the location of the subdivision and its physical environment. The second chapter depicts different aspects of population i.e. the growth of population, density, sex-ratio, literacy and some other changing socio-cultural environment of the area, like urbanisation, growth of industries as well as workers engaged in those industries, immigrant refugee population, settlement pattern, etc. All these aspects have been discussed at the subdivision as well as police station level. The changing agro-economy of the subdivision at police station level has been discussed in the third chapter. The fourth chapter represents a micro-level study which is based on the survey of villages. The detailed discussion of the total findings have been made in the fifth chapter. Lastly, a conclusion has been drawn to give a final shape of the dissertation.

Methods of collection of secondary information/data: Physical environment of the subdivision was discussed with the help of published records and topographical sheets. Police station and block-wise data for population, literacy, etc. were collected from census reports of 1941 to 1971
provisional report of 1981. Gram-panchayatwise records for population and literacy are available from census reports of 1951 and onwards. These data are available at the mouza level. One can get panchayat level data by simply adding the different mouza data. Gram-panchayat-wise population figures of 1981 were collected from different block offices of Serampore subdivision. Data for urban areas were collected from different census reports, block offices as well as from municipal offices. Number of different industries and workers engaged in them were obtained from State Government's records. Since no published record of immigrants (refugee population from erstwhile East Pakistan present day Bangladesh) is available for micro-level administrative units, the West Bengal District Gazetteers, Hooghly (1972) was consulted. Observation regarding settlement pattern is based on Survey of India topographical sheets. Ishaque's Agricultural Statistics by plot to plot Enumeration in Bengal (1944-45) and Revisional Settlement Survey record (1954-57) were consulted for previous landuse data. Ishaque's report is a published document but records of Revisional Settlement Survey are unpublished. The later is available for consultation from Land Records Office, Alipore. Both the records were collected at the police station level as these are the only available comparable administrative units. Sourcewise area under irrigation was available only from record of Revisional Settlement Survey, 1954-57 at police station level. Police stationwise data for 1980-81 regarding contemporary landuse, area under irrigation, agricultural implements, use of chemical fertilisers were collected from the Agricultural Extension Office of Serampore subdivision as well as from the office of the Principal Agricultural Officer of Hooghly district. As for other information of infrastructure like metalled
roads, markets, etc., census reports were relied on for past condition 
while for the present condition i.e. length of metalled road was determined 
from recently published topographical sheets of Survey of India with the 
help of rotameter. Information regarding number of markets and nature of 
markets were collected from the records of block development offices. Census 
record of 1961 was consulted for data of different groups of cultivators 
according to landholding size and to show the changes, the findings of the 
average from the sample study has been taken into consideration. Data for 
occupation pattern are available from 1961 and 1971 census reports. The 
block offices provided data for 1981. The base year of data depends on the 
availability of the same. All of these methods for the collection of data 
for secondary information were applied to prepare the first, second and third 
chapters of this dissertation. For the micro level survey of the fourth 
chapter i.e. for the study of sample villages, present author had to depend 
on census records of 1951, 1961 and 1971 for population figures, literacy and 
occupations and different block offices provided the similar data for 1981. 
Okardaha village was an exception. A scrutiny of the official data revealed 
that total population of Okardaha for 1981 was less than that of 1971. A 
detail household census, of male and female population was made for that 
village to check the veracity of the 1981 figure and it was found that actual 
population has increased from 1971. The literacy and occupation structure 
of Okardaha village were determined on the basis of sample household survey. 
The fourth chapter was based on primary data collected personally from the 
field except the figures for population, literacy and occupation structure of 
the villages.
Basis of sampling of villages: It would have been ideal to survey all the villages in the subdivision, but time frame of the project makes it impossible to carry out the ideal. Within the available time-span it was found convenient to sample six per cent villages to get the present picture from the micro level survey. Sampling method is purposive. Total number of villages (mouza) of Serampore subdivision is 255. Fifteen villages were selected in equal proportion from the three police stations of Serampore subdivision. One of the criteria for the selection of sample villages was distance from the urban belt (the Hooghly industrial belt). Since the belt extends continuously from north to south, the sample villages are always situated to the west of this belt. The fringe villages are selected with the assumption that even without any transport system, people can walk to the urban areas (in the present case, their place of work). The walkable commuting distance was taken as 5 kilometers which was found to be the normal practice in this area. It was observed by a preliminary survey that beyond a certain distance people rarely commute to the urban areas daily. By the same method, it was found that 25 kilometers from the urban belt was more or less the limit beyond which people do not commute daily. So, 25 kilometers from the urban belt was another limit. Villages situated beyond this limit are termed as distant villages. The area lying in between 5 kilometers and 25 kilometers from the urban belt is considered as the transition zone. The second criterion for the selection of villages was their even distribution. The villages were selected from each zone in such a manner that they also form almost an even distribution on the map. Since, the growth of urbanisation has taken place along the bank of the Hooghly river, a longitudinal urban pattern.
has developed in Serampore and Uttarpara police stations. So, the selected five urban fringe villages from this zone are aligned from north to south and are more or less equally spaced on the map in a linear fashion.

Five transition villages were selected from Chanditala police station as it happens to be in the transition zone, and five distant villages were selected from Jangipara police station. For the last two areas, more or less equally spaced villages were selected.

**Methods of data collection from sample villages:** A detail *para-wise* (village neighbourhood) lists of households were prepared for the collection of data from the villages. Each head of the family of a *para* were called at a common place of that locality to prepare a house list of that particular area. The list consists of names of heads of households, the amount of agricultural land holding of households, type of occupation of members of each household and place of their work. In this way list of each *para* was prepared. After the preparation of this list fifteen per cent random sampling was done from ten categories of each *para*. The categories are as follows:

1. landless agricultural labourer,
2. landless agricultural labourer with non-agricultural activities,
3. marginal owners (who have agricultural land up to 1.01 hectares) dependent on agricultural land,
4. marginal owners as agricultural labourers,
5. marginal owners with other occupations,
6. small owners (1.01–2.02 hectares of agricultural land) dependent on agriculture,
7. small owners with other occupations,
8. big owners dependent on agricultural land (above 2.02 hectares of agricultural land),
9. big owners
with other occupation and (10) households dependent only on non-agricultural activities*. More emphasis was given on the spatial distribution of these families (households) in order to have a representative spread of samples as far as possible. In other words, fifteen per cent households were so selected at random that they were more or less equally spaced over the total area. But 15 per cent sampling method could not be followed where household belonging to any category is very small in number. In that case, all the households of that category or as many as it could be taken were considered with a view to have average of each group separately.

The sample household survey was carried out to find out the age structure, their period of living in that village (to find out migration and immigration), level of education, places and types of their occupation, approximate income from those occupations, types of agriculture they practise, distance of their agricultural fields from the homestead, types of agricultural field (shali or suna), cropping pattern and system of irrigation of those fields, adoption of new technology, possession of agricultural implements, use of other land at their disposal, the time of their shifting from agriculture to other occupation, markets they use, how many months the agricultural labourers get work in agricultural field.

Lastly, a detailed history of the village regarding the migration, immigration, market facilities, development of communication, increase and decrease of popularity of different crops with causes, marketable produces of

* The figures of agricultural land holding of marginal owners and small owners are based on the Agro-economic Research Centre of Visva-Bharati and the households having more than 2.02 hectares of agricultural land are termed as big owners. In the present study, landless agricultural labourer are literally so.
the villages and markets they favour, the agricultural practices in general of the villages were collected from the responsible persons of the respective villages.

**Landuse survey:** Prof. Stamp's survey of Great Britain (1950) was adopted for the present work with some modifications for the landuse survey. The survey of Great Britain was a collective work of a large team of workers, but the present work was carried out by a single person. This necessitated some modifications. The method followed was - firstly, the landuse maps were prepared from the current assessment records by using different shades on the cadastral maps of 1954-57 to show different landuse categories and area of each plot was also collected from the same record. Boundaries of each plot was also collected from the same record. Boundaries of each plot were made upto-date with the help of the present working sheets prepared by *amins* (surveyors) of respective settlement offices. Then the map was divided into a number of blocks and from the centre of each block, certain agricultural plots were selected and the names of the owners of those plots were collected from the assessment record. Names of those owners were also enlisted at the time of conducting the sample survey and after that went to the field with the concerned owners and enquired from him about the types of crop he had produced in those plots during the year (1980-81) and what were the crops in other adjacent plots during that period. In this way the total crop landuse map of the village was prepared. The assessment records of 1954-57 of the relevant *mouzas* (villages) were consulted to ascertain the previous landuse to prepare a crop-landuse and general landuse map of the *mouzas* for 1954-57 by plot-wise shading. As the time was limited, it was not possible to collect
plot-wise area as was done for the present landuse survey. The village-wise record for 1944-45 was not available, so it was not possible for the present worker to prepare the landuse map of that period when village level survey was considered.

**Cartographic methods:** Different common cartographic methods were applied for the preparation of maps and diagrams. The maps that deserves special mention are the ones showing landuse changes. These maps showing landuse change at village level were prepared on the basis of superimposition method. At first, the landuse map of 1954-57 of a village was prepared with different symbols for different landuse categories like (1) agricultural use consists of cultivated land, (2) miscellaneous trees and orchards - include bamboo groves, betel-vine, mango, banana and other fruit gardens, etc., (3) non-agricultural uses include settlements, industries, bhilies, religious places, play grounds, cremation or burial grounds, dunghills, etc., (4) fallow - consists of current and old fallow, (5) culturable waste land includes jungle, threshing ground in the agricultural fields, etc., (6) water bodies include tanks, ponds, bils, etc., (7) rivers and canals, (8) metalled road, (9) unmetalled road, (10) railway line, (11) embankment and (12) ditch. After the preparation of the same, the map was superimposed on the present landuse map of 1980-81 and the changed areas were marked with different shades in black and white and unchanged portions were shown with the help of different colours. Two indices were prepared - one to show the changed uses and the other to show the unchanged uses.
Methods of data analysis: Different statistical methods were applied for analysis of data. But Serampore-Uttarpara block data presented some difficulty, as it is not comparable with the older administrative units. So, to give a comparative shape to the present block level data, the following method was adopted. All the present records of 1980-81 specially for landuse and agricultural land use are available at block level. Serampore and Uttarpara police stations excluding municipal urban areas form one block namely Serampore - Uttarpara block, whereas the landuse data for 1944-45 and 1954-57 were at police station level. The present worker interviewed older residents and knowledgeable persons of urban areas to ascertain different present landuse categories within the municipal areas and added those to the present block-level data. Data of 1944-45 and 1954-57 of Serampore and Uttarpara police stations were added to make it comparable with the present data.

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