Chapter IX

SUMMARY AND CONCLUSION

9.1 Summary

Chapter I deals with introductory aspects of the central theme of the study, containing the statement of the problem, objectives, research questions, database and methodology, review of relevant literature on the line and also organization of the work. It is important to note that various sources of maps and other primary and secondary information and methods of collecting primary and secondary data are clearly mentioned in the chapter. Besides, a brief review of works on Agricultural geography done by different scholars and geographers in International, national, regional and local levels is also made here.

Chapter II deals with general geographical description of the study area. The first part of this chapter covers physical background, mainly location, physiography and drainage, climate, soil and vegetation; while the second part is devoted to analyse the themes on cultural environment of the study area like population and ethnic structure, settlement and land revenue administration, transport etc. From this chapter it is observed that the study area, i.e. Sonitpur district of Assam is a north bank plain administrative district of the Brahmaputra valley situated within an elevation range of 80 m to 150 m above MSL. The region is composed mostly of recent alluvium of tertiary origin, with occasional outcrops of older alluvium representing red soil pockets locally known as red bank soil. The region is interspersed by a number of swift flowing streams, all of which are tributaries to the Brahmaputra. Apart from the river Brahmaputra, a number of tributaries like Jia-Bharali, Gabharu, Depota, Bargang and Buroi cause periodic floods over considerable areas along their banks. Fast depletion of the deciduous forest belt along the northern periphery of the district

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together with the removal of aquatic plants in the *chars* and *chaparis* exert considerable effect on weather, particularly in the distribution of temperature, humidity and rainfall. The effects of floods and deforestations are observed to be manifested in various ways in the agricultural economy of the region.

The population of the study area records 228.84\% growth over the last half century (1951-2001). Dhekiajuli circle registers the highest proportion of population and Tezpur circle represents the highest population density as per 2001 census. With only five urban centers, with a total urban population of 175794 persons majority of the population (89.54\%) inhabit over the rural areas with an agrarian economic base. Agriculture is the main occupation of the study area with 48.68\% of the total work force engaged in this economic sector. The region has 18 km of National highways, 38 km of state highways and 160 km of railways with an average motor able road density of 42.0 km / hundred square km of area. The rural earthen or matelled roads, even at present served as main arteries of movement of both people and goods to and from the remote rural settlements. In fact this semi modernized fabric of transport serves as the life line for agricultural growth of the district.

The history of land revenue administration of the district dates back to 1886 with the introduction of Assam Land Revenue Regulation Act by then colonial British administration. The acceptance of monetary revenue system by the peasants and inhabitants of the district abandoning the earlier practice of revenue payment in kind had to confront a period of turmoil till the early part of 19th century. This period of turmoil encouraged a considerable proportion of Bangladeshi (erstwhile Pakistani) immigrants to intrude into and to settle over several parts of the district, particularly in to the reverine tracts under the patronage of then British administration. Thus, the history of land revenue administration during the British era maintains a close
relationship with the history of immigration into the region. Further, traditional proprietary rights of certain Arunachali tribes over a vast tract along the northern periphery of the district influenced both settlements and agricultural economy of the district, not only during the pre-British and British period, but also till the sixties of the 20th century. All these aspects of the land revenue administration have considerable bearing in the early growth of agriculture of the district till 1960s. It is only after 1960s, when a peaceful socio-economic environment was started emerging, providing a stable base for the present day pattern of agricultural growth and development.

In the Chapter III, a discussion on general land use pattern of the district and changes in different land-use categories over the last two decades is made. It is observed that Biswanath circle has the highest proportion of net sown area (65.07%) in relation to total geographical area. Tezpur, Chariduar, Biswanath, Helem and Gohpur circles record a substantial reduction in net area sown over last two decades. Tezpur, Naduar and Biswanath circles have significant proportions (2.66%, 1.90% and 1.89%) of fallow land. Further, Tezpur circle has highest proportion of land not available for cultivation (32.31%). As regard forest land, Chariduar (44.86%), Naduar (36.14%) and Dhekiajuli (28.80%) circles occupy first three ranks. In fact, all these circles cover a significant proportion of govt. reserve forest along their northern peripheral belts. Again, Biswanath, Tezpur and Dhekiajuli circles possesses a considerable proportion of other uncultivated land.

Chapter IV deals with the spatio-temporal variation in cropping pattern, intensity of cropping, concentration of major crops, and diversification of cropping over the last two decades in the study area. It is seen that Gohpur circle of the district registers highest proportion of area under food grains (73.17%). Naduar ranks first in
terms of proportion of area under pulses (3.70%), while the Biswanath circle registers the highest proportion of area under horticultural crops like fruits, vegetables and nuts (21.81%). In case of cash crops like tea, Chariduar records the highest proportion (42.48%). An observation on the growth pattern of crop area over last two decades indicates that Naduar records highest growth of area under food grains (12.46% growth) followed by Dhekiajuli (10.10%). In case of cash crops, Gohpur registers highest growth (8.63%) followed by Helem (6.35%). Horticultural crops represent a growing trend in Tezpur circle (14.17%) followed by Naduar (6.35%). As regards cropping intensity, except Dhekiajuli circle all the circles represent lower strength. Among the circles Dhekiajuli circle ranks first recording 131.68% cropping intensity. This is followed by Tezpur (124.30%), Naduar (121.54%), Gohpur (117.22%), Biswanath (109.85%) and Helem (109.16). A visible growth of cropping intensity is found in all the circles under Tezpur sub-division, excepting the northern peripheral Chariduar circle. Such a growth in the western and central parts of the district indicates that commercialization of agricultural activities is faster in this part, as a significant positive correlation is exist between cropping intensity and market frequency. As regards concentration of rice it may be noted here that rice being the staple food of the area and due to homogeneity in soil and climatic condition it is cultivated in almost all parts of the district. However, statistical analysis reveals that rice concentration with L. Q. value 1-1.50 is found in the central and extreme eastern part of the district. As regards cash crops, Helem registers highest concentration, while in case of fiber highest concentration is found in Dhekiajuli circle.

So far crop diversification is concerned, almost all the circles recorded diversified cropping pattern. In subsistence economy, peasants used to cultivate a large number of crops depending on their need for consumption. There is nominal
spatial variation in respect of crop diversification, because peasants from general caste or tribal communities cultivate at least 8 to 10 crops in an agricultural year. In case of crop diversification, the Biswanath circle ranks first (8.79) followed by Helem, Naduar, Tezpur & Dhekiajuli and Gohpur. In the intensive agriculture, greater diversification of crops being an indicator of agricultural modernization, it may be noted that Biswanath circle maintains a relatively higher growth prospects.

Chapter V is concerned with trend of productivity of different crops along with spatial pattern of agricultural productivity in Sonitpur district. It is seen that spices, pulses, rice, oilseeds and fruits exhibit substantial improvement in productivity over the last two decades. While sugarcane, wheat and vegetables record a declining trend. This is mainly attributed to the impact of market on productivity.

The overall agricultural productivity index reveals certain interesting facts. In terms of growth status, Biswanath, Dhekiajuli and Helem respectively represent the 1st three ranks. It may also be noted that these circles are predominately inhabited by Muslims of immigrant origin and Nepali population. Tezpur, Gohpur, Naduar and Chariduar circles with lower productivity index are predominately inhabited by indigenous tribal and non tribal population. It is quite likely that, ethnic composition of the farm community in various circles have clear relationship with overall agricultural productivity.

Chapter VI is concerned with level of adoption of innovative agricultural practices like use of irrigation facilities, fertilizers, mechanization in agriculture, and introduction of non traditional crops including HYV to agriculture and development of market and transport infrastructure etc. by the farmers of different revenue circles of the district. It is seen that Biswanath, Tezpur, Helem and Gohpur record a very insignificant growth in irrigation facilities, which has considerable negative impact
over the agricultural development particularly in Biswanath and Gohpur sub-divisions of the district. Use of chemical fertilizers by 71% farm families is a good sign of agrarian modernization in the district. The Biswanath, Naduar, Tezpur and Dhekiajuli circles with more than 70% farm families using fertilizer represent a notable thrust towards raising productivity and modernization, while Gohpur, Helem and Chariduar with comparatively low proportion of farm families accustomed to the use of chemical fertilizers represent greater adherence to traditional agricultural practices. Again it is observed that, Biswanath circle registers highest degree of modernization, followed by Dhekiajuli circle. The agriculture of Naduar and Tezpur circles are moderately mechanized, while Chariduar, Helem and Gohpur register lowest degree of mechanization. It is important that extreme eastern and foot hill regions exhibit more self sustaining character in agriculture as compared to the central and western areas of the district as revealed by the use of fertilizer and mechanization. The circle wise mean size of farm maintains significant bearing in this regard, as greater proportion of marginal farms diminishes the scope for better mechanization.

Introduction of non traditional high market value crops including HYV to agriculture of the region is of recent emergence. The Dhekiajuli and Biswanath circles with greater proportion of immigrant agricultural Muslim peasants lead in the use of HYV rice such as Mala, Joya, Ranjit, Masuri, China-63, IRRI etc. Such HYV rice account for 86.05% and 77.30% of total rice area of the circles. Further, small scale commercial tea plantation, banana, sunflower, citronella, Mithapatti betel leaves and aromatic plants are observed more or less in all the circles of the district.

The analysis of market infrastructure reveals that the frequency of agricultural markets impart significant impact both on productivity and cropping intensity of the study area as compared to market density. Likewise, productivity and cropping
intensity are influenced by road connectivity rather than by better market accessibility.

Chapter VII deals with participation of different social groups of the district in agricultural development. Here, main focus is given on community reflection in cropping pattern and attitudes of different social groups towards innovation. It is clearly visible that rice is the predominant food crop among all the social groups in the district. Besides rice, the indigenous general caste population group produces significantly high proportion of marketable pulses. But in case of other crops they maintain a self subsistence character. It is seen that mechanization and innovative agricultural practices make significant inroad in to the agricultural landscape of the community. One important aspect regarding agricultural innovation is that, this community devoted highest proportion of area to the cultivation of nontraditional high market value crops. Among them small scale tea, commercial production of banana, citronella and most importantly the *Mithapatti* betel leaves is important. It is found that introduction of *Mithapatti* to agricultural landscape is a very recent phenomena. There is a great demand for this item as each and every families of the district consume betel leaves with lime and areca nuts.

The indigenous Scheduled Tribes produce substantial proportion of marketable sugarcane, pulses and oilseeds, while Scheduled Caste population have interest in cultivating sugarcane on a commercial basis next to rice. Poor interest in mechanization and agricultural innovation among the farmers of both the community results a slow agricultural growth.

The immigrant Muslims exhibit commercial interest in cultivation of vegetables, pulses and oilseeds. With high degree of mechanization and innovative practices, this community is treated as highly commercially motivated agricultural
community of the district. They are highly sensitive towards the new developments and prospects towards enhancing productivity and cropping intensity.

The priority crops of Nepali immigrant community are oilseeds, maize and vegetables next to rice. With poor degree of mechanization and innovative practices this community also maintains a subsistence character with a traditional commercial interest in the production of oilseeds, wheat and maize.

Chapter VII discusses the spatial pattern of agricultural development in Sonitpur district. Here, the level of spatial differences in agricultural development is analyzed by using index of physiological density, Z scores and Principal component analysis. It is observed that Naduar circle has higher level of agricultural modernization, diversification and infrastructural development along with a moderate range of commercialization and innovative practices in agriculture. Because of moderate degree of commercialization and innovative agricultural practices, the circle is placed under the moderate level of overall agricultural development. The Dhekiajuli circle registers high level of infrastructural development, modernization and diversification of agricultural activities and a moderate level of commercialization and innovative practices. It is due to high level of infrastructural development and agricultural modernization the circle exhibits higher level of overall agricultural development. The Tezpur circle registers high level of modernization and agricultural diversification and moderate level of infrastructural development, commercialization and application of innovative practices. All these aspects place this circle in the moderate range of overall agricultural development. The northernmost Chariduar circle records lower degree of agricultural modernization and diversification and high degree of infrastructural development commercialization and innovative practices. Because of low level of modernization and diversification, this circle is placed under the lower
level of overall agricultural development. Due to high degree of modernization, diversification and commercialization of agricultural activities along with higher application of innovative practices and moderate range of infrastructural facilities, the Biswanath circle registers it as highly agriculturally developed. The Helem circle registers poor infrastructural facilities and moderate range of diversification in agriculture and high degree of commercialization and application of innovative practices. Poor modernization and infrastructure place Helem circle in the lowest category of overall agricultural development. The Gohpur circle with poor infrastructural facilities, commercialization and application of innovative practices and moderate level of modernization and diversification is identified in the lowest category of overall agricultural development.

The broad observations made in the central theme of work in the study area are, thus, summerised as stated below.

- Physiography, bank line migration of rivers, flood, volatile political situation of the past, history of land revenue administration, gradual depletion of forest cover, entry of agricultural immigrants since the beginning of 20th century and fast growing population exert visible impact upon the present day agricultural growth and development in the region.

- Except the Naduar and Dhekiajuli circles the entire study area encounters with the problem of gradual reduction of net sown area. The areas in the east of the Jia-Bhalali river maintain higher degree of crop diversification as compared to the areas west of the river. Commercialization of agricultural activities registers higher growth in the central and western parts of the district covering the entire Tezpur sub division, which represents higher market frequency too.
• Crop Productivity indicate slow rate of diversion of agricultural economy of the district from subsistence to market oriented. This indication can be traced from the change of crop productivity over the last two decades. It is also noted that agricultural productivity maintains a clear relationship with ethnic composition of agricultural community, i.e. higher the concentration of agricultural population of immigrant origin, higher is the degree of productivity and vice versa.

• Study on the adoption of HYV crops, use of chemical fertilizers, and modern farm implements reveal that the westernmost revenue circle of the district, i.e. Dhekiajuli and the centrally located Biswanath circle have recorded substantial positive change over the last two decades with a prospective positive growth thrust in the near future.

• Conservative agricultural practices still persist with poor degree of modernization, an indication of economic growth aspirations in non-agricultural activities. In modernization too, ethnic composition of the agrarian population maintains a clear reflection, as higher degree of modernization is obtained in circles with higher concentration of immigrant origin population. The growth of market and transport infrastructure as observed in the work is mainly confined to the western and central parts of the district.

• The agricultural behaviour of different ethnic groups engaged in agricultural activities of the district indicates that indigenous general caste community are the main contributor of the major parts of marketable surplus of rice, though they maintain a self subsistence character in all other products. The diversification of cropping represented by this community are confined mainly to introduction of high market value crops like small scale tea, commercial
banana, citronella, sunflower, etc. On the other hand, the indigenous scheduled caste and scheduled tribe communities represent subsistence character in the production of rice and contribute substantially to the marketable surplus of sugarcane, pulses and oilseeds. The Muslims of immigrant origin exhibit high sensibility to market prospects. Accordingly, they make use of all possible avenues of modernization for securing better production and high market value of a variety of crops ranging from oilseeds to vegetables. The only agricultural community, which maintains more or less all-round subsistence character, is the Nepalese. They contribute negligibly to the agricultural surplus of wheat, maize and oilseeds.

- Spatial variation of overall agricultural development based on existing infrastructural status, modernization and diversification, commercialization and innovative practices clearly delineate the Sonitpur district of Assam into three major development zones, namely a) Highly developed: Dhekiajuli and Biswanath, b) Moderately developed: Tezpur and Naduar and c) Lowly developed: Gohpur, Helem and Chariduar. Thus this areal development status can be used as a basis of future agricultural developmental planning. Further, the thrust areas for agricultural development in the district on priority basis are:
  i) Agricultural modernization and diversification.
  ii) Commercialization and innovative practices in agriculture, and
  iii) Infrastructural development.
9.2. Conclusion

The observations made in the work provide not only the present growth and development status of agriculture in the Sonitpur district of Assam, it also pulls out certain post-observational ideas that needs the attention of both the future planners and researchers. These ideas are outlined below in the form of observational side lines or suggestions for someone’s consideration.

The following suggestions are recommended for improving the existing land-use system that may definitely help in a balanced agricultural growth of the district –

i. Significant proportions of fallow lands available at Tezpur, Chariduar, Biswanath, Helem and Gohpur circles maintains scope for their future utilization in agriculture through implementation of innovative practices and suitable crop choice.

ii. Significant proportion of barren and uncultivated lands in Tezpur, Biswanath and Gohpur circles maintain scope for bringing such areas under agriculture, which needs a cause prospect study.

iii. Considerable proportion of wet lands in Biswanath, Tezpur and Dhekiajuli circles maintain scope of extension of agricultural activities in to such areas through the implementation of sophisticated techno-economic projects.

In order to have a balanced cropping pattern in the district special attention should be placed on the following points.-

i. There is a need to increase the area under food grain cultivation in Helem, Dhekiajuli and Chariduar circles, and pulses and oilseeds cultivation in Tezpur Chariduar, Helem and Gohpur circles.
ii. There is tremendous scope for cultivation of horticultural crops like fruits, and flowers including orchids in the northernmost Chariduar circle, and in the northern narrow peripheral foot hill belts of the district. As relief, soil, climatic conditions of this belt provide sufficient sites for raising such crops.

iii. Special attention is to be given to increase the cropping intensity in almost all the circles of the district. There are very urgent needs of cultivating sufficient rabi crops by using irrigation, fertilizers, machineries etc. mainly in rice fields during winter period when they remain uncultivated. This can help not only in increasing the intensity of cropping but also can upgrade the general economic status of the farmers.

iv. More diversification of cropping is necessary in Tezpur, Dhekiajuli, Gohpur and Chariduar circles. It is important that to meet the internal demand of various agricultural products, farmers of these circles need to cultivate variety of crops for achieving higher financial return.

The following points are suggested for enhancing the productivity of the region.

i. There is a better scope for commercial production of spices and pulses in the area.

ii. The demand of sugarcane and local sugarcane products need to be increased in the study region. For this establishment of small scale agro based industries depends on such products is highly necessary. There is no doubt that the task needs special incentives from govt. and govt. undertaking enterprises.

iii. The vegetable cultivation of the area needs a special commercial thrust.
iv. Tezpur, Helem, Naduar and Chariduar circles need special packages for enhancing overall agricultural productivity.

For the development of agricultural technology and adoption of innovative agricultural practices in the study area the following steps can be adopted.

i. The Biswanath, Tezpur and Gohpur circles need well framed strategies for development of irrigational infrastructure. All these circles are well drained by a number of rivers with sufficient discharge, so there are high prospects for cannel irrigation from these rivers.

ii. The Gohpur, Helem and Chariduar circles need much importance on application of fertilizers in agriculture. In this context the farmers may motivated to the use of organic manures like Vermi-compose, which is well effective and eco-friendly. The agricultural products based on such organic manures have great market value also.

iii. Special incentives should be given to the peasants of these circles for agricultural mechanization, especially towards the use of tractor, power tiller, pump-set, modern implements etc. In this regard the state owned agricultural department can play important roles.

iv. Consolidation of small sized agricultural fields is very essential for the smooth and economic implementation of various mechanical inputs and innovative measures in agriculture of the district.

v. There is a need to motivate the farmers of the district towards the use of HYV seeds. Besides, Tezpur, Chariduar, Biswanath and Helem circles have better prospect for cultivation of high market value crops like small scale tea, commercial banana, citronella, Mithapatti betel leaves etc.
In order to improve the existing cropping pattern and changing the attitudes of different social groups towards agricultural innovation, the following steps are very essential

i. First of all any agricultural development programme for the district needs multi-facet growth incentives strategies.

ii. The Scheduled Tribes, Scheduled castes and Nepali community need commercial motivation in the production of oilseeds, pulses, wheat, maize and vegetables and mechanization and innovative practices in the production of these crops.

iii. The indigenous general caste population needs incentives to devote more in commercial crops like tea, citronella, banana, sugarcane and pulses with enhancement of mechanical inputs and innovative practices.

iv. The Muslim community of immigrant origin needs incentives for commercial production of oilseeds, jute and vegetables and intensive production of rice.

The following action plan would be useful for agricultural development in the region-

i. The Chariduar circle significantly needs a thrust towards modernization and diversification of agricultural activities

ii. The Gohpur circle needs a thrust towards commercialization of agriculture and application of innovative practices.

iii. Again Helem and Gohpur circles need special attention in improvement of infrastructural facilities.

iv. On the basis of the findings the basic observation is that overall agricultural development as well as agricultural modernization and diversification needs lowering of physiological density under existing
land use and cropping pattern. Here it may be noted that either the net sown area is to be increased for lowering the physiological density or a substantial proportion of workforce is to be channalized to other non agricultural occupation, lowering the agricultural dependency and keeping the physiological density unaltered.

The present work unfolds many areas of Agricultural Geography, that warrants serious attention of the researchers and planners. These areas are mainly –

a. Bank line migration of streams and its impact on agricultural economy and productivity of the study area.

b. Agricultural prospect in the periodic and perennial flood zones of the district.

c. Market and corporate control on modernization of Agriculture in the study area.

d. Evaluation of traditional community skill based cropping strategy and many others.

Thus, the present study is considered as a portrait of the existing agricultural growth and development scenario of Sonitpur District of Assam and also as a vehicle for dispensing out the problems confronted by the agricultural community of the district.