1.1 Background of the Study

There are broadly two ways through which agricultural production in an economy can be increased- a) expansion of cultivable area and/or b) more productive utilization of land already under cultivation (Bezbaruah, 1994). But mainly due to the inelastic nature of supply of land along with higher population pressure on it, the scope for increasing agricultural production through expansion of cultivable area has become very limited. Therefore, the higher growth of agriculture is to be realized through more productive utilization of land already under cultivation where mechanization of agriculture has significant role to play. Agricultural mechanization can contribute to agricultural production by helping in timely cultivation, maintaining quality of operation, increasing productivity of land and labour, reducing cost of cultivation and risks of weather and non-availability of labour etc. (Singh, 2006 and Singh, 2011). Mechanization of farm operation also reduces unhygienic farm operation and the drudgery for human labour (Singh, 2011). Further, mechanized farming increases the overall employment opportunities by increasing area under cultivation, development of different agro-industries, multiple cropping and other related services (Singh, 2011).

Presently, mechanization has assumed importance in Assam’s agriculture at least on two counts. First, better tilling of land through mechanized ploughing can increase crop productivity. Mechanized farming also reduces land preparation time for planting crops. This can facilitate increasing cropping intensity (number of times the land is cultivated in a year). Secondly, it has been observed that with the spread of education, the new generation in the farm households is becoming less willing to take up the backbreaking work of manual agriculture (Kuri, 2003). But the poor cultivators are not able to purchase costly machineries like tractor, power tiller, combine
harvester etc. (Singh, 2011). Moreover, a large proportion of agricultural holdings in Assam are too small to fully utilize agricultural capital goods. For instances, a standard pumpset for irrigation can irrigate up to two hectares just in a day whereas the average size of the holdings in Assam was only 1.10 hectares as per Agriculture Census of Assam, 2010-11. Again, with a standard power tiller, a farmer can plough nearly two hectares of land in just a day. In the context of this mismatch between farm size and capacity of most of the agricultural capital goods such as a tractor, a power tiller or a pump set, a rental market of such capital goods can play an important role in mechanization of farm operation in Assam. If such rental markets function, the owners of such capital goods can lease out their excess capacity which will improve the returns on their investments on capital goods. On the other hand, those who cannot afford to invest in such capital goods can still mechanize their farm operation by hiring-in such capital goods. There are evidences of using of farm machinery like tractor through hiring-in by the small and marginal farmers (Kumar et al cited in Singh, 2011). In other words, a rental market functioning without a great deal of imperfection can improve efficiency by increasing agricultural production and utilizing agricultural capital goods in a fuller manner. In this context, such a rental market can play a similar role as the land lease market (Ray, 2011). Additionally, reduced dependence on draught animals will save the farmers’ some amount of investment on such animals and at the same time ease pressure on grazing resources.

The proposed study therefore aims to investigate the working of such markets and their impacts on agricultural productivity and production in Assam agriculture.

1.2 Objectives, Research Questions and Methodology

1.2.1 Objectives
The specific objectives of the proposed study are-

a) To examine the extent of rental markets of agricultural capital goods in Assam.
b) To examine the characteristics of market participants.
c) To examine the rental rate structure and the determinants of the rental rates.
d) To examine the impacts of rental markets of agricultural capital goods on agricultural productivity and production.
e) To suggest policy for more effective working of rental markets of agricultural capital goods.

1.2.2 Research Questions
The first research question thrown up by the review of literature is whether the emerging rental markets of agricultural capital goods have substituted the pending agrarian reforms especially related to consolidation of land holdings.

Another research question is how access to different forms of finance influence ownership and/or hiring-in of agricultural capital goods. It may be expected that access to institutional credit encourages ownership of capital goods whereas access to even non-institutional credit may encourage hiring-in of capital goods.

1.2.3 Methodology
1.2.3(I) Data Source and Sample Design
Available secondary data has been used for preparing the statistical background of the study. For economic background of Assam and present state of agriculture of it along with its comparison with All India level, data were collected from sources like Directorate of Economics and Statistics, both of Assam and India, Department of Agriculture of Assam, the Planning Commission (Government of India), Department of Agriculture and Cooperation, Government of India, various issues of Statistical Hand Book of Assam, Economic Survey of Assam of various years, Agriculture Census of Assam, 2010-11 and other relevant sources.

Overview of Irrigation status has been done using data collected from Input Survey of Assam for the periods, 2001-02 and 2006-07,

Discussion on the use of agricultural capital goods has been made on the basis of data collected from Input Survey, Assam for the periods 1996-97, 2001-02 and 2006-07 and Input Survey, India for the periods 2001-02 and 2006-07. Lack of availability of up to date data caused to use some quite old data in the present study. Besides, data were also collected from relevant sources like published works etc. for the overall study.

But core of the study is based on primary data. For the collection of primary data, the sample was selected using a multistage sampling design. At the first stage, three districts from three agro-climatic zones were purposively selected from Brahmaputra Valley with due consideration to factors such as extent of mechanization and geographical representation. In the second stage a total of nine villages, three from each district, were selected. At this stage data were collected mainly about the basic infrastructure related to agriculture and the nature and size of rental markets by interacting with the village headman and other informed sources. From selected villages not less than 7.5 percent of farm households subject to minimum 15 households were surveyed. Thus, a total of 232 sampling units were selected for detailed investigation.

1.2.3(II) Outline of the Analytical Framework

As secondary data has provided only a broad picture of present state of agriculture in the state and status of use of agricultural capital goods along with its comparison with All India level, objectives of the study have been fulfilled using primary data. In order to fulfill the first objective, extent of rental markets in terms of farmers’ participation has been examined by measuring Market Participation Rates by both implement and location using primary data. Study has also been done on the proportion of owners of capital goods participated in rental markets of such capital goods. Further, spatial extent of such markets
has been checked in terms of proportions of hirers from different sources by distance.

The second objective of the study has been addressed by examining proportionate participation in rental markets by farm size, educational attainment and caste. Percentage distributions of lessees and lessors by farm size, educational attainment and caste have also been examined.

To see the rental rate structure of ploughing machineries, average rental rates for villages have been calculated for concerned machineries. Thereafter, extents of variations of rental rates of these machineries have been examined in terms of coefficient of variations across both villages and households. Further, factors affecting rental rates of agricultural machineries have been determined using regression model discussed in details in chapter-5. Formulation of regression models have been supported by the information derived from literature review and field.

Impact of rental markets of agricultural capital goods on agricultural productivity and production has been studied by calculating average values of productivity, cropping intensity, crop diversification of different farmer groups by their market participation status and use status. Further, the impressions derived have been ascertained using appropriate regression analyses.

Fulfillment of the fourth objective of the study has given the answer of the core research question up to some extent. For completing the answer of it, overall and size group-wise beneficiaries from emergence and functioning of rental markets of agricultural machineries have been examined. Besides, Fisher’s $t$-test has been used to validate some of the ideas derived.

The other research question has been answered by checking the impact of access to credit in use of agricultural capital goods and role of borrowings by form in procuring and hiring-in of them. For these
analyses, cross tabulation and suitable regression analyses have been used.

1.3 Layout of the Report
The whole study has been covered in eight chapters. Followed by this brief introduction a review of literatures has been done on factors markets in agriculture along with an appraisal of the programme of consolidation of holdings in India as a solution to small and fragmented land holdings in chapter-2. Then the significance of emerging rental markets of agricultural capital goods has been discussed. A brief background about Assam, agrarian structure and status of use of agricultural capital goods in the state has been discussed in chapter-3. In chapter-4, procedure of field study, locations selection and sample selection along with collection of data, a description of field study locations and a preliminary discussion on rental markets of agricultural machinery and its various aspects have been incorporated. Chapter-5 to 7 reports the analytical findings from use of primary data and the inferences thereof. The concluding chapter presents a summary of the findings and reports the broad conclusion and policy implication extracted from the findings.