CHAPTER 2

2.1 HISTORICAL BACKGROUND OF AGRICULTURE IN INDIA

Agriculture in India is a traditional way of life which for centuries has shaped the thought, outlook and culture of the country. In the present study, agriculture has been divided into three parts namely 1. Agriculture in Ancient India. 2. Agriculture in Medieval India and 3. Agriculture in Modern India.

2.1.1 AGRICULTURE IN ANCIENT INDIA:

Agriculture is often called the mother of civilization (Anonymous. 1980). It is closely interwoven with the progress of culture, because it was the taking up of agriculture that made it possible for the primitive man to live in selected spots, forming a society and growing a significant portion of his food nearby. This enabled human being to find a certain amount of leisure to create the initial ingredients of what is known as civilization. Thus the revolution brought by the knowledge of agriculture is the first revolution in human civilization and is called agricultural revolution.

(i) PLOUGH AND WHEELED CART INVENTION: Cultivation in any form was unknown to them. The forest provided them not only with the major source of food but almost all their material requirements. Major change took place as man invented the plough and wheeled cart. With the help of bullock drawn plough, man cut the jungles and conquered the hard soil. The rich alluvial soil started yielding bumper crops of wheat. The plough gave place to the field, and agriculture really began. In fact, the plough heralded an agriculture revolution just as the tractor is used in the present century.
(ii) **INVENTION OF POLISH STONE AXE** :- The invention of polish stone axe was an important tool which enabled man to obtain a foothold in the forest. Very often, man used fire for burning forest. When the forest clearing was done, man started cultivation of crop and grain of cereals were dibbled with the aids of pointed stick. Later on, stone hoe with wooden handle were invented. These primitive people carried out a primitive type of agriculture. The system of nomadic shifting cultivation gave way to cereal fallow system in which irrigated farming started to develop.

(iii) **DOMISTICATION OF ANIMALS** :- Man learned to supplement his own physical capability with that of domesticated animals. Domestication of goats, sheeps, cattle and animals took place in the pre-agricultural phase. This indicated that there was a close link with agriculture. The development of animal husbandry without crop raising is impossible. This fact was proved from archaeological excavation which showed that animal husbandry and agriculture occurred together. Domesticated animals provide man with food in the shape of meat, milk and also power in helping in ploughing. Thus, domestication of plants and animals was the foundation of civilization.

(iv) **ARCHAEOLOGICAL EVIDENCES** :- Evidences of agriculture in the Indus Valley and others which come under the influence of Harappan Chalcolithic culture from rock-carving, caves and rock-engraving illuminated a detailed picture that agriculture and man's civilization go hand in hand. Records of travel - accounts of foreigners and scholars who came to India as well as sculptures, excavations and paintings also provide clear evidence of past agriculture.

2.1.2 **AGRICULTURE IN MEDIEVAL INDIA** :-

There was a natural expansion of agriculture resulting from an increase in population. This led to the progress of agriculture due to
technological improvements. The discovery of the new world by Christopher Columbus opened up a new source of plants and crops which enriched the agriculture of the old world. Crops and plants such as groundnut, tobacco, potato, chilli, guava, cashew nut, pineapples, etc. were introduced by the Portuguese. Different varieties of crops were grown in India. Therefore, these newly introduced crops and fruit enriched the agriculture of India.

(i) **INVENTION OF PAPER AND PRINTING**: The invention of paper making in the year 105 A.D. by T'sai Lun of China was a great landmark for the spreading of knowledge to Central Asia and Europe. This radical development which took place in Europe in the fifteenth century led to the invention of printing. As a multiplier of knowledge, the printing press promoted literature and science. Credit goes to Johann Gutenberg of Mainz in Germany for the invention of printing in 1439 and its conversion into a practical art and a productive industry. The invention of both paper and printing machine have created a revolution in writing and printed documents. Writing became easy and popular. Preservation and tranporation also became much more convenient. As a result of this production of multiple copies of documents through printing could reach to different corners of the world through travellers and explorers, etc. making knowledge available to people of different lands. The potential value of paper and printing became prominent during the nineteenth century and opened communication channels for future. The printed books enforced an intellectual habit of sequential thinking and that resulted in modern science and technology.

(ii) **PRINTING IN INDIA**: Credit for the introduction of printing in India goes to the Portuguese. The first printing press was established in Goa in 1556 by John de Bustamante, a Spaniard. Between 1556 and 1674 more than hundred books were printed in Goa. The printing industry also contributed to the development of science.

(iii) **BIRTH OF SCIENCE**: The economic and technological change in Europe between fifteenth and seventeenth centuries, as a result of vastly expanded trade, influenced the growth of science and the arts. It encourages
societies and publications. In this "Age of the Revival of Science" new discoveries took place in the universe of science. The progress of physical science was also stimulated by the discovery of scientific instruments.

(iv) PRINTING OF MOVABLE TYPE: - The invention of printing using movable types in the mid-fifteen century and the establishment of the paper mill had exerted a tremendous impact on the publication of literature in agriculture. The position was improved further with the rise of learned societies and periodicals in the second half of the eighteenth century.

(v) SECOND AGRICULTURAL REVOLUTION: - The Agricultural Revolution which began in the early eighteenth centuries in England was the results of the application of capitalist methods to the production of crops, the demand for which had been multiplied by conditions created during the Commercial Revolution. New techniques along with new products were introduced and great steps were taken in improving crops that had been cultivated for centuries. The sum total of these changes comprised the Second Agricultural Revolution. The scientific rotation of crops was introduced in India. Improvements in agriculture was made with the device of improving what they saw being imperfectly performed.

(vi) INDUSTRIAL REVOLUTION: - The success of Industrial Revolution in England which began about the middle of the eighteenth century was a product of scientific advancement through major contribution of science. However, it has an effective impact on Indian agriculture as well. The engineers, scientists and manufacturers mixed together in their works in social life. They exchanged exhaustive and productive views about complicated problems with each other, experimented and associated in new projects.

(vii) ROYAL AGRI-HORTICULTURAL SOCIETY: - The Royal Agri-Horticultural Society was founded on 19th September, 1820 by William Carey. This Society did not limit its activities only to some states, but extension of improved agriculture was also done very successfully by distribution of better seeds, plants, implements, livestock and dissemination of useful
information, through transaction, proceedings, branch societies and similar other organization in various parts of India. This led to the birth of a journal entitled "Journal of the Agricultural and Horticultural Society of India". This was the first journal in India devoted to agriculture and horticulture in India. Thus, it provides a medium for exchange of information and experiences among the members in different parts of India.

(viii) IMPERIAL AGRICULTURAL RESEARCH INSTITUTE :-
The first scientific approach towards agriculture in India was the establishment of "Imperial Agricultural Research Institute" in 1905 at the village of Pusa, Bihar on a government land for the purpose of agricultural research institute, experimental farm and an agricultural college. Agricultural research on soils, plants, organic matters etc was in progress.

(ix) INSTITUTIONAL AGRICULTURAL COLLEGES :- Another step that marked the beginning of a new era towards the growth of agriculture was the establishment of provincial department of agriculture and agricultural colleges. There was an enormous amount of experiments and research conducted in different aspects of agriculture in these places.

(x) ROYAL COMMISSION OF AGRICULTURE :- The Royal Commission of Agriculture was setting up in 1925. The Commission made detailed recommendations in the field of agricultural research, crop production, animal husbandry, forestry, fisheries, soil erosion measures etc. However, a new impetus was felt to the development of agriculture in India, and to promote the welfare and the prosperity of the rural population. Therefore, the modernisation of Indian agriculture was to be brought about through research, extension, greater co-ordination of various departments dealing with agriculture and development of co-operative institution. The Royal Commission recognised the importance of research and stated that the basic of all agricultural progress was experimentation. However, unless that organisation is based on solid foundation by research, it is merely a house built on sand.
2.1.3  AGRICULTURE IN MODERN INDIA

BEFORE PARTITION :- Before independence, certain imbalances had arisen in the agricultural economy. Agricultural research has a low status with only nine research institutes. The performance of Indian agriculture was quite dismal, because of the Bengal famine. To add to the woes, the most difficult problem at the time of partition of the country, was that thirty two percent of the fertile and irrigated land in undivided India went to Pakistan.

AFTER INDEPENDENCE :- After independence, the increase in production of food grains was growing steadily. The increases in food grains was due to the traditional technology which was relied upon. More areas was brought under irrigation and waste land was reclaimed. The increased production was due to expansion of labour and amount of land under cultivation.

(i)  GENESIS OF AGRICULTURAL UNIVERSITIES :- On the recommendation made by the University Education Commission, 1949, Joint American Team, 1955, 1960, the newly developing agricultural universities came up. This was an important mile stone in the development of these agricultural universities. The Govind Ballabh Pant University of Agriculture and Technology, Pantnagar established in 1960, is the first agricultural university set up in India. This was followed by similar universities such as University of Udaipur, Udaipur, Rajasthan; Orissa University of Agriculture and Technology, Bhubaneswar, 1962; Punjab Agricultural University, Ludhiana, Punjab in 1963; Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur. Madhya Pradesh, 1964; Andhra Pradesh Agricultural University, Hyderabad. Andhra Pradesh, 1964; University of Agricultural Science, Bangalore in Karnataka along with thirty four research stations were established in 1963. With the establishment of agricultural universitites, the value of scientific research was realised. These newly established agricultural universitites have made remarkable contributions in the field of agriculture through research. They forged a link between scientists and farmers. Today.
they are serving as the fountain heads of new knowledge, gained through purposeful, problem solving research and have become the main centre of dissemination of useful knowledge to the scientific community. However, they promoted the green revolution in 1966.

(ii) **BUILDING AGRICULTURAL RESEARCH INSTITUTES** :-

The government of India was naturally anxious to improve agricultural research and education as the backbone for building up a welfare state. It was at this time also that a rapid development of the Indian agricultural research Institutes took place including the setting up of a well known post graduate school in 1958.

As a first step, the premier national research institutes viz., Indian Agricultural Research Institute, New Delhi; Indian Veterinary research Institute, Izatnagar. National Dairy Research Institute, Karnal had strengthened crops like rice, potato, cassava, and horticulture in general which had not received adequate attention in research previously were attended to and research institutes were funded to attend to their problems.

(iii) **IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH** :-

The government of India after careful consideration to the recommendation made by the Royal Commission of Agriculture to examine the conditions of the agricultural and rural economy of India, decided to set up the Imperial Council of Agricultural Research by the resolution of Simla dated 23rd May, 1929 as a registered society for promoting, guiding and co-ordinating agricultural and Veterinary research in India. This was renamed as Indian Council of Agricultural Research. Besides being an apex body for monitoring higher agricultural education and research in the country, it acts as a clearing house for information and establishes bureau for crops as well as for animal husbandry, dairying and veterinary matters through a network of central and research institutes, research centres, project directorates, national centres and twenty eight state agricultural universities and research stations. These research institutes had provided extended research facilities in all branches of agriculture to meet the long term objectives of having increased production in the country.
(iv) AGRICULTURAL PUBLICATIONS: Since 1906, the Indian Council of Agricultural Research published the Agricultural Journal of India and the Memoirs of the Department of Agriculture in India. From 1931 onwards the Institute started to publish many journals devoted to agricultural sciences and animal sciences. Thus, they encourage the exchange of ideas among the workers engaged in research in different disciplines and extensively encourage investigation of applied value. The need was felt to promote scientific farming among the Indian farmers. With a view to provide latest scientific information on the cultivation of fruits, vegetables, flowers, etc. and to cope with the current problems in agriculture, few journals devoted to horticulture, farming and other aspects came into existence. Therefore, these publications reflect the current problem of agriculture in India. They provide the aspirations to the farmers. Besides, they appeal to the leading agriculturists to keep pace and touch with the agricultural progress of the country and to test in practice the improved methods of cultivation and the application of science to agricultural problems which the steady progress of knowledge of the plant life rendered increasingly available.

(v) GREEN REVOLUTION: Introduction of non-conventional imputs thus brought about which has been termed as the seed-fertilizer revolution or more popularly known as the Green Revolution. The Green Revolution was sparked off by the introduction of short-statured, hybrid yield varieties of wheat and rice in 1965-66. The adoption of HYV technology has benefited a vast trait of Indian agriculture. The achievement of Green Revolution was backed by scientific enterprise and application of new technology, because every state had at least one agricultural university for imparting education in agriculture and for research and extension. Therefore, the success of the green Revolution was the innovative and adaptive researches carried out by the Indian scientists.

(vi) AGRICULTURAL PROBLEMS: The existing problems in our agriculture is so complicated and complex. These problem fall under three factors. These are environmental, technological and institutional. Environmental factor itself is a complex one as agriculture in India is variously
affected by the environmental variation from one region to another. The traditional system of ploughing is widely practising in India. Majority of the farmers are completely ignorant of the modern technologies and unwilling to adopt them. The institutional factor also plays a major role in development of agriculture. The role of technological factor in the agricultural development was largely responsible for minimising the environmental role in agricultural development.

(vii) **ADOPTION OF IMPROVED TECHNOLOGY:** By adoption of improved production technology, rapid dissemination of new technology. Scientific research, the agricultural universities has brought about a real renovation in farming techniques and also had an impact on the attitude of the farmers. Therefore, the agricultural universities has made a significant contribution for the improvement of agricultural technology, which has made this state the granary of India. New crops and new varieties were introduced in Indian agriculture to cater to the needs of new demand. The use of inputs such as irrigation, fertilizers etc. accompanied by infrastructural facilities and other improvement packages has immensely augmenting agricultural food production. The adoption of this technology is also inducing agro-national change.

(ix) **TECHNOLOGICAL CHANGES IN AGRICULTURE:** Technological change is one of the most crucial factors determining the pace of agricultural development. The most significant one is the use of high yielding varieties seeds of different crops particularly wheat, paddy, etc. Increase use of irrigation, water, fertilizer, manures, insecticides, etc. have also been responsible for raising productivity. Improved tools and implements have been brought into the use for improving agricultural production through higher yield as well as by bringing cultivatable wastelands under plough. Improvement have been taken place in the methods of soil and water management, agricultural practices like seed treatment, inter-cropping, etc. This technological changes has opened up new vistas in Indian agriculture which has resulted in the increase production and productivity in the field of agriculture.
AGRICULTURAL MECHANIZATION:
The degree of mechanization of Indian agriculture was rather low till 1966. Since then the pace of mechanization has gathered momentum from the increase of pump sets, irrigation and tractorisation. Mechanization is one of the chief manifestations of advanced farming. The chief factors behind the poor level of inputs in agriculture are small parcels of lands, primitive technologies, cultural backwardness of the cultivators which prevent the use of new innovations.

PACKAGE PROGRAMME:
Keeping in view the serious food situation, the Government of India sponsored an agricultural production team to study the food situation in India. The team adopted what has been called a 'package of practices or technology'. They usually include improved implements, mechanization, greater use of fertilizer and manure, adoption of hybrid seeds, effective control of insects, pesticides and diseases, proper soil and water conservation and the use of chemicals. The idea is actually a system approach to the problems of increasing agricultural productivity. This is basically based on the results of latest research findings. However, these packages of practices was reviewed from time to time so that gaps in knowledge were brought to the notice of researchers for further improvement. Thus, a link was forged ahead between research and extension.

TOWARDS MODERNISATION:
After years of research and experimentation the newly high yielding seeds of wheat and rice have proved their potentialities and became available for commercial cultivation. India promptly took full advantage of this discovery and put all its resources to the adoption and spread of the HYV seeds. With this, agricultural development strategy took a dramatic turn from the traditional to what could be termed as modern agriculture. Thus, Indian agriculture has experienced rapid changes through the process of transformation of traditional subsistence agriculture into a modern commercialised enterprise.

As it has been pointed out by experts, planners, and economists
the welfare of the society in India to a large extent depends on the progress and prosperity of the field. Agriculture is the backbone of all developments. It supports directly and indirectly seventy percent of the population of India and their subsistence. Agriculture not only provide food and fibre for our population but also a good deal of raw materials for major and small scale industries. Eighty percent of the population lives in villages (Samaraja, 1981) and over seventy percent of the population is dependent for livelihood on agriculture (Patil, 1994; Sankaran and Subbian, 1995). Thus, a national well-being and progress are closely connected with agriculture.

(xii) AGRICULTURAL ADVANCEMENT: As a consequent of agricultural advancement research studies have taken a new shape in the field of agriculture and allied fields. Researchers, scientists, technologists and academicians started to concentrate their research studies, experiments in various fields of specialization. They have communicated their research findings through a variety of channels such as journals, reposts, research bulletins, technical reports, newsletters, Another familiar forms are maps, serial, books, patents, theses and dissertations, conference and seminar proceedings, symposiums, monographs, etc. These forms of documents serve as the carrier of nascent thought generated by the scientists. Immediate results of experimental research, technical development, etc. are transmitted through local, national and international communication channels. Besides, the written forms of publications, other media such as microforms, microfiches, magnetic discs, CD ROMs, online databases, etc are the main sources of communication artifice to the scientists in recent years. They also point out towards future trends of technological progress. Therefore, they represent a comprehensive and important vehicle of research communication in agriculture and transfer of technology extensively.

(xiii) CONCLUSION: It can be concluded that a primitive type of agriculture such as shifting cultivation in hill areas in particular was practising in ancient India. Knowledge of agriculture have resulted the human civilization known as agricultural revolution.
In mediaeval India, agriculture started to progress due to technological improvements. Newly introduced sources of plants and fruit crops enriched the agriculture in India. Invention of paper and printing make knowledge available to people of different lands. Development of sciences encourages intellectual thinking, stimulate new discoveries in the universe of sciences.

The early eighteenth centuries gave birth to the second agricultural revolution in England. Thus, it brought profound changes in India. New techniques, new products were introduced for improving the crops. Scientific rotation of crops were also introduced for improvement of agriculture. The product of scientific advancement contributed through science has an effective impact on Indian agriculture. Scientists, technologists, engineers from all walks of life exchange exhaustive and productive views experimented in new projects.

The Royal Agri - Horticultural Society founded in 1820 led to the birth of the first agricultural journal entitled "Journal of Agriculture and Horticulture Society of India" devoted to agriculture and horticulture. It is aimed to exchange and disseminate useful information among members.

Establishment of Imperial Agricultural Research Institute in 1905 and institutional agricultural colleges was an approach towards agricultural development in India. Research and experiment in different aspects of agriculture was in progress.

*The Royal Commission of Agriculture was set up in 1925. It stressed a progress and modernisation of Indian agriculture through solid foundation based on research and experimentation. Before partition, research was not at all progressive due to the Bengal famine and other factors. This adversely affected agriculture in India.*

*On the recommendation of the University Education Commission, 1949 after independence, newly developing agricultural universities, research*
stations came up in different parts of India. Besides remarkable scientific research contribution in the field of agriculture, they became the main centre for dissemination of useful information to the scientific communities.

National research institutes were established to attend to the existing problems by paying adequate attention through research. The Imperial Council of Agricultural Research which was renamed as Indian Council of Agricultural Research came into existence. It serves as the highest agricultural research centre in the country. Various research institutes, research centres, project directorates, state agricultural universities, research stations were established in different parts of the country. They provide extended research facilities in all branches of agriculture to increase production in the country.

The Indian Council of Agricultural Research started to publish agricultural publications in the form journals devoted to agricultural and animal sciences. They encourage exchange of ideas and investigation of applied value among the workers engaged in research in different disciplines. Besides, they promote scientific farming with latest information to cope with the current problems in agriculture.

The achievement and success of the Green Revolution was backed by scientific application of new technology coupled with the innovative and adaptive researches carried out by the Indian scientists. Improved production technology like fertilizer, manure, insecticides, hybrid seeds etc. were introduced in India in agriculture to cater to the needs of new demand.

Technological changes took place due to improvement packages such as seed treatment, inter-cropping, soil and water management etc. This has led to the increase production and agricultural food productivity.

Agricultural mechanisation has not gained momentum in Indian agriculture because of poor levels of inputs, primitive technologies, cultural backwardness of the farmers etc. which prevent the use of new innovations.

Package programme practice of technology was introduced based on
the results of latest research findings to increase agricultural productivity. They were frequently reviewed to fill the gaps in knowledge for further improvement.

However, agriculture in India has experienced the rapid process of transformation from traditional subsistence into a modern commercial enterprise. Scientists, researchers and other active workers communicated their research findings in a variety of formal and informal channels through local, regional, national and international communication channels as well on online data bases and other media in recent years.

2.2 AGRICULTURE IN NORTH EASTERN REGION

2.2.1 PRE-INDEPENDENT AGRICULTURE IN NORTH EASTERN REGION

The agriculture was primarily primitive type and pastoral economy among others still persisted. The methods of cultivation have been as primitive as even particularly in remote areas of plains and hills. It hardly provided even subsistence to the inhabitants. A large portion of the cultivators are involved in the same or other form of shifting cultivation (jhumming) Irrigation is practiced to a very small extent.

(i) TRADITIONAL IMPLEMENTS: Small implements used by the farmers can be identified as traditional. The farmers used small number of such traditional implements. The desi plough is used for tillage operation and the bamboo ladder is used for levelling and breaking clods.

The hoe is another important associated tillage implement used invariably in small scale cultivation of vegetables, etc. These farming implements can be made by the farmer himself at a very low cost. The implements of agriculture used were extremely crude and primitive. These imperfect instrument serves merely to scratch the ground to the depth of about four inches.

(ii) PRE - COLONIAL ERA: Before coming of the British, the people of the region were not so developed and were in no way a match with
other states of India, because modern science and technology was fully unknown to them. Technological development in this period was much behind the rest of India. Isolation from the rest of the country were the primary factor responsible for technological backwardness. The seventeenth century had been the land mark in the history of agriculture in North Eastern Region. A gradual expansion of plough and wet paddy cultivation resulted in generating of agricultural surplus to an extent. Steadily, some developmental steps took place such as reclamation of the cultivatable waste-land.

(iii) **AGRICULTURAL EDUCATION:** The state of agricultural education in general may be described as deplorable in the extreme. Never till lately was a provincial school known in this region. Towards the close of the year 1835, a school was established at Gauhati under the patronage of the General Committee of Public Education. This institution in the course of a few years, had become an important provincial college which was particularly meant for disseminating knowledge in the neighbouring districts. This region remained in a state of backwardness in respect of facilities for higher education, research and training in the field of agriculture and allied disciplines. In the earlier years, it has been served by the Calcutta University.

(IV) **INSTITUTIONAL EDUCATION:** Prior to the establishment of the Assam Agricultural College in 1984, there were no institution for higher education in agriculture within this region. However, the Gauhati University was established in 1984. There were training institutions for lower level workers of the agriculture departments. The scientific as well as technological growth brought during the second world war, perhaps, largely affected the literacy works.

2.2.2 **POST INDEPENDENCE AGRICULTURE IN NORTH EASTERN REGION**

**PHYSICAL FEATURES:** The North Eastern Region of India is comprised of seven states, namely, Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura (Figure 1). Since 1947 unified
Fig. 1 Map showing the states of North Eastern Region
Assam has undergone geo-political transformation and given birth to other states like Nagaland (1963), Meghalaya (1970) and Mizoram (1971) statehood in (1986). North Eastern Region is connected with the rest of the country by a slender strip of land. The region is embracing a land surface of two and half square kilometers. It accounts for 8% of the total area of the country. Nearly 90% of the population lives in the rural area and 33-37% in the urban area are living below poverty line as compared to national average of 50.82% and 38.19% in rural and urban areas respectively depends on live stocks, forestry, fishing, hunting and plantations (Anonymous, 1990). The vast area of hills interspersed with fertile valleys represents agro-climate temperature to typical tropical falling with altitude range from 0 to 5000 meters and above (Anonymous, 1997b).

(i) **OCCUPATIONAL PATTERN**: Agriculture is the principal occupation of the people of this region. The age-old farming system of shifting cultivation or jhumming still predominate in most of the areas. The region is basically based on agriculture and more than 75% of the working population are engaged in agriculture and allied based activities (Borthakur, 1990; Goswami, 1993). coupled with this is the abundance of natural water resources, high rainfall and prolonged rainy seasons, high altitude humidity, followed by spells of dry periods, acidic to neutral soil with moderate water retentive capacity and predominance of hilly terrains with slopes ranging from 10 to 80 offering biodiversity and congenial conditions for cultivation of wide range horticultural plantation (including agroforestry) and aromatic crops as well as species (Saskar, 1991-1992).

(ii) **MAJOR CONSTRAINTS AND PROBLEMS**: Nature has endowed this region with beautiful resources. But paradoxically in the midst of plenty, this region has remained a backward area and such the agriculture of the region is also not at all developed. It remained cut off from the mainstream of the country. The problems confronting agriculture of the region are the following :-

(a) Soil in the entire region is acidic in nature. Proper technology for management of acidic soil and varieties of crops suited to such conditions
(b) The high rainfall and humidity create favourable environment for a wide range of pests, diseases and weeds. Similarly, climate create problems in storage of grains and others.

(c) The undulating topography, hill slopes and various altitudes also create problems of agriculture.

(d) Shifting cultivation has led to a wide range of adverse effects, besides low production, deforestation, soil and fertility erosion, denudation of the hill slopes and responsible for climatic changes and degradation of flora and fauna.

(e) Flood is creating havoc in plain areas, even in Arunachal Pradesh which is hilly region. Landslides also create problem for agriculture in this region.

(f) One of the main factor is lack of effective local response for the projects and services delivered by the external agencies of change of the local situations (Maithani. 1995).

(g) Dearth of proper technology as well as poor utilisation of technology have greatly limited agricultural production.

(h) Cropping patterns, identification, development of appropriate varieties are only in the process of emergence. Similarly, appropriate methods of water harvesting recycling used are yet to be developed.

(i) Utilisation of known technology is also poor such as farm power, bamboo drip irrigations, etc., which are found implemented in very small areas only.

(j) Difficult terrain of the region for accessibility, geographical isolation
as a whole creates hurdle in timely supply of inputs such as seeds, fertilizers etc

(k) Post-harvest technology facilities are poorly available.

(l) Transport and communication system is absolutely poor in the whole region. This hamper the transfer of technology in the field of agriculture.

(m) Lack of marketing facilities is a major constraints particularly for commodities like pine-apple, banana, potato, ginger, etc. which have sizeable surplus for marketing.

(n) Improper management of land in many cases lead to poor return from the soil.

(o) In-service training of extension personnel is very essential to keep them abreast of latest development. The scope for such training is rather inadequate.

(p) A large section of the farmers are not using improved methods of cultivation due to various reasons including unwillingness to part with the age old system. Rural indebtedness and small holdings are the effect of old-age subsistence nature of farming, influenced by social customs. The tragedy is not only poverty, backwardness and misery alone, but helplessness and despair that render the rural problems as difficult.

(q) The agriculture of the region is very closely associated with many social and cultural custom patterns. As such a great deal of care is necessary to bring about the desired change in attitudes. The region has not received due to attention in the past as it deserved. The centre remains at long distance both geographically as well as economically besides ethnic and cultural differences with majority of the people of the North East. Therefore, co-ordinated efforts by the scientists of various disciplines in different centres.
institutions, organizations would certainly help in a large way in solving most of these problems (Borthakur, 1982).

(iii) **POTENTIALITIES:** In spite of the above problems, there are potentialities for the development of agriculture as a whole in the region (Borthakur, 1992). However, the region is bestowed with rich resources, being one of the fertile areas of the country. In the last two decades, the region has made some strides in the advancement of agriculture (Sharma, 1988).

   (a) Potentialities of agriculture in the whole region are vast in the fields of both agriculture and animal husbandry. Besides the present food and fibre crops, potentialities exist for growing large number of other economic crops and plants, vegetables, horticultural crops, medicinal and aromatic crops, plantation crops which can be grown successfully in different altitudes of the region.

   (b) Prospects of animal husbandry are very good especially in the hilly region. This region is endowed with rare animal wealth such as mithu, yak, Himalayan sheep of Arunachal Pradesh, etc.

   (c) In aquaculture, indigenous fishes are also considered to be very important.

   (d) With proper development of transport, communication, marketing, etc., this region has the potentialities for development of agro-based industries.

   (e) The North Eastern Region offers ample scope for increasing cropping pattern. This is one of the very important means to augment agricultural production. The holistic approach is vital to boost up production on sustainable basis without impairing the ecological environmental balance (Sharma and Gangwar, 1994). However, it is believed that with the concerned efforts of all concerned it will be possible to bring the subsistence agriculture
of the region to a sustainable and profitable level which would contribute to
the economic prosperity of the region immensly.

(iv) **ESTABLISHMENT OF INSTITUTIONAL UNIVERSITIES:**
After independence the institutional set up for development of agriculture in
the region has come up only during the last decade. One agricultural college
and one veterinary college were established in the undivided Assam. The
Government established a few research stations which were under the
administrative control of the State Directorates of Agriculture and Animal
Husbandry.

(v) **ASSAM AGRICULTURAL UNIVERSITY:** The Assam
Agricultural University was established on 1st April, 1969 under the Assam
Agricultural University Act, 1966. The University started functioning with
the college of Agricultural science and the College of Veterinary Science as
its constituents. The College of Home Science was established in the same
year at Jorhat campus. The jurisdiction of the university extends to the entire
Assam and neighbouring states of the region.

(a) **ACADEMIC INSTITUTIONS:** The following are the
agricultural colleges in North Eastern Region:

1. College of Agricultural Science, Jorhat, Assam:
2. College of Agricultural Science, Imphal, Manipur:
3. College of Agricultural Science, Medzipharma, Nagaland:
4. College of Agricultural Engineering, Guwahati, Jorhat, Assam.
5. The lone Animal Husbandry and Veterinary College in North
Eastern Region is the College of Veterinary Science, Khanapara, Guwahati,
Assam.

During the year 1988, three more new colleges, i.e. Biswanath
College of Agricultural Science in Sonitpur District, College of Fisheries at
Raha in Nowgong District and Lakhimpur College of Veterinary in Lakhimpur
District have started functioning.
(b) **RESEARCH STATIONS:** The important research institutes under Assam Agricultural University are as follows:

1. Agro-Economic Research Centre, Jorhat district;
2. Buralikson sugarcane Research station, Bolaghat district;
3. Kahikuchi Horticultural Research Station, Kamrup district;
4. Karimganj Rice Research Institute, Karimganj district;
5. Raha Rice Research Institute, Nowgong district;
7. Tinsukia Citrus Research Station, Tinsukia district.

Under World Bank Assistance two more important research stations have been established at North Lakhimpur and Gosaigaon for multicrops respectively. Department of Agriculture have also established many Field Trial Stations (FTS) in different agro climatic zones of the region for conducting location specific technologies.

(vi) **ESTABLISHMENT OF NORTH EASTERN COUNCIL (N.E.C):**

The government of India realising the potentialities of the region and the anxiety to develop this region at a faster rate, have given top priority to develop the entire region. The first step in this direction was the establishment of the North Eastern Council (NEC) in the year 1972. Since then, it has been taken a large number of measures to sustain and develop infrastructural facilities, such as seed farms, livestock breeding, watershed management etc. As such, there has been an accelerated rate of development in all spheres of agriculture and allied sectors.

(vii) **ESTABLISHMENT OF INDIAN COUNCIL OF AGRICULTURAL RESEARCH (I.C.A.R), UMIAH:**

(a) **GENESIS:** The North Eastern Region did not have a research base to keep up agricultural development. Realising this need, the Government of India, through the Indian Council of Agricultural Research, established the first major agricultural institute known as I.C.A.R. Research Complex for N.E.H. Region in 1975 at Umiam, Meghalaya. The institute is meant to
serve primarily the backward and tribal areas of North Eastern Region. It has in its fold research wings of agriculture as well as animal sciences, soil and water conservation, horticulture, agricultural engineering, biotechnology and fisheries, etc. (Borthakur, 1978)

(b) REGIONAL RESEARCH CENTRES: As a full fledged research institute with its main centre in Umiam, Meghalaya, the institute has strong research centres in Basar, Arunachal Pradesh; Lamphelpat in Manipur; Kolasib in Mizoram; Medziphema in Nagaland and Lembucherra in Tripura. With the merger of Sikkim as a state of India another regional centre was also established at Tadong, Gangtok in year 1976. In order to meet other essential requirements, the institute has in its fold five krishi vigyan kendras and a trainer's training centre located at Manipur, Nagaland, Tura, Arunachal Pradesh and Sikkim respectively for training farmers, village level workers etc.

(c) RESEARCH ACCOMPLISHMENTS: With the establishment of the I.C.A.R. Research Complex, research programmes were further expanded to cater to the major needs of the region such as production of crops and livestocks, fisheries production, diseases and its control and management practices. However, a multi-disciplinary research programme was carried out to develop an alternative system for farming which could cause least destruction to the socio-cultural life of the people, improved varieties of all crops, crop management practices through integrated approach utilising indigenous resources. Therefore, the institute has developed the technology suitable to the farmers to boost up agricultural production and allied sectors in the region.

(vii) RESEARCH ORGANISATION: The North Eastern region do not have any organised research set-up except few operating in small centres in one or two states. Tripura has a research centre at Arundhuti Nagar. Meghalaya has two centres in Shillong and Tura. All Indian Co-ordinated Research Projects are operating in the states of Meghalaya, Manipur, Tripura and Sikkim. Recently Rubber Board has set up a research centre in Tripura. The Central Potato research Institute, Shimla has set up a sub-centre at Upper
Shillong, Meghalaya. National Bureau of Soil Survey and Land Use Planning have a centre at Jorhat. Central Plantation Crops Research Institute at Kalhikuchi. Jute Agricultural Research Institute has a ramie research centre at Sorbhog, Assam. Other major research set ups of this region are the Colleges of Agriculture in Nagaland and Manipur, Forest College and research Institute at Burnihat. Botanical Survey of India, Zoological Survey of India, Shillong, Meghalaya. The Gauhati University has facilities for research in agriculture primarily in the Department of Agricultural Botany, Bio-technology, Botany and Zoology as well as in Dibrugarh University of applied nature. Mention should also be made for Toklai Experimental research station. Tea Research Organisation of India, Jorhat; Defence Research Laboratory, Tezpur, Assam played a dynamic role in this direction. Another institute in the offing is the North Eastern Regional Institute of Science and Technology, Itanagar in Arunachal Pradesh.

(ix) **SCOPE FOR COLLABORATION:** There is an urgent need to explore the potentialities of the region. The first step for attaining it in this direction, is the creation of a strong base collaborative research programmes with various institutions and organizations, to tackle some problems of basic nature related to the agricultural potentialities of the region. The Assam Science Society plays a vital role not only to bring out the awareness in this regard, but also to initiate an effective programme of collaboration.

(a) **LINKAGE WITH AGRICULTURAL UNIVERSITIES:**
The results available from various research centres of agricultural universities are being utilised for production programmes in the region. Therefore, there is a need to build a strong collaborative mechanism for development through exchange programmes in research activities to utilize the resources effectively.

(b) **LINKAGES AMONG VARIOUS INSTITUTIONAL CENTRES:** Keeping in view the needs of research infrastructure of the region, pertaining to different agroclimatic situations, there should be a strong linkage with various research institutional centres to conduct research for specific situation.
(c) **LINKAGE WITH GOVERNMENT DEPARTMENTS:**
Needs arise to have a strong linkage with various departments of agriculture, horticulture, animal husbandry, fisheries, forestry of different states of the region. However, these departments have been conducting some programmes of research of applied nature. Moreover, the base of research in most of them is absolutely inadequate both in term of facilities and manpower.

(d) **LINKAGE WITH NORTH EASTERN COUNCIL:** The North Eastern Council is organising various development programmes in different states of the region. Therefore, it is necessary to have a linkage with a view to keep abreast with all the developmental programmes being operated in the region. This is applicable for inclusion of the recent technological advancement for further multiplication and distribution.

(e) **LINKAGE WITH NORTH EASTERN HILL UNIVERSITY:**
This is a general university, but it is also, partially conducting research works on agricultural aspects. Another collaborative work is in the form of transfer of technology programmes. joint workshops to focus problem for research and review research findings particularly identifying technology for adaptive trials, etc.

(f) **LINKAGE WITH OTHER INSTITUTES:** Collaborative programmes with the different national and international institutes outside the region in the form of exchange of materials for effective utilisation of locally available resources.

2.3 **INFORMATION EXPLOSION:**

During the 1950s and 1960s the term "Information Explosion" was coined to refer to the vast increase in the information being generated in science, technology and other subject fields. Royal Society discussed the implications of information explosion at the first international conference on the subject held in London in 1948.
Knowledge is generated at many points in the world over research institutions, universities, industrial, academic institutions and commercial organizations, particularly because of extensive research programmes initiated by them. Another factor, being stimulated by industrial competition on one hand and government urges for scientific and technological development on the other. Early scientific literature seem to grow moderately slow. However, since the second world war the growth has become more rapid. This knowledge is doubling in each five to ten years period and this rate of knowledge accumulation is accelerating.

2.3.1 LITERATURE OUTPUT:

Information is generated through a number of channels. Predominantly through printed media viz., books and periodicals and mass media viz., newspapers, radio, television, cinema, etc. These sources generated a large quantity of information. Second half of the twentieth century has been an era of exponential growth of scientific literature. However, it has been growing since 1965 at an annual rate of 5 to 7 percent. Publication of Indian agriculture literature is not an exception to this sort of growth. India is the sixth largest producer of books in the world and the largest among third world countries (Devarajan. 1989)

2.3.2 CONCLUSION:

It can be pointed out that prior to independence the agriculture in North Eastern Region was of primitive type, particularly in remote areas of plains and hills. Shifting cultivation is prevalent among majority of the cultivators.

Small traditional implements were used. They were extremely crude and primitive. These could be fabricated by the farmers at a very low cost

During the pre-colonial era, this region was regarded as one of the technologically backward states of India, due to isolation from the rest of the
country. Indigenous known technology also was poorly utilised and only in some areas.

A gradual expansion of plough and wet paddy cultivation started in the seventeenth century.

Prior to the establishment of Assam Agricultural College in 1948, there was no higher education in agriculture within this region. Earlier it was served by the Calcutta University.

Post-independence agriculture in North Eastern Region depicts that the old age shifting cultivation still predominates in most of the areas.

Agriculture in this region is not at all developed due to many constraints. These are acidic soils, high rainfall, climatic changes, humidity, undulating topography, hill slope and terrain, shifting cultivation, deforestation, soil erosion, flood and land slides, lack of marketing facilities, poor transportation and communication system, poor utilisation of technology, unwillingness of the farmers to part with the old age of farming.

In spite of the above mentioned problems, the region is bestowed with diverse potentialities for the development of agriculture in animal husbandry, horticultural crops, medicinal and aromatic crops, plantation crops, vegetables, fruits, etc.

After the establishment of the Assam Agricultural University in 1969, many academic institutions, research stations in different parts of the region have started functioning for conducting local specific technological researches.

North Eastern Council was also established in 1972, to accelerate development in all spheres of agriculture and allied sectors.

The Indian Council of Agricultural Research (ICAR) was established in 1975 meant to serve primarily the backward and tribal areas of
NK Region to develop each area according to its potentialities through research and also to provide an adequate base for research.

Regional research stations were also set up in different states of the region to meet other essential requirements in agriculture and allied fields.

These regional research centres are conducting location specific technological research and experimentation suitable to the farmers to boost up agriculture production and allied sectors of the region.

Research projects, multi-disciplinary research programmes were further expanded to cater to the major needs of the region such as crop production, livestock production, disease control, alternative farming system, crop management practices which cause least destruction to environment by utilising indigenous resources.

Collaborative research programmes with various research institutions, organizations, agricultural universities, government departments, etc., were forged to tackle multi problems of basic nature related to agricultural potentialities of the region.

Achievements of these ventures are exchange of programmes for effective utilisation of locally available resources, transfer of technology programmes, joint workshops to focus problems for research, review research findings, identifying technology for adaptive trials, etc.

However, a large number of agricultural literature is generated through close coordination of scientists of various research organizations in this region.