CHAPTER - III

BASIC ASPECT OF TOBACCO CULTIVATION

3.0 Introduction

The purpose of this chapter is to introduce the tobacco crop, the geographical requirements for its cultivation, varieties grown, present status of tobacco cultivation, curing practice employed for tobacco in the country, in general and the Jati and Motihari tobacco the principal variety grown in Dinhata subdivision of Koch Behar district in particular. Special emphasis has been laid on trade scenario and end uses of tobacco of the study area and export of tobacco from India. Further, an attempt has been made to find out negative impact of tobacco farming on water, farmers' health, and food security of the study area. The prime objective of this chapter is to investigate the present status of tobacco cultivation of the study area.

Probably the word *'Tobacco'* comes from the Arabic word *'tabaq'* which means *'euphoria producing herb'*. Many says the word *'tobacco'* derived from the island of *'Tobago'* in the Aribbean. Some says the word *'Tobacco'* originated from the Carib word *'tabaco'* (the name of the pipe in which tobacco was smoked) (Reddy and Gupta, 2004). According to Gopalchari (1982), the word tobacco is derived from a Spanish word *'tobaca'* which is a Y-shaped instrument used by early American Indians to inhale snuff.

Cultivation of tobacco is very old process in human civilization. Production of this plant dates back 8000 years. There were two species of this plant namely Nicotiana rustica and Nicotiana tobacum which were dispersed by American Indians through the southern and Northern American continent. Tobacco seeds were discovered in Mexico and Peru and the permanent settlements built around 3500 BC (Reddy and Gupta, 2004). Tobacco belongs to the plants called solanaceac or the night shaded which contains around 60 species including potato and the genus Nicotiana. It is now grown chiefly in Turkey, India and Russia. Tobacco cultivation was introduced in India by Portuguese during 1600 A.D (Viswanathan, 2004). Its use and production is so high that today India is the second

largest producer of tobacco in the world. Tobacco cultivation spread rapidly along the Portuguese trade routes in the east, via Africa to India, Malaysia, Japan and China. Cochin and Goa on the west coast of India and Machlipattnam along the East coast were the main ports for Portuguese trade. Tobacco was first introduced in the kingdom of Adil Shahi. Asad Beg, Ambassador of the Mughal Emperor Akbar visited Bijapur in Karnataka during 1604 and large quantities of tobacco was taken to the Mughal kingdom in the north and presented some to Akbar along with jewel encrusted pipes. After that Tobacco was appreciated by everybody. Thus trading of tobacco spreads rapidly in everywhere (Bhonsle et al., 1992).

Tobacco was cultivated on a large scale in Kaira and Mehsana districts of Gujarat and later spread to other areas of India. Improvement of Indian tobacco has began with the establishment of the Calcutta Botanical gardens at Kolkata during 1784. A model farm was establishment at Pusa in 1875. There was the establishment of Imperial Agriculture research institute in 1903. Virginia tobacco was introduced in India by the Indian leaf Tobacco Development Company in 1920. After 1930, India found a great place in tobacco cultivation in the world. The Central Tobacco Research Institute (CTRI) was established in 1947 under Indian Central Tobacco Committee (ICTC) in Madras. CTRI has seven regional research station located at Guntur, Kandukur, Jeelugumili, Hunsur, Vedasankar, Dinhata and Pusa.

3.1 Types, species of tobacco

Probably man has invested more time and energy to develop tobacco varieties than to develop varieties of food grain! It is said that there are as many as sixty five valid species of tobacco in the world of which two are cultivated extensively. These two species are Nicotiana tabacum and Nicotiana rustica. In India, tabacum covers the largest area and rustica plays a relatively minor role.

The genus Nicotiana is one of the five large genera of Solanaceae and is represented by about 60 recognized species (Tucker, 1982). Description is available for all the 60 species which are grouped in three sub-groups.

1. Sub-genus- rustica
2. Sub-genus- tabacum
3. Sub-genus- petunioides

The original habitat of the genus is considered to be South American, particularly the regions surrounding the Andes. There are, however, several species in Australia and South Pacific Island that do not occur in the new world. They are considered to be derivatives of the South American stock.

Out of the 60 species, only two species, i.e. Nicotiana tabacum and Nicotiana rustica are cultivated extensively. India grows both the species, but by far the largest area in under N. tabacum which is grown all over the country. Since N. rustica requires cooler climate, its cultivation is confined mainly to the northern and north-eastern areas of the country, i.e. Punjab, Uttar Pradesh, West Bengal, Bihar and Assam. The varieties developed in N. rustica are used for only chewing, hookah and snuff tobaccos.

3.1.1 Cigarette types (Nicotiana tabacum)

The principal types of tobacco of this class are Virginia and Natu or Desi grown mainly in Andhra Pradesh and to some extent in Karnataka and Gujrat states. 'Harrison Special' was the chief variety grown in India which replaced the 'Adcok' variety which for a long time was the favorite variety among the American tobaccos grown in the country. A number of new variety have been brought under cultivation with the establishment of the Central Tobacco Research Institute, Rajahmundry, displacing the variety 'Harrison Special' from general cultivation.

In Guntur District, *Natu tobacco* having leaf with tendril-like tip is called *Thokaku*, the one having moderately narrow leaf is known as Desavali and that having board leaf is called Dakshinathi. The leaves possess a moderately thin texture with pleasing aroma of medium strength and the leaf colour ranging from light to dark brown .The bright brown leaves are used in the manufacture of cheap cigarettes and the dark heavy grades used for pipe and shag tobacco.

'White Burley,' an air-cured exotic variety, is grown in a limited area and is utilized for blending in varying proportions in the manufacture of certain brands of cigarettes.

3.1.2 Bidi types

(i) *Nicotiana tabacum:* Bidi-tobacco is principally grown in the Charotar area of Gujarat and Nipani area of Karnataka. The Principal varieties

grown in Gujarat are' Keliu, Piliu and Gandiu.' Other type which are found in small proportions with keliu are Movadiu, Kalipat and also, Piliu. Another variety commonly grown in the area is saijpuriu. The important varieties grown in the Nipani area of Karnataka are Mirji, 'Nipani','Sangli.' and 'Jawari'. The leaves are considered tobacco be stronger than those from the Gujarat area (Gopalchari, 1985).

(ii) *Nicotiana rustica:* A variety of the species called 'Pandharpuri' is grown in the Nipani area and is used for giving strength to bidi-tobacco.

3.1.3 Cigar and cheroot types (Nicotiana tabacum)

Cigar and cheroot-tobacco varieties are mostly grown in Tamil Nadu and West Bengal. Cigar leaf is brown tobacco dark brown in colour, thin in texture, and mild to medium and even strong in flavour. The colour of the cured leaf of tobacco used in cheroot, produced in Tamil Nadu, is dark brown or almost black and used for cheroots. The Lanka tobacco produced on the river beds of Godavari and Krishna are used in the manufacture of indigenous chuttas (cheroots).

The 'Bhengi' variety of jati tobacco grown in West Bengal and used mostly in the manufacture of cheroots is greenish brown in colour, medium in texture and strength.

3.1.4 Hookah types

(i) *Nicotiana tabacum:* The cultivation of hookah tobacco is mostly confined to the States of Assam, West Bengal, Bihar, U.P, and Punjab. In Assam, it is called Desi, Mitha or Jati. The chief varieties grown are 'Snidurkhatua', 'Kadamdal', 'Hatikania', 'Chama', 'Patuakhol', 'Daria', 'Sakunia', and 'Barapat' (Gopalchari, 1982).

Hookah tobacco grown in West Bengal is called Jati which is also used in the manufacture of cheroots. The main Hookah tobacco varieties are 'Bhengi', 'Mena Bhengi', 'Naokhol', 'Snidur Khots' and 'Hingli'.

Hookah tobacco grown in Behar is called as desi. The varieties grown are 'Boari' (thick and dark leaf) 'Churia', (medium and yellow –brown leaf), 'Kaunia' (long narrow and sometimes bending), 'Katali', (pointed as if cut on both sides). 'Deshla' (Long and broad leaves), 'Bosi' (long and broad leaves), 'Jakhri' (long and narrow leaves), 'Lothi' (long, narrow and best leaves) etc.

In U.P, Desi tobacco known as poorbi which is used for chewing is sometimes used for hookah also.

In Punjab, the desi variety is used in hookah. The varieties grown are called by different names in different areas but most of them can be divided in to four groups viz. 'Noki' (long narrow and tapering leaves, mild in smoking), 'Kakka' (dwarfish plant with thick and broad leaves processing folds on the surface and strong in smoking), 'Ghora' (tall plant with broad and thin leaves poor smoking quality) and 'Gidri' (medium –sized plant whit broad leaves strong in smoking).

The bidi tobaccos groun in charotar area of Gujarat and Nipani area of Karnataka are also partly used in hookah. In Hyderabad (Andhra Pradesh) tobaccos which are used in hookah as also for making chuttas, bidi and cheroots are called zarda and Desi. The leaves of zarda are thin to medium in texture, yellowish to light brown in colour and mild in strength. The Desi variety has two sub-types one having long narrow leaf and the other with short and broad leaf .The cured leaf is dark brown in colour, medium in texture and strong and bitter in flavour. The Desi variety is also known as 'Jawari' 'Bhushner' or 'Sulehpetti.'

(ii) *Nicotiana rustica:* The principal varieties are Culcuttia, Gobhi, Motihari and Vilayati. Culcuttia is mostly grown in Punjab and U.P. The cured leaf is medium to thick, coarse in texture greenish brown in colour, strong in flovour. 'Gobhi' is grown in Punjab and is similar to 'Calcuttia' except that the plant is smaller and the leaves are broader and stronger. The well-known hookah tobacco grown in Kaimganj and Kampil areas of Farukhabad district in U.P is called Kampila tobacco comprising two varieties, viz., 'Hakra'(tall plant with smaller leaves) and 'Baonia' (smaller plant with bigger leaves). 'Motihari' grown in the northern area of West Bengal is the strongest hookah tobacco.

3.2 Favourable condition for tobacco cultivation

Soil and climate are the two important facts of physical environment which determine the suitability of a region for commercial cultivation of tobacco crop. This is how production of some of the finest types of tobacco have been concentrated on specific agro-climatic regions of the world viz, Flue Cured Virginia in U.S.A and Rhodesia; Cigar-Wrapper in Sumatra and Cuba; Cigar –Filler Leaf in Florida; and Oriental Leaf in

Turkey. In general, tobacco grows best on sandy loam surface soil with slightly finer sub-soil having adequate internal drainage, good aeration and high moisture holding capacity .As regards climate, a frost-free growing season of 100-120 days with a mean temperature of about 26.7^{0}C (80^{0}F) and a liberal and well distributed rainfall of 8.8 to 12.5 cm per month are the ideal requirements for the tobacco crop. The relative humidity may vary from 70-80 percent in the morning to 50-60 percent during mid-day.

3.2.1 Climate

Though tobacco is tropical in origin and thrives best in warm climate, it is being grown under a wide range of conditions in tropical, sub-tropical and temperate zones, it grows as far North as Central Sweden at a latitude of approximately 60^0 N and as far South as New Zealand at a latitude of about 40^{0}S the most important factor determining its cultivation being temperature. Being a short duration Crop, it is possible to grow tobacco at any latitude and longitude if a mean temperature of about 26.7^{0}C (80^{0}F), considered optimum, prevails for a period of 80 to 120 days at any time of the year. Tobacco in India is grown from 34^{0}N latitude to 8^{0}N latitude and in each major tobacco growing region the cropping season is so chosen as to have a suitable temperature range for the type of tobacco grown, as for instance 23^{0}C for F.C.V. tobacco. This period of suitable temperature dose not coincide with the rainy season except in the case of F.C.V. tobacco in Karnataka and cigar and chewing tobacco in Tamil Nadu. Even here the shortfall in rains is made up by irrigation. However some tobacco such as F.C.V. tobacco raised in heavy black soils of Andhra Pradesh are invariably grown under unirrigated conditions. Hookah and chewing tobaccos grown in Bihar and West Bengal are given one or two light irrigations, while the Karnataka is not usually irrigated, while in Chanta tract of Gujarat, quite a few irrigations are necessary particularly for the newly evolved high yielding varieties.

The rainy season in India is of monsoon type and the rains are heavy and uneven during a limited period of the year viz. May-September for south west monsoon. The atmospheric temperatures during the period in different tobacco growing areas in India except Karnataka are higher than the optimum level necessary for the successful growth of the crop. Due to this, tobacco (Particularly F.C.V. tobacco) raised in India as a monsoon crop is susceptible to leaf spot diseases and the yields are not comparable with

those of U.S.A or Rhodesia. On the other hand, when the crop is mainly grown in winter (October- February) as in Andhra Pradesh, the soil moisture reserve in heavy black soils is insufficient to meet the crop demands for full growth and expansion of leaf. Supplemental irrigations can neither be heavy nor frequent for these soils. As a result the yields of F.C.V tobacco on black soils are severely affected.

Relative humidity of the atmosphere has a very important bearing on the moisture balance in the soil and plant and consequently on the moisture balance in the soil and plant and consequently on the yield and quality in the soil and plant and consequently on the yield and quality of the tobacco produced. Humidity is also essential during the curing season both for curing and handling the cured leaf. In India the relative humidity during the tobacco season, varies from 74.4 to 90.7 percent in the forenoon.

3.2.2 Soil

The importance of soil in relation to the leaf quality of the plant has always been recognized by the tobacco farming community, traders and manufacturers. In any tobacco producing area, certain fields are reputed to produce tobacco of excellent quality, while the produce from other fields even in close proximity, may be poor (Gopalchari, 1982). Apparently, apart from the easily understandable soil properties such as soil texture, chemical composition, cation exchange capacity, etc., there are certain other factors such as drainage, soil aeration, etc., which cannot be easily measured and controlled but which none-the-less predominantly influence the yield and quality of the crop. Thus, the sub-soil also plays a vital role in the production of quality tobacco. Superimposed on these soil factures is the peculiar monsoon type of climate in India. The range of soil on which a particular type of tobacco can be grown in any area is, therefore, rather limited. it is for this reason that the main tobacco types found in India are localised in well-defined zones where the soil conditions are best suited for their growth, e.g. F.C.V. tobacco in Andhra Pradesh, Cigar tobacco in Tamil Nadu, Bidi tobacco in North Gujarat, Karnataka, Chewing tobacco in West Bengal etc. A description of the soil types on which various types of tobacco are grown in India is given below:

Flue cured tobacco soils: For production of good quality F.C.V. tobacco it is necessary to have a soil which is free draining and which can be kept well aerated throughout the growing period. The fertility status of the soil should not be high. In fact, nitrogen

starvation condition should prevail at the time of maturity of leaf. Flue cured tobacco in U.S.A is grown on light medium coarse sand to sandy loam surface soil with a friable well drained sandy clay sub-soil which extends to a depth of 120 to 150 cm and is characterized by low organic matter content and an acid reaction. Similarly in Rhodesia, flue-cured tobacco is principally grown on soils of medium to coarse grey granitic sands overlying rather finer yellow or yellow-grey subsoil. These soils do not have any structure and the clay content is only 2 percent. With increase in crop production, some sandy clay loams of sedimentary origin have also been brought under tobacco cultivation in Rhodesia. But these soils are found to produce leaf of inferior quality. Well drained podzolic sands with about 8.5 per cent sand, 7.5 per cent silt and 7.5 percent clay are used in Canada for growing flue-cured tobacco. In Australia and New Zealand flue-cured tobacco is produced on sandy and sandy loams though they are of slightly heavier texture than the Rhodesian soils. Soils in countries like Japan Thailand and Tanzania which have recent been brought under flue-cured tobacco cultivation also conform sandy or sandy-loam textures. On the other hand, in India about 95 per cent of the flue-cured tobacco crop is produced in soils which are heavy i.e. in the Ongole –Guntur-Godavaris belt of Andhra Pradesh comprising chiefly the five districts of Prakasam, Guntur, Krishna, East and west Godavaris Such heavy soils growing flue-cured tobacco are also found in the three interior districts of the Khammam, Karimnagar, and Warangal.

Black soils: Black soils of Andhra Pradesh which are used for tobacco cultivation may be divided into the following classes:

a) Soils which are formed in situ and derived from lime stone these can be further sub-divided into (i) deep and (ii) shallow soils. Such soils are met within the Guntur district. They have characteristic lime nodules in the profile.

b) Soils which are formed out of old alluvial deposits through fluviatile agencies. Most of these soils are deep to medium deep and are found in East and West Godavari districts as also parts of Krishna district. These soils do not show any lime nodules in their profile.

c) Soils which are of recent origin and are formed from silty deposits along the bunds and in deltaic island of river Godavari .These soils are very fertile and uniformly clayey throughout the profile. Often they have slopy terrains. Such soils are found along the river bunds of Godavari in Khammam district and also in deltaic islands of Godavari.

Light soils: In recent years, a substantial reduction in the area under traditional flue cured tobacco has taken place in Guntur district because of the release of irrigation water from Nagarjuna sagar dam and the consequent switch over to irrigated food and other cash crops by farmers. In order to meet this shortfall in tobacco acreage, flue – cured tobacco cultivation is being extended to light soils, which are sandy to sandy loam in texture, e.g., in East Godavari, West Godavari, Nellore and Kurnool districts. While some soils are of granitic origin, most of the soils, particularly, the light soils of East and West Godavari district are derived from sand stone. They are sandy to sandy loam in texture and acidic in soil reaction, very low in exchangeable cations and low in total cation exchange capacity. They are characterized by high hydraulic conductivity and low moisture equivalent. They are of very poor fertility requiring addition of plant nutrients like nitrogen, phosphorus, potassium, calcium and magnesium. Improvement in yield and quality of tobacco produced on this soil s seems to depend on the management practices which should aim at optimum supply of nutrients during growing season and then maintenance against leaching losses that may occur in the soil.

Karnataka is also producing small quantities of flue cured tobacco. The cultivation is slowly extending from the traditional sandy clay loam soils of Mandya and Mysore districts to the lighter sandy and sandy loam areas of Hassan, Chikmagalore and Shimoga districts. This new belt of Western Karnataka comprising mostly laterite soils is being developed for commercial cultivation of flue-cured tobacco. Flue-cured tobacco is also grown to a small extent in Vijayapur area of Mehsana district of Gujarat, soils of which are sandy to sandy loam.

Natu tobacco soils: This local type of tobacco is used in the manufacture of cheroot, cigarettes, chewing powders and snuff and also to a limited extent in the preparation of pipe mixtures. The leaf used in the manufacture of cigarettes should be thin in texture with a pleasing aroma and moderate strength, while that used in cheroot, chewing powders and snuff may be stronger. The principal natu tobacco growing areas are in Andhra Pradesh distributed in the districts of Guntur, Prakasam, Khammam. West Godavari, Krishna, Kurnool and Anantapur. Natu tobacco is also grown for Cheroot and chewing purposes in Visakhapatnam and Srikakulam districts of Andhra Pradesh.

The soils on which natu tobacco is grown range from heavy black clayey soil as in Guntur district to sandy and sandy loam soils of West Godavari and Srikakulam districts. In Guntur district natu tobacco is grown on heavy clay soil as an unirrigated crop on the conserved moisture from monsoon rains. These soils are generally rich in lime. Some 'pati' soils (soils from old village sites which are rich in potash) are also used for growing natu tobacco. In West Godavari district natu tobacco is grown on shallow red loams with gravelly sub-soil. Because of the well-draining nature of soil, crop is irrigated several times (once a week or ten days). Similarly natu tobacco is grown in srikakulam district. In general as an irrigated crop, on red looms.

Lanka tobacco soils: Lanka tobacco is exclusively grown on the banks and deltaic islands of Godavari river in Andhra Pradesh .The soils are derived from the recent alluvium deposited annually by the river Godavari during floods and range from sandy to loam in texture. Some of these soils, which are submerged during floods every year are silty in nature and therefore, highly fertile requiring no fertilization for the crop grown. These soils also conserve lot of moisture and so tobacco is cultivated year after year on such low lying lankas without any irrigation. Lanka tobacco raised on high level lands on the other hand, requires two or three irrigation.

Cigar filler tobacco soils: In India cigar filler and binder tobacco are grown on sandy to loamy well drained red and brown soils off Madurai, Tiruchirapalli and Coimbatore district of Tamilnadu. Unlike the cigar tobacco soils of U.S.A this are alkaline in reaction and contain free calcium carbonate. Contents of CaO are higher than K_2O. Because of their highly sandy nature (about 65 percent coarse fraction) and yet a fairly good water holding capacity, the right air –water relationship and permeability characteristics exist in these soils. Though some rainfall is received by the crop during its growth period, it is heavily irrigated, about 20 times in all from well waters without fear of water logging.

Cigar wrapper tobacco soils: For the production of wrapper tobacco of good quality, the requirements of soil and climate are more exacting than for other types. The requirements of cigar wrapper for the cigar industry prior to partition of the country was net from Rangpur now in Bangladesh after partition exploratory trials carried out had shown that wrapper tobacco of reasonably good quality could be grown in Dinhata region of Koch Behar district of West Bengal. The required qualities of the leaf namely thinness,

silky texture, elasticity mild taste and light aroma are the outcome, of high humidity and low temperature prevailing in this area during the growing period. The soil on which this tobacco is grown at Dinhata is Silt loam .The texture of the surface soils is light silt loam and that of sub- soils heavy silt loam. The soil is acidic and has good water holding capacity.

Chewing tobacco soils: In Tamil Nadu, a large area is under this tobacco which is exclusively used for chewing purpose. For production of good quality tobacco, soils of red loam nature tilting towards more clay fraction and alkaline pH with assured drainage facilities are generally considered ideal. In the costal belt of Thanjavur district of Tamil Nadu, some costal sands are used for growing chewing tobacco. Chewing tobacco is preferably grown under irrigation with well water which is brackish and rich in soluble salts, particularly chlorides, since chlorine enables the chewing tobacco to retain the sauces and essences added to it during processing. The different conditions of soil and climate conditions have an important influence on the quality of chewing tobacco. This is evident from the large number of chewing tobaccos viz. Meenampalayam, Sivapuri, Vedanarayan, Momai, etc., which are produced in different regions of the state, each noted for its special quality.

Hookah and chewing tobacco soils: Hookah and chewing tobaccos are grown over a very wide types of soils in many states in India viz., Uttar Pradesh, Bihar, West Bengal and Punjab. Some of the hookah types can be used for chewing purposes and vice versa depending upon the method of curing.

In Uttar Pradesh, hookah tobacco which receives regular irrigation is grown mainly on the alluvial soils of Farrukhabad and Etah districts. Some of this soils are also saline. In Bihar, these types of tobacco are grown on sandy to silt loam alluvial soils of the northern tract. Lighter soils at higher elevations are generally used for N. tabacum type, while the low lying heavier soils are preferred for N. rustica type. These soils are deficient in available phosphorus and potassium. The soils are alkaline in reaction and contain free calcium carbonate.

In West Bengal, these types of tobacco are grown on sands tobacco Loamy soils of Koch Behar, Jalpaiguri, Dinajpur, Malda, and Murshidabad districts. In the Punjab, they are

grown on sandy loam soils of Jullundur and Ferozepur districts. These soils are alkaline and well supplied with nutrients.

Bidi tobacco soils: Bidi is the indigenous equivalent of a cigarette but with a leafy wrapper. The soils best suited for bidi tobacco cultivation are light to medium loams of old alluvial origin. Development of spangles (reddish brown spots), which is of vital importance to the quality of bidi tobacco is generally found to be profuse in light loams. However, this type of tobacco is grown in medium and medium heavy loams although the spangle development in these soils is not satisfactory.

Cultivation of bidi tobacco is confined to two zones namely Chantal in north Gujarat and Nipani in Karnataka. In the Chantal zone, which corresponds to the Kaira and Baroda district of Gujarat State, bidi tobacco is generally grown on sandy to sandy loam soils called goradu soils. In Baroda district two types of soils are met with viz, black and gorat, which are both Alluvial with differences in their contents of sand and clay. While the gorat soils have low content of organic matter and nitrogen, the black soils contain a little higher amount of nitrogen. The soils of Kaira district are sub divided into four groups by the farmers. They are (1) goradu (2) resar (3) black and (4) batha soils. The farmer two are coarser and contain from 6 to 10 percent clay and 70 to 80 percent sand, while the latter two are finer and contain 10 to 13.5 percent clay and 50 to 70 percent sand. The soils are alkaline in reaction with a pH of about 7.9 and are low in total exchange capacity. In Nipani area bidi tobacco is grown on silt loams.

3.3 Cultural practice of tobacco

In tobacco farming there are different types of processes like sowing, transplanting of seedlings, spraying, topping of flowering buds, disbudding of axillary buds, harvesting of plant, separating of leaves, curing, grading etc. Usually the farmers of the study area do not wear the gloves during the various agricultural processes like axillary buds and harvesting of plant, their hands get smeared with thick sticky plant sap and they have to wash their hands which require soap and kerosene after each shift to remove this plant sap. Most of tobacco farmers, tobacco farm-workers are ignorant about the adverse health consequences they face. In the organized sector, the government has legislated for the rights of the workers (such as the Factories Act. and Mining Act.) but there are no such enabling provisions for unorganized tobacco farm workers. It is well

documented that workers engaged in tobacco cultivation suffer from an occupational illness known as 'Green Tobacco Sickness' (GTS), largely due to absorption of nicotine through the dermal route (Riza et al., 2008). The symptoms of GTS include headache, nausea/vomiting, dizziness, loss of appetite, fatigue and weakness. Severe toxicity may also lead to breathlessness and fluctuation in blood pressure or heart rate. The studies carried out by the National Institute of Occupational Health (NIOH), in CTRI farms in Andhra Pradesh reveal discoloration of the skin for workers coming into contact with tobacco leaves (NIOH,1978). Even the storage of tobacco in houses was found to lead to higher incidences of nausea, headache and dizziness. Likewise the dust generated during the processing of tobacco was found to result in allergies among the workers.

Another studies by NIOH (2000) reveals that the prevalence of GTS among Indian tobacco harvesters both of the varieties i.e., non-Virginia (86.20%) and Virginia (53.29%). They also observed that excretion rate of nicotine and its major metabolic continue in urine were increased about 3 to 4 times among exposed workers (NIOH, 2000).

3.3.1 Bed preparation

Tilled beds where tobacco saplings are grown and regularly watered and weeded, with frequent application of fertilizers, insecticides and pesticides. High lying, well-drained soil should be selected for a good nursery site. Apply well-rotten and semi-dry powdered farm-yard manure at two kilos for every square metre area of nursery (2 tonnes per hectare). Mix it thoroughly with the soil. After preparing of beds, single super phosphate @ 350-400 kg per hectare or 200-220 g per bed is applied on top soil and mixed thoroughly. Seed rate for Wrapper and Jati tobacco should be 3 to 5 kg/ha or 0.3 to 0.5 g/sq. m bed 3 to 5 g/10 sq m bed and for Motihari tobacco should be 6 kg/ha or 0.6 g/sq m bed or 6.0 g/10 sq m bed as recommended by CTRI, Dinhata.

Seedbeds should be 15 cm high from ground level, 1.0 m wide (net) and of convenient length (10 m). In between the beds 45-50 cm space to be maintained to facilitate, irrigation, drainage and cultural operations including weeding and plant protection measures. Time of sowing of Wrapper and Jati Tobacco is at end of August to 1st week of September and Motihari Tobacco sowing time is middle of October to 3rd week of October. To ensure good germination seedbeds are mulched with paddy straw, which are removed after the initiation of germination.

3.3.2 Land preparation

Land preparation is an important part of successful production. Extensive ploughing is necessary but most should be completed before transplanting rather than during the production period. Soil should be prepared fairly deep, and ploughed only when the moisture level is normal or soil is in good tilth. Deep summer ploughing in June-July 2-3 times is highly useful to minimize weed population, Orobanche menace, insect pest and soil borne pathogens (CTRI, Dinhata). It also helps in improving soil water and nutrient holding capacity. Ploughing the field 6-8 times with tractor followed by equal number of ploughing by bullock drawn patella (plank) helps in preparation and levelling of the field.

3.3.3 Transplanting

Transplanting is done in the morning or in the evening. The seedling are taken out from the bed, and carried in a bamboo basket to the field, which lies around and close to the farmer's dwelling. A hole is made with a *pasoon* at each intersection of the rows already marked out, and a plant is put into the same about 2 inches into the earth, and the gap closed by gently pressing the soil around. The transplantation is made in the afternoon so that the seedling may be immediately nourished by the dews and coolness of the night. Four men can transplant one Bigha of land in one afternoon. The newly transplanted plants formerly covered for about two days with some leaves during day time but now-a-days in Dinhata cultivators are not covered the newly transplanted seedling. Motihari (Rustica) tobacco seedling is transplanted after 5 to 6 weeks of sowing during middle of November to 2nd week of December and Jati and Wrapper (Tabacum) tobacco seedling is transplanted after 7 to 9 weeks during end of October to 1st week of November. Spacing between plants of Motihari, Jati and Ciger wrapper as recommended by CTRI, Dinhata are 45 cm, 90 cm, and 45cm respectively. Spacing between rows of Motihari, Jati and Ciger wrapper as recommended by CTRI, Dinhata are 60 cm, 90 cm, and 90cm respectively.

3.3.4 Manures and fertilizer

Cigar wrapper: Basal application of FYM @ 15 tonnes/ha one month before planting and soil application of 60 kg nitrogen/ha through urea, 112 kg P_2O_5 through single super phosphate and 224 kg K_2O through sulphate of potash K_2SO_4 and top dressing of urea (60 kg N/ha) at 50-55 days after planting is found beneficial (Rao, 1998).

Jati: Basal application of 20 tonnes FYM/ha one month before planting. Application of 56 kg nitrogen/ha through urea, 112 kg P_2O_5 through SSP and 112 kg K_2O/ha through SOP and top dressing of urea (56 kg N/ha) at 55-60 days after planting is recommended by CTRI, Dinhata.

Motihari: Basal application of 10 tonnes FYM/ha one month before planting. Soil application of 65 kg Nitrogen/ha through urea, 50 kg P_2O_5 /ha through SSP and 75 kg K_2O/ha through SOP and top dressing of urea (60 kg Nitrogen/ha) at 40-45 days after planting is the essential requirement (Rao, 1998).

3.3.5 Irrigation

Requirement of irrigation for tobacco crop depends upon the types of tobacco and the tracts where it is grown. For wrapper tobacco 3-4 irrigations are required while for Jati and Motihari 2-3 irrigations are sufficient to achieve desirable yield and quality of leaf. For wrapper, Jati, Motihari the critical stages of irrigation are 40-45, 55-60, and 45-50 days after planting respectively.

3.3.6 Interculture

Intercultural operation is essential for aiding full development of potential returns of the crop. Interculturing of the field with hand plough is made at weekly intervals after the transplantation of the crop.

3.3.7 Weeding

Onbanche is an important weed of tobacco. This weed derives almost its nourishment from tobacco plant itself. Hence cleaning of this weed is suggested to be essential.

3.3.8 Topping

The objective of topping operating is to divert the energy and plant nutrients from the reproductive growth to vegetative growth generally the number of leaves are increased while its size and decreased when the plan is about 60cm height. Leaves become uneven and coarse with increased in leaves. To avoid the situation, the terminal floral buds at this stage, are topped leaving 8 leaves on the plant excluding the sand leaves. In this way stem grows to about 75cm in height with all the leaves are nearly of the uniform size. This also prevents the excessive coarseness of the leaves.

3.3.9 De-sucking

De-suckering is also made to influence the yield and quality of tobacco. Dormant buds in axils of the leaves become active due to topping and put forth stood known as suckers .Quality of leaves is noted to be detoriated due to existence of suckers. It is, therefore, necessary to remove the suckers at felt needs. This operating is known as du-suckering.

3.3.10 Priming, curing and bulking

Motihari and Jati tobaccos: Formation of yellow spangle on leaf lamina, subsequently turning to reddish brown spot/tinge is an indicator of maturity in Motihari and Jati tobaccos. The leaves are primed in the morning and spread flat on the ground. Late in the afternoon these leaves are tied in bunches of 4-5 with a thin bamboo splinter and lifted to the curing barn and heaped on the floor. The next day morning the primed leaves with bamboo structures are loaded in country barn made of bamboo mat walls and G.I. sheet roof for curing. Curing is completed with the drying of lamina, midribs and petioles. Thereafter the leaves are removed, spread on the floor and tied with bamboo splinter having 20-25 leaves in each bundle. Bundles are arranged in a bulk for fermentation. The bundles are turned periodically at an interval of 8-10 days to facilitate fermentation process and development of reddish brown coloration on leaf lamina (Deo Singh, 2003).

A temperature of 35-40^{0}C is ideal for desired fermentation and colouration process of leaf and for good marketability.

Wrapper tobacco: A total of 6-7 primings are done according to the leaf maturity. Three to four leaves are primed at a time and taken to a shade for sorting out according to the size of the leaf. The leaf bundles/hands with 16-20 pairs of leaves are strung with jute thread (sutli) keeping their dorsal surface facing each other on bamboo sticks. These structures are kept in thatched curing barn for air curing. For slow curing the country type barn made of bamboo mat and paddy straw with thatched roofing is used. It provides congenial atmosphere for adequate humidity and aeration from January to April. The opening and closing of ventilators and windows are to be regulated to maintain slow air-drying.

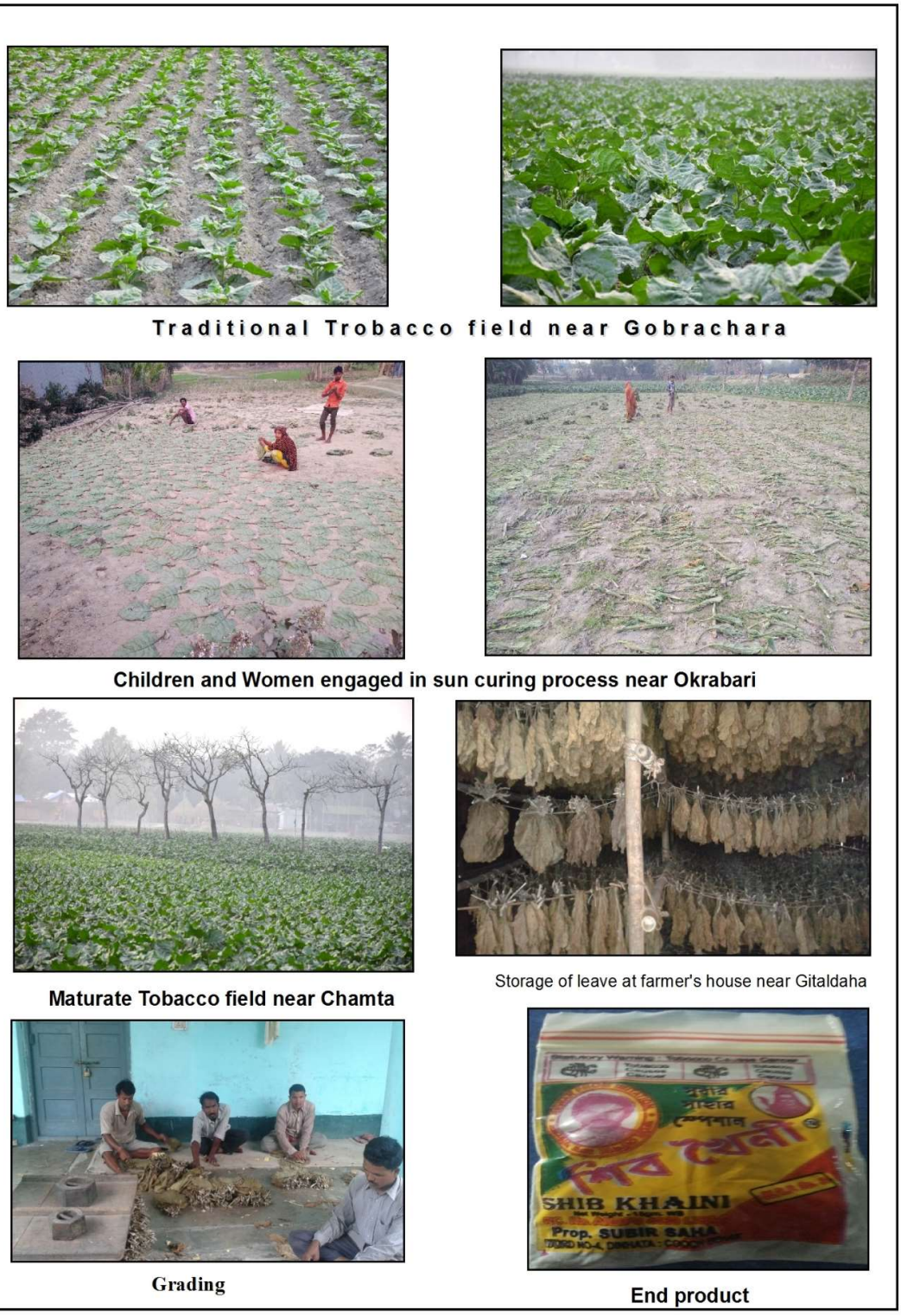

Plate 3.1 Tobacco Cultivation and processing

When the atmospheric relative humidity is high and the weather is cool, the leaves should be unloaded and graded according to grade standards.

Flue-cured tobacco: Bright cigarette tobacco means flue cured tobacco. Flue curing method is followed entirely in curing Virginia tobacco. Green leaf is dried under artificial atmospheric condition under the process of this type of curing.

Fire-curing: Chewing type of tobacco are fire cured. This type of curing is not followed in Dinhata subdivision.

Sun-curing: Jati and Motihari tobacco in study area is cured by this process. In this process, tobacco leaves are kept suspended on the ropes or laid on floor to be cured in sunlight and natural air. The important thing in this process is that sunlight must fall on the tobacco leaves. Leaves are put inside corrugated iron sheds with all four walls remaining open so that there is free air. They are then tied in bunches of 8 to 10 leaves and cured at bamboo splinter for 6 weeks. Thereafter, they are bulked and fermented.

3.1.1 Grading

Motihari and Jati tobaccos: Grading of *Jati* and *Motihari* tobacco is characterized on the basis of thickness, aroma and maturity.

i. **Pan patta (Special grade):** Oily surface, thick uniform leaves, coppery brown in colour and good puckering.

ii. **No.1 Grade (Good quality):** Medium thick leaves, coppery brown colouration with satisfactory oiliness, minor physical injuries also included.

iii. **Niras grade (Khunda):** Thin bodied leaves, slightly dark appearance with dry texture, devoid of puckering and may have considerable injury.

iv. **Zala patta grade (Fired leaves):** Leaves are not matured properly and are partially burnt on the plant before harvest.

Wrapper tobacco: Unblemished cigar wrapper tobacco leaves are graded lengthwise as follows

i. Special grade- 20” and above (50 cm and above)

ii. 1st grade- from 16”-20” (40-50 cm)

iii. 2nd grade - from 12”-16” (30-40 cm)

iv. 3rd grade- from 8”-12” (20-30 cm)

3.4 Exports of tobacco from India

India's export of unprocessed tobacco and tobacco product from 1991-92 to 2007-08 shown in Table 3.3. The export of unprocessed tobacco from India in terms of volume shows a steady growth from 71792 tonnes in 1991-92 to 174690 tonnes during 2007-08. The rupee value of unprocessed tobacco has increased 342.69 ₹ Crores in 1991-92 to ₹1478.51 crores during 2007-08.

The volume of tobacco products exported from India also shows a high growth from 14662 tonnes in 1991-92 to 30657 tonnes during 2007-08. The rupee value of tobacco product has increased ₹ 47.71 Crores in 1991-92 to ₹ 544.27 crores during 2007-08.

It is noted that demand of tobacco is increasing day by day in global market. This is perhaps due to restrictions in other countries especially developed countries on tobacco cultivation. Obviously, this is not good news for food security of our country.

Table: 3.1 Export of Tobacco and Tobacco product from India (1991-2007)

Year	Tobacco		Tobacco products		Tobacco & Tobacco Products		
	Quantity	Value	Quantity	Value	Quantity	Value in crore	
	In Tons	In crore ₹	In Tons	In crore ₹	In Tons	In IND. ₹	In US $
1991-92	71,792	342.69	14,662	47.71	86,454	390.4	164.49
1992-93	81,294	434.41	13,424	73.33	94,718	507.74	175.32
1993-94	91,998	406	9,221	79.72	101,219	485.72	154.87
1994-95	44,600	207.83	10,822	59.95	55,422	267.78	85.29
1995-96	72,052	361.36	11,883	59.68	83,935	421.04	126.06
1996-97	117,466	733.66	13,115	92.86	130,581	826.52	234.32
1997-98	136,739	972.83	7,795	88.36	144,534	1,061.19	272.52
1998-99	82,366	634.48	18,957	171.71	101,323	806.19	199.1
1999-00	122,590	864.47	13,631	185.45	136,221	1,050.22	245.55
2000-01	100,537	677.04	15,393	226.34	115,390	903.38	203.55

2001-02	86,010	602.89	16,076	285.63	102,086	888.52	189.04
2002-03	107,715	770.62	19,842	325.33	127,557	1,095.95	224.95
2003-04	128,186	825.48	22,776	350.15	150,962	1,175.63	251.04
2004-05	138,159	968.9	24,774	393.28	162,933	1,362.18	305.77
2005-06	142,007	1,027.52	24,862	385.95	166,869	1,413.47	322.49
2006-07	152,618	1,241.05	28,370	482.37	180,988	1,723.42	381.54
2007-08	174,690	1,478.51	30,657	544.27	205,347	2,022.78	502.67

Source: Tobacco Board, Ministry of Commerce, Guntur

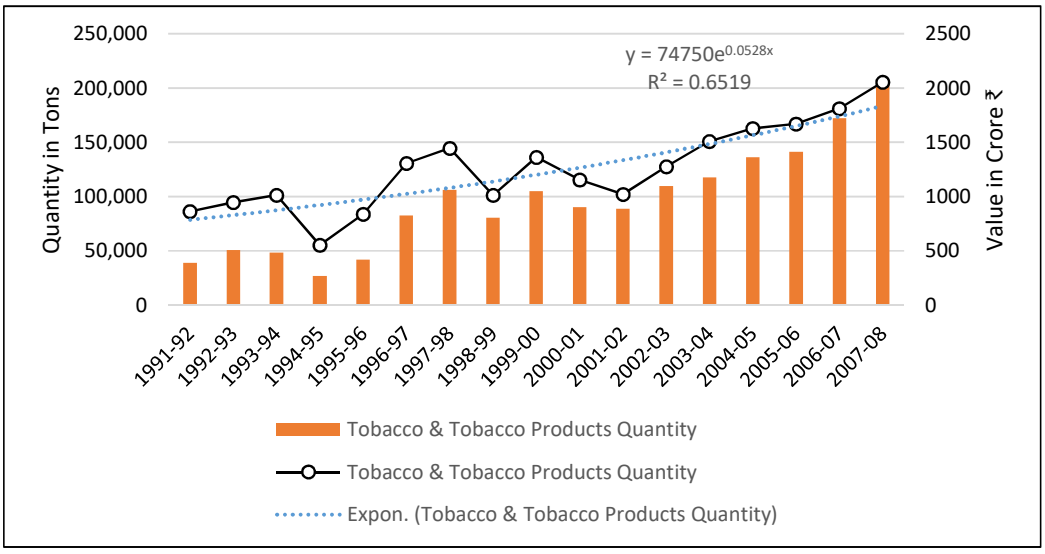

Figure: 3.1 Export of tobacco and tobacco product from India (1992-2008)

3.5 Trade scenario and end uses of tobacco of the study area

3.5.1 Motihari Tobacco

Cultivation of Motihari tobacco has a significant place among farmers and traders in Koch Behar and Jalpaiguri district of North Bengal since it is grown a wider acreage comprising 70-80% of the total tobacco growing area in the state compared to other type of tobacco. The price of cured leaves of motihari tobacco varies with the varietal performance and great commensurate to trade demand locally and other state of India. Local market price on an average ranges from Rs20-25, Rs15-20 and Rs 10-15/kg for 1st, 2nd, and 3rd graded cured leaves respectively (2011-2012).

The cured tobacco of Motihari type is used for the preparation of Khaini for chewing purpose, which has numerous small scale units in this region. The cured leaves are

fermented to make kala patti used for consumption mostly in North Eastern State of India. Besides, the tobacco of this region has special demand in state of Bihar, Orissa and, Maharashtra for the manufacture of Hookah Paste, Guraku, Gutka and also for the preparation of dyes .The dry stem of Motihari tobacco is exported to neighbouring Bangladesh for the manufacturing of cigarette, Bidi characterized by the Bidi tobacco wrapped in paper .The dust and small bits (Kandi) obtain from dry stem is blended with bidi tobacco for enhancing burning quality of the product.

3.5.2 Jati tobacco

Chama and podali type under jati tobacco grown exclusively on bank of river Singimari in Cooch Behar district of North Bengal has special trade preference especially in North Eastern State of India .The average price of jati tobacco in the local market ranges from Rs 30-35, Rs. 20-25 and Rs 15-10/for 1st, 2nd, and 3rd grad cured leaves respectively (2011-2012).

The cured leaf of jati tobacco is fermented in bulk covered by jute gunny bags or tarpaulin to obtain kala patti for direct consumption as an ingredients of pan for chewing purpose .The cured leaves are also blendedin the preparation of Zarda along with other chewing types of tobacco. The cured leaves are used for chwing and smoking wrapped in ordinary newspaper and special paper in North Eastern India. The inferior grad of jati tobacco is transported to Gujarat for a manufacture of a product name `Botad` which is filled in Hookah for smoking purpose.

3.5.3 Cigar Wrapper tobacco

Though cigar wrapped tobacco is grown in restricted pocket of Cooch Behar district ,it has a trade demand in Tiruchirapalli and Dandigul district of Tamil Nadu for export purpose .On an average the local market price of special grade , first, second and third grade cured leaves realized varies from Rs 70-80/kg, 60-70/kg , 50-60/kg, 30-40/kg, respectively (2011-2012).

Cigar wrapper tobacco of this region has a special market demand for manufacturing cigar for smoking under different brands in overseas market.

3.6 Trend of tobacco cultivation of the study area

Tobacco is planted during rabi season in the region. Production of tobacco in the region had been fluctuated due to anti-tobacco campaign, health hazard and market fluctuation.

To computing compound annual growth rate of tobacco production, area and yield rate Exponential curve have been used (Gupta, 2008).

Here use exponential curve for computing compound annual growth rate of tobacco production, area and yield rate (Gupta, 2008)

$$\hat{g} = (\hat{b} - 1)100$$

By taking logarithm equation become linear function,

$$\log Y = \log a + (\log b)x$$

Where, Y= log y; A= log a; B= log b

Now, the method of least square can be applied to yield the normal equations given the estimates of A and B.

Then, a=Antilog A; b= Antilog B

3.6.1 Volume of production

Total production of tobacco in Tobacco in Dinhata Subdivision had been increasing by an average of 3.0% annually from 2006 to 2012. From a total volume of 8832 metric tons in 2006, it raised to 10949 metric tons in 2012. Among the 3 administrative blocks, Dinhata-I exhibited the highest incline of motihari tobacco averaging 6.80% annually from 1920 metric tons in 2006 to 3125 metric tons in 2012, while Sitai block had the least incline at 1.45% annually from 5900 metric tons in 2006 to 6525 metric tons in 2012. But in case of Jati tobacco it was only Dinhata-I that exhibited negative growth. However, this was very minimal decline an average of 1.83% annually. This decline was due to the reduction in the area planted/harvested during this time period.

Table: 3.2 Volume (mt) and annual growth rate (%) of production of tobacco in the study area

Type	Block	2006	2007	2008	2009	2010	2011	2012	Annual growth rate (%)
Motihari Tobacco	Dinhata-I	1920	1365	2244	3332	1255	2210	3125	6.8
	Dinhata-II	742	844	918	883	758	1032	1056	4.67
	Sitai	5900	5625	6100	7600	6165	5895	6525	1.45
	Total	8562	7834	9262	11815	8178	9137	10706	3.10
Jati Tobacco	Dinhata-I	120	116	115	125	60	117	125	-1.83
	Dinhata-II	-	-	-	-	-	-	-	-
	Sitai	150	95	52	220	120	121	118	2.17
	Total	270	211	167	345	180	238	243	0.02
Total Tobacco production		8832	8045	9429	12160	8358	9375	10949	3.0

Source: SAO, Dinhata, 2013 and complied by the researcher

3.6.2 Tobacco Production

Total area of tobacco cultivation has been increasing at an average annual rate of 3.5% in Dinhata sub-division. Similar to the trend in the volume of production, the area planted/harvested in the 3 blocks of Dinhata subdivision had been incline, except Jati tobacco area. Among Motihari tobacco area, Dinhata-I having the highest incline (6.99%), while Sitai had the least incline at 1.69 % annually. But in Jati tobacco had experienced a decline in the total area cultivated in this subdivision at an average annual rate of -2.19 %. This decline was due to the reduction of demand of Jati tobacco in neighboring state of West Bengal.

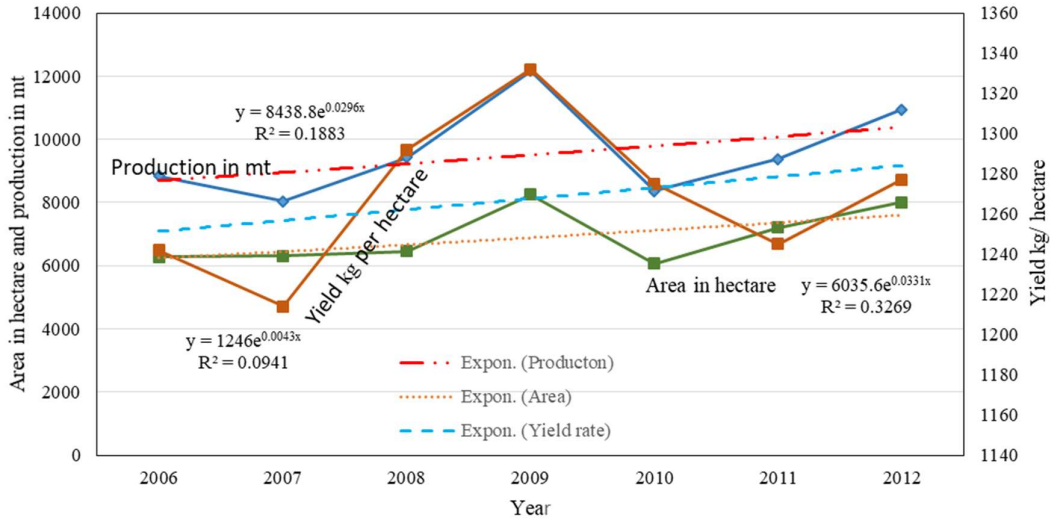

Figure: 3.2 Trend of tobacco production (2006-2012)

Table: 3.3 Total area (hectare) planted/ harvested and annual growth rate (%) of tobacco in the study area

Type	Block	2006	2007	2008	2009	2010	2011	2012	Annual growth rate (%)
Motihari Tobacco	Dinhata-I	1500	1050	1700	2380	930	1700	2500	6.99
	Dinhata-II	530	570	600	570	570	800	800	6.89
	Sitai	4000	4500	4000	5000	4500	4500	4500	1.69
	Total	6030	6120	6300	7950	6000	7000	7800	3.61
Jati Tobacco	Dinhata-I	100	95	100	100	50	100	100	-2.09
	Dinhata-II	-	-	-	-	-	-	-	-
	Sitai	150	100	50	200	100	100	100	-1.85
	Total	250	195	150	300	150	200	200	-2.19
Total Tobacco production		6280	6315	6450	8250	6060	7200	8000	3.35

Source: SAO, Dinhata, 2013 and complied by the researcher

3.6.3 Yield per hectare

Table 3.4 shows the average yield per hectare (kg) for two types of tobacco in 3 administrative blocks of Dinhata subdivision. Production of tobacco per hectare has been little increasing at an average annual rate of 0.44% in Dinhata subdivision. From an average of 1242 kg/h in 2006, this had reached into 1277 kg/h by 2012. But in Motihari tobacco, there was a decreasing trend at an average rate of 0.85% annually in the study area in spite of aggressive extension activities of the various government agencies particularly CTRI and private tobacco companies. This decline yield rate was due to the traditional and orthodox method of tobacco culture. Dinhta-II has exhibited the highest decrease at -2.07 %, although which did not compensate for the total volume production of Motihari tobacco in this region due to increase in tobacco cultivated area, while Sitai block had experienced the least decline at -0.25% annually.

Table: 3.4 Average yield per hectare (kg) and annual growth rate (%) of tobacco in the study area

Type	Block	2006	2007	2008	2009	2010	2011	2012	Annual growth rate (%)
Motihari Tobacco	Dinhata-I	1280	1300	1320	1400	1350	1300	1250	-0.17
	Dinhata-II	1400	1480	1530	1550	1330	1290	1320	-2.07
	Sitai	1475	1250	1525	1520	1370	1310	1450	-0.25
	Total	1385	1343	1485	1490	1350	1300	1340	-0.85
Jati Tobacco	Dinhata-I	1200	1220	1150	1250	1200	1170	1250	0.30
	Dinhata-II	-	-	-	-	-	-	-	-
	Sitai	1000	950	1050	1100	1200	1210	1180	4.06
	Total	1100	1085	1100	1175	1200	1190	1215	2.09
Total Tobacco production		1242	1214	1292	1332	1275	1245	1277	0.44

Source: SAO, Dinhata, 2013 and complied by the researcher

3.7 Impact of tobacco farming

Tobacco as a 'crop' is harmful many ways. A number of concerns have been raised about the impact of tobacco cultivation on the farming families who grow the crop. Among these are the low returns from the crop leading to poverty and it has direct impact on soil depletion, pollution of soil and water from excessive use of chemical fertilizer, the enormous other environmental, health and socioeconomic costs associated with its production. But in India, the government and the tobacco companies argue that the tobacco industry contributes significantly to government revenues, both directly and indirectly, and also employs a considerable number of Indians, as farmers, as traders dealing in cigarette distribution and as workers in the tobacco companies.

3.7.1 Impact on water

Tobacco is a sensitive plant prone to many diseases and pests, therefore farmers use huge amounts of fertilizer to increase foliage weight and quality so as to maximize yield and returns. Massive amounts of herbicides and pesticides are also used in its production. The application of these chemicals covers the period from the nursery to when the crop is harvested. In the study area, farmers reported using a variety of chemicals and fertilizers in tobacco cultivation (see Table 3.5). These chemicals leach into the soils and in the long run find their way into and pollute wetland, rivers and food chains, thus destroying biodiversity.

Worse still, in rural area of the study area, most people use water from these rivers and streams for their washing, drinking and cooking and for their animals. The agrochemicals used in the production process may also indirectly cause the genetic selection of pesticide-resistant disease transmitting agents, making control of diseases such as malaria much more difficult.

Table: 3.5 Chemical and Fertilizer Used in Tobacco Cultivation in the Study area

Chemical and Fertilizer	Urea	Potash	NPK	DAP	SSP	Agromin +	Agromin liquid	Boron	Sulpher	Zinc
Kg/Ha	722	361	126	126	451	27	3.61	2.53	9.03	0.72

Source: Field Survey, 2012

3.7.2 Impact on Soil

FCTC Working group Report states that 'tobacco deplates soil nutrients at a much faster rate than most crops' and that 'engineering of tobacco to deliver nicotine result in a massive outflow of nutrients and causes ecosystem disruption' (BAT, 2012).

Intense tobacco cultivation contributes to poor food supply and causes soil aridity. Tobacco uses more primary soil nutrients than most cash and food crops. The impact is therefore severe in this subdivision which has low soil nutrients. The majority of farmers in the study area indicated that repeated tobacco cultivation has resulted in severe soil degradation in the area. Farmers further pointed out that tobacco cultivation has introduced various stubborn weeds which were not common in the area before.

3.7.3 Impact on Farmers' health

As mentioned above, the tobacco farming requires a massive amount of agrochemicals to protect it from insects and diseases. As a result, farmers use numerous separate applications of agrochemicals from the time the crop is planted in the nursery to the time it is finally harvested. The intensive and repeated use of these chemicals takes a toll on tobacco farmers, many of whom are unaware of the proper safety procedures necessary to handle them. Research indicates that as a result of their occupation, tobacco farmers are exposed to green tobacco sickness, a type of nicotine poisoning caused by the absorption of nicotine through the skin (NIOH, 2000).The sickness is worse and more frequent when workers do not wear gloves or protective clothing (Campaign for Tobacco-Free kids, 2001).

In the survey (2012), farmers were asked if they are aware of any health risks or harmful effects associated with tobacco cultivation and processing and also to indicate the effects. Most of the farmers (75.8%) said they are aware of the health risks associated with tobacco farming. The effects mentioned include: chest problems/pains, especially after spraying the crop; poor eyesight, blurred vision or complete loss of sight, miscarriages for pregnant women; fever; dry throat; itchy/irritated skin at harvesting; and back problems, especially after harvesting.

Table: 3.6 Response of Tobacco farmer on them aware of any health risk associated with tobacco cultivation and their percentage distribution

Response	Dinhata-I	Dinhata-II	Sitai	Average
Yes	80.0%	70%	77.5%	75.83%
No	17.5%	30%	22.5%	23.33%
No answer	2.5%	0	0	0.84%

Source: Field Survey, 2012

Farmers who stipulate knowledge of the health effects associated with tobacco cultivation and processing were then asked whether they take any preventive measures to avoid these illness effects. Results show that a very poor percentage (12.5%) of tobacco farmers protect themselves from these harmful effects. The only protective measure mentioned by farmers was the use of homemade protective gear when spraying agrochemicals. Farmers complained that, there are not available of such kind of protective materials in local market, so it difficult to acquire them, despite the known fact that high doses of herbicides and pesticides are said to be dangerous to workers, damaging eyes, skin and internal organs.

Table: 3.7 Response of Tobacco farmer on take any preventive measures during tobacco cultivation and their percentage distribution

Response	Dinhata-I	Dinhata-II	Sitai	Average
Yes	7.5%	27.5%	2.50%	12.5%
No	87.5%	62.5%	75%	75%
No answer	5%	10%	22.5%	12.5%

Source: Field Survey, 2012

3.7.4 Child and Women labour

Farm operations for tobacco cultivation has been analysis in the section 3.3. Some of these include having women and underage family members assist in farm operations, especially, topping, de-sucking, priming, curing bulking, curing etc., which are done in the early morning or evening time. Farmers therefore resort to other cost cutting measures to increase their earnings. The Field Survey revealed that 79.16% of children of sample

tobacco growing families and 61.67% of children of sample non-tobacco growing families were involved in farming process in the study area. The use of children in tobacco cultivation on these farms presents a unique health problem. Various research shows that exposure to pesticides and other agrochemicals used in tobacco cultivation poses a considerably higher risk to children than adults, since children's nervous and immune systems can be more easily damaged, leading to a greater risk of cancer (Campaign for Tobacco-Free kids, 2001). The involvement of children in tobacco cultivation also leads to increased school drop-out rates. This perhaps explains the low education level of most of the farmers that grow tobacco in the study area. The International Labour Organization (ILO) convention No. 182 calls for eliminating the worst forms of child labour without delay (ILO, 1999).

Table: 3.8 Response of Tobacco and non-tobacco farmer on involvement of children's in farming process and their percentage distribution

Response	Dinhata-I	Dinhata-II	Sitai	Average
Tobacco Farmer	72.5%	80.0%	85.0%	79.16%
Non-Tobacco Farmer	67.5%	65.0%	52.5%	61.67%

Source: Field Survey, 2012

3.7.5 Impact on Food security

In the study area most of the agricultural land are belong to single, double and triple cropped area. Tobacco is mostly grown in double and triple cropped areas. For tobacco and its alternative crops, two cropped areas mean primarily rabi season (mid-October to end of April for crops such as Potato, Maize, Boro paddy, Wheat, Mustard, Cabbage, cauliflower, pulses, vegetables etc.) and Pre-kharif season (March to mid-July for Jute, Aus paddy, maize, vegetables etc.). So in terms of seasons and land covered, tobacco cultivation plays an effective role in replacing food and other important commercial crops such as Jute, Maize etc. Although tobacco is an important cash crop in the study area, but farmers produce food and other crops both for cash and subsistence purpose. So all crops are cultivated in the study area for cash as well as for subsistence purpose. Potato, cabbage, cauliflower, onions, tomato, turmeric, pulses do not have immediate food value, but its help farmers cash requirement for fulfilling needs such as house repairing, clothes, medicine, agricultural equipment and other needs. Sowing and

harvesting period of tobacco compares with existing major crops in the study area have been shown in the table 3.8. Following table demonstrate that harvesting period of Aman paddy, Ginger, Turmeric and sowing time of Aus paddy, summer mung, Sesam and Jute clashes with tobacco period.

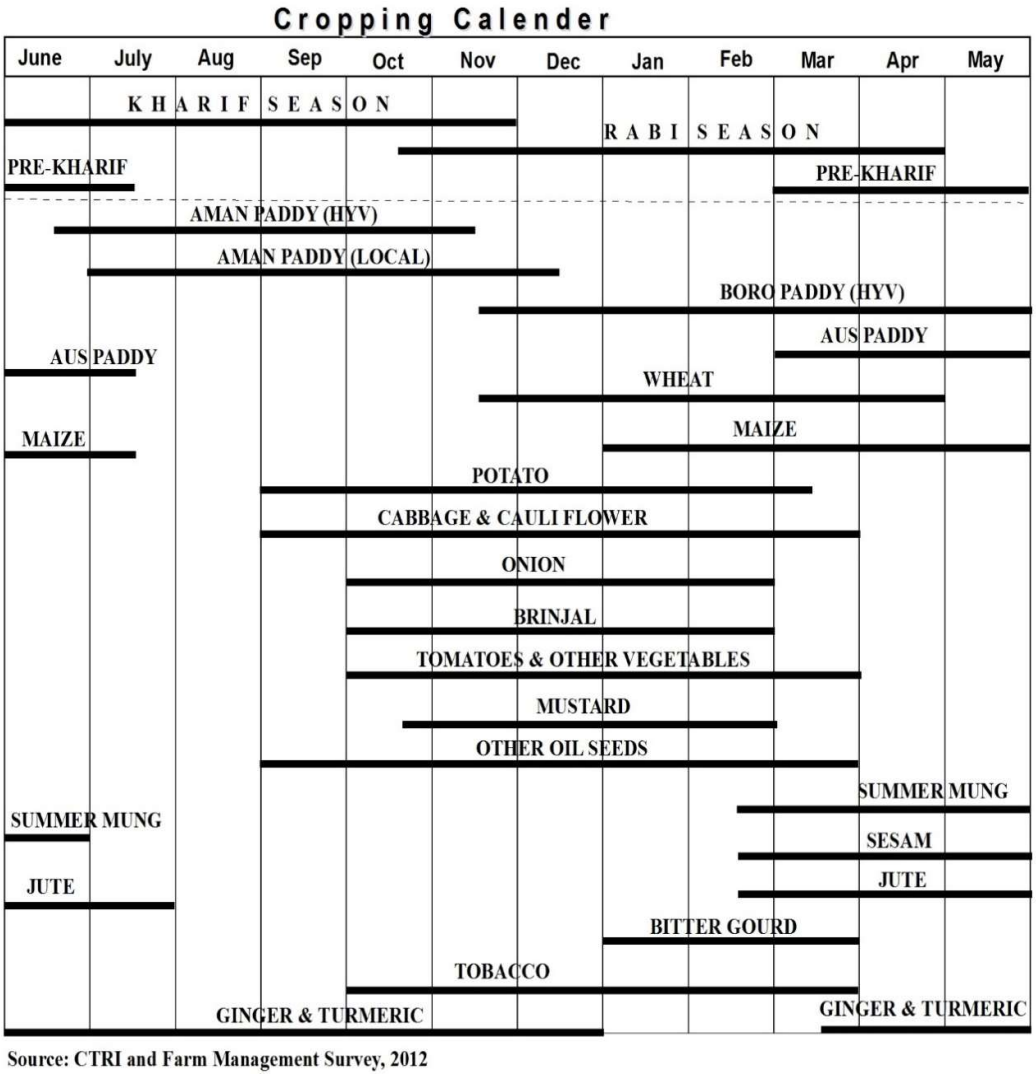

Figure: 3.3 Cropping calendar

Table. 3.9: Sowing and harvesting period of major crops in the study area

Sl No.	Name of Crop	Sowing and Harvesting Period	Overlaps with Tobacco
1	Aman Paddy (HYV)	Mid June to Mid-November	Harvesting
2	Aman Paddy (Local variety)	Early July to Mid-December	Harvesting

3	Boro Paddy (HYV)	Mid November to End May	Sowing and Harvesting
4	Aus Paddy (HYV & Local)	Early March to Mid-July	Sowing
5	Wheat	Mid November to End April	Sowing and Harvesting
6	Maize	Early January to Mid-July	Sowing aid Harvesting
7	Potato	Early September to Mid-March	Sowing aid Harvesting
8	Cabbage	Early September to End March	Sowing aid Harvesting
9	Cauliflower	Early September to End March	Sowing aid Harvesting
10	Onion	Early October to End February	Sowing aid Harvesting
11	Brinjal	Early October to End February	Sowing aid Harvesting
12	Tomato	Early October to End March	Sowing aid Harvesting
13	Mustard	Mid October to End February	Sowing aid Harvesting
14	Other oilseeds	Early September to End March	Sowing aid Harvesting
15	Summer mung	Mid February to End June	Sowing
16	Sesam	Mid February to End May	Sowing
17	Jute	Mid February to End July	Sowing
18	Bitter gourd	Early January to End March	Sowing and Harvesting
19	Ginger	Mid-March to End December	Harvesting

20	Turmeric	Mid-March to End December	Harvesting
21	Tobacco	Early October to End March	-

Conclusion

Tobacco should be termed as 'crop' remains a question, it is a 'killer plant' or 'merit bad crop' like opium. The aforesaid analysis revealed that tobacco cultivation have been many disadvantages but how these are assessed depends on farmers' circumstances. Farmers are exposed to facing multiple hazards of which health effect is but one. Result also indicate that despite the negative economic, social and environment impacts associated with tobacco production, area of tobacco cultivation is still increasing. This expansion is at the expense of food crops whose role is vital to food security and in essence undermines WHO FCTC efforts. This is perhaps due to restrictions in other countries on tobacco cultivation. Tobacco cultivation in the study area is not under the contract farming, but farmer take Credit advance from local tobacco companies or tobacco businessmen, which is not available for other crops. Unstable price and market of all other crops is another hindrance for alternative crops. In case of FCV tobacco, No person shall grow Virginia tobacco seedlings for commercial purposes; grow FCV tobacco without obtaining registration from the Tobacco Board, but there have not such regulation in non-FCV tobacco. Obviously, this is not good news for replacement of tobacco cultivation in the study area. However, the ability of farmers to move out of tobacco cultivation suggests that there is an element of choice in what they do within the general constraints, given the restricted range of options available to them. Suitable extension support can help crop diversification programs.

References

Akhter, F. (2011). Tobacco cultivation and its impact on food production in Bangladesh. *UBINIG,* Dhaka.

Arcury, T.A., Quandt, S.A. (2006). Health and social impacts of tobacco production. *Journal of Agromedicine,* 11:71–77.

BAT (2012). Research and Evidence collection on Issues related to article 17 and 18 of the Framework Convention on Tobacco control. *DD International,* Kent.

Bhonsle, R.B., Murti, and P.R. Gupta, P.C. (1992): Tobacco habits in India. In: Gupta, P.C., Hamner J.E., Murti, R.R. (eds.) *Control of tobacco related cancer and other diseases international symposium 1990.* Bombay. Oxford University press, pp 25-45.

Campaign for Tobacco-Free kids (2001). Golden leaf, barren harvest: the costs of tobacco farming. *Campaign for Tobacco-Free kids,* Washington.

Clay, J. (2004). World Agriculture and the environment. *Island Press,* Washington DC.

Deo Singh, K. (2003). Production technology for Motihari, Jati, Cigar Wrapper tobacco in North Bengal. *Central Tobacco Research Institute,* Dinhata, West Bengal, 34p.

Gopalchari, N.C. (1982). Tobacco. *Indian Council of Agricultural Research,* New Delhi, 327p.

Gopalchari, N.C. (1985). Tobacco in India. *Central Tobacco Research Institute,* Rajamundry, 92p.

Gupta, S.P. (2008). Statistical Method. *Sultan chand & sons,* New Delhi, pp.623.

ILO (1999). C182 - Worst Forms of Child Labour Convention (No. 182*)* Available from*http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_ILO_CODE:C182.* Accessed on 21 April 2011.

Kumaresan, A. (2009). Tobacco Exports: The untapped Potential, Market Survey. *EFY magazine,* Electronic Version. Accessed on 16 August 2012.

National Institute of Occupational Health (1978). Studies on occupational health problems in tobacco workers. *Annual Report,* Ahmadabad, NIOH, 1977 and Annual Report 1978.

National Institute of Occupational Health (2000). Occupational health problems of tobacco harvesters and their prevention. *Annual Report,* Ahmadabad, NIOH, 2000.

Rao, P.V.V.(1998). Package of practices for wrapper, filler, jati and motihari tobacco in North Bengal. *Central Tobacco Research Institute,* Dinhata, West Bengal, 59p.

Reddy, K.S. and Gupta, C.P. (2004). Tobacco control in India. *Ministry of Health & Family welfare.* Government of India, 378p.

Riza, E., Baka, A., Linos A. (2008). Health risks related to tobacco growing. *Study conducted for the second meeting of the study group on economically sustainable alternatives to tobacco growing,* Mexico City, 17–19 June 2008.

Schmitt, N.M. et al. (2007). Health risks in tobacco farm workers – a review of the literature. *Journal of Public Health,* 2007, 15:255–264.

Tucker, D. (1982). Tobacco: an international perspective. *Euromonitor Publication Ltd.* London, 211p.

Viswanathan, C. (2011). Priorities in health. Available from URL:*http://www.acsh.org/publications/priorities/1304/notes.html*. Accessed on 29 April 2011.

Wynder, E.L. & Hoffmann D. (1967). Tobacco and Tobacco smoke. *Academic Press,* New York, 730p.