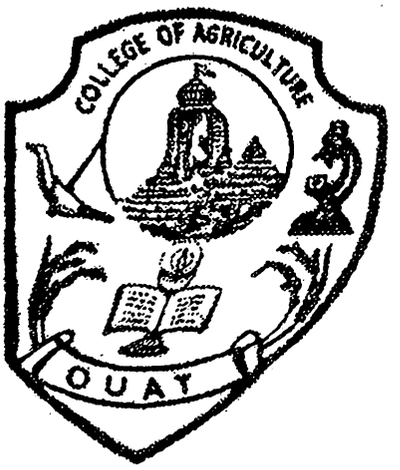
A STUDY ON "ADOPTION BEHAVIOUR OF BETEL VINE FARMERS" OF BALASORE DISTRICT OF ODISHA

A
THESIS SUBMITTED TO
THE ORISSA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY
BHUBANESWAR
IN PARTIAL FULFILMENT OF THE REQUIREMENTS
FOR THE DEGREE OF

MASTER OF SCIENCE IN AGRICULTURE
(EXTENSION EDUCATION)

By

PRADIPTA KUMAR SEN



DEPARTMENT OF EXTENSION EDUCATION
COLLEGE OF AGRICULTURE
ORISSA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY
BHUBANESWAR, ORISSA
2013

THESIS ADVISOR: Dr. N. ROUT

Dedicated To

My

Beloved Parents

& u...

DEPARTMENT OF EXTENSION EDUCATION
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ORISSA UNIVERSITY OF AGRICULTURE & TECHNOLOGY
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CERTIFICATE

This is to certify that the thesis entitled, **A STUDY ON "ADOPTION BEHAVIOUR OF BETEL VINE FARMERS" OF BALASORE DISTRICT OF ODISHA.** *Submitted in partial fulfillment of the requirements for the award of the degree of* **MASTER OF SCIENCE (AGRICULTURE)** *in the discipline of EXTENSION EDUCATION to the Orissa University of Agriculture and Technology, Bhubaneswar, in an authentic record of bonafide research work carried out by* **PRADIPTA KUMAR SEN** *under my guidance and supervision.*

This research work is original and no part of this thesis has been submitted for any other degree or diploma. The assistance received during the course of investigation has been duly acknowledged by him.

Nityananda Rout
29.07.2013

(Dr.N. Rout)
CHAIRAMAN
Advisory committee.

APPROVAL SHEET

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Last but not least, with heartful devotion, I solicit the benediction of all mighty "God" who is most benevolent to guide me to face the challenge in life.

Bhubaneswar
Dated 29.07.2013

Pradipta Kumar Sen
PRADIPTA KUMAR SEN

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Abstract

The study entitled, A Study on "Adoption Behaviour of Betel vine Farmers" of Balasore District of Odisha was conducted in 8 villages viz. Dagara, Jamatkula, Beatgadia & Narayanpur of Baliapal block and Bhograi, Bartana, Deula & Satguhalia of Bhograi block of Balasore district, Odisha with the objectives: to study the socio-economic profile of Betel vine farmers of Balasore district, to assess the knowledge and extent of adoption of Betel vine package of practices by the farmers, to identify some of the discontinued innovations in Betel vine farming and reason for discontinuance , to list out the constraints in Betel vine cultivation as experienced by the farmers and to suggest measures to over come constraints for better adoption of Betel vine practices. It was an explorative type of study in which the data were collected through personal interview from 100 no. of Betel vine farmers, each selected randomly with the help of structured interview schedule prepared after pilot survey and pretesting. Appropriate statistical analyses required were employed for analysis and interpretation of data to reveal the following results.

The salient finding of the study revealed that the socio-personal factors like age (majority i.e. 54% in 26-50 years), education (up to high school level 39%), caste (general caste i.e. 50%), nuclear family type (72%), social participation (75% i.e. no membership), 58 percent often having contact with extension agency and utilizing television a information source (95%) were having a direct bearing on the extent of adoption betel vine cultivation. Similar was the case with economic factors like availability of land and irrigation facility (maximum having irrigated upland i.e. 72% with less than 1hectare & 1-3 hectare of land), 66 percent having 30,000 or more annual income & 72 percent living in semi pucca house. The main purpose of adoption being maximization of income by the cultivators. Most of adopters were found following scientific recommendation like recommended verities, irrigation schedule, timely plant protection measure, recommended spacing and fertilizer dose etc. to a greater extent in important aspects of betel vine cultivation. The extent of adoption was found significantly correlated with age, education, annual income and contact with extension agency. The important social, organizational, technological and economical constraints of the study were lack of cosmopoliteness, lack of proper market, lack of technical know-how and supervision, and the cost factor involved respectively.

Chapter I

Introduction

INTRODUCTION

The deep green heart shaped leaves of betel vine are popularly known as *Paan* in India. It is also known as Nagaballi, Nagurvel, Saptaseera, Sompatra, Tamalapaku, Tambul, Tambuli, Vaksha Patra, Vettilai, Voojangalata etc in different parts of the country (CSIR, 1969; Guha and Jain, 1997). The scientific name of betel vine is *Piper betle* L. It belongs to the family Piperaceae, i.e. the Black Pepper family (Gunther, 1952). The vine is a dioecious (male and female plants are different), shade loving perennial root climber. There are about 100 varieties of betel vine in the world, of which about 40 are found in India (Guha, 1997; Maity, 1989; Samanta, 1994). The most probable place of origin of betel vine is Malaysia (Chattopadhyay and Maity, 1967). In spite of its alienness, the plant is much more popular in India than in any other country of the world since the antiquity. This would be evident from the numerous citations laid down in the ancient literature, particularly the Indian scriptures. In these citations, significance of the leaves has been explained in relation to every sphere of human life including social, cultural, religious and even day-to-day life, which is very much relevant even these days. For example, a well-prepared betel quid is still regarded as an excellent mouth freshener and mild vitalizer, routinely served on the social, cultural and religious occasions like marriage, *Puja* (religious festivals), *Sraddha* ceremony (religious function performed after cremation) etc. It is also used as a special item offered to the guests in order to show respect and for such traditional use of betel leaf in the Indian society, the leaf really stands alone without any parallel even today (Guha, 1997; Mehrotra, 1981). In fact, this edible leaf has achieved an esteemed position in the human society right from the dawn of civilization, particularly in the countries like Bangladesh, Burma, China, India, Indonesia, Malaysia, Nepal, Pakistan, Philippines, South Africa, Sri Lanka, Thailand etc. (Jana, 1996; Khoshoo, 1981; Samanta, 1994; Sharma et al., 1996), where leaves are traditionally used for chewing in their natural raw condition along with many other

ingredients like sliced areca nut, slaked lime, coriander, aniseed, clove, cardamom, sweetener, coconut scrapings, ashes of diamond, pearl, gold and silver (Ayurvedic preparations), jelly, pepper mint, flavouring agent, fruit pulp etc. (CSIR, 1969).

AGRONOMY AND AGRO-ECONOMICS OF BETEL LEAF PRODUCTION

The betel vines (usually the male plants) are cultivated throughout India except the dry northwestern parts. Further, the female plants also rarely produce any flower or fruit in the Indian climate (CSIR, 1969). In spite of that the vines are cultivated for harvesting the heart shaped green leaves. It grows best under the shaded, tropical forest ecological conditions with a rainfall of about 2250-4750 mm, relative humidity and temperature ranging from 40-80% and 15-40°C, respectively. A well-drained fertile sandy or sandy loam or sandy clay soil with pH range of 5.6 –8.2 is considered suitable for its cultivation (CSIR, 1969; Guha and Jain, 1997). However, in the areas with lower rainfall (1500-1700 mm) the crop is cultivated with small and frequent irrigations, i.e. every day in summer and every 3-4 days in winter, whereas adequate drainage is required during the rainy season (Jana, 1995; Mishra et al., 1997).

The vine is raised by vegetative propagation from the cuttings under partially shaded and humid environment inside the *Boroj,* which is a small hut like structure of approximately 2 m in height and 0.02 ha in area. It is constructed with the locally available materials like bamboo stems, jute sticks, paddy straw, petioles and leaves of banana etc. wherein the vines are grown on elevated beds imitating the natural ecological conditions suitable to the crop. However, height of the beds goes on increasing due to frequent earthing of the vines. Further, the cuttings from 3-5 years old vines are planted in the furrows (8- 10 cm deep) of sterilized soil with spacing of 50- 60 cm X 10-20 cm during rainy or autumn season. The vine is a highly labour intensive crop and a voracious feeder of nutrients requiring about 400- 600 Kg N/ha, 200-

300 Kg P2O5/ha and 200-250 Kg K2O/ha, which are supplied only through the organic sources, normally the oil cakes, but in some places chemical fertilizer like urea is also being used sparingly now a days (Bhowmick, 1997; Guha and Jain, 1997; Jana, 1995; Jana, 1998; Maity, 1989). On the contrary, plantprotection- chemicals are used in a larger scale because the crop is very susceptible to insect pests and diseases, particularly the latter ones. In fact, the crop requires special care for its cultivation like sterilization of soil, which is achieved mainly by solarization (Jana, 1996). Further, fungicides like Bordeaux mixture (0.5-1.0%) and Bavistin (0.1%) and the insecticides like Malathion (0.05%) and Endosulphan (0.05%) are extensively sprayed on the leaves to control the diseases and insect pests, respectively (Chattopadhyay and Maity, 1967; Maity, 1989). However, all the agronomic requirements may vary from place-to-place, variety-to-variety, season-to-season and due to several other factors but the scientific data pertaining to these factors are scarce.

The crop is usually cultivated by the poor farmers generation after generation following the traditional methods. However, the scientific methods are also slowly penetrating the system by the virtue of the research work carried out under the "All India Coordinated Research Project On Betelvine" sponsored by the Indian Council of Agricultural Research, New Delhi. This would be evident from the Annual Reports, bulletins and research papers published by the scientists of the different centres of this project located in different places in the country (ICAR, 1997; ICAR, 2000; Maity, 1989). However, an effective extension work is required to be initiated to disseminate these research findings to the farmers so that they can maximize production, minimize cost of cultivation and also eliminate the risk of frequent devastation of the entire crop by the insect pests and diseases, particularly the latter ones.

The initial cost of cultivation of betel vine including construction of a *Boroj* may be about Rs 1- 2 lakh/ha at the minimum during the first year that may come down to about Rs 0.5-0.6 lakh/ha in

the subsequent years and a minimum net profit of Rs 0.5-1.0 lakh/ha/year or more (Rs 5.02 lakh/ha/year in one case as reported by ICAR, 2000) is not an unexpected value from a well-established farm though the figures may vary due to several factors like agro-climate, location of the farm, variety, demand and supply, season, variation in price of the leaves (which may vary significantly in the evening compared to morning), inflation etc. (Bhowmick, 1997; Guha and Jain, 1997; ICAR, 2000; Lahiri, 1991; Samanta, 1994; SDAMM, 1996). Such wild and unwarranted fluctuation in price of betel leaves may discourage cultivation of the crop and endanger the economic stability of the farmers. This may be safeguarded by evolving a well regulated marketing system for which research work particularly, on the marketing systems and intelligence and allied aspects relevant to the crop are required to be initiated.

It is very interesting to note that in spite of such a high input requirement of the crop it's cultivation is quite affordable even to the small farmers as because it can be successfully cultivated in a very small area, as small as three decimals. Further, a small *Boroj* of even 10-15 decimals may provide considerable net profit for maintaining a small family of five members (Jana, 1995; SDAMM, 1996). Such a *Boroj* may be termed as a *household bank* since the leaves can be plucked and sold straight in the market as and when hard cash is required and this may continue for 10-30 years or more (Chattopadhyay, 1981; Jana, 1995). Further, since the leaves mature within 15-30 days (Jana, 1995) therefore, 1-4 harvestings are normally done every month (Guha and Jain, 1997). Thus, cultivation of betel vines provide a continuous source of income to the farming family unlike the major crops, which provide income only once in a year or so. That apart, most of the major crops require some sorts of post-harvest processing for making the produce marketable but the betel leaves do not require any such processing at all. Moreover, the leaves may also be retained on the vines for about six months without any visual signs and symptoms of deterioration (Bhowmick, 1997). This again provides an opportunity to escape the dull

markets but the total production may get affected. Interestingly, the annual yield of a good crop is about 60-70 leaves/ plant and 6-7 million leaves/ ha. In India, a 2006 research reported betel vines being cultivated on about 55000 hectares of farmland, with an annual production worth of about IN Rs. 9000 million ($200 million total, averaging $1455 per acre). The betel farming industry, the report claims, supports about 400,000 - 500,000 agricultural families.

A March 2011 report claims that betel farming is on a decline in India. While in ideal conditions, some farms may gross annual incomes after expenses of over IN Rs. 26,000 per 10 decimal farm ($5,780 per acre), a betel farm income is highly erratic from year to year, because of rainfall patterns, temperature, and spoilage rates of 35% to 70% during transport over poor infrastructure.Simultaneously, the demand for betel leaves has been dropping in India because of contagious acceptance of gutkha (chewing tobacco) by consumers over betel leaf-based "paan" preparation;the report cites betel leaf trading has dropped by 65% from 2000 to 2010, and created an over supply. As a result, the report claims Indian farmers do not find betel farming lucrative anymore.

WASTAGE OF SURPLUS BETEL LEAVES

The Betel leaf is a very perishable commodity and therefore, always subject to wastage by quick spoilage due to dehydration, fungal infection, dechlorophyllation etc. This may cause a postharvest loss ranging from 35% to 70% during transport and storage (Rao and Narasimham, 1977). Even if the most conservative estimate of 10% loss were considered that too would reveal a menacing loss of betel leaves worth about Rs 900 million every year to the country. Not only this, particularly in the rainy season a large portion of the leaves remain unsold or sold at a throw away price (Guha and Jain, 1997). So much is the wastage that the farmers try to reduce the production by curtailing the agricultural inputs during the glut season. Moreover, the surplus leaves are fed to the cattle and sometimes buried in the ground to avoid environmental pollution and health hazards caused by millions of

decaying leaves, which is a total wastage at present. However, a strikingly contradictory situation may be observed during the peak demand period in the winter season when a single piece of good quality betel leaf (not a quid!) may cost as high as Rs 3.60/-(Guha, 1997).

In view of the alarming losses, attempts are being made to minimize the wastage by drying the leaves (Ramalakshmi et al., 2002), controlling senescence (Misra and Gaur, 1972), by chemical treatments, manipulation of storage temperature, adopting better packaging materials and methods (Guha, 2004; Rao and Narasimham, 1977) besides curing and bleaching of the leaves (Dastane, 1958; Sengupta, 1996). Such wastage may also be minimized by extracting essential oil from the stranded or unsold leaves be it fresh or stale or dechlorophylled or even partially decayed, by an apparatus called "Betel leaf oil extractor" designed and developed at IIT, Kharagpur. The essential oil extracted with this apparatus clearly revealed that the Mitha, Bangla and Sanchi varieties of betel leaves contained about 2.0%, 1.7% and 0.8% essential oil respectively, on dry weight basis. This oil of Bangla variety was constituted by a mixture of about twenty-one different compounds of which eugenol was the chief ingredient constituting about 29.5 % of the oil (Guha, 2003). Similarly, the essential oil and its constituents of most of the other varieties show a comparable trend but in some varieties terpenyl acetate is the chief constituent. However, these constituents may vary qualitatively and quantitatively as well due to several factors like variety, soil, climate and the agronomic practices followed to raise the crop etc. like any other essential oil yielding crops (Garg and Jain, 1996; Gunther, 1952; Kanungo, 1996; Ramalakshmi et al., 2002; Sankar et al., 1996; Sharma et al., 1981). In fact, these constituents are the sources of the medicinal, aromatic, stimulant, tonic and various other useful properties found in the leaves (Khanra, 1997). Such useful properties of the oil indicate a promising industrial future for it as a raw material for manufacturing skin emollients, tooth-pastes, tooth-powders, *paanmasala*, perfumes, room fresheners, de-odorants, soaps, face creams, antiseptic creams and lotions, cold drinks, chocolates, incense

sticks, appetizers, carminative mixtures, digestive agents, tonics, medicines etc (Guha, 2000).

IMPACT OF BETEL LEAVES ON NATIONAL ECONOMY

The vast economic potentiality of the crop can be adequately established by the fact that about 15-20 million people consume betel leaves in India on a regular basis (Jana, 1996) besides those in other countries of the world which may include over 2 billion consumers (Jeng et al., 2002). That apart a small *Boroj* of about three decimal area can generate employment opportunity for an agricultural worker throughout the year (Bhowmick, 1997) helping him to maintain his family. Further, as far as the national employment generation is concerned, it is estimated that about 20 million people derive their livelihood directly or indirectly, partly or fully from production, processing, handling, transportation and marketing of betel leaves in India (Jana, 1995; Jana, 1996). In this way, the crop provides a National Income to the tune of Rs 6000- 7000 million every year. Betel leaves are transported from Odisha to different parts of India like Bilaspur, Cochin, Gondia, Gandhinagar, Hyderabad, Jabalpur, Jalgaon, Katni, Nagpur, New Delhi, Raipur, Srinagar, Trivendram etc. The leaves are also in great demand in several other countries of the world where it is either not grown at all or the demand exceeds the local supply. Consequently, leaves worth about Rs 30-40 million are exported to the countries like Bahrain, Canada, Great Britain, Hong Kong, Italy, Kuwait, Nepal, Pakistan, Saudi Arab and many other European countries (Jana, 1996; Singh et al., 1990). This clearly indicates the foreign exchange earning potentiality of the crop, which is required to be strengthened in the interest of the nation.

MEDICINAL AND NUTRITIVE VALUE OF BETEL LEAF

Betel leaf is traditionally known to be useful for the treatment of various diseases like bad breath, boils and abscesses, conjunctivitis, constipation, headache, hysteria, itches, mastitis, mastoiditis, leucorrhoea, otorrhoea, ringworm, swelling of gum,

rheumatism, abrasion, cuts and injuries etc as folk medicine while the root is known for it's female contraceptive effects (Chopra et al., 1956; Khanra, 1997). Further, the essential oil contained in the leaves possesses antibacterial, antiprotozoan and antifungal properties. Therefore, the oil kills or inhibits growth of dreadful bacteria causing typhoid, cholera, tuberculosis etc that needs proper evaluation and exploitation (CSIR, 1969). Not only that, the betel leaves really does not have any match as a cheap, natural and easily available appetizer, digestive, mild stimulant, aphrodisiac and refreshing mastication. Chewing of betel leaves produce a sense of well-being, increased alertness, sweating, salivation, hot sensation and energetic feeling with exhilaration. It also increases the capacity to exercise physical and mental functions more efficiently for a longer duration but it may produce a kind of psychoactive effect causing a condition of mild addiction leading to habituation and withdrawal symptoms (Chu, 2001; Garg and Jain, 1996). Further, the leaves are very nutritive and contain substantial amount of vitamins and minerals (Table 1) and therefore, six leaves with a little bit of slaked lime is said to be comparable to about 300 ml of cow milk particularly for the vitamin and mineral nutrition. The leaves also contain the enzymes like diastase and catalase besides a significant amount of all the essential amino acids except lysine, histidine and arginine, which are found only in traces (CSIR, 1969; Gopalan, 1984; Guha and Jain, 1997). However, relevant data from a complete biochemical analysis is not available from any single source. Consequently, the analytical values from two or more reports may reveal a very wide or even contradictory trend. Therefore, research work in this direction becomes inevitable.

Table 1: Nutritional composition of fresh betel leaf

S. No.	*Constituents*	*Approximate composition*
1	Water	85-90%
2	Protein	3-3.5%
3	Fat	0.4-1.0%
4	Minerals	2.3-3.3%
5	Fiber	2.3%
6	Chlorophyll	0.01-0.25%
7	Carbohydrate	0.5-6.10%
8	Nicotinic acid	0.63-0.89 mg/100g
9	Vitamin C	0.005-0.01%
10	Vitamin A	1.9-2.9 mg/100g
11	Thiamine	10-70 µg/100g
12	Riboflavin	1.9-30 µg/100g
13	Tannin	0.1-1.3%
14	Nitrogen	2.0-7.0%
15	Phosphorus	0.05-0.6%
16	Potassium	1.1-4.6%
17	Calcium	0.2-0.5%
18	Iron	0.005-0.007%
19	Iodine	3.4 µg/100g
20	Essential Oil	0.08 - 0.2%
21	Energy	44 kcal/100 g

THE CANCER CONTROVERSY ON BETEL LEAVES

In spite of the nutritive, stimulating and refreshing properties, excessive consumption of betel leaves like any other edible items may also prove to be harmful particularly to the teeth. Such harmful effects are exerted by the additional ingredients consumed along with the leaves

for making the quid more palatable and attractive. These include in particular, the tobacco or allied products, which really call for a word of caution. This is because the tobacco based quids may cause dental caries, alveolaris, oral sepsis, palpitation, neurosis and even oral cancer (CSIR, 1969) but the non-tobacco based quids are not known for sure to cause any such calamity particularly at a non-addictive level of consumption. However, there is no denial of the fact that the leaves may contain a good amount (15 mg/g) of Safrole (Chen et al., 1999; Sharma et al., 1996), a carcinogen, but it is quickly metabolized in human body into dihydroxychavicol and eugenol, which are excreted along with urine(Chang et al., 2002a). The betel leaves are also reported to possess antioxidant activity besides antimutagenic and anticarcinogenic properties particularly against the tobacco carcinogens(Chang et al., 2002b; Padma et al., 1989a, Padma et al., 1989b; Wu et al., 2004) due to the presence of ingredients like hydroxyl chavicol (Amonkar et al., 1989) and chlorogenic acid (TNN, 2004) in it. The latter compound is also reported to kill the cancerous cells without affecting the normal cells unlike the common cancer drugs and relevant therapeutic means. Therefore, possibility of manufacturing of a new blood cancer drug from it cannot be ruled out. In fact, some scientists from the Indian Institute of Chemical Biology, Kolkata have applied for a patent for the drug. If successful, the drug would also fetch substantial amount of foreign exchange to the country and highlight the significance of betel leaf to a further extent (TNN, 2004). Contrary to the above, there are a few reports, which indicate that chewing betel leaves may independently produce carcinogenic effects (Chen et al., 1999; Merchant et al., 2000). However, the evidences are inadequate and do not match with the traditional history of betel leaf chewing in India. Interestingly, it is also claimed that the inflorescence of betel vine contains carcinogens whereas the leaves possess anticarcinogenic agents. This practically indicates that parts of the same plant contain carcinogenic and anticarcinogenic substances (Wu et al., 2004). In view of the above controversial claims, it becomes imperative to carry out conclusive biochemical and genetic investigations together with clinical trials and

demographic studies before imposing such a horrifying malignant property on betel leaf.

Objective of the Study

1. To study the socio-economic profile of Betel vine farmers of Balasore District.
2. To assess the knowledge and extent of adoption of Betel vine package of practices by the farmers.
3. To identify some of the discontinued innovations in Betel vine farming and reasons for discontinuance.
4. To list out the constraints in Betel vine cultivation as experienced by the farmers.
5. To suggest measures to over come constraints for better adoption of Betel vine practices.

SCOPE AND IMPORTANCE OF THE STUDY

In the present context of agriculture scenario of the state, Betel vine cultivation have wider scope to bridge the economic gap of the farmers of Odisha. The most important aspect of Betel vine cultivation is transfer of technology to explore its production potentiality. It is also necessary to motivate the farmers to develop a ground to accept and act upon the technology to increase farm income. It is a matter of fact that no effort has been made so far in Odisha. To make a systematic analysis of Betel vine cultivation and its impact upon the farmers along with constraints associated with it. The present study being first of its kind assumes greater significance in this regard. To improve the economic condition of the farmers, Betel vine cultivation has to be promoted on a commercial basis which has wider market.

Limitation of the Study

Though, all possible efforts were made to make the study objective and precise, certain limitations did remain. The present study, being part of the Master's programme, has the normal limitations of time, funds and other facilities commonly faced by single student researcher. These limitations led to the purposive selection of only one district as the locale of the study. Generalizations made based on the findings of the study may not be directly applicable to other areas and need to be substantiated with other studies. Since, the study has adopted the ex-post facto design the memory bias on the part of the respondents can not be ruled out.

Due to limited time only 110 respondents were taken for the study. Hence the study may be considered as explorative in nature. However, research workers will definitely get valuable information from this study which will help them in large scale investigation.

Organization of the Thesis

The thesis follows the normal pattern with introduction, review of literature, the setting, research methodology, result discussion, summary and conclusion, Bibliography and Appendices arranged chronologically in chapter-I, II, III, IV, V, VI, &VII respectively.

Chapter II

Review of Literature

REVIEW OF LITERATURE

Review of literature has significant importance in any scientific research; its main functions are –

1. To provide a basis of the development of theoretical framework.

2. To provide an insight in to the methods and procedures.

3. To suggest operational definitions.

4. To provide basis for interpretation of findings.

In this chapter an attempt was made to review relevant literature on important aspects of the investigation having direct and indirect bearing on the study and has been organized under the following heads.

1. Introduction
2. Socio-economic characteristics of farmers
3. Importance of betel vine
4. Constraints in adoption of betel vine cultivation

1. Introduction

CSIR (1969), Guha and Jain (1997) stated that the deep green heart shaped leaves of betel vine are popularly known as *Paan* in India. It is also known as Nagaballi, Nagurvel, Saptaseera, Sompatra, Tamalapaku, Tambul, Tambuli, Vaksha Patra, Vettilai, Voojangalata etc in different parts of the country.

CSIR (1969) stated that the betel vines (usually the male plants) are cultivated throughout India except the dry northwestern parts.

Further, the female plants also rarely produce any flower or fruit in the Indian climate.

CSIR (1969) reported that the betel leaves are traditionally used for chewing in their natural raw condition along with many other ingredients like sliced areca nut, slaked lime, coriander, aniseed, clove, cardamom, sweetener, coconut scrapings, ashes of diamond, pearl, gold and silver (Ayurvedic preparations), jelly, pepper mint, flavouring agent, fruit pulp etc..

Khanduja and Balasubrahmanyam (1984) reported that the Betelvine (*Piper betle*) is an important cash crop in India.

Jana (1996), Khoshoo (1981), Samanta(1994) and Sharma et al.(1996) reported that the edible leaf of betel vine has achieved an esteemed position in the human society right from the dawn of civilization, particularly in the countries like Bangladesh, Burma, China, India, Indonesia, Malaysia, Nepal, Pakistan, Philippines, South Africa, Sri Lanka, Thailand etc.

Bhowmick (1997) stated that a small *Boroj* of about three decimal area can generate employment opportunity for an agricultural worker throughout the year helping him to maintain his family.

Guha and Jain (1997) reported that betel vines grows best under the shaded, tropical forest ecological conditions with a rainfall of about 2250-4750 mm, relative humidity and temperature ranging from 40-80% and 15-40°C, respectively. A well-drained fertile sandy or sandy loam or sandy clay soil with pH range of 5.6 –8.2 is considered suitable for its cultivation.

Guha (1997) and Mehrotra (1981) stated that betel vine is used as a special item offered to the guests in order to show respect and for such traditional use of betel leaf in the Indian society, the leaf really stands alone without any parallel even today.

Bhowmick (1997), Guha and Jain (1997), Jana (1998), Maity (1989) stated that the vine is a highly labour intensive crop and a voracious feeder of nutrients requiring about 400- 600 Kg N/ha, 200-300 Kg P2O5/ha and 200-250 Kg K2O/ha, which are supplied only through the organic sources, normally the oil cakes, but in some places chemical fertilizer like urea is also being used sparingly now a days.

2. Socio Economic charact

Age:

Shide and Joshi (1984) reported that there is no association between age and adoption. The findings of Rai (1967) Ray et al.(1978), Naidu and Bhaskaran (1974), Rasid (1976), Narayanappa (1978), confirmed the above statement.

Jagatap and Kadam (1985) found out that age is negatively correlated with adoption. This finding is in conformity with Reddy and Reddy (1972), Choukidwar and George (1972), Sahoo and Barik (1974).

Hansara and chopra (1986) found out that a negative and significant correlation existed between gain and retention of gained knowledge and age of the respondent.

Rao and Reddy (1988), Radhakrishnamutyh (1989) reported that age has a significant but negative association with knowledge.

Education:

Das (1980) stated that the extent of primary education in particular shows the pace of development of development of human materials. The economy of Odisha is backward as it has a low percentage of literature. A large proportion of population in Odisha is still unable to read and write.

Pandey (1982) stated that education is the most effective tool in molding the response of agents of production to a common purpose. It can generate potent forces helpful in the transformation of traditional

society. Education can prove a more effective approach in solving certain problems of national development and individual growth.

Ravindra (1990) indicated that majority(77%) of the respondent were found to have medium knowledge level,compared to only 7.5% in the high knowledge category.

Caste:

Dighe and Pawar (1982) reported that the association between caste and adoption was statistically non-significant.

Singh and Sinha (1993) reported that caste hierarchy of the respondent's has played significant role in motivating the farmers in symbiotic adoption.

Family Type:

Sinha (1970) observed that the structure of family is not significantly related to adoption of new ideas.

Rajguru and Venkataramaiah (1971) concluded that farmers residing in joint family system were more progressive and adaptive to new farm practice. Similar findings were reported by Dudhani and Rao (1969).

Occupation:

Subramanyam and Sripal (1978) pointed out that farmers engaged in subsidiary occupation and having low cropping intensity were non-adopters of modern farm technology and they had low knowledge regarding the innovations.

Reddy (1990) revealed a positive and highly significant association between average annual income and their adoption behavior.

Social participation:

Rajguru and Satyanarayan (1981) reported that nearly half of the farmers had social participation up to medium level followed by low and high.

Radhakrishnamurty (1989) established no significant relationship between social participation knowledge.

Bavalatti *et al.* (1990) revealed that participation will help to acquire more knowledge about improved Agricultural technology and also provide opportunity for contrived experiences and interaction leading to the increased knowledge which in turn helps for higher adoption of practices.

Contact with change agent:

Blum (1989) reported that extension had a strong influence on the farmers decision making, especially by giving "how to" advice. The family seems to have more influence on the decision to adoption an innovation where socio-economic bonds are stronger.

Radhakrishnamurty (1989) reported that extension contact did show positive and significant association with knowledge level.

Kher (1992) revealed that extension contact and participation in extension programm were significantly associated with adoption behavior.

Size of land holding:

Rogers(1991)reported that the rate of adoption of improved agricultural practices increased along with the increase in farm size.

Julana, Annamalui and Sommasundaram (1991) reported that even through there are different knowledge level existed among farmers, big farmers were found to have more knowledge than small and marginal farmers.

Dube and Sawarkar (1992) revealed that 50% farmers of small and marginal were having partial knowledge and partial adoption of rice production technology.

Mohamad (1992) observed that 65% of small farmers were in medium knowledge level while 15% and 20% of them were low and high knowledge level respectively.

Income level:

Chattopadhyay(1981) and Jana (1995) reported that a *Boroj* may be termed as a *household bank* since the leaves can be plucked and sold straight in the market as and when hard cash is required and this may continue for 10-30 years or more.

Subrao and Pochaiah (1990) reported that income has a positive and significant association with education, farm size, innovativeness, farm decision making, knowledge of vegetable growing, risk taking ability, information seeking and market orientation in small medium and big farmers.

Jana (1995) and SDAMM (1996) stated that a small *Boroj* of even 10-15 decimals may provide considerable net profit for maintaining a small family of five members.

Bhowmick (1997), Guha and Jain (1997), ICAR (2000), Lahiri (1991), Samanta (1994) and SDAMM (1996) reported that the initial cost of cultivation of betel vine including construction of a *Boroj* may be about Rs 1- 2 lakh/ha at the minimum during the first year that may come down to about Rs 0.5-0.6 lakh/ha in the subsequent years and a minimum net profit of Rs 0.5-1.0 lakh/ha/year or more (Rs 5.02 lakh/ha/year in one case as reported by ICAR, 2000) is not an unexpected value from a well-established farm though the figures may vary due to several factors like agro-climate, location of the farm, variety, demand and supply, season, variation in price of the leaves (which may vary significantly in the evening compared to morning), inflation etc.

Knowledge level:

Radhakrishnamurty (1989) reported that age with knowledge has shown negative and significant association, risk performance, scientific orientation and extension contact did show positive and significant association. All the remaining variables likes land, education, occupation, caste, social participation, economic motivation, risk performance and mass media exposure have not shown any significant relationship with knowledge of the farmers.

Wijeratne (1992) found that the farmers are having low knowledge about selection of rice variety to aspecific location, identification of major pests and diseases and medium knowledge with respect to transplanting, chemical fertilizer application and chemical weed control.

INPUTS USE BEHAVIOUR OF FARMERS

Saxena et al. (1990) found that 65.5% farmers were not aware of the latest technology which was the most important factor for non-adoption.

Vikaria, Patel and Mahajan (1993) revealed that knowledge and attitude towards Agricultural Technologies were positively and significantly co-related with the input use behavior of all categories of farmers.

Mohiuddin (1993) reveled that 64.5% of farmers had shown average adoption of technology where as 20% had shown high rate of adoption and 15.5% low adoption of agricultural technology .

Jaiswal (1995) reported that the adoption of improve dry land practices was not up to the mark and use of fertilizer & pesticide restricted to big and rich farmers only .

3. Importance of betel vine

CSIR (1969) reported that the essential oil contained in the leaves possesses antibacterial, antiprotozoan and antifungal properties. Therefore, the oil kills or inhibits growth of dreadful bacteria causing typhoid, cholera, tuberculosis etc that needs proper evaluation and exploitation.

Khanduja and Balasubrahmanyam (1984) stated that the Betelvine (*Piper betle*) is an important cash crop in India.

Jana (1995) and Jana (1996)stated that as far as the national employment generation is concerned, it is estimated that about 20 million people derive their livelihood directly or indirectly, partly or fully from production, processing, handling, transportation and marketing of betel leaves in India.

Jana (1996) reported that the vast economic potentiality of the crop can be adequately established by the fact that about 15-20 million people consume betel leaves in India on a regular basis .

Jana (1996) stated that the betel leaves are great demand in several other countries of the world where it is either not grown at all or the demand exceeds the local supply. Consequently, leaves worth about Rs 30-40 million are exported to the countries like Bahrain, Canada, Great Britain, Hong Kong, Italy, Kuwait, Nepal, Pakistan, Saudi Arab and many other European countries.

Khanra (1997) repoted that betel leaf is traditionally known to be useful for the treatment of various diseases like bad breath, boils and abscesses, conjunctivitis, constipation, headache, hysteria, itches, mastitis, mastoiditis, leucorrhoea, otorrhoea, ringworm, swelling of gum, rheumatism, abrasion, cuts and injuries etc as folk medicine while the root is known for it's female contraceptive effects.

Bhowmick (1997) found that apart a small *Boroj* of about three decimal area can generate employment opportunity for an agricultural worker throughout the year .

Guha and Jain (1997) stated that the leaves contain the enzymes like diastase and catalase besides a significant amount of all the essential amino acids except lysine, histidine and arginine, which are found only in traces.

Chu (2001) reported that betel leaves increases the capacity to exercise physical and mental functions more efficiently for a longer duration but it may produce a kind of psychoactive effect causing a condition of mild addiction leading to habituation and withdrawal symptoms.

4. Constraints

Rao and Narasimham (1977) stated that the Betel leaf is a very perishable commodity and therefore, always subject to wastage by quick spoilage due to dehydration, fungal infection, dechlorophyllation etc. This may cause a postharvest loss ranging from 35% to 70% during transport and storage.

Rao and Narasimham (1977) reported that the Betel leaf is a very perishable commodity and therefore, always subject to wastage by quick spoilage due to dehydration, fungal infection, dechlorophyllation etc. This may cause a postharvest loss ranging from 35% to 70% during transport and storage.

Zaman (1985) in a series of studies stated that atleast 50% or above of the yield potential of mustard, groundnut and software under rainfed condition can be exploited where only the opportunity of seed sowing could be taken.

Ajore (1985) reported that main constraint in adoption of high yielding varieties was due to lack of knowledge and technical guidance.

Rao (1987) suggested that that the farmers who are generally small and marginal, need the basic inputs like improved seeds, modern knowledge credit, fertilizer, pesticides, implements, market support and wherever possible a life saving sprinkler irrigation to increase the production.

Ramachandran and Sripal (1990) reported that the constraints in dryland technologies are pre-monsoon sowing, seed varieties, application of FYM, chemical fertilizer, weedicide application, use of sex trap, proper plant protection measures, insufficient rainfall, non availability of inputs in time, lack of knowledge, insufficient livestock, risk due to failure of monsoon, high cost and lack of remunerative price.

Srivastava and Singh (1990) revealed that the three major constraints viz. high price of fertilizer, lack of irrigation facilities and erratic rainfall were faced by all categories of cultivators.Besides these constraints non-availability of improved seed, lack of technical knowledge, low price of farm produce, tack of capital, non-availability of credit were faced by majority of farmers in rainfed paddy cultivation.

Gill and Singh (1992) stated that the reason for the non adoption of the practices like minimum village bi-directional method of sowing, seed rate, soil testing, production of pure seed, green manuring were ignorance in the part farmers about the recommendation, lack of suitable farm machinery and equipment, inputs and inadequate finance were the other resons particularly at implementation and conformation stages.

Guha and Jain (1997) reported that particularly in the rainy season a large portion of the betel leaves remain unsold or sold at a throw away price.

Guha (1997) stated that a strikingly contradictory situation may be observed during the peak demand period in the winter season when a single piece of good quality betel leaf (not a quid!) may cost as high as Rs 3.60/-.

Ramalakshmi et al. (2002) stated that in view of the alarming losses, attempts are being made to minimize the wastage by drying the leaves.

Guha (2004), Rao and Narasimham (1977) repoted that by chemical treatments, manipulation of storage temperature, adopting better packaging materials and methods, attempts are being made to minimize the wastage of betel leaves.

Chapter III

The Setting

THE SETTING

The study will be conduct in Balasore district of Odisha. Odisha extends from 17-degree 49 N to 22-degree 34N latitude and from 81-degree 27-E to 87-degree 29' E longitudes on the eastern coast of India. It is bound by the States of West Bengal on the North East, Jharkhand on the North and Chhatisgarh on the West, Andhra Pradesh on the South & Bay of Bengal on the East. The Bay of Bengal has a long coast of 482 km at east of the state.

Morphologically Odisha can be divided into five parts. The coastal plains, the middle mountainous country, the rolling upland, the river valleys & the subdued plateaus.

According to 2011 census, Odisha has a population of 41,947,358, out of which 21,201,678 are males and 20,745,680 are females. The average density of population is 269 persons per sq. km. The overall literacy rate of the state is 73.45 %. The male literacy rate is 82.40 %and that of females is 64.36 %. The sex ratio (i.e. number of females per 1000 males) is 978.

Agriculture has been the main occupation of a large section of state's population and provides employment to 74.7 percent of the work force and accounts for about 60 percent of the state's income. Prospects of cultivation in the state depend on timely monsoon and other meteorological parameters. A major portion of the area suffers from drought condition resulting in failure of crops.

The state has been divided in to the following 10 agro-climate zones.

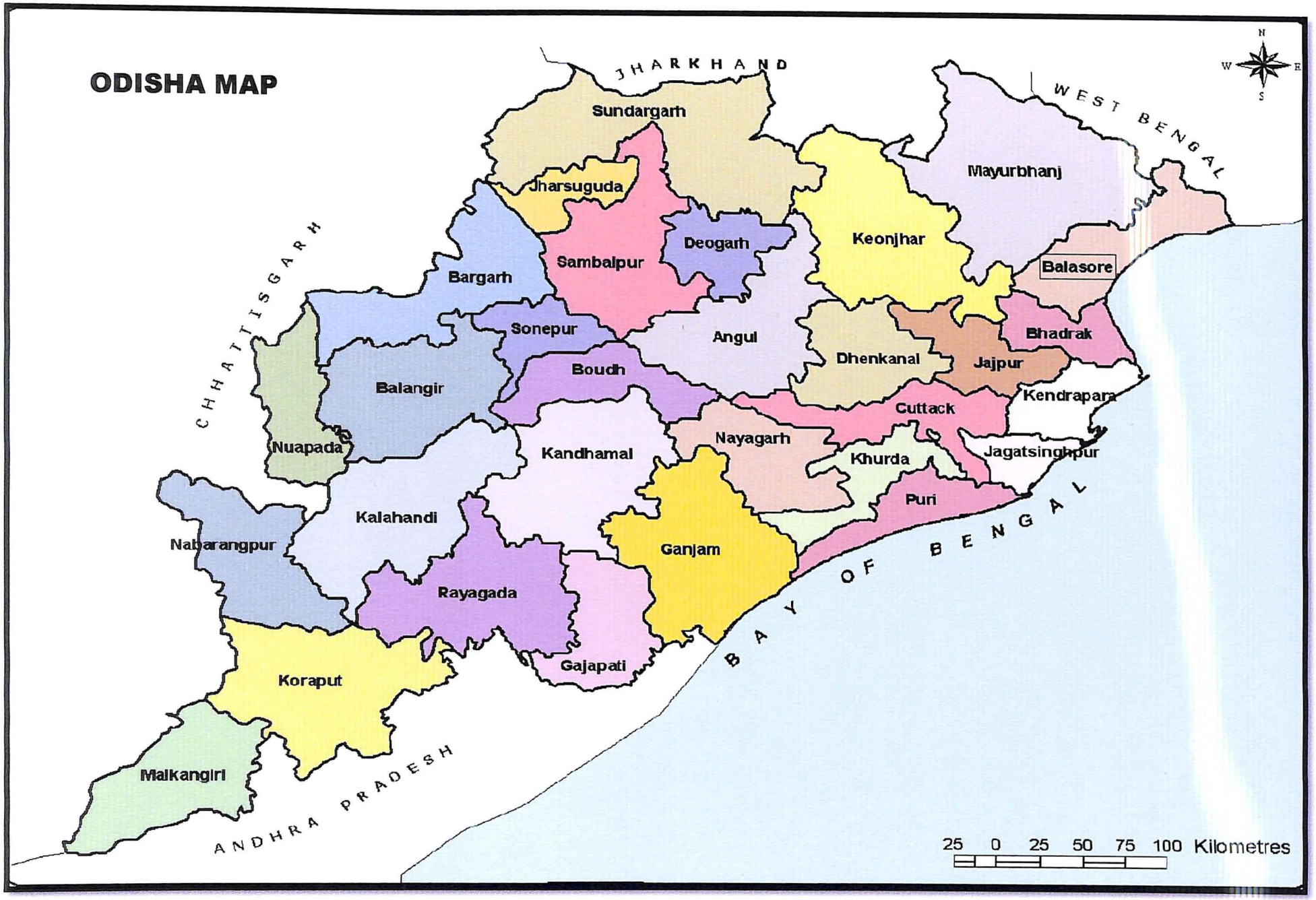
ODISHA MAP
JHARKHAND
WEST BENGAL
CHHATTISGARH
ANDHRA PRADESH
BAY OF BENGAL
Sundargarh
Jharsuguda
Mayurbhanj
Keonjhar
Deogarh
Sambalpur
Bargarh
Balasore
Sonepur
Angul
Bhadrak
Dhenkanal
Jajpur
Boudh
Balangir
Kendrapara
Cuttack
Nuapada
Nayagarh
Kandhamal
Khurda
Jagatsinghpur
Puri
Kalahandi
Nabarangpur
Ganjam
Rayagada
Gajapati
Koraput
Malkangiri
N
W
E
S
25 0 25 50 75 100 Kilometres

Table 3.1: Agro-climatic zones of Odisha

Sl. No.	*Agro-climatic zone*	*Climate*	*Mean Annual Rainfall (in mm.)*	*Soil Group*
1	2	3	4	5
1.	North-Western Plateau	Hot and moist	1648	Red and Yellow
2.	North-central Plateau	Hot and moist	1535	Red and Loamy
3.	North-Eastern coastal plateau	Hot and moist	1568	Alluvial
4.	East and South-Eastern Plateau	Hot and moist	1449	Coastal alluvial Saline(near the cost line)
5.	North Eastern Ghats	Hot and moist	1597	Late rite and brown forest
6.	Eastern ghat high land	Warm and humid	1522	Red
7.	South Eastern ghat	Warm and humid	1522	Red, red and yellow mixed
8.	Western undulating	Warm and moist	1527	Black, mixed red and black
9.	West central table land	Hot and moist	1527	Red, heavy textured colors
10.	Mid central table land	Hot and dry sub-humid	1421	Red loam laterite mixed red and black

Source: Publication Division D.E. & S, Odisha.

The district comes under the North-Eastern Costal Plateau.

Table 3.2: The State "Odisha": at a glance

Sl. No.	*Particulars*	*Figures in Detail*
1	Total area (Sq. Kms.)	1,55,707
2	Total Population, 2011 census (Provisional)	41,947,358
	(a) Total males	21,201,678
	(b) Total females	20,745,680
3	Decadal growth rate, 1991–2001 (in percentage)	13.97
4	Density of population per Sq. Km.	269
5	Sex ratio (Females per 1000 males)	978
6	Total Urban population, 2011	6,996,124
	(a) Total Males	3,616,819
	(b) Total Females	3,379,305
7	Total Rural Population, 2011	34,951,234
	(a) Total males	17,584,859
	(b) Total Females	17,366,375
8	Total literates and literacy rate	27,112,376 (73.45 %)
	(a) Total male literates & literacy rate	15,326,036 (82.40 %)
	(b) Total female literates & literacy rate	11,786,340 (64.36 %)
9	Total Scheduled Castes Population (2001)	6,082,063
	and percentage to total population	16.53 %

10	Total Scheduled Tribes Population (2001)	8,145,081
	and percentage to total population	22.13 %
11	Number of Districts	30
12	Number of Subdivisions	58
13	Number of Tahasils	316
14	Number of Grama Panchayats	6,234
15	Number of Blocks	314
16	Total Number of Villages,	2011 51,313
17	Number of Towns including Census Towns (includes ULBs and Industrial Towns)	223
18	Number of Municipal Corporations	03
19	Number of Municipalities	37
20	Number of Notified Area Councils	63
21	Number of Industrial Towns	02
22	Number of Police-Stations (General-533 + Women-6 + Energy-34 +Vigilance-6 + Cyber crime - 1 + CID - 1+ Marine-5)	586
23	Number of Fire Stations	
	(i) Sanctioned	255
	(ii) Functioning	178

24	Number of Assembly Constituencies	147
25	Number of Lok Sabha Constituencies	21
26	Number of Rajya Sabha Seats	10

Basic Information about Balasore District:

Balasore is one of the coastal district of Odisha,lies on the northern most part of the state having 21 degree 03' to 21 degree 59' North Latitude & 86 degree 20' to 87 degree 29' East Longitude. Geographical area of the district is 36, 34 Sqr. KM. Midnapore district of West Bengal is in its North, the Bay of Bengal is on the east and Bhadrak district lies on the South whereas Mayurbhanj and Kendujhar districts are on its western side. As per the 2011 Census, the population is 23,17,419 comprising 11,84,371 males and 11,33,048 females.

Broadly this district can be divided into three geographical regions, namely, the Coastal belt, the inner alluvial plain and the North-Western hills. The coastal belt is about 26 Kms wide and shapes like a strip. In this region, sand dunes are noticed along the coast with some ridges. This region is mostly flooded with brackish water of estuarine rivers which is unsuitable for cultivation. But, presently this area is utilized for coconut and betel cultivation. Shrimp culture and salt manufacturing units are also developing in this area recently. The second contiguous geographical region is deltaic alluvial plain. It is a wide stretch of highly fertiled and irrigated land. This area is highly populous and devoid of any jungle. The third region, north-western hilly region covers most of Nilgiri Sub-division. It is mostly hilly terrain and vegetated with tropical semi-ever green forest. The hills of Nilgiri has highest peak of 1783 ft. above the sea level. The

Scheduled Tribe persons of the district are mostly seen in this region of valuable forest resources and stone quarries.

Balasore, the coastal district of Odisha is crisscrossed with perennial and estuarine rivers because of its proximity to sea. Two important rivers of Odisha, namely :- Budhabalanga and Subarnarekha have passed through this district from west to east before surging into the Bay of Bengal.The irrigation system in Balasore district is very much widespread.

Industrialization is also gaining ground as the rubber, plastic,Paper and alloyes industries are mushrooming around Balasore town.

The soil of Balasore district is mostly alluvial laterite. The soil of Central region is mostly clay, clay loam and sandy loam which is very fertile for paddy and other farm produces. Nilgiri Sub-division is mostly gravelly and lateritic soil, which is less fertile.

A small strip of saline soil is also seen along the extreme coastal part of the district.

The climate of Balasore district is mostly hot and humid. The hot season starts from March till May and followed by rainy season from June to September. During this period, south-west monsoon causes maximum rain. But the district experiences highest rain fall during July and August. Because of its strategic location, this district faces most of the cyclonic storm and depression which is raised from the Bay of Bengal. The cold season from December to February is very pleasant. The average temperature of the district varies between 22*C to 32*C and the average rain fall is 1583 mm.

Balasore district is divided into two sub-divisions namely Balasore, and Nilagiri having 19 Police Stations,07 Tahasils for revenue and administrative purposes.Only the sub-division Nilagiri is of hilly region with

hillocks and forest.For undertaking developmental works in the rural areas, the district is also divided in to 12 Blocks.Besides,there are four statutory towns consisting of 1 municipality and 3 NACs. These local bodies look into civic aspects of urban areas.

The South Eastern Railway covers a distance 102 Kms within Balasore District connecting it with Kolkata , Bhubaneswar & Chennai. Besides, National highways pass through the district and runs from Kolkata to Chennai .The National highway No.5 covers a distance 66 Kms. and National highway No.60 covers a distance 53 Kms.within Balasore is about 220 kms (by road) & 232 kms (by rail) from Kolkata and about 215 kms by road & 206 kms by rail from Bhubaneswar. The Kolkata International air port & Bhubaneswar National air port are only about four hour journey by road/rail from Balasore .

This is one of the most important district of Odisha which finds place not only in the National map but also in International map for its History ,Geographical situation, Culture, Marine development and for important institutions like Proof and Experimental establishment, Interim Test Range.

A coastal district on the north eastern Sea board Balasore has destination of having been called the " Granary of Orissa " with stretches of green paddy fields ,a network of rivers blue hills, extensive meadows and extraordinary breach.

The religious centers at Remuna ,Chandaneswar,Panchalingeswar, Sajanagarh, Ayodhya ,Maninageswar temple at attraction for the tourists.

BALASORE MAP

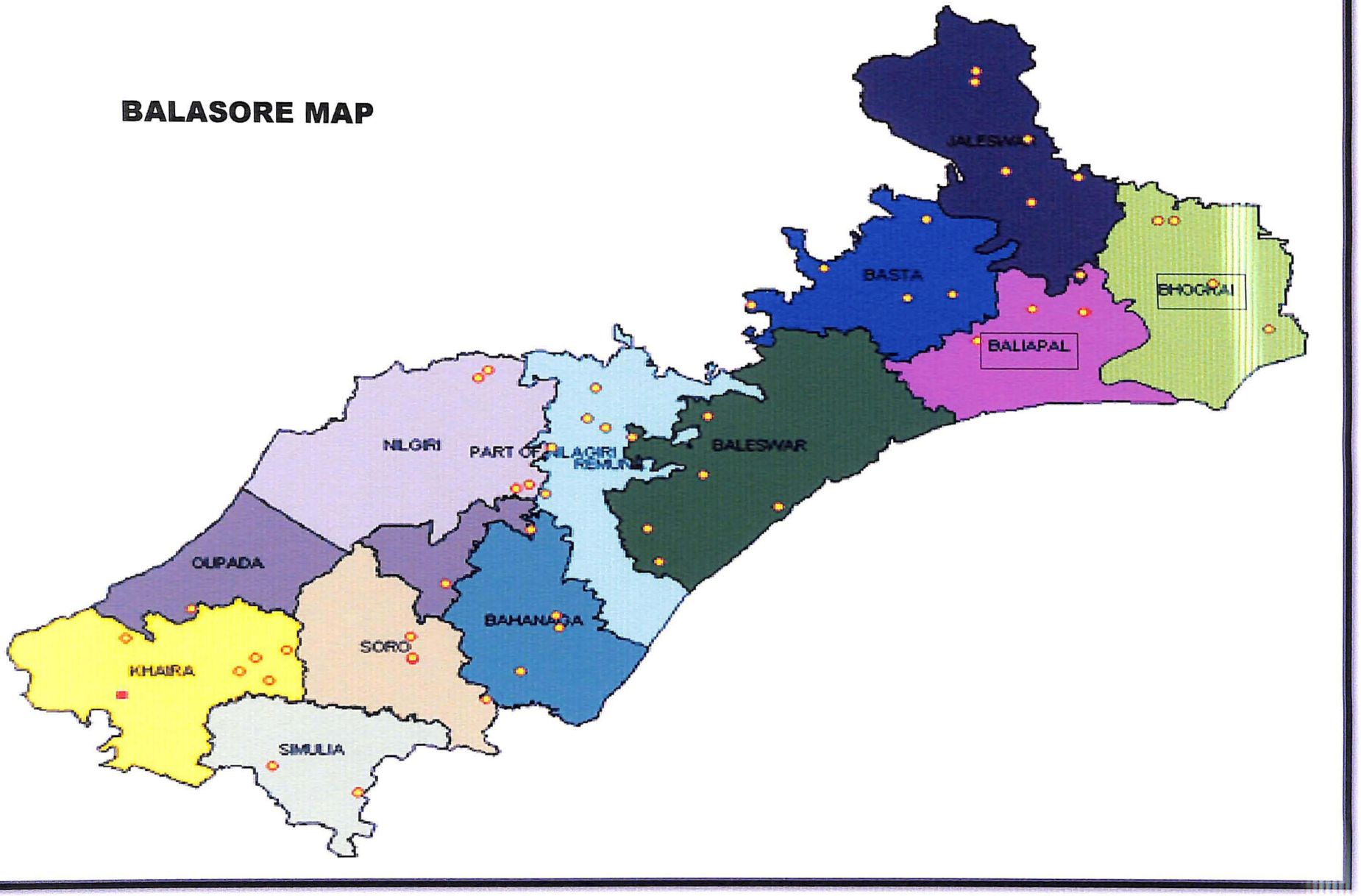

Table 3.3 BASIC INFORMATION OF BALASORE DISTRICT

Sl. No.	*Particulars*	*Figures in Detail*
1	Geographical area (Sq. Km)	3,706
2	Cultivable area	2,69,630 Hects
3	Irrigated area	78,164 Hects.
4	Latitudes	20.48N 21.59N
5	Longitudes	86.16E 87.29E
6	Coast line	81 Kms.
7	No. of Subdivisions	2 (Balasore and Nilgiri)
8	No. of Tahasils	7 (Balasore, Baliapal, Basta, Jaleswar, Nilgiri, Simulia and Soro)
9	No. of Blocks	12 (Bahanaga, Balasore, Baliapal, Basta, Bhograi, Jaleswar, Khaira, Nilgiri, Oupada, Remuna, Simulia and Soro)

10	Towns & Urban bodies	4
11	Gram Panchayats	289(257 old+ 32new)
12	Villages	2971
13	Inhabited villages	2602
14	Major Rivers (5)	Subarnarekha, Budhabalanga, Jalaka, Kansabansa and Sono
15	Communication facilities	Bus, Railway (BBSR to Howrah)
16	Interim Test range (I.T.R)	Chandipur (Sadar block, Srikona G.P.)
DEMOGRAPHY (CENSUS 2011)		
17	Population 2011	23,17,419
	Male	11,84,371
	Female	11,33,048
18	Population density (persons per Sq km)	609
19	Sex Ratio (Female per 1000 male)	957
20	Literacy Rate	80.66%
21	Male Literacy	88.06%
22	Female Literacy	72.95%
23	Children (0-6 years)	2,74,432
24	Child Sex ratio (0-6 years)	941

25	Rural	
26	Urban	
27	Scheduled Caste (SC)	
28	Scheduled Tribe (ST)	
29	Number of rural families	
30	Rural Families Below Poverty Line (BPL) (1999 survey)	
INSTITUTIONS		
31	ICDS Projects (Integrated Child Development Services)	12
32	Anganwadi Centres (AWC)	1578
33	Hospitals (Dist Hqr & Sub-division)	2
34	CHC (Community Health Centre) & PHC (Primary Health Centre)	3 & 75
35	ANM Sub-centres (Auxiliary Nurse Midwife)	264
36	Ayurvedic & Homeopathic Hospitals and Dispensaries	24 & 30
37	Primary Schools	1507
38	Middle Schools	856
39	High Schools	439

Chapter IV

Research Methodology

RESEARCH METHODOLOGY

This chapter deals with various methods and procedure followed by the investigator to analyses the problem during the course of investigation. The details of the methods and procedure used in this study along with plan of statistical analysis have been outlined under the following headings.

1. Selection of problems.
2. Research Design.
3. Plan of Work.
4. Location of the study.
5. Sampling procedures.
   a) Selection of the District.
   b) Selection of the Block.
   c) Selection of gram panchayat.
   d) Selection of the Villages.
   e) Selection of the respondents.
6. Tool & techniques
7. Collection of information.
   a) Preparation of interview schedule.
   b) Pre-testing, reliability and validity test for the interview schedule and final preparation.
   c) Interviewing.
8. Measurement Procedures.
9. Statistical measures.

1. Selection of problems :

The most important factor in behavioral research is selection, delineation and conceptualization of the problems. Research workers,

should play attention towards the formulation of a realistic, clear and an unambiguous problem since delineation of a problem is often more important and essential than its solution. So keeping the present situation and future happening in view, the topic "Socio-economic profile of Betel vine Farming" was selected. In this study due attention has been given to personal and socio-economic factor and adoption behavior of the respondents. The present status of Betel vine production, distribution and constraints associated with its cultivation as well as suggestions for development were studied.

2. Research Design :

The present research project was formulated on the basis of expost-factor approach. Accordingly, specific objectives were set to provide the basis of inquiry. In the light of the objectives, the scope of study was oriented and due techniques of investigation were followed; tools used and pattern of statistical analysis decided. Then the study was outlined from observation level up to interpretation of observations, giving correct operational definitions of concepts used. The study was then carried out in the light of objectives set and within the frame work of selected outlines.

3. Plan of work :

Before actual investigation, efforts were made to conduct a detail survey of all related aspect of Betel vine production in Odisha. As the project had to be completed within a stipulated academic period, as per the course curriculum the area of investigation, sample size, analysis of data were planned and decided accordingly.

4. Location of the study :

The study was carried out in Baliapal & Bhograi blocks of Blasore district of Odisha.

5. Sampling procedure :

Multi stage random sampling technique was followed to select the sample for study. The district and blocks were selected purposively. Then random sampling procedure was adopted to select the gram panchayats, villages and respondents for the study.

a) **Selection of the district:** Balasore District was selected purposively for study since maximum number of farmers of this district was found adopting Betel vine farming.

b) **Selection of the blocks:** In Balasore district 2 blocks namely Baliapal and Bhograi are selected purposively considering the area and production of Betel vine.

c) **Selection of the gram panchayats:** Multi stage random sampling was followed to select gram panchayat. Two Gram panchayats are selected from each Blocks at random totaling 4 Gram panchayats. These are Dogra, Betagadia, Bhograi and Deula.

d) **Selection of villages:** Multi stage random sampling was followed to select Villages. From the above 4 Gram panchayats two villages from each Gram panchayats are selected constituting eight villages. These are Dagara, Jamatkula, Betagadia, Narayanpur, Bhograi, Bartana, Deula and Satguhalia.

e) **Selection of respondents:** A preliminary survey of the selected villages was carried out at the beginning of the study and information were collected on the following aspects.

i. List of total farm families.

ii. List of betel vine growers.

iii. List of non betel vine growers.

6. Tools and Techniques:

In order to ensure maximum objectivity of the study, a number of standard tools developed by different experts in the field of science were considered. However, selected tools were modified to required extent as

per applicability. Before using these tools and techniques the implications of the application were thoroughly understood through available literature and discuss with those who had earlier used them.

7. Collection of information:

a) **Pilot study:** Prior to preparation of interview schedule a pilot study was carried out in the blocks and the district head-quarter to collect information regarding socio-economic situation, activities undertaken, different locations, type and nature of respondents, accessibility to the selected villages, possible communication facilities and even the ethnic characteristics of respondents including the language, social structure and group dynamics.

b) **Instrument for data collection:** The information from the respondents was collected with the help of a structured schedule developed covering questions related to the objective of the study (Appendix-1).

c) **Pre-testing of the instrument:** A pre-test was carried out to the practicability of the questions as well as to remove the ambiguities, if any. The interview schedule was pre-tested with 10 per cent of sample respondents. On the basis of observation made during pre-testing, some minor modifications were carried out as to the language and context. Finally the interview schedule was prepared for collection of data.

d) **Administration of instrument:** The data were collected through structured interview schedule personally, by the investigator. During the course of collection of data the help of concerned field agents working in the centers were undertaken for establishing accurate report with the selected respondents in order to get correct information. In all, 100 respondents were interviewed for the data collection.

8. Measurement procedure of variables

Socio personal variables

Variables		Empirical measurement
1. Age	:	Chronological age in year was taken in 3 categories.
2. Education	:	It was taken in 5 levels starting from illiterate to college education according to scale developed by Trivedi (1963).
3. Caste	:	Caste groups taken in 3 levels starting from Higher caste to SC according to scale developed by Trivedi (1963).
4.Family type	:	Nuclear and joint family types were taken.
5. Occupation	:	5 levels of occupation groups were taken as per the schedule developed.
6. Social participation	:	5 levels of social participation were taken as per the developed schedule.
7. Contact with Extension agency	:	As per scale developed by Desai (1981), 3 levels of extension agency contact were taken for study.
8.(a) Utilization of information sources	:	As per scale developed in the schedule for study.
(b) Contact with extension personnel	:	As per scale developed in the schedule for study.

Economic variables:

Variables		Empirical measurement
1. Farm size and irrigation potentiality	:	As per socio-economic status scale developed by Trivedi (1963) with necessary modification.
2. Average annual income	:	Schedule developed for the study keeping poverty line under consideration.
3. Housing pattern	:	As per the scale developed by Trivedi & Pareek (1963) with suitable modification.

Extent of adoption

As an important objective of the study it was decided to measure extent of adoption of recommended practices of betel vine cultivation were selected with due consideration and only the adopters were asked to give their responses in a 3 point scale as given below. Finally the mean score & rank order against 10 statements were measured.

Degree of adoption		Score
Full adopting	_	3
Partly adopting	_	2
Non adopting	_	1

Constraints in betel vine cultivation:

The different constraint faced by the betel vine cultivators were taken in to 4 major heads for the purpose of study. Accordingly suitable statements relating to each major area of constraints were selected and incorporated in the study in consultation with the experts in the field. The respondents were asked to record their view in a 3 point scale as

given below. Finally the mean score & rank order against individual statement under each major group of constraint was found out.

Major heads of constraint

Constraints	Highly affect (3)	Moderately affect(2)	Least affect(1)
1)Social Constraints statements	–	–	–
2)Organizational Constraints statements	–	–	–
3)Technological Constraints statements	–	–	–
4)Economic Constraints statements	–	–	–

Suggestions

The betel vine cultivators were asked to give suggestions freely on different aspects of betel vine betel vine cultivation. All these suggestions given by the respondents were finally arranged on the basis of maximum number of respondent's views to a minimum no. of views for each suggestion. The frequency & percentage of respondents against each major suggestion for betel vine cultivation was finally taken for the study.

Suggestion	Frequency	Percentage
–	–	–

9. STATISTICAL MEASURE

Statistical measure provided the investigator the opportunity for expressing the facts in an imperial way. But appropriate statistics which can provide clear-cut solution to the problem have been taken in this investigation. However the statistical measure which have been used in

this way are (1) Percentage (2) Mean score (3) Standard deviation (4) Rank order (5) Person's coefficient of correlation (6) Student 't' test.

1) Percentage: Percentage was used in descriptive analysis for making simple comparison between two responses. For calculating percentage, the frequency of a particular cell was multiplied by 100 and divided by the total number of respondents in the particular category to which cell they belonged.

$$\text{Percentage} = \frac{\text{No.of respondents}}{\text{Total no.of respondent}} \text{ X } 100$$

2) Mean score: It is also simple comparison which is calculated between sums of total score obtained with total number of items.

$$MS = \sum^{fx}/_{N}$$

Where, M.S. = Mean score

$\sum fx$ = Sum of total score obtained by the individual,

N= Total no. of respondents.

3) Standard deviation: It is taking to know difference of item in the sources from arithmetic mean, squaring the differences with diving by number of items and extracting the square root.

$$S.D = \sigma = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - \mu)^2}$$

Where, N = Number of items.

4) Rank order: On the basis of mean score rank order was made the item securing highest mean score was given first rank and then next highest was given second rank so on.

5) Pearson's co-efficient of correlation: This test was applied to ensure the degree of association between number of variables and factors of the respondents with their level of achievement.

$$r = \frac{N\sum xy - (\sum x)(\sum y)}{\sqrt{[N\sum x^2 - (\sum x)^2][N\sum y^2 - \sum y]^2}}$$

Where, r = Co-efficient of correlation.

N = No. of pairs to be correlated.

X & Y Variables being correlated summation

6) Student 't' test: Student 't' test was done to test the significance between the variables link age, income, knowledge level, economic motivation, attitude, skill etc.

$$t = \frac{\bar{x} - \bar{y}}{\sqrt{S^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

Where x = Mean of one sample.

y = Mean of another sample.

S = Standard deviation.

n_1 = Number of observation in one sample.

n_2 = Number of observation in another sample.

Chapter V

Results & Discussion

RESULT AND DISCUSSION

INTRODUCTION

With a clear-cut objective of analyzing the impact of Betel vine cultivation on the socio economic standards of the farmers eight no. of villages named Dagara, Jamatkula, Betagadia & Narayanpur of Baliapal block and Bhograi, Bartana, Deula & Sataguhalia of Bhograi block of Balasore district, were selected, taking in to consideration the coverage of Betel vine cultivation and the same pre-tested questionnaire was administered to the farmers. The information regarding the socio-economic background of the respondents is presented below.

OBJECTIVE-1 To study the socio-economic profile of Betel vine farmers of Balasore district.

(A) Age & Education: Age as a social factor has been subject to study by the social researchers in many situations relating to farm and farm research. Age structure is significant in terms of experience, maturity of judgement, decision making and power to understand. Hence is an inevitable variable in any social study.

Similarly education is linked with the mental and psychological ability of an individual to understand, decide and adopt new ideas and practices. It shows the light to move ahead.

Randomly respondents belong to different age groups were interviewed in order to locate if there is any impact of age on the adoption of Betel vine cultivation. Simultaneously it came out with difference in their educational status that is reflected below in the Table-5.1.2.

AGE AND EDUCATION STATUS OF RESPONDENTS

Table 5.1.1 Distribution of Respondents on the Basis of Age

Age	No	%
(a) Up to 25 years	30	30
(b) 26-50 years	54	54
(c) Above 50 years	16	16

Table 5.1.2 Distribution of respondents on the basis of educational status

Level of Education	No	%
(a) Illiterate	6	6
(b) Up to Primary	13	13
(c) Up to M.E.	20	20
(d) Up to High School	39	39
(e) College education	22	22

As regards to the age limit more Betel vine farmers are comes under age 26-50 years & as regards to educational status, more the farmers are educated seem conscious about adopting Betel vine cultivation.

(B) Caste and Occupational distribution of respondents:

As proved in history, in a society like that of ours caste has a definite impact on the occupational behavior but regarding improving upon or improving techniques to earn more is seen with those who have already a taste of earning more . To strengthen our belief, the very statement by "Obguan and Nimkoff" states that "Occupation is an indicator of a persons standing in the social system".

Caste and Occupational distribution of respondents

Table 5.1.3 Distribution of respondents on the basis of their caste

Caste	No	%
(a) General caste	50	50
(b) OBC	38	38
(c) Scheduled caste	12	12

Table 5.1.4 Distribution of respondents on the basis of their Occupation

Occupation	No	%
(a) Farming	46	46
(b) Farming + Business	48	48
(c) Farming + Service	5	5
(d) Farming + Business + Service	1	1
(e) Any other (specify)	0	0

Again basis on the caste of farmers don't revel any difference in their adoption behavior, rather farmers with business bent of mind along with farming as their occupation are better adopters.

Pattern of Family and Social Participation Level, contact with extension agency, utilization of information sources and personal cosmopolite sources:

Family type: Decision making happens to be the crucial factor in adopting and implementing certain practices. Joint comprises more adults with a traditional bent of mind in comparison to nuclear family. That reflected in the decision making behavior.

Social participation: The extent of social participation tells about the progressiveness and social standing of a person in the society. A man with greater exposure is supposed to be more up to-date and more enthusiastic about new innovations.

Contact with Extension Agency: Contact with extension agency helps a person to know much about the out side world. The dimension of contact increases further with the intensity of contact at various levels.

Utilization of information sources: It is also obvious that the more the utilization of information sources greater is the motivation for adoption. The table below reflects the distribution of respondents opinion as per they said.

Table 5.1.5 Classification of respondents basing on their family type:

Family Type	No	%
(a) Nuclear	72	72
(b) Joint	28	28

Table 5.1.6 Classification of respondents according to their social participation

Social participation	No	%
(a) No membership	75	75
(b) Ward member	3	3
(c) Member of Co-operative society	2	2
(d) Member of Youth club/farmer's association	20	20
(e) Any other (specify)	0	0

Table 5.1.7 Distribution of respondents on the basis of their contact with extension agency

Contact with extension agency	No	%
(a) Frequently	40	40
(b) Often	58	58
(c) Never	2	2

Table 5.1.8 Distribution of respondents basing on their utilization of information sources

Information sources	Regular		Occasional		Never	
	No	%	No	%	No	%
i. Radio	50	50	20	20	30	30
ii. TV	95	95	5	5	0	0
iii. News paper	30	30	20	20	50	50
iv. Education film	0	0	16	16	84	84
v. Farm publication	0	0	38	38	62	62
vi. Krishi mela/ Exhibition	0	0	36	36	64	64
vii. Demonstration	0	0	62	62	38	38

Table 5.1.9 Distribution of respondents basing on contact with extension personnel

Extension personnel	Regular		Occasional		Never	
	No	%	No	%	No	%
i. V.A.W.	0	0	38	38	62	62
ii. Cooperative personal	0	0	8	8	92	92
iii. Input dealer	20	20	30	30	50	50
iv. Bank personal	0	0	16	16	84	84
v. A.E.O./J.A.O.	0	0	38	38	62	62
vi. Neighbouring farmer	50	50	20	20	30	30
vii. Panchyat personal	0	0	62	62	38	38

As regards to social participation farmers with more of cosmopolite attitude show a positive trend towards adoption of Betel vine cultivation.

Radio and TV happens to be major sources of information provides followed by educational film, publication.

ECONOMIC FACTORS

Farm size and Irrigation potentiality:

Land is the basic need for cultivation, possession of land is an important determinant for assessing economic condition of farmers that to type of land and irrigation potentiality in the area decides the cultivation practices of the farmers.

Table 5.1.10 Farm type, farm size, and irrigation potentiality

Land type & irrigation potentiality		<1ha		1-3ha		>3ha	
		No	**%**	**No**	**%**	**No**	**%**
Upland	Rainfed	30	30	24	24	0	0
	Irrigated	34	34	38	38	0	0
Medium land	Rainfed	12	12	24	24	6	6
	Irrigated	14	14	34	34	4	4
Low land	Rainfed	8	8	22	22	0	0
	Irrigated	0	0	0	0	0	0

As revealed from the above table the farmers with more cultivation land, perhaps managed due to the area factor, so less attention to crop diversification. But the vice versa is seen in context of farmers with 1-3ha area or even less than that, who seem to concentrate on getting more yield from limited area and the progressive ones mostly with assured irrigated source are better adopters of Betel vine cultivation practices particularly in upland and medium land condition.

Average Annual income and Housing pattern

Experience tells that economically sound men are better adopters in all aspects of development. Sound background increases the risk bearing ability of farmers. Hence an important determinant in the process of adoption of Betel vine cultivation.

Table 5.1.11 Distribution of Respondents on the basis of their Annual income

Average annual income	No	%
(a) Up to Rs. 10,000/-	6	6
(b) 10,001/- to 15,000/-	10	10
(c) 15,001/- to 20,000/-	18	18
(d) 20,001/- to 30,000/-	32	32
(e) > 30,000/-	34	34

Table 5.1.12 Distribution of Respondents on the basis of their Housing pattern

Housing pattern	No	%
(a) Pucca House	6	6
(b) Semi Pucca House	72	72
(c) Katcha House	22	22

It depicts that the category of farmers with considerable annual income show positive tendency towards an input intensive Betel vine cultivation and also possess improved agricultural implements and plant protection equipments. Also the adopters reflect a better housing status.

OBJECTIVE-2 To assess the knowledge and extent of adoption of Betel vine package of practices by the farmers.

Knowledge of farmers about betel vine package of practices:

- Tropical climate & high rainfall place are suitable for betel vine cultivation.
- Heavy clayey loam & sandy loam soil are best for betel vine cultivation
- Bengali pan, Bali pan, Haldia pan are the varieties cultivated in their locality.
- Closed system of cultivation practices followed.
- Bamboo sticks, jute sticks, coconut leaves are required for construction of bareja.
- They applied fertilizers in 4-6 split doses.
- Light irrigation applied in betel vine cultivation.
- May-june is the ideal time for planting of betel vine under closed system of cultivation.
- The Spacing of betel is 50-70cm X 10-20cm.
- Fertilizer dose of betel vine is 200kg nitrogen, 100kg phosphorus & 100 kg potash /ha./year.
- They harvest the betel leaves by plucked by hand.

Extent of adoption of Betel vine package of practices by the farmers

In order to assess the impact one has to be sure of the results. Again to rest assured about the desired output one has to strictly adopt the recommendation there to.

Table 5.2.1 Evaluation of extent of adoption of recommended practices.

Areas of Technology	Mean score	Rank
1. Land preparation	1.96	VIII
2. Recommended verities	2.60	I
3. Recommended spacing	2.20	IV
4. Recommended height of bareja	1.92	IX
5. Cultivation practice	2.14	VI
6. Proper planting time	2.10	VII
7. Recommended fertilizer dose	2.20	IV
8. Recommended irrigation schedule	2.56	II
9. Recommended timely plant protection measure	2.36	III
10. Recommended procedure of grading of betel vine after harvesting	2.16	V

So the researcher here in had made an attempt to know about the extent of adoption of the package of practices meant for betel vine cultivation. The assessment thus made are compiled in the table above, that show the adopters stick maximum to recommendation varieties then to recommended irrigation schedule, timely plant protection measure, fertilizer dose, spacing & grading etc.

OBJECTIVE-3 To identify some of the discontinued innovations in Betel vine farming and reasons for discontinuance.

Attempt was made in the present study to identify some of the important innovations in betel vine farming to find out some of the discontinued innovation in betel vine farming and the reasons for their discontinuance. The result obtain were presented in the table 5.3.1.

Table 5.3.1 Distribution of respondents according to their discontinued innovations in Betel vine farming

Discontinued innovations	No	%
1.Soil Preparation	0	0
2.Soil Sterilization	18	18
3.Propagation by stem cutting	0	0
4.Closed system of Cultivation Practice	0	0
5.Training	3	3
6.Pruning	2	2
7.Application of Fertilizer	0	0
8.Application of Micro nutrient	87	87
9.Application of Insecticide	0	0
10.Grading	0	0

The above table show, that the maximum adopters discontinued application of micro nutrient then to soil sterilization, training and pruning. The reasons for discontinue are lack of knowledge about the discontinued innovations, they don't know about the benefit of these innovation in betel vine cultivation.

OBJECTIVE-4 To list out the constraints in Betel vine cultivation as experienced by the farmers.

For successful & profitable betel vine cultivation farmers in the area of study adopted improved package of practice. Inspired of their effort to increase their production and productivity a number of facilities are require but the farmers are restrain because of several constraint experienced by them. In the frame work of investigation a attempt was made to identify such constraints as has detailed below.

A. Social Constraint:

Table 5.4.1 Ranking of the social constraint (N=100)

Constraints	Mean Score	Rank
(a) Traditional bent of mind	1.42	V
(b) Lack of Awareness	2.38	IV
(c) Lack of Cosmopoliteness	2.73	I
(d) Low adoption by Neighbors	2.50	III
(e) Hesitation of family members	2.64	II

In order to bring out some propositions for further improvement and to conclude with suggestions the author has tried to locate the constraints faced by the farmers.

As per the importance attached by the respondents it is quite clear from the table above that lack of cosmopoliteness followed by lack of family support impact of neighbors, awareness and traditional bent of mind are ranked in descending order by the adopters.

B. Organizational Constraints

Table 5.4.2 Ranking of the Organizational Constraints (N=100)

Constraints	Mean Score	Rank
1. Poor coordination and cooperation among farmers	1.50	IV
2.Non availability of production inputs in time	2.68	III
3. Lack of proper market for their produce	2.76	II
4. Lack of effective supervision by extension workers	2.94	I

As regards organizational constraints are concerned the adopters opined lack of proper market for their produce to be the main constraint they faced followed by lack of effective supervision, non-availability of production inputs in time and lastly Poor coordination and cooperation among farmers.

C. Technological Constraints

Table 5.4.3 Ranking of the Technological constraints (N=100)

Constraints	Mean Score	Rank
1. Inadequate training to farmers	2.22	II
2. Inadequate demonstration of new varieties	2.48	III
3. Inadequate follow up services	1.56	VI
4. Lack of location specific result oriented recommendation	1.82	V
5. Deficiency in technical know how	2.38	I
6. Lack of soil testing facilities	1.24	IV
7. Inadequate availability of mass media sources of information at village level	2.12	VII
8. Lack of market intelligence	2.42	VIII

As regards modern methods and advanced technologies in Betel vine cultivation the adopters speak of adequate demonstrations followed by lack of market intelligence, deficiency in technical know-how etc are the technological concerns on priority basis, as evident from the table.

D. Economic Constraints

Table 5.4.4 Ranking of the Economic constraints (N=100)

Constraints	Mean Score	Rank
1. Poor economic condition of farmers	2.42	III
2. Non availability of agricultural credit	1.70	VI
3. Low risk bearing ability	1.26	VII
4. Poor transportation	2.24	IV
5. Low marketing price at the time of glut	2.78	I
6. Absence of storage	2.70	II
7. Lack of crop insurance in Betel vine farming	2.10	V

The purse of a person decides the activities one has to take up or one can take up. Betel vine cultivation as one of the input intensive activity demands a better market price, which of course has been assigned s the number are economic constraint by the adopters followed by absence of storage, poor economic condition of farmers etc.

OBJECTIVE-5 To suggest measures to over come constraints for better adoption of Betel vine practices.

Constraints in betel vine cultivation are many but the farmers take corrective measure to over come such constraint to boost of the production & adoption of betel vine practices. The study attempted to record the suggestion of respondent under study so as to over come the general constraint & increase the production and productivity. The suggestions given by the respondents are presented in the table below.

Table 5.5.1 Suggestion of the respondents on the general constraints of Betel vine cultivation for better adoption (N=100)

Statement	Frequency	Percentage
1. Assured irrigation is required	75	83.33
2. Storage facility to be enhanced	88	99.77
3. Subsidy on inputs be provided	90	100
4. Special training for Betel vine cultivation required	79	85.55
5.Quality planting material supply be done	31	32.22
6.Market facility	66	73.33
7.Provision of authorized dealer in the area	48	53.33
8. Location specific research recommendation needed	20	22.22
9. Information on weather in peak harvesting period	45	45
10. Availability of agricultural credit and to ease procedure to avail loan	89	98.88

A look at the table reveals important suggestion given by adopters of betel vine cultivation of the area under study, upon the constraints of betel vine cultivation to over come them. In other words, the above mentioned suggestions should be taken in to consideration carefully for

increasing the status of betel vine cultivation in the area under study. It appears from the responses of the respondents that more or less the statement propositions are to be taken care of and strengthened for effective adoption of the betel vine cultivation.

The constraints in betel vine cultivation are many and diversified. It is due to which farmers think twice while going for adoption of betel vine cultivation. The constraints differ from individual to individual on the basis of family requirement, socio-cultural variation, economic condition including a disposition towards technological know how etc. This study has unveiled many social, organizational, technological transfer and economic constraints of which low quality planting material, high cost, untimely supply, lack of follow of guidance and institutional finance are outstanding ones which impedes the adoption and spread of the betel vine are more specific. This requires quick redresser at appropriate levels for increasing production and productivity of betel vine.

Chapter VI

Summary & Conclusion

SUMMARY & CONCLUSION

The fresh leaves of betel vine are popularly known as *Paan* in India, which are consumed by about 15-20 million people in the country. It is cultivated following the traditional methods in India on about 55,000 ha with an annual production worth about Rs 9000 million. On an average about 30% of such production is contributed by the state of Odisha where it is cultivated on about 12,000 ha encompassing about 2-3lakh *Boroj* employing about the same number of agricultural families. This has supposed to build up modern bent of mind with the farmers & a remarkable influence on the socio-economic status, which tempted the investigator to go for the study titled "A study on the adoption behavior of Betel vine farmers of balasore district of Odisha". Under the following objectives:

1. To study the socio-economic profile of Betel vine farmers of Balasore District.
2. To assess the knowledge and extent of adoption of Betel vine package of practices by the farmers.
3. To identify some of the discontinued innovations in Betel vine farming and reasons for discontinuance.
4. To list out the constraints in Betel vine cultivation as experienced by the farmers.
5. To suggest measures to over come constraints for better adoption of Betel vine practices.

For the purpose of the study, keeping all limitation of the researcher in to account, selection of 8 villages like Dagara, Jamatkula, Betagadia & Narayanpur of Baliapal block and Bhograi, Bartana, Deula & Sataguhalia of Bhograi block of Balasore district were done. Again data were collected from 100 respondents who were selected in random sampling process. The information received were classified, tabulated

and put to statistical analysis. The important findings of the study are presented below.

1. As regards to the age limit more betel vine farmers are comes under age 26-50 years.
2. Educational status bears a greater influence on adoption behavior of the respondents.
3. Higher caste farmers show better response towards adoption of new practices related to betel vine cultivation.
4. Farmers with farming along with a business bent of mind were found to have a better inclination towards betel vine cultivation.
5. Farmers belonging to a nuclear type of family show better and positive decision for betel vine cultivation.
6. Respondents with a more cosmopolite attitude, high degree of social participation, greater contact & exposure to information outlets are first among the adopters.
7. Irrigated patches of upland & medium land mainly proved to have greater potential for betel vine cultivation.
8. Cultivation of betel vine over a couple of years has shown consideration increase in their annual income and housing pattern.
9. As proved statistically, adopters do possess a greater motivation, "Traditional method and farming has to be changed and new method of farming is more profitable" was proven to be vital factors for economic motivation.
10. Maximization of income happened to be the main purpose behind betel vine cultivation as opined by adopters. Hence farmers with commercial bent of mind show a better adoption rate towards new innovation. Moreover availability of suitable land, assured irrigation and suitable climate also contributed towards the purpose behind betel vine cultivation along with other main factor that "betel vine can be grown round the year".

11. Cosmopoliteness of adopter adds to the knowledge level regarding selection of planting material to harvesting and marketing of betel vine including its package of practices for cultivation.
12. The maximum adopters discontinued application of micro nutrient then to soil sterilization, training and pruning. The reasons for discontinue are lack of knowledge about the discontinued innovations, they don't know about the benefit of these innovation in betel vine cultivation.
13. Better skill was found among adopters regards to propagation, soil preparation, soil sterilization, training, pruning, application of fertilizers, application of insecticide, grading and packaging that added value to the betel vine cultivation, reducing the risk factor and finally ensuring more profit.
14. Self realization about getting a better yield and more profit even though it is input –intensive, reflected a positive attitude of the adopters.
15. In order to achieve desired out put one has to take maximum care in following scientific recommendations as regards to cultivation practices, which was found befitting in this case. Most of the adopters were found following the recommendations in respect of selection of planting material, planting time, irrigation schedule, fertilizer management, training, pruning and grading etc.
16. Disadvantages act as barriers in the path progress in any field and act as negative factor to every positive thought, similar is in the case with betel vine cultivation. A series of constraints were faced by the cultivators in betel vine cultivation were mainly grouped under social, organizational, technological & economical heads. Among the social constraints a traditional bent of mind along with lack of awareness ranked top by the adopters.
17. Inadequate demonstration and lack of follow-up service by followed by lack of market intelligence & technical know-how were major tech-hindrances in adoption of betel vine cultivation as opined by adopters.

18. Being input-intensive & high cost involvement, the betel vine cultivation demanded better economic status, high risk bearing ability, timely availability of credit and proper market etc. from the cultivators which were found to be the major economic constraints for adopters.

Suggestion of the study:

Simply identification of problems does not serve the purpose, unless & until realistic and definite suggestions are put forth. Keeping in view the pros & cons of betel vine cultivation, it is suggested to take up betel vine cultivation where the following facilities are available.

1) Subsidy on inputs
2) Storage facility
3) Assured irrigation
4) Special training and demonstration
5) Availability of agricultural credit
6) Quality planting material
7) Marketing facility
8) Provision of authorized dealer
9) Location specific research recommendation
10) Information on weather in peak harvesting period

Feature scope of the study & thrust area of research:

- In depth study on the latest technology on betel vine cultivation.
- Involvement of farmer's interest group for promotion of export oriented betel vine cultivation.
- Specialize betel vine like bali pan, bengali pan & haldia pan for better income.
- Proper marketing of betel vine for higher profit.
- Minimization of transport loss etc..

CONCLUSION

In this age of management, the winner is that who comes out with maximum output & benefit by making the most rational use of available resources. Irrespective of several constraints one can conclude upon betel vine cultivation to be better yielding, profitable and remunerative. In order to improve upon the existing socio-economic status, our farmers need to concrete more upon betel vine cultivation. By this they can not-only satisfy the nutritional requirement of the family but also can be good earners. Farmers as a whole without discrepancy as regards to age, education and economic status at least need to have a positive bent of mind towards modern methods of agricultural practices. In order to achieve something one should have a clear and concrete purpose being so as to get more income, as in case of betel vine cultivation. Better knowledge, excellent skill & positive attitude are pre-requisites for bringing in behavioural changes of farmers from traditional to modern approaches. The constraints as mentioned in the earlier section are not that right but can be easily addressed through awareness camps, training exposures, providing credit support to cultivators and creating proper market for their produce through preservation & value addition techniques. The study although conducted within limited resources, specific time period, much academic mobility and financial constraints, definitely unfolded some significant areas in the field of betel vine cultivation, which can be critically analyzed and suitable streamlined by the planner, policy makers, scientists besides the cultivators for a economically sound, resource rich, material stronger, cheerful and happy farming community.

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Appendices

INTERVIEW SCHEDULE

Objective-1: To study the socio-economic profile of Betel vine farmers of Balasore District.

Socio-economic profile of Betel vine Farmer

Name of the respondent :

Date of Interview :

Village :

Gram Panchayat :

Block :

Part-I

(A) Socio Personal Factors :

1. Age
   - (a) Up to 25 years
   - (b) 26-50 years
   - (c) Above 50 years
2. Education
   - (a) Illiterate
   - (b) Up to Primary
   - (c) Up to M.E.
   - (d) Up to High School
   - (e) College Education
3. Caste
   - (a) General Caste
   - (b) Other Backward Caste
   - (c) Scheduled Caste

4. Occupation
   (a) Farming
   (b) Farming + Business
   (c) Farming + Service
   (d) Farming + Business + Service
   (e) Any other (specify)

5. Family Type
   (a) Nuclear
   (b) Joint

6. Social Participation
   (a) No Membership
   (b) Ward member
   (c) Member of Co-operative Society
   (d) Member of Youth club/farmer's association
   (e) Any other (specify)

7. Contact with Extension Agency
   (a) Frequently
   (b) Often
   (c) Never

8. (a) Utilization of information sources

	Regular (3)	Occasional (2)	Never (1)
i. Radio ii. TV iii. News paper iv. Education film v. Farm publication vi. Krishi Mela / Exhibition vii. Demonstration (s)			

(b) Contact with Extension Personnel :

	Regular (3)	Occasional (2)	Never (1)
i. V.A.W. ii. Cooperative personal iii. Input Dealer iv. Bank Personal v. A.E.O. / J.A.O. vi. Neighboring farmer vii. Panchayat personal			

ECONOMIC FACTORS:

1. Farm Holding size (ha)

Land type & irrigation potentiality		<1ha		1-3ha		>3ha	
		No	%	No	%	No	%
Upland	Rainfed						
	Irrigated						
Medium land	Rainfed						
	Irrigated						
Low land	Rainfed						
	Irrigated						

2. Average annual income
   (a) Up to Rs. 10,000/-
   (b) 10,001/- to 15,000/-
   (c) 15,001/- to 20,000/-
   (d) 20,001/- to 30,000/-
   (e) >30,000/-
3. Housing Pattern
   (a) Pucca House
   (b) Semi Pucca House
   (c) Katcha House

Objective-2: To assess the knowledge and extent of adoption of Betel vine package of practices by the farmers.

Knowledge Test Of Respondent:

1. What is the suitable climate for Betel vine cultivation? a) Tropical Climate b) High Rainfall c) Other (if any)
2. Which type soil suitable for Betel vine cultivation? a. Heavy Clayey loam b. Sandy loam c. Other (if any)
3. How many nodes in stem cutting should be propagated? a. 3 b. 4 c. 5 d. Other (if any)
4. How many nodes are buried in the soil during planting? a. 2 b. 3 c. Other (if any)
5. What are the procedures followed for land preparation? a. Ploughing b. Labeling c. Field Bed Preparation d. Soil Sterilization e. Other (if any)
6. How many ploughing done for soil preparation? a. 4 b. 5 c. Other (if any)

7. What are the varieties cultivated in your locality?
   a. Bengali pan
   b. Bali pan
   c. Haldia pan
   d. Other (if any)

8. Which type of cultivation practices you have followed?
   a. Open system
   b. Closed system
   c. Other (if any)

9. What is the fertilizer dose of Betel vine?
   a. 200kg Nitrogen/ha./year
   b. 100kg Phosphorus/ha./year
   c. 100kg potash/ha./year
   d. Other (if any)

10. What are the materials required for construction of Bareja?
   a. Bamboo sticks
   b. Jute sticks
   c. Coconut leaves
   d. Other (if any)

11. What should be the height of a Bareja?
   a. 2m
   b. 2.5m
   c. Other (if any)

12. What is the ideal time of planting of Betel vine under closed system of cultivation?
   a. May
   b. June
   c. Other (if any)

13. How many cuttings are used per hector in closed system of Betel vine cultivation?
   a. 1lakh
   b. 1.1lakh
   c. 1.2lakh
   d. Other (if any)

14. What is the spacing of Betel vine?
   a. 50-70cm X 10-20cm
   b. Other (if any)

15. In how many split doses fertilizers should be applied?
    a. 2-4
    b. 3-5
    c. 5-6
    d. Other (if any)

16. Which type of irrigation applied in Betel vine cultivation?
    a. Light irrigation
    b. Other (if any)

17. Which type of Diseases is occurred in Betel vine?
    a. Brown leaf spot
    b. Stem & leaf rot (Angari patra and sadha roga)
    c. Leaf spot (Jhaina or Jatu roga)
    d. Leaf spot (Sankhiamara roga)
    e. Bacterial leaf spot (Jaba roga)
    f. Other (if any)

18. How do you harvest the Betel vine?
    a. Plucked by hand
    b. Plucked by machine
    c. Other (if any)

19. Which type of instruments you used for plant protection?
    a. Sprayer
    b. Duster
    c. Other (if any)

20. How the picked leaves are sorted in to different Grades?
    a. According to Size
    b. According to Colour
    c. According to texture
    d. According to maturity
    e. Other (if any)

Extent of Adoption of Betel vine Package of Practices

Areas of Technology
1. Land preparation a. Ploughing b. Labeling c. Field Bed Preparation e. Soil Sterilization f. Other (if any)
2. Recommended varieties 1. Bengali pan 2. Bali pan 3. Haldia pan 4. Other (if any)
3. Recommended spacing a. 50-70cm X 10-20cm b. Other (if any)
4. Recommended Height of the Bareja a. 2m b. 2.5m c. Other (if any)
5. Cultivation practice a. Closed system b. Other (if any)
6. Proper planting time a. May b. June c. Other (if any)

7. Recommended fertilizer dose a. 200kg Nitrogen/ha./year b. 100kg Phosphorus/ha./year c. 100kg potash/ha./year d. Other (if any)
8. Recommended irrigation schedule a. 2 times/week b. Light irrigation c. Other (if any)
9. Recommended timely plant protection measures a. After ETL b. Before EIL c. Other (if any)
10. Recommended procedure for grading of Betel vine after harvesting a. According to Size b. According to Colour c. According to texture d. According to maturity e. Other (if any)

Objective-3: To identify some of the discontinued innovations in Betel vine farming and reasons for discontinuance.

Discontinued innovations in Beetle vine farming and reasons for discontinuance:

Sl. No.	Discontinued innovations	Reasons
1.	Soil Preparation	
2.	Soil Sterilization	
3.	Propagation by stem cutting	
4.	Closed system of Cultivation Practice	
5.	Training	
6.	Pruning	
7.	Application of Fertilizer	
8.	Application of Micro nutrient	
9.	Application of Insecticide	
10.	Grading	

Objective-4: To list out the constraints in Betel vine cultivation as experienced by the farmers.

The Constraints in Betel vine Cultivation

A. Social Constraints :

STATEMENT	Highly affect (3)	Moderately affect(2)	Least affect(1)
1. Traditional bent of mind			
2. Lack of Awareness			
3. Lack of cosmopoliteness			
4. Low adoption by neighbors			
5. Hesitation of family members			

B. Organizational Constraints

STATEMENT	Highly affect(3)	Moderately affect(2)	Least affect(1)
1. Poor coordination and cooperation among farmers			
2. Non availability of production inputs in time			
3. Lack of proper market for their produce			
4. Lack of effective supervision by extension workers			

C. Technological Constraints :

STATEMENT	Highly affect (3)	Moderately affect(2)	Least affect (1)
1. Inadequate training to farmers			
2. Inadequate demonstration of new varieties			
3. Inadequate follow up services			
4. Lack of location specific result oriented recommendation			
5. Deficiency in technical know how			
6. Lack of soil testing facilities			
7. Inadequate availability of mass media sources of information at village level			
8. Lack of market intelligence			

D. Economic Constraints

STATEMENT	Highly affect(3)	Moderately affect(2)	Least affect(1)
1. Poor economic condition of farmers			
2. Non availability of agricultural credit			
3. Low risk bearing ability			
4. Poor transportation			
5. Low marketing price at the time of glut			
6. Absence of storage			
7. Lack of crop insurance in Betel vine farming			

Objective-5: To suggest measures to over come constraints for better adoption of Betel vine practices.

Suggestion for improvement in Betel vine cultivation

Statement	Frequency	Percentage
1. Assured irrigation is required		
2. Storage facility to be enhanced		
3. Subsidy on inputs be provided		
4. Special training for Betel vine cultivation required		
5.Quality planting material supply be done		
6.Market facility		
7.Provision of authorized dealer in the area		
8. Location specific research recommendation needed		
9. Information on weather in peak harvesting period		
10. Availability of agricultural credit and to ease procedure to avail loan		