

**A STUDY ON KNOWLEDGE AND ADOPTION OF BETEL VINE (*Piper betel*)
CULTIVATION PRACTICES FOLLOWED BY THE FARMERS OF
DAVANAGERE DISTRICT OF KARNATAKA**

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COLLEGE OF AGRICULTURE, SHIVAMOGGA

**UNIVERSITY OF AGRICULTURAL AND HORTICULTURAL SCIENCES,
SHIVAMOGGA**

2020

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Thesis submitted to the

**UNIVERSITY OF AGRICULTURAL AND HORTICULTURAL SCIENCES,
SHIVAMOGGA**

In partial fulfillment of the requirements for the award of the degree of

Master of Science (Agriculture)

in

AGRICULTURAL EXTENSION

Shivamogga

November, 2020

**DEPARTMENT OF AGRICULTURAL EXTENSION
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CERTIFICATE

This is to certify that the thesis entitled '**A STUDY ON KNOWLEDGE AND ADOPTION OF BETEL VINE (*Piper betel*) CULTIVATION PRACTICES FOLLOWED BY THE FARMERS OF DAVANAGERE DISTRICT OF KARNATAKA.**' submitted in partial fulfillment of the requirements for the award of the degree of **MASTER OF SCIENCE (AGRICULTURE)** in **AGRICULTURAL EXTENSION** to the college of Agriculture, Shivamogga, University of Agricultural and Horticultural Sciences, Shivamogga, is a bonafide record of research work carried out by **SUBHASH V, ID. No. MA1TAH0268** (subhashvcrk@gmail.com) during the period of study in this University under my guidance and supervision and no part of this thesis has been submitted for the award of any other degree, diploma, associateship, fellowship or any other similar titles.

**Shivamogga
November, 2020**



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ACKNOWLEDGEMENT

“Gratitude is the most exquisite form of memory” At last the moment has come to look into the deeper layers of my heart which is filled of togetherness and loveliness; consolation and satisfaction. Some are permanent and some momentary, but both involve number of persons I acknowledgement my warm regards.

*At the very outside, I feel inadequacy of words to express my profound indebtedness and sense of gratitude to my Ex-chairman late **Dr. Ramappa Patil**, professor, and station head Department of Agricultural Extension, Agricultural and Horticultural Research station Kathalagere, University of Agricultural and Horticultural Sciences Shivamogga, for the provoking, inspiring and valuable guidance in planning and execution of my research work. Also, I owe my heartfelt thanks for his patience, critical and completion of this investigation. It was really a great pleasure and privilege for me to be associated with him during my M.Sc. programme.*

*I place on record my deep sense of reverence, gratitude and thanks to my esteemed chairman **Dr. Basavaraj Beerannavar** Associate professor, Department of Agricultural Extension, College of Agriculture, Shivamogga and chairman of my advisory committee for his guidance, valuable suggestions, constructive criticisms and constant encouragement throughout the course of research and study. I would rather remain indebted to him forever than to go in search of words that can adequately express my gratitude,*

*I am extremely grateful to **Dr. Nagarajappa Adivappar**. Assistant Professor, Dept of Horticulture, COA Shivamogga and **Dr. Mallikarjuna H.B.** Assistant Professor, Dept. of Agricultural Statistics, COA, Shivamogga, and **Dr. T. S. Ganesh Prasad**. Assistant Professor, Department of Agricultural Extension, COF, Ponnampet, members of my advisory committee, for their valuable counsel throughout the course of investigation and sensible criticisms in ameliorating the manuscript.*

*I avail this opportunity to express my sincere gratitude's to the fascinating teachers of department of Agricultural Extension. **Dr. Sudheendra, Dr. Sahana, Mr. Ramesh, Dr. Chinnappa, BamdDr. Kiran Kumar Patil** and supporting staff*

Shivagami, Manjunath, Sreenivas, for their consultative suggestions and help during my tenure of studies.

I am greatly beholden of vocabulary and owe deep sense of honour to my beloved parents, father **MrVenkatesh R M.** and mother **Bhagya M.**, sister **Anusha V.**, for their abundant love, affection and blessings shown on me.

My diction does not seem to be rich enough to provide suitable words to articulate my love to them. My indebtedness to my friends **Srikanthshinde, Emran, Vivek, Chethan sir, Venky, Chethanbabu, Vishwas, Vishwanath(bussu), Monesh, Dileep, Harish, Saban, Srikanth, Narendra, Praveen, Jaam** for their help, concern, moral support, lively companionship, unbroken inspiration and affection shown to me is beyond words. Still I wish to express my heartfelt thanks to them.

My diction does't seem to rich enough to provide suitable words to articulate my sincere and heartfelt gratitude to my classmate friends **Muhammad Emran, Chethan, Chaithra, Monesh, Poornima, Priyanka and Srikanth** who devoted all of their time and efforts to correct my manuscript and their advice and guidance helped me to carry out my research and also in every time extending their help for encouragement and my juniors friends **Rahul, Varun, PrahaladBhat, Rakshitha, Sandya, Shrammila and Gangalakshmi** for kind co-operation and timely help throughout the study and research.

I extend my sincere thanks to my seniors **Girish(simha), Naveesh, Abhishek (bakery), Ambrish, Sagar, Narendra, Vivek, Chethan, Dharmaraj**, for their help, valuable suggestions and support.

. I also extended my sincere thanks to **Snehamilana Associates Mr.Dinesh and Mr. Yoganna** for neat alignment, printing and binding of thesis Last but not least I extended my gratitude to all people who have helped, supported and encouraged me in ways for the completion of my post-graduation.



Shivamogga,
November, 2020

(Subhash V)

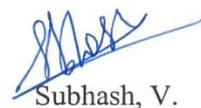
A Study on Knowledge and Adoption of Betel vine (*Piper betel*) Cultivation Practices Followed by the Farmers of Davanagere District of Karnataka

(Subhash, V.)

Abstract

The study was conducted in Harihara and Honnali Taluks of Davanagere District in 2019-20. Eight villages have been selected from two taluks, four villages from each taluk. From each village 15 betel vine farmers were randomly selected. Thus, the total sample was 120 respondents. The study indicated that majority of the respondents had medium (76.67 %) level of knowledge. In case of adoption 65.00 per cent of the respondents belong to medium level of adoption category. Majority of the respondents were middle-aged (47.50 %), and educated up to high school level (40.83 %). Majority of the respondents belong to small farmers category (42.50 %), whereas 67.50 per cent of the respondents are having medium level of farming experience in betel vine cultivation. Majority of the respondents belong to medium (76.67 %) level of annual income category, whereas 68.33 per cent of the respondents are having medium level of participation (60.83 %), Information-seeking behaviour (63.33 %). Majority of the respondents are belong to medium level of the Innovativeness (60.00 %), Risk-orientation (70.83 %). Non-availability of the skilled labour (77.50 %), High cost of inputs (75.00 %), lack of technical guidance (56.66 %) and lack of capital (52.50 %) were the major constraints faced by the respondents. Hence the Agricultural Universities, state Horticulture Department and KVKs should provide required training to the farmers and demonstrate the new technologies, organizing the Exhibitions, field days in the villages to increase the level of knowledge of the farmers and to make them adopt the important practices in the betel vine cultivation.

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ಕರ್ನಾಟಕದ ದಾವಣಗೆರೆ ಜಿಲ್ಲೆಯ ರೈತರು ಅನುಸರಿಸುವ ವೀಳ್ಯದೆಲೆ ಬಳ್ಳಿ (ಪೈಪರ್ ಬೆಟಲ್) ಕೃಷಿ ಪದ್ಧತಿಗಳ ಜ್ಞಾನ ಮತ್ತು ಅಳವಡಿಕೆ ಕುರಿತು ಅಧ್ಯಯನ

(ಸುಭಾಷ್, ವಿ.)

ಸಾರಾಂಶ

ದಾವಣಗೆರೆ ಜಿಲ್ಲೆಯ ಹರಿಹರ ಮತ್ತು ಹೊನ್ನಾಳಿ ತಾಲೂಕುಗಳಲ್ಲಿ ಈ ಅಧ್ಯಯನವನ್ನು ೨೦೧೯-೨೦ರಲ್ಲಿ ನಡೆಸಲಾಯಿತು. ಜಿಲ್ಲೆಯ ನಾಲ್ಕು ತಾಲೂಕುಗಳಿಂದ ನಾಲ್ಕು ಗ್ರಾಮಗಳನ್ನು ಆಯ್ಕೆ ಮಾಡಲಾಯಿತು. ಪ್ರತಿ ಹಳ್ಳಿಯಿಂದ ೧೫ ವೀಳ್ಯದೆಲೆ ಬಳ್ಳಿ ಬೆಳೆಯುವ ರೈತರನ್ನು ಯಾದೃಚ್ಛಿಕವಾಗಿ ಆಯ್ಕೆ ಮಾಡಲಾಯಿತು. ಹೀಗಾಗಿ ಒಟ್ಟು ಮಾದರಿಯು ೧೨೦ ಪ್ರತಿಸ್ಪಂದಕರ ಪೈಕಿ ಹೆಚ್ಚಿನವರು ಮಧ್ಯಮ ಮಟ್ಟದ (ಶೇ.೭೬.೬೭) ಜ್ಞಾನವನ್ನು ಹೊಂದಿರುವುದು ಅಧ್ಯಯನದಿಂದ ಕಂಡುಬಂದಿದೆ. ಅಳವಡಿಕೆ ಸ್ವೀಕಾರದ ಸಂದರ್ಭದಲ್ಲಿ ಶೇ. ೬೦.೦೦ ರಷ್ಟು ಮಂದಿ ಮಧ್ಯಮ ಮಟ್ಟದ ಅಳವಡಿಕೆ ಮಟ್ಟಕ್ಕೆ ಸೇರಿದವರು. ಪ್ರತಿಕ್ರಿಯಿಸಿದವರಲ್ಲಿ ಹೆಚ್ಚಿನವರು ಮಧ್ಯಮಯಸ್ಕರು (ಶೇ. ೪೭.೫೦) ಮತ್ತು ಪ್ರೌಢಶಾಲಾ ಹಂತದವರೆಗೆ (ಶೇ. ೪೦.೮೩) ಶಿಕ್ಷಣವನ್ನು ಪಡೆದವರಾಗಿದ್ದಾರೆ. ಪ್ರತಿಕ್ರಿಯಿಸಿದವರಲ್ಲಿ ಹೆಚ್ಚಿನವರು ಸಣ್ಣ ರೈತ ವರ್ಗಕ್ಕೆ (ಶೇ. ೪೨.೫೦) ಸೇರಿದವರಾಗಿದ್ದು ಹಾಗೂ ಶೇ.೬೭.೫೦ ರಷ್ಟು ಮಂದಿ ವೀಳ್ಯದೆಲೆ ಬಳ್ಳಿ ಕೃಷಿಯಲ್ಲಿ ಮಧ್ಯಮ ಮಟ್ಟದ ಕೃಷಿ ಅನುಭವವನ್ನು ಹೊಂದಿರುವರು. ಪ್ರತಿಕ್ರಿಯಿಸಿದವರಲ್ಲಿ ಹೆಚ್ಚಿನವರು (ಶೇ. ೭೬.೬೭) ರಷ್ಟು ಮಧ್ಯಮ ವಾರ್ಷಿಕ ಆದಾಯ ವರ್ಗಕ್ಕೆ ಸೇರಿದವರಾಗಿದ್ದು, ಹಾಗೂ ಶೇ. ೬೮.೩೩ ರಷ್ಟು ಮಂದಿ ಮಧ್ಯಮ ಮಟ್ಟದ ವಿಸ್ತರಣಾ ಸಂಪರ್ಕವನ್ನು ಹೊಂದಿರುವರು. ಪ್ರತಿಕ್ರಿಯಿಸಿದವರಲ್ಲಿ ಸಮೂಹ ಮಾಧ್ಯಮ ಭಾಗವಹಿಸುವಿಕೆ (ಶೇ. ೬೦.೮೩), ಮಾಹಿತಿ ಬೇಡಿಕೆಯ ನಡವಳಿಕೆ (ಶೇ. ೬೩.೩೩), ನವೀನತೆ (ಶೇ. ೬೦.೦೦), ಅಪಾಯ ದೃಷ್ಟಿಕೋನ (ಶೇ. ೭೦.೮೩) ಗಳು ಮಧ್ಯಮ ಮಟ್ಟದಲ್ಲಿರುವುದು ಕಂಡುಬಂದಿರುತ್ತದೆ. ನುರಿತ ಕಾರ್ಮಿಕರ ಲಭ್ಯತೆ (ಶೇ. ೭೭.೫೦), ಒಳಹರಿವಿನ ಹೆಚ್ಚಿನ ವೆಚ್ಚ (ಶೇ. ೭೫.೦೦), ತಾಂತ್ರಿಕ ಮಾರ್ಗದರ್ಶನದ ಕೊರತೆ (ಶೇ. ೫೬.೬೬) ಮತ್ತು ಬಂಡವಾಳದ ಕೊರತೆ (ಶೇ. ೫೨.೫೦) ಪ್ರತಿವಾದಿಗಳು ಎದುರಿಸುತ್ತಿರುವ ಪ್ರಮುಖ ನಿರ್ಬಂಧಗಳಾಗಿವೆ. ಆದುದರಿಂದ ಸಂಬಂಧಿಸಿದ ಕೃಷಿ ವಿಶ್ವವಿದ್ಯಾಯಗಳು, ರಾಜ್ಯ ತೋಟಗಾರಿಕಾ ಇಲಾಖೆಗಳು ಕೃಷಿ ವಿಜ್ಞಾನ ಕೇಂದ್ರಗಳು ಹಾಗೂ ರೈತ ಸಂಪರ್ಕ ಕೇಂದ್ರಗಳು ರೈತರಿಗೆ ಸೂಕ್ತವಾದ ತರಬೇತಿಯನ್ನು ನೀಡಿ ಹೊಸ ತಂತ್ರಜ್ಞಾನಗಳನ್ನು ಅಳವಡಿಸಿಕೊಳ್ಳಲು ತರಬೇತಿಯನ್ನು ನೀಡಲು ಪ್ರತಿ ಗ್ರಾಮಗಳಲ್ಲಿ ತರಬೇತಿ ಶಿಬಿರಗಳನ್ನು ಆಯೋಜಿಸಿ ರೈತರ ಕೃಷಿಜ್ಞಾನದ ಮಟ್ಟವನ್ನು ಹೆಚ್ಚಿಸಲು ಹಾಗೂ ಪ್ರಮುಖ ಪದ್ಧತಿಗಳನ್ನು ಅಳವಡಿಸಿಕೊಳ್ಳುವಂತೆ ಮಾಡಬೇಕು.

ಕೃಷಿ ವಿಸ್ತರಣಾ ವಿಭಾಗ

ಕೃಷಿ ಮಹಾವಿದ್ಯಾಲಯ, ಶಿವಮೊಗ್ಗ

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INTRODUCTION

I INTRODUCTION

Betel vine is an ever-green perennial creeper. It is scientifically known as *Piper betel* L. and belongs to the family *Piperaceae*, i.e. the Black Pepper family. The betel vine is a dioecious plant (male and female plants are different), there are about 100 varieties of betel vine in the world, of which about 40 are found in India. It is believed that betel vine is native to Malaysia. Despite its alien origin, the plant is much more popular in India than in any other country of the world since antiquity. This would be evident from the numerous citations laid down in the ancient literature, particularly the Indian scriptures. In these citations, the significance of the leaves has been explained in religious and 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. The deep green heart-shaped betel vine leaves are known by many names across the country and abroad. In the Indian subcontinent it is known as Paan in Hindi, Taambula in Sanskrit, Villyadale in Kannada, Vettilai in Tamil, Nagarbel in Gujarati, Tamalapaku in Telugu, vettilakkoti in Malayalam, Videch-pan in Marathi and pan in Bengali. In foreign languages, it is known as Tanbol in Arabic and Burg-e-Tanbol in Persian. The word Paan in Hindi and other Indian languages is probably a derivative of the Sanskrit word 'Paan' meaning 'leaf'. It has been very intimately connected with the ancient Indian history, religion and culture as is evident by many references in the early Sanskrit literature (3000 BC), like Vedas, Ramayana, Mahabharata, Mahavansha, etc. Marco Polo (1295 AD) took notice of the pan chewing habit of the people in south India. Over the centuries, pan chewing had become so prevalent that serving and chewing of pan had been raised to the level of fine art at the Mughal Darbar, particularly during the Akbar's regime. In course of time, offering the 'Bida' of betel vine has become a symbol of offering and acceptance of mutual love and friendship. In South India in a region known as 'Old Mysore', it is a tradition to offer two betel leaves to the guests on every auspicious occasion. Also, a betel nut and a coin are placed on a betel leaf to be offered as Dakshina for priests and elders in South India. Betel leaves are also used to embellish the Kalash (pot) used for performing various religious rituals as it purifies the water. According to Ramayana, the time when Shri Hanuman reached Lanka to convey the message of Lord Ram to Sita Devi, she gave him a garland made with betel leaves when she couldn't find anything else to offer him as a token of delight and appreciation. This is why people offer betel leaves while worshipping Shri Hanuman.

Table: 1.1 Nutritional compositions of fresh betel vine leaf

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

Source: (Guha and Jain 1997)

According to folk medicine, betel leaf can help in the treatment of headache, itching, mastitis, cuts, abrasions, constipation and injuries. Betel leaves may help in lowering blood glucose levels. They contain active molecules called tannins that have anti-diabetic properties. Betel alkaloids can lower blood glucose levels by inhibiting glucose absorption in the intestine. This leaf also contains a variety of polyphenols that have excellent antioxidant potential. These molecules protect the pancreatic cells from free radical damage. In India, eating paan (betel quid) after meals is a common practice. Some studies have proven that this practice can lower the biomarkers of hyperglycaemia (high blood sugar). Applying betel vine extract to wounds increases the rate of wound healing. Higher collagen content facilitates rapid wound repair and tissue regeneration. Chewing on paan may induce a sense of well-being, alertness, increased heartbeat, and mild euphoria. Betel leaves can relieve cough. These leaves are soaked in mustard oil, warmed, and applied to the chest to ease congestion in the lungs. A betel leaf contains vitamin C, iron, carotene, fiber, potassium, iodine, and thiamine and hence is used widely in Ayurvedic medicines to prevent bad teeth, treat

ulcers, and acne, helps in relieving coughing and even to cure respiratory disorders like bronchitis.

Despite 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 call for a word of caution. This is because the tobacco-based quids may cause dental caries, alveolar, 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), a carcinogen, but it is quickly metabolized in the human body into dihydroxychavicol and eugenol, which are excreted along with urine (Chang *et al.*, 2002). The betel leaves are also reported to possess antioxidant activity besides antimutagenic and anticarcinogenic properties particularly against the tobacco carcinogens (Chang *et al.*, 2002) due to the presence of ingredients like hydroxyl chavicol (Amonkaret *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, the possibility of manufacturing a new blood cancer drug from it cannot be ruled out. 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 a 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 shreds of evidence 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). Because 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 a betel leaf.

The vast economic potential of the crop can be adequately established by the fact that about 15-20 million people consume betel leaves in India regularly, besides those in other countries of the world, which may add up over two billion consumers. Betel farming activities can generate employment opportunities for agricultural workers throughout the year, helping them to support their families. Further, as far as

national employment generation is concerned, about 20 million people derive their livelihoods directly or indirectly by producing, processing, handling, transporting, and marketing betel leaves in India. The Indian betel leaves are in great demand in several other countries of the world where demand far exceeds the local supply. Consequently, leaves worth about Rs.30-40 million are exported to European countries. This indicates the profitability of the crop which can be further exploited in the interest of the nation. (Jana 1998). So betel vine crop plays an important role in the rural economy and rural employment and hence growing this crop is very economical either as monochrome or as intercrop.

The general shelf life of the leaves is 3-5 days in summer and 5-7 days in winter after harvesting. Being a very perishable commodity around 35-70 per cent of the gross production is post-harvest losses every year (Rao and Narasimham, 1977). Particularly in the rainy season a large portion of the leaves remain unsold or sold at a throwaway price (Guha and Jain, 1997). 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. Due to such reason, the farmers try to reduce production by curtailing the agricultural inputs (Guha and Jain, 1997). The wastage can also be minimized the extraction of essential oil from betel leaves. Such type of extractor has been developed by P. Guha in the year 2006 at the Agricultural and Food Engineering Department, Indian Institute of Technology, Kharagpur, West Bengal, India. The special emphasis of this extraction system was the raw materials means betel leaves may be fresh, or stale or de-chlorophyll, or even partially decayed. The essential oil extracted with this apparatus revealed that the Mitha, Bangla, and Sanchi varieties of betel leaves contained about 2.0 per cent, 1.7 per cent, and 0.8 per cent essential oil respectively, on a 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 per cent of the oil (Guha and Jain, 1997).

Betel vine is one of the important commercial crop grown mostly by small and marginal farmers in the states of Assam, West Bengal, Bihar, Andhra Pradesh, Karnataka, Tamil Nadu, Maharashtra, Madhya Pradesh, Kerala, Uttar Pradesh and Orissa with an estimated area of 53,539 ha. Annual production is worth Rs. 9000 million and estimated that about 20 million people earn their livelihood directly or indirectly partly or fully from production, processing, handling, transportation, and marketing of betel leaves in India. Betel leaves worth 30-40 million rupees are exported to countries like Bahrain, Canada, Great Britain, Nepal, Pakistan, Saudi Arabia, and many other European countries.

It is one of the most important commercial crops of Karnataka grown by small and marginal farmers. The area, production, productivity, and important districts have

grown are given in Table 1.2. The important betel vine-growing districts are Haveri, Davanagere, Tumkur, Bangalore Rural, Mysore, Dharwad, Shimoga, Chikmagalur, North Canara, Belgaum, and Bijapur. Haveri district is leading in Betel vine production followed by Davanagere, Tumkur, and Ramanagara during the last 3 years. The average productivity for the last few years is 19.41 lakh leaves/ha. There is fluctuation in the area under Betel vine during the last 7 years. However, during 2011-12, it is grown in an area of 6988 ha with a production of 1,31,795 lakh leaves with productivity of 18.86 lakh leaves/ha.

In Davanagere district betel vine is cultivating for 150-200 years. In Davanagere on an average 1,170 ha area and 23,000 lakh leaves production of betel vine crop is seen in 6 taluks, in that Harihara is highest in area and production of betel vine leaves followed by Honnali.

There are several varieties grown based on leaf shape, size, pungency, *etc.* Ambadi, a male cultivar is grown in Northern Karnataka districts particularly in Bijapur, Bagalkot, and Belgaum. Most of the cultivars grown in Southern districts of Karnataka are female clones. Kariyele is a common female cultivar grown in Bagalkot whereas Mysore yelee, which is given a Geographical Indication tag is restricted to Mysore district. Rani yelee, a Sanchi type cultivar is grown in Honnavartaluk of Uttara Kannada district. Savanuryele and Imangala cultivars are popular in Savanur area of Haveri district and Hiriyurtaluk of Chitradurga respectively. There are several local clones such as Kalasavalli, Panchavalli, Gobbarpanchavalli, Lavangavalli and Sarabyele, *etc.* under areca nut gardens of malnad region (Shivamogga and Chikkamagalur district). High yielding clones viz., Godi Bangla and SwarnaKapoori are performing well in arecanut garden and few farmers have taken up their cultivation.

Table 1.2. Area, production, productivity and important Betel vine growing districts in Karnataka (2005-06 to 2011-12)

Year	Area(ha)	Production (Lakh leaves)	Productivity (Lakh leaves)	Important Districts (Area in Ha)
2005-06	6380	120486	18.88	Davanagere (997), Tumkur (660) Haveri (770), Bagalkot (560)
2006-07	6751	129575	19.00	Davanagere (1068), Haveri (840) Tumkur (679), Bagalkot (553)
2007-08	6495	143412	22.08	Davanagere (1237), Haveri (962) Tumkur (679), Chikmagalore (505)
2008-09	6537	124951	19.11	Davanagere (1000), Haveri (980) Tumkur (731), Bagalkot (563)
2009-10	6612	130256	19.70	Haveri (1188), Davanagere (922) Tumkur (776), Ramanagara (542)
2010-11	7143	130332	18.25	Haveri (1381), Davanagere (956) Tumkur (890), Ramanagara (460)
2011-12	6988	131795	18.86	Haveri (1350), Davanagere (956) Tumkur (814), Ramanagara (467)

Source: Department of Horticulture, Karnataka

Table 1.3 Taluk wise Area and Production of betel vine crop in Davanagere district

Sl. No	Taluk	2014-15		2015-16		2016-17		2017-18		2018-19	
		Area (Ha)	Production (lakh leaves)	Area (Ha)	Production (lakh leaves)	Area (Ha)	Production (lakh leaves)	Area (Ha)	Production (lakh leaves)	Area (Ha)	Production (lakh leaves)
1	Davanagere	62	1126	56	1036	14	379	22	321	24	567
2	Harappanahalli	50	963	31	632	43	963	21	297	—	—
3	Chennagiri	113	2469	114	2398	293	3698	480	5984	71	1698
4	Harihara	470	9565	746	17632	483	10364	810	19654	811	19873
5	Honnali	118	2654	75	1623	125	2635	156	3641	130	2865
6	Jagaluru	25	479	42	652	25	564	62	1632	62	1589
	Total	838	17256	1064	23973	983	18603	1571	31529	1398	26592

Source: DSO and JDA office Davanagere

Table:1.4 Important varieties in different States

States	Popular varieties
Andhra Pradesh	Karapaku, Chennor, Tellaku, Bangla and Kalli Patti
Assam	Assam Patti, Awani pan, Bangla and Khasi pan.
Bihar	Desi pan, Calcutta, Paton, Maghai and Bangla
Karnataka	Kariyale, Mysoreyale and Ambadiale
Odisha	Godi Bangla, Nova Cuttak, Sanchi and Birkoli
Madhya Pradesh	DesiBangl, Calcutta and Deswari
Maharashtra	Kallipatti, Kapoori and Bangla (Ramtek)
West Bengal	Bangla, Sanchi, Mitha, Kali Bangla and Simurali Bangla.

Betel vine cultivation requires well-drained fertile clay loamy soil, it cannot tolerate saline and alkaline conditions it requires high humidity and shady areas its cultivation is suitable in areas having 1250-4750mm of annual rainfall. The land has to be dug well and laid out into furrows of 10-15mt length, 75cm width, and 75cm depth. Planting drumstick, mulberry, monkeypod, etc act as windbreaks around the garden. Trees for shade and trailing standards are to be planted 4 weeks before the planting of betel vine seedlings. Giving a proper drainage system helps in the removal of excess water. Planting should be done in June-July terminal cuttings obtained from 2-3-year-old vine have to be used the length of the cuttings used should be 30-45 cm with 5-6 nodes. While planting, two nodes shall be buried in the soil and the soil around the planted cuttings must be pressed firmly to encourage quick germination. Coconut leaves can be used as shading materials. Watering has to be done by splashing water on the vines by hand. The spacing recommended for planting betel vine is 1.5*0.45mt and recommended vines per hectare are 15,000 vines as vines are voracious feeder, nutrients required is N:P: K - 50:50:50 g/vine and FYM around 25-50 kg/vine, Ammonium sulphate of potash is a best suitable nutrient for betel vine. Rooted seedlings should be transplanted near the base of standards or trees, Arecanut palm and bamboo sticks can also be used for trailing purpose. *Erythrina subumbrans* can be used for trailing purpose as it is resistant to some insects. Trailing is done by tying the vines loosely with banana fibres at an interval of 15-20cm along with the standards. Trailing is done every 15-20 days depending on the growth of vines. There are different systems of transplanting betel vine namely Paathi system, Belagavi system, Aaalaguli system, Gulikaaluve and sasimadi system, Kirupaata system. Frequent light irrigation should be given, standing water should not be remained for more than half an hour, the best time for irrigation is morning and evening. The lowering of vines has to be done at least once a year. It is done during the month of December-January. Before lowering all the leaves in the basal portion of the vines to a height of 15cm are removed and coiling the vines and burying it in the ground by leaving 60cm length of a top shoot out of the soil. The major insects seen in betel vine are scale insects, aphids, mealybugs and mites to control these insects plant protection chemicals are used in large scale like Spraying Chlorpyrifos 20 EC 2 ml/lit, NSKE 5 per cent, Malathion 50 EC 1 ml/lit, Wettable sulphur 50 WP @ 1 g/lit, Dicofol 18.5 EC, 0.5 ml/lit, Dimethoate 30 EC 2ml/lit. The important disease in betel vine crop is wilt to control wilt disease remove the affected vines through away from the garden and burn them, during winter season avoid frequent irrigation, application of *Trichoderma viride* @ 5 g/vine, drench the seed vines for about 30 minutes in Streptocycline 500 ppm or Bordeaux mixture 0.5 per cent. Matured betel leaves should be plucked by hand and leaves has to be plucked with a portion of the petiole. Harvested leaves have to be washed and cleaned and leaves have to be graded according to size for marketing.

Duly keeping in mind, the importance of Betel vine cultivation in Karnataka this study was undertaken to identify the extent of adoption and Knowledge of recommended cultivation practices of Betel vine and constraints responsible in adoption of betel vine cultivation practices. Keeping these aspects in view, the present study was undertaken with the following specific objectives:

1. To study the knowledge level of Betel vine growers on cultivation practices.
2. To study the Adoption level of Betel vine growers on cultivation practices.
3. To know the socio-economic characteristics of Betel vine growers.
4. To document the constraints in relation to cultivation practices of Betel vine.

Scope and significance of the investigation

An earnest attempt has been made in this study to explore knowledge level of the farmers regarding various improved practices recommended in Betel vinecultivation; the level of adoption of technology by farmers, Besides this, study could reveal the relationship of personal socio-psychological, economic characteristics of farmers with knowledge and adoption of the farmers. This study adoption, will also explore the constraints encountered by the farmers in adoption of improved production technology of Betel vine.

The findings of the study could be gainfully utilised by the administrators, scientists and extension workers to know the existing status of Betel vine cultivators, technological gap in adoption of Betel vine cultivators, the various constraints in adoption of Betel vine technology which would facilitate in planning and organising effective programmes to increase Betel vine leaf production. This improves the economic and social life of the Betel vine cultivators. The results of the study could be effectively used in other areas where similar conditions exist with necessary structural changes.

Limitations of the study

The study had the usual limitations of a single student research project, although every attempt has been made to have a thorough investigation in to several aspects of the problem.

Since, the researcher had to restrict the study to a limited area and sample size, its findings are, therefore likely to hold good only for similar agro-climatic conditions in other areas.

The study was based on the response received from the farmers about what they knew and felt about. Therefore, the made out of validity of response and generalisation them may be applicable in similar situations and not for wider application.

REVIEW OF LITERATURE

II REVIEW OF LITERATURE

A comprehensive review of literature is of paramount important to any research endeavour, as it not only gives an idea on the work done in the past and assists in delineation of problem area but also provides basis for interpretation and discussion of findings. Research studies on knowledge and adoption of betel vine cultivation practices is scarce. However, sincere efforts have been made to review the related literature under the following heads which was found to be meaningful and having direct or indirect bearing on this study.

- 2.1. Knowledge level of Betel vine growers on cultivation practices
- 2.2. Adoption level of Betel vine growers on cultivation practices
- 2.3. Socio-economic characteristics of Betel vine growers
- 2.4. Relationship between independent variables and adoption of farmers
- 2.5. Relationship between independent variables and knowledge of farmers
- 2.6. Constraints in relation to cultivation practices of Betel vine

2.1 Knowledge level of Betel vine growers on cultivation practices

Venkateshwarulu(1992) in his study on study technological gap adoption improved technology Betel vine production Guntur district Andhra Pradesh found that majority of the respondents had medium level of knowledge on recommended package of practices of betelvine. Item analysis revealed that majority of the respondents had no knowledge on the practices like selection of soils, application of manures and fertilisers, packing of leaves and plant protection measures.

Achutaraju (1998) in his study on Training Needs of Betel vine Farmers in Guntur District of Andhra Pradesh revealed that Majority of the respondents had medium level of knowledge of recommended betel vine cultivation practices.

Ali (2014) in his study on Problem confrontation in Betel leaf cultivation by the farmers of Natore District revealed that the majority (62.24 %) of the betel leaf farmers fell in medium knowledge category followed by 21.43 per cent in high knowledge category and only 16.33 per cent in low knowledge category.

Khatun (2016) in his study on Innovativeness of Betel leaf growers to use improved practices revealed that three-fourths of the respondents (75.20%) were highly and one-fifth of the respondents (19.50%) were moderately knowledgeable while only 5.30 per cent of them possessed poor knowledge in betel leaf cultivation.

Singh *et al.* (2012) showed that majority of the respondents (45.00 %) had medium level of knowledge, followed by 33.33 per cent who had high level of knowledge and it was observed that 21.67 per cent had low level of knowledge.

Biswaset *al.* (2019) conducted a study on socio demographic attributes and knowledge level of Betel vine growers on improved practices of betel vine cultivation in Nadia district of West Bengal found that the farmers have medium level of knowledge with clear conception about vine cultivation, but they do not follow scientific recommendations on use of fertilizer and pesticide application.

Shivashankaryand Thivahary.(2014) in their study on Entrepreneurial behaviour of betel farmers In Manmunai South and EruvilPattu divisional secretariat Division of Batticaloa district revealed that Majority (47.50 %) of the respondents had high level of knowledge regarding the betel cultivation.

Imran (2016) in his study on Problems faced by the farmers in betel leaf cultivationreveals thatreveals that 65.90per cent of the farmers had medium knowledge on betel leaf cultivation, 18.80per cent had low knowledge on betel leaf cultivation and the lowest 15.3 per cent had high knowledge on betel leaf cultivation.

Pawaret *al.* (2015) conducted a study on Technological gap in pepper cultivation in Uttara Kannada District revealed that most of the respondents (56.67%) had medium level of knowledge about recommended cultivation practices of pepper.

The generalization that, could be drawn from the above studies is that, there was variation in knowledge level of the respondents about recommended practices but most of the farmers were having medium level of knowledge. These studies have given a base to study the knowledge level of the betel vine growers with respect to recommended betel vine cultivation practices.

2.2 Adoption level of Betel vine growers on cultivation practices

Venkateshwarulu(1992) in his study on study technological gap adoption improved technology Betel vine production Guntur district Andhra Pradesh found that Majority of the farmers were medium adopters of recommended package of practices of Betel vine.

Achutaraju (1998) in his study on Training Needs of Betel vine Farmers in Guntur District of Andhra Pradesh revealed that Majority of the respondents belonged to medium adoption category of recommended betel vine cultivation practices.

SatyaPrakash *et al.* (2010) conducted a study on Extent of adoption of vine-betel practices by ATMA beneficiaries in Madhubani district of Bihar found that Majority of beneficiaries had high extent of adoption for betel vine practices.

Sneha Elizabeth (2012) conducted a study on Economics of organic and conventional pepper production in Idukki district revealed that only Ten per cent and 22.00 per cent of the recommended practices were only adopted respectively by conventional and organic pepper growers.

Chethan (2011) conducted study on knowledge and adoption of cardamom cultivation practices by the farmers of Chikkamagalur district revealed that, 48.66 per cent of the respondents belonged to medium adoption category, followed by high (29.33%) and 22.00 low adoption categories.

2.3 Socio-economic characteristics of Betel vine growers

2.3.1. AGE

Venkateshwarulu(1992) in his study on study technological gap adoption improved technology Betel vine production Guntur district Andhra Pradesh found that majority of the respondents (63.33%) were grouped into middle age, followed by young age group (25.00%) and old age group (11.67%).

Shivashankaryand Thivahary.(2014) in their study on Entrepreneurial behaviour of betel farmers In Manmunai South and EruvilPattu divisional secretariat Division of Batticaloa district revealed that more than half of betel farmers (53.80 %) belonged to old age category.

Ali (2014) in his study on Problem confrontation in Betel leaf cultivation by the farmers ofNatoreDistrictrevealed that the middle aged betel leaf farmers comprised the highest proportion (44.90 %) followed by young old aged category (29.59 %) and the lowest proportion were made by the old aged category (25.51 %).

Khatun (2016) in his study on Innovativeness of Betel leaf growers to use improved practices revealed that the middle-aged betel leaf growers comprised the highest proportion (42.90%) followed by old aged category (29.30%) and young aged category (27.80%).

Pawaret *al.* (2015) conducted a study on Technological gap in pepper cultivation in Uttara Kannada District revealed that majority of the respondents(46.67%) belonged to middle aged group.

Vedamurthy (2002) conducted a study on the management of areca gardens and marketing pattern preferred by the arecanut farmers of Shimoga district in Karnataka focused that, 25.33 per cent of the growers were old aged, 40.00 per cent of middle aged and 34.66 per cent were young aged group.

Imran (2016) in his study on Problems faced by the farmers in betel leaf cultivationreveals that the middle-aged farmers comprised the highest proportion (61.20%) followed by old aged category (29.40%) and the lowest proportion were made by the young aged category (9.40%).

2.3.2. Education

Venkateshwarulu(1992) in his study on study technological gap adoption improved technology Betel vine production Guntur district Andhra Pradesh found that 53.33 per cent of selected Betel vine growing farmers were having upto primary education while 37.50 per cent had above primary education and only 9.17 per cent were illiterates.

Achutaraju (1998) in his study on Training Needs of Betel vine Farmers in Guntur District of Andhra Pradesh revealed that 25.30 per cent of the farmers are illiterate while 27.50 per cent of the farmers are belonged to functional literacy.

Pawaret *al.* (2015) conducted a study on Technological gap in pepper cultivation in Uttara Kannada District revealed that 41.11 per cent of the respondents were educated up to high school level and 26.67 per cent were illiterate, followed by Pre University (12.22%), middle school (10.00%), primary school (10.00%) and none of them educated up to degree and above.

Shivashankaryand Thivahary.(2014) in their study on Entrepreneurial behaviour of betel farmers In Manmunai South and EruvilPattu divisional secretariat Division of Batticaloa district revealed that 58.90 per cent of betel farmers were educated up to secondary level of education.

Ali (2014) in his study on Problem confrontation in Betel leaf cultivation by the farmers of NatoreDistrictrevealed thatrespondent under illiterate category constitute the highest proportion (47.96 %) followed by secondary education (26.53 %). On the other hand the lowest 8.16 per cent in primary education level category followed by above secondary category (17.35 %).

Khatun (2016) in his study on Innovativeness of Betel leaf growers to use improved practices revealed that more than one-third (38.40 %) of the respondents never received any formal education. The highest proportion of the respondents (27.10%) fallen into “no education” category while almost an equal proportion of the respondents (24.80 % and 24.10%) received primary and secondary level education respectively.

Imran (2016) in his study on Problems faced by the farmers in betel leaf cultivationreveals thatshows that farmers under primary education category constitute the highest proportion (47.10%) followed by secondary education (40.00%).

From the above review of literature, it could be inferred that, majority of the farmers had better educational level.

2.3.3. Farming experience

Achutaraju (1998) in his study on Training Needs of Betel vine Farmers in Guntur District of Andhra Pradesh revealed that majority of the farmers have medium experience in Betel vine cultivation (57.50%).

Shivashankar and Thivahary (2014) in their study on Entrepreneurial behaviour of betel farmers in Manmunai South and Eruvilpattu divisional secretariat Division of Batticaloa district revealed that 47.50 per cent of them had more than 20 years of experience in betel cultivation.

Ali (2014) in his study on Problem confrontation in Betel leaf cultivation by the farmers of Natore District revealed that that majority (70.41 %) of the respondents felt in medium experience category followed by 19.39 per cent in low experience category and only 10.20 per cent in high experience category.

Pawar *et al.* (2015) conducted a study on Technological gap in pepper cultivation in Uttara Kannada District revealed that 37.78 per cent of the respondents had medium farming experience while 32.22 per cent of the respondents had high farming experience and 30 per cent of respondents had low farming experience.

Khatun (2016) in his study on Innovativeness of Betel leaf growers to use improved practices revealed that almost equal proportion of the respondents had low and medium experience in betel leaf cultivation (40.6% and 38.3 %)

Imran (2016) in his study on Problems faced by the farmers in betel leaf cultivation reveals that the majority (65.90%) of the farmers fell in medium experience in betel leaf cultivation category, whereas the lowest 16.50 per cent in low experience category and 17.60 per cent in high experience in betel leaf cultivation category.

2.3.4. Annual income

Venkateshwarulu (1992) in his study on study technological gap adoption improved technology Betel vine production Guntur district Andhra Pradesh found that 70.00 per cent of respondents belonged to middle income group, 17.50 per cent with high income group and 12.50 per cent with low income group.

Achutaraju (1998) in his study on Training Needs of Betel vine Farmers in Guntur District of Andhra Pradesh revealed that majority of the farmers had medium annual income (70.00%).

Chethan (2011) conducted a study on knowledge and adoption of cardamom cultivation practices by the farmers of Chikmagalur district reported that, majority of (52.00%) respondents belonged to medium income category followed by 24.66 per

cent high income, whereas only 23.33 per cent of respondents belonged to low income category.

Pawar *et al.* (2015) conducted a study on Technological gap in pepper cultivation in Uttara Kannada District revealed that 40.00 per cent of the respondents had medium level of annual income, followed by 37.78 per cent had high annual income, while 22.22 per cent of them belonged to low annual income.

Ali (2014) in his study on Problem confrontation in Betel leaf cultivation by the farmers of Natore District revealed that the betel leaf farmers having low family annual income constitute the highest proportion (50.00 %) followed by medium income (39.80 per cent) and low income (10.20 %).

Khatun (2016) in his study on Innovativeness of Betel leaf growers to use improved practices revealed that betel leaf growers having medium annual income constitute the highest proportion (42.10%) while the lowest proportion in low income (20.30 per cent) followed by high income (37.60%).

Imran (2016) in his study on Problems faced by the farmers in betel leaf cultivation reveals that the medium annual family income from betel leaf cultivation constituted the highest proportion (52.90%) followed by the high annual family income from betel leaf cultivation (44.70%). Only 2.40 per cent farmers had low annual family income from betel leaf cultivation

2.3.5. Size of land holding

Venkateshwarulu (1992) in his study on study technological gap adoption improved technology Betel vine production Guntur district Andhra Pradesh found that 40.83 per cent of the respondents belonged to small farmers category, while 38.33 per cent of the farmers belonged 71 to marginal farmers and 20.84 per cent belonged to big farmers category.

Achutaraju (1998) in his study on Training Needs of Betel vine Farmers in Guntur District of Andhra Pradesh revealed that majority of the farmers are belonged to small farmers and followed by marginal and big farmers.

Pawar *et al.* (2015) conducted a study on Technological gap in pepper cultivation in Uttara Kannada District revealed that 42.22 per cent of farmers belonged medium land holding category (10.00-25.0 acres) followed by 30.00 per cent small farmers (2.51-5.0 acres) and 27.78 per cent semi - medium farmer (5.01-10.00 acres) and none of them were marginal and big farmers.

Ali (2014) in his study on Problem confrontation in Betel leaf cultivation by the farmers of Natore District revealed that small farm holder constitutes the highest

proportion (68.37 per cent) and the lowest 10.20 percent marginal farm holder followed by medium farm holder (21.43 %).

Khatun (2016) in his study on Innovativeness of Betel leaf growers to use improved practices revealed that the small farm holder constitutes the highest proportion (70.70per cent) followed by medium farm holder (18.80%).

Imran (2016) in his study on Problems faced by the farmers in betel leaf cultivation reveals that indicates that the medium betel leaf cultivation area constituted the highest proportion (57.60%) followed by small betel leaf cultivation area (22.40%), whereas the lowest 20.00per cent farmers had large betel leaf cultivation area.

From the above review of literature, it could be inferred that, majority of the farmers belonged to medium land holding category.

2.3.6. Extension contact

Venkateshwarulu(1992) in his study on study technological gap adoption improved technology Betel vine production Guntur district Andhra Pradesh found that 56.67 per cent of the Betel vine growing farmers had medium extension contact followed by 21.66 per cent with low level of extension contact and 21.66 per cent with high level of extension contact.

Achutaraju (1998) in his study on Training Needs of Betel vine Farmers in Guntur District of Andhra Pradesh revealed that majority of the farmers had medium extension contact (57.50%).

Sunil Kumar (2004) revealed that, 40.83 per cent of the respondents belonged to medium extension contact category, followed by 30.00 and 29.16 per cent belonging to high and low categories of extension contact, in Belgaum district of Karnataka state, respectively.

Chethan (2011) conducted a study on knowledge and adoption of cardamom cultivation practices by the farmers of Chikmagalur district reported that, as high as 48.66 per cent of the cardamom growers had medium level of extension contact, followed by 22.66 and 18.66 per cent of respondents had low and high level of extension contact, respectively.

Pawar *et al.* (2015) conducted a study on Technological gap in pepper cultivation in Uttara Kannada District revealed that 43.33 per cent of the farmers belonged to medium extension contact category followed by high (38.89%) and low (17.78%) extension contact category respectively.

Imran (2016) in his study on Problems faced by the farmers in betel leaf cultivation shows that the highest proportion (61.20%) of the farmers had medium

agricultural extension media contact as compared to 24.70 per cent of them having less agricultural extension contact and the lowest 14.10 per cent farmers had high extension media contact.

2.3.7 Mass media participation

Venkateshwarulu(1992) in his study on study technological gap adoption improved technology Betel vine production Guntur district Andhra Pradesh found that 67.50 per cent of respondents had medium mass media exposure 19.17 per cent with high mass media exposure followed by 13.33 per cent with low mass media exposure.

Achutaraju (1998) in his study on Training Needs of Betel vine Farmers in Guntur District of Andhra Pradesh revealed that majority of the farmers had medium mass media exposure (65.83%).

Shakuntala and Chaman (2000) found that, entertainment access radio and television were possessed by 59.00 per cent of rural families.

Pawar *et al.* (2015) conducted a study on Technological gap in pepper cultivation in Uttara Kannada District revealed that majority of (35.56%) the respondents belonged medium mass media participation category followed by low (34.44%) and high (30.00%) category.

Ali (2014) in his study on Problem confrontation in Betel leaf cultivation by the farmers of Natore District revealed that highest proportion (50.00 %) of the respondents had medium media exposure compared to 40.82 per cent had high media exposure and 38 the lowest proportion (9.18 %) had low media exposure.

Vedamurthy (2002) noticed that, relatively a greater number of areca nut growers (48.00%) belonged to medium mass media participation category. While, 37.00 per cent of them had high mass media participation and 27.33 per cent fell in low mass media participation category.

2.3.8 Information seeking behaviour

Venkateshwarulu(1992) in his study on study technological gap adoption improved technology Betel vine production Guntur district Andhra Pradesh found that 54.17 per cent of the respondents had medium information seeking behaviour while 24.16 per cent had high and 21.67 per cent had low information seeking behaviour.

Khirkar(2009) in his study on Socio-Economic Transformation due to Pan-Pimpri Cultivation in Akola and Amravati District revealed that 62.00 per cent of the farmers had medium information seeking behaviour followed by high (20.00%) and low (18.00%) information seeking behaviour.

Kavitha *et al* (2014) in their study on Information Seeking Behaviour of Dairy Farmers revealed that 52.86 per cent of the farmers belonged to medium information seeking behaviour and followed by high (31.43%) and low (15.71%) information seeking behaviour.

2.3.9 Innovativeness

Acharjee (1992) in his study on Study on the relationships of some socio-cultural and economic characteristics with modernisation of Betel vine cultivation revealed that 51.25 per cent of the respondents belonged to medium innovativeness.

Bhagyalaxmiet *al.* (2003) observed that, majority (69.44 %) of the entrepreneurs had medium innovativeness, followed by 15.56 and 15.00 per cent of respondents having high and low innovativeness, respectively

Khirkar, (2009) in his study on Socio-Economic Transformation due to Pan-Pimpri Cultivation in Akola and Amravati District revealed that 62.00 per cent of the farmers had medium information seeking behaviour followed by high (20.00%) and low (18.00%) information seeking behaviour.

Khatun (2016) in his study on Innovativeness of Betel leaf growers to use improved practices revealed that Majority of the respondents had medium innovativeness (60.9 per cent) and a considerable number of respondents (39.10 %) had high innovativeness to use improved practices.

Supriya (2016) conducted a study on Decision making pattern and work participation of farm women in management of coffee plantation in Kodagu District and revealed that 45.56 per cent of the farm women had high level of innovativeness, whereas, 33.33 per cent of them had low level and 21.11 per cent of them had medium level of innovativeness.

2.3.10 Risk orientation

Achutaraju (1998) in his study on Training Needs of Betel vine Farmers in Guntur District of Andhra Pradesh revealed that majority of the farmers had medium risk orientation (60.00%).

Shivashankaryand Thivahary.(2014) in their study on Entrepreneurial behaviour of betel farmers In Manmunai South and EruvilPattu divisional secretariat Division of Batticaloa district revealed that majority of the farmers are belonged to medium risk-taking ability followed by high and low risk-taking ability.

2.4 Relationship between independent variables and their knowledge level

Independent variables	Year	Respondents	Nature of relationship
Age			
Venkateshwarulu	1992	Betel vine farmers	Negatively significant
Gopinath	2005	Farmers	Non-significant
Sunil aryaet <i>al.</i>	2012	Paddy farmers	Non-significant
Suman	2013	Farmers	Significant
Navyashree	2016	farmers	Non-significant
Subhash	2018	Farmers	Non-significant
Education			
Thiyagarajan	2011	Paddy farmers	Significant
Singh <i>et al.</i>	2012	Moth bean farmers	significant
Sarmaet <i>al.</i>	2013	Farmers	Significant
Dhayal <i>et al.</i>	2015	Green gram	Significant
Annual income			
Vasava	2005	Pigeon pea farmers	Non-significant
Dhayal <i>et al.</i>	2015	Green gram	Significant
Land holding			
Patel and Patel	2006	Pigeon pea farmers	Non-significant
Shakya	2008	Chick pea farmers	Significant
Dhayal and Mehta	2015	Green gram	Significant
Farming experience			
Venkateshwarulu	1992	Betel vine farmers	Non-significant
Achutaraju	1998	Betel vine farmers	Non-significant
Extension contact			
Prasad	1996	Maize farmers	Significant
Maraddi	2006	Sugarcane farmers	Significant
Thiyagarajan	2011	Paddy farmers	Significant
Sudha	2014	Paddy farmers	Significant
Mass media participation			
Venkateshwarulu	1992	Betel vine farmers	Significant
Achutaraju	1998	Betel vine farmers	Non-significant
Thippeswamy	2007	Coconut farmers	Significant
Information seeking behaviour			
Venkateshwarulu	1992	Betel vine farmers	Significant
Venkataramulu	2003	Farmers	Significant

Innovativeness			
Balasubramani	1997	Rubber farmers	Non-significant
Babanna	2001	Arecanut farmers	Non-significant
Govinda	2002	Grape farmers	Significant
Risk orientation			
Birajdar	1999	Grape growers	Significant
Nagaraja	2002	Sugarcane growers	Significant
Kavaskar and Govind	2006	Banana farmers	Significant

2.5 Relationship between independent variables and adoption of farmers

Independent variable	Year	Respondents	Nature of relationship
Age			
Venkateshwarulu	1992	Betel vine farmers	Negatively significant
Narayana and Reddy	1994	Farmers	Non-significant
Metiet <i>al.</i>	1997	Groundnut farmers	Significant
Ranganathan <i>et al.</i>	2001	Rice growers	Non-significant
Sahoo	2004	Groundnut farmers	Non-significant
Satish Kumar	2006	Groundnut farmers	Non-significant
Chavda	2007	Groundnut farmers	Non-significant
Francis	2008	Farmers	Non-significant
Subhash	2018	Farmers	Non-significant
Education			
Venkateshwarulu	1992	Betel vine farmers	significant
Sahoo	2004	Groundnut farmers	Significant
Karkar and Kalsariya	2006	Farmers	Significant
Satish Kumar	2006	Groundnut farmers	Significant
Chavda	2007	Groundnut farmers	Significant
Johnson and Monoharan	2007	Cashew growers	Significant
Subhash	2018	Farmers	Non-significant
Land holding			
Venkateshwarulu	1992	Betel vine farmers	significant
Karpagam	2000	Turmeric growers	Significant
Venkataramulu	2003	Chilli growers	Significant
Sumit and Rajesh	2017	Paddy farmers	Non-significant
Subhash	2018	Farmers	Non-significant
Annual income			
Venkateshwarulu	1992	Betel vine farmers	Non-significant
Singh	2003	Bajra growers	Significant
Sahoo	2004	Groundnut farmers	Non-significant
Karkar and Kalsariya	2006	Farmers	Significant

Chavda	2007	Groundnut farmers	Significant
Chaudhary	2010	Paddy farmers	Significant
Subhash	2018	Farmers	Non-significant
Farming Experience			
Achutha	1998	Betel vine farmers	Non-significant
Venkateshwarulu	1992	Betel vine farmers	Significant
Vasava	2005	Pigeon pea	Significant
Parmar <i>et al.</i>	2017	Paddy farmers	Non-significant
Subhash	2018	Farmers	Non-significant
Extension contact			
Achutha	1998	Betel vine farmers	Non-significant
Venkateshwarulu	1992	Betel vine farmers	significant
Thiyagarajan	2011	Paddy farmers	Significant
Subhash	2018	Farmers	Non-significant
Information seeking behaviour			
Venkateshwarulu	1992	Betel vine farmers	significant
Subhash	2018	Farmers	Non-significant
Kavitha <i>et al.</i>	2014	Dairy farmers	Significant
Khiratkar	2009	Pam-pimpri farmers	Significant
Innovativeness			
Narayana and Reddy	1994	Farmers	Non-significant
Kalaskaret <i>al.</i>	1999	Cotton farmers	Significant
Sahoo	2004	Groundnut farmers	Significant
Satish Kumar	2006	Groundnut farmers	Significant
SumitRajendraSalunkhe and Rajesh DilipPandya	2017	Paddy farmers	Significant
Risk orientation			
Trivedi <i>et al.</i>	2002	Lily growers	Significant
Patel and Patel	2006	Tribal farmers	Significant
SumitRajendraSalunkhe and Rajesh DilipPandya	2017	Paddy farmers	Significant
Mass media Participation			
Venkateshwarulu	1992	Betel vine farmers	significant
Prasad	1996	Cashew growers	Significant
Johanson and Monoharan	2007	Cashew growers	Significant
Mihiretu	2008	Onion growers	Non-significant
P.Sreekantha Verma	2009	Banana growers	Significant
Subhash	2018	Farmers	Non-significant

2.6. Constraints in relation to cultivation practices of Betel vine

Kantharaju (1989) pointed out that, the coffee and cardamom growers of Hassan had faced many problems in their day to day work. Attack of pest and diseases, failure of rains, poor planting problems of these growers as regarding credit, insignificant time for repayment of loan, non-availability of credit in time and inadequate amount of credit were the problems perceived by the coffee and cardamom growers. In respect of marketing problems, high rate of taxes, high transportation cost and lack of transportation had been perceived as important problems by growers.

Achutaraju (1998) studied the constraints faced by farmers in betel vine cultivation. Revealed that, high incidence of pest and diseases (100.00%) was the major constraints expressed by all the respondents. The important technical constraints such as lack of ineffective plant protection chemical (81.67%), high cost of fertilizers (100.00%), high cost of plant materials (96.67%) and high labour wages (93.33%) were the major identified economic constraints. Low price of farm produce (100.00%), lack of market news (80.33%), lack of transport facilities (55.00 %) and lack of nearby collection centre.

Pavithra (2016) in her study on an economic analysis of production and marketing of betel leaf- a study in Tumkur district, Karnataka revealed that labour shortage, price fluctuation and water scarcity are the major constraints faced by the farmers.

Sneha Elizabeth (2012) conducted a study on Economics of organic and conventional pepper production in Idukki district revealed that Climate, disease and pest attack, labour were identified as the major constraints by both organic and conventional farmers. High variability in price was identified as the major marketing constraint.

Mandal and Mandal(2016) in their study on Financial Feasibility and Constraints of Cultivation in Coastal areas of West Bengal found that inappropriate management of fertilizer and pesticides due to lack of adequate knowledge is the most important constraints faced by the betel vine cultivators.

Amogh (2017) conducted a study on Economic impact of climate change and adaptation strategies in black pepper (*Piper nigrum L.*) cultivation in Kerala revealed that increased in high incidence of pest and disease and high labour cost, fluctuation in market prices, Increase in labour cost, fluctuation in market prices and high cost of adaptation practices were major constraints faced by adopters and non-adopters respectively.

METHODOLOGY

III METHODOLOGY

The study was conducted during 2019-20 in Davanagere district of Karnataka. In this chapter, the general typology and description of the research methods and procedures adopted in the present investigation are explained under the following major headings.

- 3.1 Research design
- 3.2 Selection of district
- 3.3 Selection of taluks
- 3.4 Selection of villages
- 3.5 Selection of respondents
- 3.6 Brief description of the study area
- 3.7 Variables for the study
- 3.8 Procedure followed for Data collection
- 3.9 Statistical tools used

3.1 Research design

"*Ex post facto design*" was employed in the present research study as the events have already occurred and design was considered appropriate.

3.2 Selection of district

The study was undertaken in Davanagere district. This district was purposively selected because of the highest area and production under betel vine cultivation in Karnataka.

3.3 Selection of taluks

Considering the maximum area under betel vine cultivation as criteria, the two talukviz., Harihara and Honnalitalukas of Davanagere District were selected purposively for conducting the study. Accordingly, Hariharataluk had an area of 811 ha and Honnalitaluk had an area of 130 ha under betel vine cultivation.

3.4 Selection of villages

The villages having a maximum area under betel vine cultivation were listed in descending order in consultation with the State Department of Horticulture. From the list, four villages having maximum area were selected from each taluk as listed below in table 3.1.

3.5 Selection of respondents

From each selected village, 15 betel vine farmers were selected randomly. Thus, the sample from each taluk was 60 making a total sample size of 120 respondents.

Table 3.1: Details of Taluks and Villages selected for the research study**n = 120**

Sl. No.	Taluk	Villages	Respondents	
1	Harihara	Belloddi	15	60
		Nagenahalli	15	
		Ramtheertha	15	
		Shamshipura	15	
2	Honnali	Anaji	15	60
		Guddadamadapura	15	
		Kulagatte	15	
		Nagavanda	15	

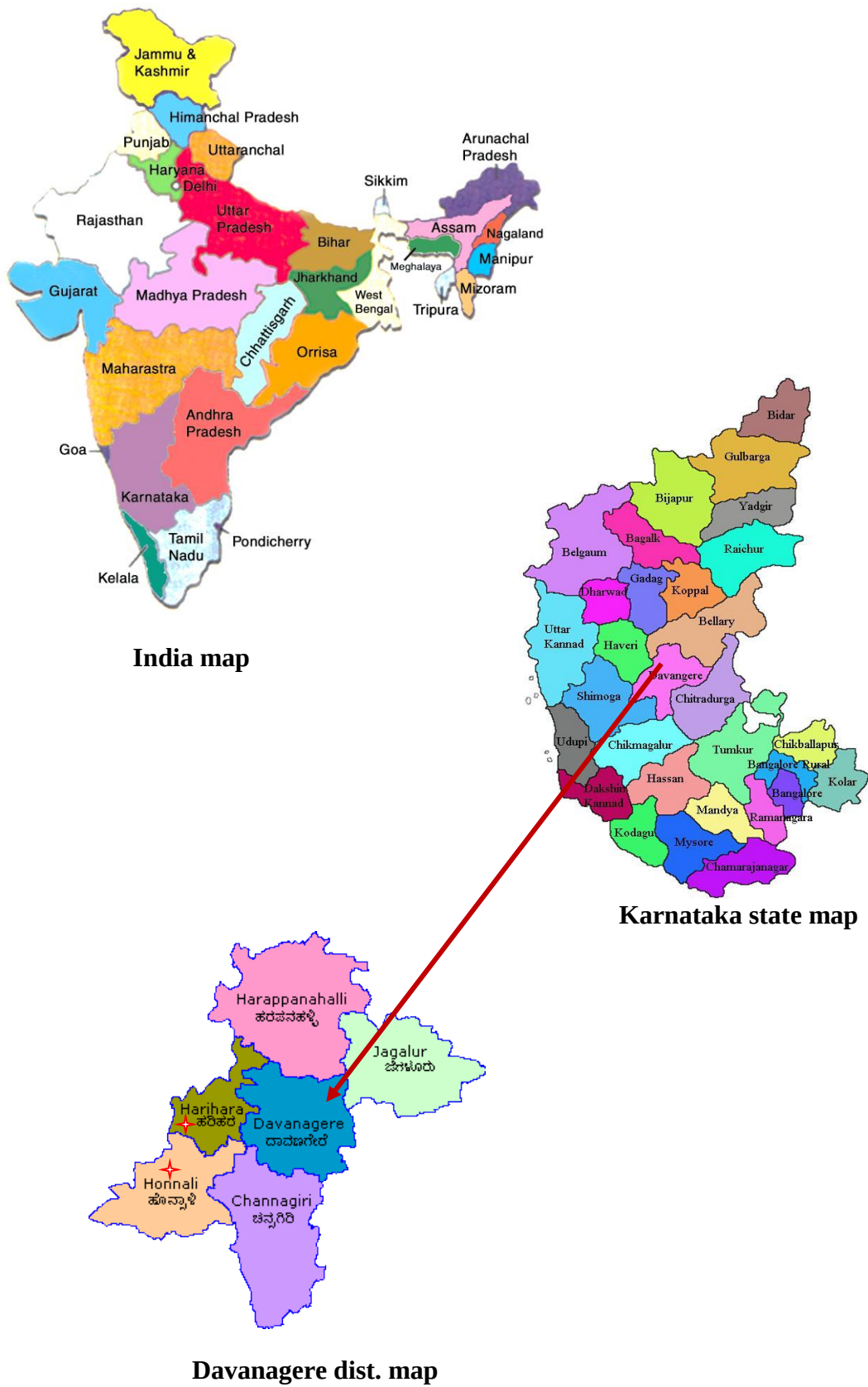


Fig. 3.1 Map showing study area

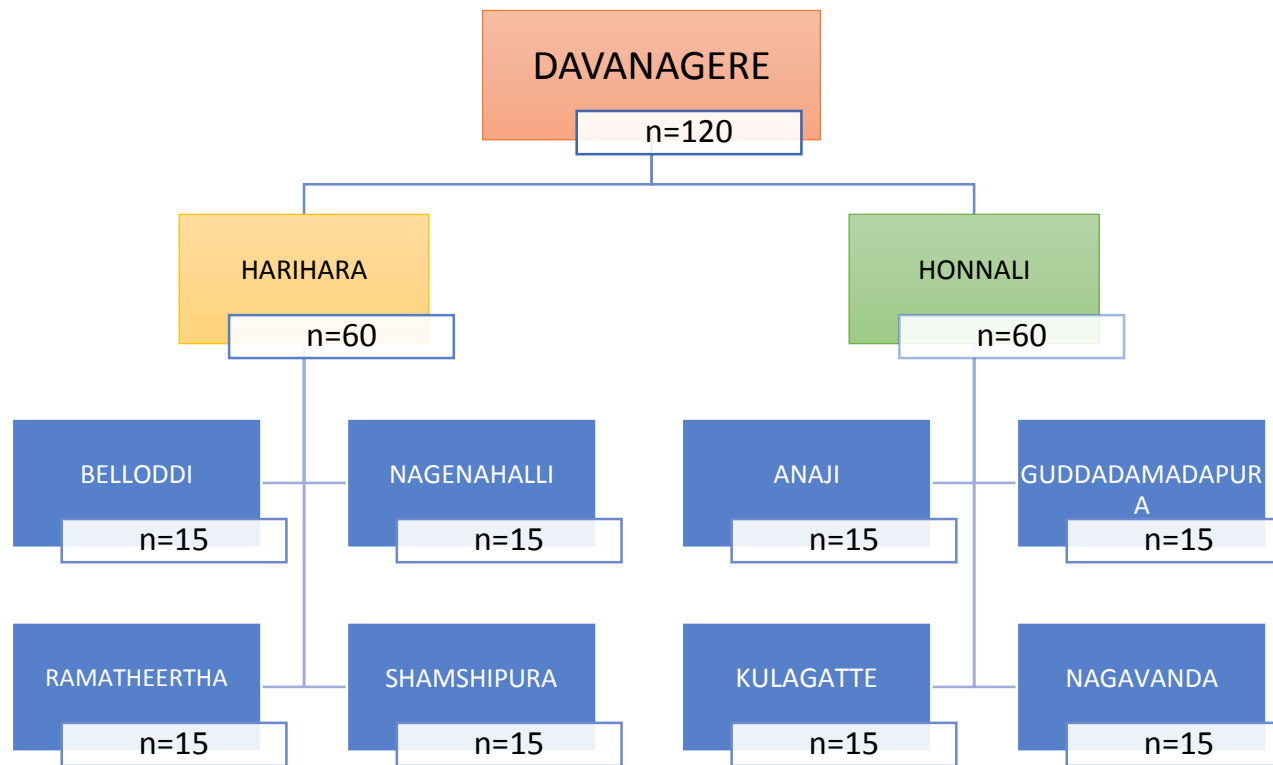


Fig:3.2- Schematic Representation of Sampling Plan for the Study

3.6 Brief description of the study area

The study was conducted in Davanagere District of Karnataka State. The landscape of Davanagere district mainly consists of vast stretches of plains. The southern part of the district covering Chennagiri and Honnalitaluks are under the malnad area and Davanagere and Hariharataluks are covered by low hills and meandering streams. Sasalhalli also is known as Sulekerehalli, a major stream flow through Davanagere and Hariharataluks. The northern portion consists of vast expanses of the plain country. This region is well drained by several streams. The district consists of mainly 3 types of soils, viz., black, alluvial, and red soil with shallow to medium depth gravel and clay soil. Black soil has high water retaining capacity; it is self-aerating with small to medium depth and rich in clay. It is suitable for crops like cotton, paddy, sugarcane, etc. Both black and red soils found in the district are generally fertile. The major crops grown in the district are maize, paddy, jowar, ragi, red gram, green gram, groundnut, and sunflower. The productivity of these crops can be increased by adopting some of the interventions. They are used for quality seeds, biofertilizers, bio-pesticides, and micronutrients in addition to the application of the recommended dose of N P K fertilizers. Bhadra Command Area in Davanagere district occupies an area of 5 97,597 ha. Out of this Kharif season covers an area of 3,40,000 ha, Rabi season 26,000 ha, and summer it is 60,000 ha. The average productivity of betel vine is 21.5 lakh leaves/ha. The area irrigated in Davanagere dist. is about 1,45,578 ha. The majority of the area is irrigated by canals (82300 ha) and bore wells (53187 ha) lift irrigation (5806 ha) and 2741 ha from other sources.

As of the 2011 India census, Davanagere had a population of 17,90,952. Males constituted 51.24 per cent of the population and female's 48.75 per cent. The average literacy rate was 70 per cent, higher than the national average of 59.5 per cent, male literacy was 78 per cent and female literacy 61 per cent (2011, Indian census report, Govt of India). The district has a population density of 329 inhabitants per square kilometre. It lies in latitudes 14.4644°N and longitude 75.9218°E.

3.7 Variables for the study

Variables and their empirical measurements

Sl. No	Variables	Techniques adopted for measurement
I	Dependent variables	
1	Knowledge	Procedure developed by Anastasi (1961)
2	Adoption	Procedure developed
II	Independent variables	
1	Age	Schedule developed
2	Education	Procedure developed by Trivedi (1963)
3	Land holding	Procedure developed
4	Farming experience	The procedure followed by Shipashree (2012)
5	Annual income	Procedure developed by Hanchinal (1999)
6	Extension contact	Procedure developed by Hardikar (1998)
7	Mass media participation	Scale developed by Hinge (2009)
8	Innovativeness	Scale developed by Moulik and Rao (1973)
9	Risk orientation	Scale developed by Supe (1969)
10	Information seeking behaviour	Shedule developed

3.7.1 Dependent variable

3.7.1.1 Knowledge:

Knowledge refers to information possessed by an individual. It also refers to those behaviours and test situations that emphasize the remembering of some phenomenon or material by an individual either by recognition or by the recall of ideas.

The knowledge level in the present study has been operationalized as the extent to which an individual possesses understanding and comprehension of various betel vine cultivation practices.

The knowledge test was constructed based on the package of practices and discussion with subject matter specialties, extension personnel of the University.

A list of 30 items was selected for the purpose and each was administered in a question form to the respondents to obtain the response. The questions and answers

about the knowledge test were carefully designed in consultation with members of the advisory committee. The answers to questions were quantified by giving one score to the correct answer and zero scores to the incorrect one. As a result, the maximum score that one could get was 30 and the minimum was zero. The total knowledge score for each respondent was calculated by summing up the number of items correctly answered by an individual respondent. The knowledge level was quantified by using frequency and per cent. Based on the total score, the respondents were classified into three categories namely, 'low', 'medium', and 'high' using mean (X) and standard deviation (SD) as a measure of the check.

Category	Criteria
Low	Less than (Mean - SD)
Medium	Between (Mean $\pm$ SD)
High	More than (Mean + SD)

3.7.1.2 Adoption

Adoption is a decision to make full use of an innovation as the best course of action available. In this study, it refers to the adoption of paddy seed production practices were listed. A total number of 17 questions from land preparation up to harvesting were listed by consulting with experts and where the responses were quantified by giving 1 and 0 scores for adopted and not adopted respectively for each of the practices. Thus, the maximum and minimum score that the respondent can score is 62 and 0.

Item	Score
Adoption	1
Non-adoption	0

Based on the total score obtained for the 62 betel vine cultivation practices by the respondents, the betel vine farmers were grouped into low, medium, and high using mean and standard deviation as a measure of the check.

Category	Criteria
Low	Less than (Mean - SD)
Medium	Between (Mean $\pm$ SD)
High	More than (Mean + SD)

3.7.2 Independent variables

3.7.2.1 Age

Age is the basic characteristics related to a person's maturity, physical wellbeing, and motivation it may influence adoption. Age is operationalized and measured as the completed years in the life of respondents at the time of the interview. The respondents were classified into young, middle, and old based on age in years using general classification.

Category	Age in years
Young	Up to 35
Middle	Between 36 to 50
Old	Above 50

3.7.2.2 Education

It is the process of producing the desirable changes in the behaviour of an individual. It refers to the number of years of formal education acquired by the respondents. In this study scale developed by Trivedi (1963) was used with slight modifications to measure the educational status. The scoring pattern was as follows:

Level of education	Score
Illiterate	0
Primary School	1
Middle school	2
High School	3
Pre-University College	4
Graduate	5
Post graduate and above	6

3.7.2.3 Land holding

The operationally defined as the actual land holding of the respondents at the time of the investigation. The categorizations of the respondents into three groups namely small farmers, medium farmers, and large farmers based on mean and standard deviation.

Category	Land holding (in acres)
Marginal farmers	<2.5
Small farmers	2.51-5.00
Medium farmers	5.01-10.00
Big farmers	>10.00

3.7.2.4 Farming experience

In this study, it is referred to as the total number of years of experience put in farming. The farmers were categorized into three groups based on their experiences as the procedure followed by Shilpashree (2011) with slight modification. Based on total score the individuals were grouped into less, moderate, and more category of experience.

Category	Farming Experience (in years)
Low	Up to 20
Medium	20-30
High	Above 30

3.7.2.5 Annual income

It was calculated by adding the income from agriculture and other subsidiary occupation. The subsidiary income was defined as one which comprised of income from all sources other than agriculture. The procedure followed by Hanchinal (1999) was used to categorize the annual income of the respondents.

Category	Criteria
Low	Less than (Mean - SD)
Medium	Between (Mean $\pm$ SD)
High	More than (Mean + SD)

3.7.2.6 Extension contact

Contact with extension agents or personnel refers to the degree to which an individual was having contact with Extension personnel for getting information on paddy seed production. This variable was measured in terms of frequency of contact of an individual with different Extension agencies. The scoring procedure followed by Hardikar (1998) was adopted and the respondents were classified into three categories based on mean and standard deviation.

Category	Criteria
Low	Less than (Mean - SD)
Medium	Between (Mean $\pm$ SD)
High	More than (Mean + SD)

3.7.2.7 Innovativeness

It refers to the behavioural pattern of an individual who has an interest and desire to seek changes in betel vine cultivation practices willing to introduce such changes into his operation when practicable and feasible and also it refers to the

degree to which a farmer is eager in adopting the innovation betel vine cultivation practices early in his field.

The innovativeness scale developed by Moulik and Rao (1973) was used in this study, with slight modification was administered for quantification of the degree of farmers' self-evaluation about their innovativeness. This scale consisted of eight statements of which contain five positive and 3 negative statements with weights of 3, 2, and 1 indicating "strongly agree", "agree and disagree. Based on the scores obtained, the respondents were grouped into three categories using mean and standard deviation as a measure of the check.

Category	Criteria
Low	Less than (Mean - SD)
Medium	Between (Mean $\pm$ SD)
High	More than (Mean + SD)

3.7.2.8 Mass media participation

This variable was operationalized by considering the exposure of an individual to different mass media channels such as newspapers, farm magazines, radio, television, WhatsApp/Facebook, and his degree of participation in them. The variable was quantified based on the procedure followed by Hinge (2009).

Based on the total scores of mass media participation, the respondents were classified into three categories such as 'low', 'medium' and 'high' by considering mean (X) and standard deviation (SD) as a measure of check

Category	Criteria
Low	Less than (Mean - SD)
Medium	Between (Mean $\pm$ SD)
High	More than (Mean + SD)

3.7.2.9 Risk orientation

This variable was operationalized as the degree to which the farmer was oriented towards risk and uncertainty and dares to face the problems in the adoption of betel vine cultivation practices in crop production.

Scoring and categorization: The scale developed by Supe (1969) with suitable modifications was used for quantifying the variable. The scale consisted of four positive and two negative statements. The response categories were 'agree', 'undecided', and 'disagree' with the scores of 3, 2, and 1 for positive and 1, 2, and 3 for negative statements respectively. The score obtained by a respondent for all the

statements is computed to an obtained total score of that respondent on risk orientation. The maximum and minimum possible scores were 18 and 6 respectively.

Based on the scores obtained respondents were grouped into low, medium, and high-risk orientation categories based on equal class interval method.

Category	Criteria
Low	Less than (Mean - SD)
Medium	Between (Mean $\pm$ SD)
High	More than (Mean + SD)

3.7.2.10 Information seeking behaviour

This variable was operationalized as the extent of exposure of respondents to sources such as informal sources, formal sources, and others about betel vine cultivation practice.

Scoring and categorization: four response categories namely 'frequently, occasional, rarely and never were provided with weights of 4, 3, 2 and 1 respectively. All the scores on sub items were summed up to get a total score. The respondents were classified into three categories as given below by using the class interval technique.

Category	Criteria
Low	Less than (Mean - SD)
Medium	Between (Mean $\pm$ SD)
High	More than (Mean + SD)

3.7.2.11. Constraints about cultivation practices of Betel vine.

To identify the problems in the betel vine production, the probable problems of betel vine growers in the study area were listed out in discussion with progressive farmers, scientists, and experts in the field. Responses were obtained from the betel vine growers. Later on, frequency and per cent were calculated to analyse each of the problems.

3.8 The procedure followed for data collection

Keeping in view the objectives and variables of the study, a structured interview schedule was developed by consulting experts and also referring to the relevant literature at the package of practices developed by University Horticultural Sciences, Bagalkot, IIHR, Bengaluru and KAU Thrissur. Then, Pre-testing of the schedule was carried out in the non-sample area for its practicability and relevancy. The final schedule was prepared by making necessary modifications, additions, and a

deletion based on pre-testing results and as the need for data collection. The final format of the interview schedule is given in Appendix I.

The data were collected from the respondents through a personal interview method in an informal atmosphere.

3.9 Statistical tools used

The statistical tools or techniques used for analysing the data were as follows:

i) *Percentage*

The percentage was used for simple comparisons. For calculating percentage, the frequency of a particular set was divided by the total number of observations multiplied by 100.

ii) *Mean*

This technique was considered for categorizing the respondents into groups based on their scores. The formula for calculating the arithmetic mean was as follows:

$$\bar{X} = \frac{\sum X}{n}$$

Where,

$\bar{X}$ = Mean of the observations

f_i = Frequency of the i^{th} class

X_i = mid value of the i^{th} class

N = Total number of observations

iii) *Standard Deviation*

It is defined as the square root of the arithmetic mean of the sum of the squares of deviation taken from the arithmetic mean. The formula used for obtaining standard deviation is as follows

$$SD = \sqrt{\frac{\sum (X - \bar{X})^2}{n}}$$

iv) *Multiple Regression Analysis*

Generally, several antecedent variables simultaneously contribute or influence the consequent variable as in the case under study. It is of immense practical value to the extent to which the antecedent variables, individually or jointly could predict or contribute towards the consequent variable. This can be seen by multiple regressions. If Y is the dependent variable and $X_1, X_2, X_3, \dots, X_n$ are the independent variables, the multiple regression equation is given by:

$$Y = a + b_1X_1 + b_2X_2 + \dots + b_nX_n$$

Where,

a = Intercept or constant

$b_1, b_2, b_3, \dots, b_n$ are the partial regression co-efficients.



Plate No: 1Researcher during data collection

RESULTS

IV RESULTS

The results of the study are presented in this chapter according to the following headings.

4.1 Knowledge level of Betel vine growers on cultivation practices

4.2 Adoption level of Betel vine growers on cultivation practices

4.3 Socio-economic characteristics of Betel vine growers

4.4 Contribution of Independent variables to their Knowledge level

4.5 Contribution of Independent variables to their Adoption level

4.6 Constraints in relation to cultivation practices of Betel vine

4.1 Overall Knowledge level of betel vine growers

Here an attempt was made to distribute the respondents according to their overall knowledge level regarding recommended cultivation practices of betel vine crop.

With respect to overall knowledge of the respondents regarding betel vine cultivation practices, Table 4.1 indicates that majority of the respondents belonged to the medium level (76.67%) of knowledge whereas 15.83 per cent of the respondents belonged to low level of the knowledge and 7.50 per cent of the respondents belonged to the high level of knowledge.

4.1.1 Practice wise knowledge level of the respondents regarding recommended cultivation practices of Betel vine crop

It was observed from the Table 4.2 that 100.00 per cent of the respondents have knowledge about Irrigation and Harvest, 93.75 percent of the farmers have knowledge about land preparation, 76.67 per cent of the farmers are aware about Transplanting, 72.50 per cent and 72.22 per cent of the farmers have knowledge about soil requirement and nursery preparation, whereas 79.16 percent and 66.67 per cent of the farmers have knowledge about Lowering of the vines and plant protection measures, whereas only 49.72 per cent and 40.83 percent of the farmers have knowledge about recommended nutrient application and spacing practices.

4.2 Overall Adoption of Betel vine Cultivation practices

Here an attempt was made to distribute the respondents according to their overall Adoption level regarding recommended cultivation practices of betel vine crop.

With respect to overall adoption of respondents regarding betel vine cultivation practices, Table 4.3 indicates that majority of the respondents belonged to medium level (65.00 %) of adoption whereas 18.33 per cent of the respondents belonged to the high level of adoption and 16.67 per cent of the respondents belonged to low level of adoption.

Table 4.1 Overall Knowledge level of the respondents (#)

Sl.No.	Category	Criteria	Frequency	Percentage
1	Low	Less than (Mean-SD)	19	15.83
2	Medium	Between (Mean $\pm$ SD)	92	76.67
3	High	More than (Mean+SD)	9	7.50
Mean=21.32, SD=2.76				

= Number of respondents =120

Table 4.2 Practice wise distribution of the respondents (#)according to their knowledge level

Sl. No.	Cultivation Practices	Frequency	Percentage
1	Soil Requirement	87.00	72.50
2	Land Preparation	112.00	93.75
3	Nursery Preparation	87.00	72.22
4	Spacing	49.00	40.83
5	Nutrient application	60.00	49.72
6	Transplanting	92.00	76.67
7	Irrigation	120.00	100.00
8	Lowering of Vines	95.00	79.16
9	Plant Protection	80.00	66.67
10	Harvest	120.00	100.00

= Number of respondents =120

Table 4.3 Overall Adoption level of the respondents(#)

Sl. No.	Category	Criteria	Frequency	Percentage
1	Low	Less than (Mean-SD)	20	16.67
2	Medium	Between (Mean $\pm$ SD)	78	65.00
3	High	More than (Mean+SD)	22	18.33
Mean=35.73 SD=3.16				

= Number of respondents =120

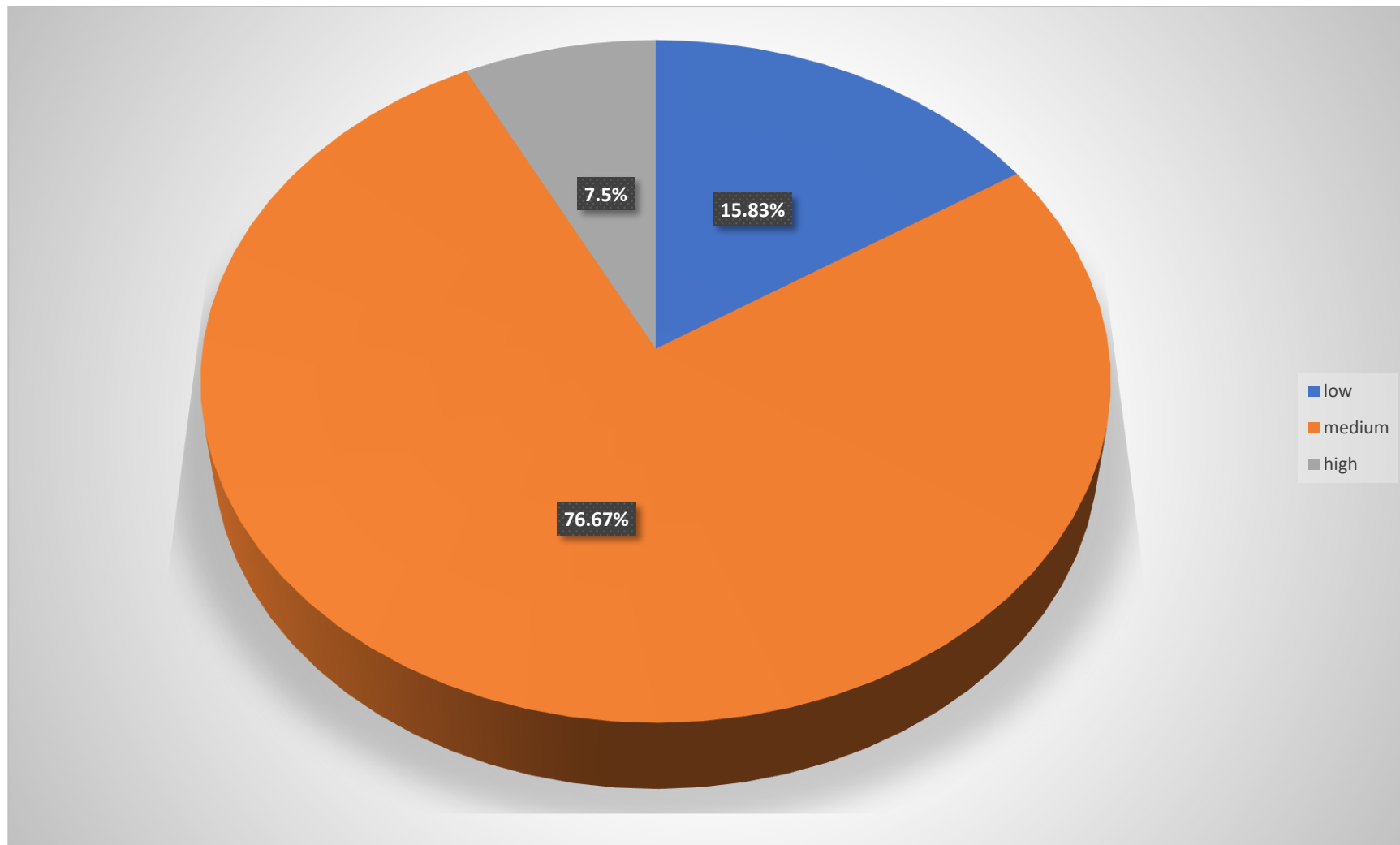


Fig: 4.1 Pictorial representation of overall knowledge level of betel vine growers.

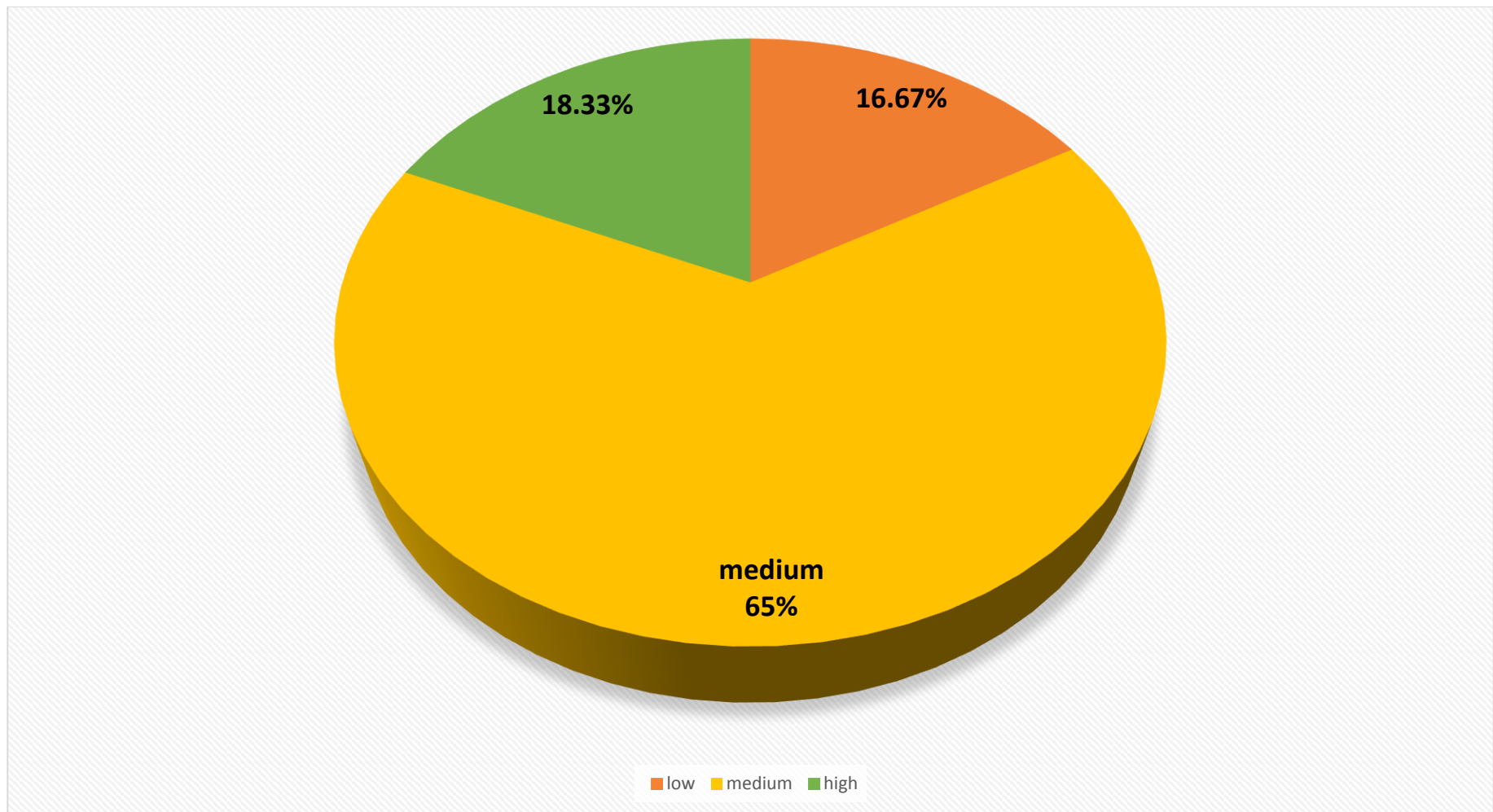


Fig: 4.2Pictorial representation of overall Adoption of Betel vine Cultivation practices.

4.2.1 Practice wise Adoption level of the respondents regarding recommended cultivation practices of Betel vine crop

It is observed from the Table 4.4 that 100.00 per cent of the respondents had adopted Irrigation and Harvest practices, whereas 78.75 per cent, 72.36 per cent, 71.33 per cent, 68.67 per cent, 52.22 per cent and 50.83 per cent of the respondents adopted Lowering of vines, Nursery preparation, Soil requirement, land preparation, Nutrient application and Transplanting and only 38.48 per cent and 1.67 per cent of the respondents had adopted recommended Plant Protection and spacing practices.

4.3 Socio-economic characteristics of Betel vine growers

4.3.1 Age of the respondents

The data furnished in Table 4.5 indicates that the majority (47.50%) of the respondents were belonged to middle age group whereas 40.83 per cent respondents belonged to the young age and 11.66 per cent of the respondents belonged to the old age group.

4.3.2 Education level of the respondents

The data furnished in Table 4.6 indicates that 40.83 per cent of the respondents were educated up to high school followed by 25.83 per cent of the respondents were educated up to middle school, 13.33 per cent, 10.83 per cent, 9.17 per cent and 0.00 per cent were educated up to PUC, primary school, graduate, illiterate and post graduate respectively

4.3.3 Land holding of the respondents

It is observed from the Table 4.7 that 42.50 per cent of the respondents were belonged to small farmers whereas 31.67 per cent of the respondents were belonged to marginal farmers followed by medium farmers (22.50%) and big farmers (3.33%).

4.3.4 Farming Experience of the respondents

The results presented in Table 4.8 shows that majority of the respondents had medium level (67.50%) of betel vine cultivating experience followed by high (16.66%) and low (15.83%) betel vine cultivating experience.

4.3.5 Annual income of the respondents

The data furnished in Table 4.9 indicates that majority of the respondents belonged to medium annual income category (76.67%) whereas 13.33 per cent and 10.00 per cent belonged to high and low annual income category.

4.3.6 Extension Contact of the respondents

It was observed from Table 4.10 that majority of the respondents had medium level (68.33 %) of the extension contact while, 16.67 per cent of the respondents had low extension contact and 15.00 per cent of the respondents had high extension contact.

Table 4.4 Practice wise distribution of the respondents (#)according to theirAdoption level

Sl.	Cultivation Practices	Frequency	Percentage
1	Soil Requirement	86.00	71.33
2	Land Preparation	82.00	68.67
3	Nursery Preparation	87.00	72.36
4	Spacing	2.00	1.67
5	Nutrient Application	63.00	52.22
6	Transplanting	61.00	50.83
7	Irrigation	120.00	100.00
8	Lowering of Vines	95.00	78.75
9	Plant protection	46.00	38.48
10	Harvest	120.00	100.00

= Number of respondents =120

Table 4.5 Distribution of the respondents (#) according to their Age

Sl.No.	Category	Age in years	Frequency	percentage
1	Young	Up to 35	49	40.83
2	Middle	Between 36 to 50	57	47.50
3	Old	Above 50	14	11.67
Mean=39.40 SD=9.9				

= Number of respondents =120

Table 4.6 Distribution of the respondents (#) according to their Education

Sl.No.	Level of education	Frequency	Percentage
1	Illiterate	0	0.00
2	Primary School	13	10.83
3	Middle school	31	25.83
4	High School	49	40.83
5	Pre-University College	16	13.33
6	Graduate	11	9.18
7	Post graduate	0	0.00
Mean=2.84 SD=1.08			

= Number of respondents =120

Table 4.7 Distribution of the respondents (#) according to land holding

Sl.No.	Category	Land holding (in acres)	Frequency	Percentage
1	Marginal farmers	<2.5	38	31.67
2	Small farmers	2.51-5.00	51	42.50
3	Medium farmers	5.01-10.00	27	22.50
4	Big farmers	>10.00	4	3.33
Mean=4.32 SD=3.08				

= Number of respondents =120

Table 4.8 Distribution of the respondents(#) according to Betel vine Farming Experience

Sl.No.	Category	Criteria	Frequency	Percentage
1	Low	Less than (Mean-SD)	19	15.83
2	Medium	Between (Mean±SD)	81	67.50
3	High	More than (Mean+SD)	20	16.67
Mean=22.84SD=11.42				

= Number of respondents =120

Table 4.9 Distribution of the respondents (#) according to annual income

Sl.No.	Category	Criteria	Frequency	Per
1	Low	Less than (Mean-SD)	12	10.00
2	Medium	Between (Mean±SD)	92	76.67
3	High	More than (Mean+SD)	16	13.33
Mean =2.89 SD=1.39				

= Number of respondents =120

Table 4.10 Distribution of the respondents(#) according to their extension contact

Sl.No.	Category	Criteria	Frequency	Per
1	Low	Less than (Mean-SD)	20	16.67
2	Medium	Between (Mean±SD)	82	68.33
3	High	More than (Mean+SD)	18	15.00
Mean=15.04 SD=1.67				

= Number of respondents =120

It is observed from the Table 4.11 that 58.33 per cent of the respondents are having regular extension contact with techno promoters whereas 55.00 per cent, 40.00 per cent, 40.00 per cent, 30.00 per cent, 8.33 per cent, and 2.50 per cent of the respondents had regular extension contact with NGO, Extension scientists of UAHS, Shivamogga/AHRS Kathalagere, Horticultural officer, Agricultural officer, ATM/BTM (ATMA), Bank extension officer.

4.3.7 Mass media participation of the respondents

With respect to mass media Participation of the respondents, results depicted in Table 4.12 clearly indicates that 60.83 per cent of the farmers belonged to medium level of mass media participation, followed by low (20.83%) and high (18.33%) level of mass media participation.

4.3.8 Information seeking behaviour of the respondents

With respect to Information seeking behaviour of the respondents, the Table 4.13 clearly indicates that 63.33 per cent of the farmers belong to medium level of Information seeking behaviour followed by high (25.00%) and low (11.67%) information seeking behaviour.

It is observed from the Table 4.14 that in Informal sources 80.00 per cent of the respondents seek information frequently from progressive farmers followed by 63.33 per cent, 59.17 per cent and 55.00 per cent, of the respondents seek information from Friends/relatives, Neighbours and Elder family members respectively. In Formal sources 42.50 per cent of the respondents seek information from Scientists from UAHS/AHRS Kathalagere, followed by contact farmers (40.83%), horticulture officer (45.00 %) and Asst. Director of Horticulture (5.00 %).

4.3.9 Innovativeness of the respondents

It was observed from the Table 4.15 that the majority of the respondents were belonged to medium level (60.00%) of innovativeness whereas 21.67 per cent of the respondents belongs to low innovativeness category and 18.33 per cent of the respondents belonged to the high innovativeness category.

4.3.10 Risk orientation of the respondents

With respect to Risk orientation of the respondents, Table 4.16 clearly indicates that majority of the farmers belongs to the medium level (70.83%) risk orientation, whereas 25.00 per cent of the farmers belongs to low level of risk orientation and 4.17 per cent of the respondents belonged to the High level of risk orientation.

Table 4.11 Extension contact of the respondents (#)

Sl. No	Category	Regular		Occasional		Never	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	Agricultural officer	36.00	30.00	34.00	28.33	50.00	41.67
2	Horticultural officer	48.00	40.00	57.00	47.50	15.00	12.50
3	Bank extension officer	3.00	2.50	88.00	73.33	29.00	24.17
4	NGO	66.00	55.00	8.00	6.67	46.00	38.33
5	Extension scientists of UAHs, Shivamogga /AHRS Kathalagere	48.00	40.00	72.00	60.00	0.00	0.00
6	ATM/BTM (ATMA)	10.00	8.33	94.00	78.33	16.00	13.33
7	Techno Promoters	70.00	58.33	38.00	31.67	9.00	7.50

= Number of respondents =120

Table 4.12 Distribution of the respondents(#) according to their mass media participation

Sl.No.	Category	Criteria	Frequency	Percentage
1	Low	Less than (Mean-SD)	25	20.83
2	Medium	Between (Mean $\pm$ SD)	73	60.83
3	High	More than (Mean+SD)	22	18.34
Mean=28.78 SD=3.50				

= Number of respondents =120

Table 4.13 Distribution of the respondents (#) according to information seeking behaviour

Sl.No.	Category	Criteria	Frequency	Percentage
1	Low	Less than (Mean-SD)	14	11.67
2	Medium	Between (Mean $\pm$ SD)	76	63.33
3	High	More than (Mean+SD)	30	25.00
Mean=28.12 SD=2.67				

= Number of respondents =120

Table 4.14 Information seeking behaviour of the respondents (#)

Sources		Frequently	%	occasional	%	Rarely	%	Never	%
Informal sources	Elder family members	66.00	55.00	29.00	24.17	25.00	20.83	0.00	0.00
	Friends/relatives	76.00	63.33	25.00	20.83	19.00	15.83	0.00	0.00
	Progressive farmers	96.00	80.00	24.00	20.00	0.00	0.00	0.00	0.00
	Neighbours	71.00	59.17	41.00	34.17	8.00	6.67	0.00	0.00
	Contact farmers	49.00	40.83	61.00	50.83	10.00	8.33	0.00	0.00
Formal sources	Horticulture officer	54.00	45.00	48.00	40.00	10.80	9.00	7.20	6.00
	Asst. Director of Horticulture	6.00	5.00	24.00	20.00	23.00	19.17	67.00	55.83
	Scientists from UAHS/ AHRS Kathalagere	51.00	42.50	65.00	54.17	4.00	3.33	0.00	0.00

= Number of respondents =120

Table 4.15Distribution of the respondents (#) according to Innovativeness

Sl.No.	Category	Criteria	Frequency	Percentage
1	Low	Less than (Mean-SD)	26	21.67
2	Medium	Between (Mean $\pm$ SD)	72	60.00
3	High	More than (Mean+SD)	22	18.33
Mean=17.53 SD=3.09				

= Number of respondents =120

Table 4.16Distribution of the respondents (#) according to their risk orientation

Sl.No.	Category	Criteria	Frequency	Percentage
1	Low	Less than (Mean-SD)	30	25.00
2	Medium	Between (Mean $\pm$ SD)	85	70.83
3	High	More than (Mean+SD)	5	4.17
Mean=13.34 SD=1.78				

= Number of respondents =120

4.4 Contribution of Independent variables to their Knowledge level

To identify the extent of contribution made by the independent variables and to identify those variables which contribute significant towards the variation in knowledge level of the respondents Multiple-regression analysis was carried. The results of the regression analysis of independent variables with knowledge level of betel vine cultivation practices of the respondents were furnished in Table 4.17.

It is observed that Education, extension contact, mass media participation and information seeking behaviour are significant at one per cent level of significance and innovativeness was significant at five per cent level of significance to the knowledge level, whereas Age, Land holding Farming experience, Annual income and risk orientation are found non-significant to the knowledge level of the respondents. Co-efficient of determination (R^2) obtained was 0.712.

4.5 Contribution of Independent variables to their Adoption level

The results of the regression analysis of independent variables with Adoption level of betel vine cultivation practices of the respondents were furnished in Table 4.18, depicts that Knowledge, Land, Annual Income, innovativeness and Risk orientation was significantly correlated with adoption level of the respondents by one per cent level of significance and Extension contact was significant at five per cent level of significance whereas, Age, Education, Farming experience, Mass media participation and information seeking behaviour are found non-significant to the adoption level of the respondents. Co-efficient of determination (R^2) obtained was 0.756.

Table 4.17 Relationship between independent variables and knowledge of respondents (#)

Sl. No	Variables	Beta	Std. Error	t statistic
1	Age	-0.019	0.046	-0.415 ^{NS}
2	Education	0.146	0.048	3.073**
3	Land holding	0.068	0.069	0.994 ^{NS}
4	Farming experience	0.022	0.044	0.500 ^{NS}
5	Annual income	0.008	0.151	0.052 ^{NS}
6	Extension contact	0.634	0.105	6.022**
7	Mass media participation	0.175	0.049	3.551**
8	Information seeking behaviour	0.210	0.063	3.319**
9	Innovativeness	0.136	0.063	2.168*
10	Risk orientation	0.023	0.085	0.275 ^{NS}
R ² = 0.712				

*Significant at 5% level of significant,

** Significance at 1% level of significance,

^{NS}Non-Significant

= Number of respondents =120

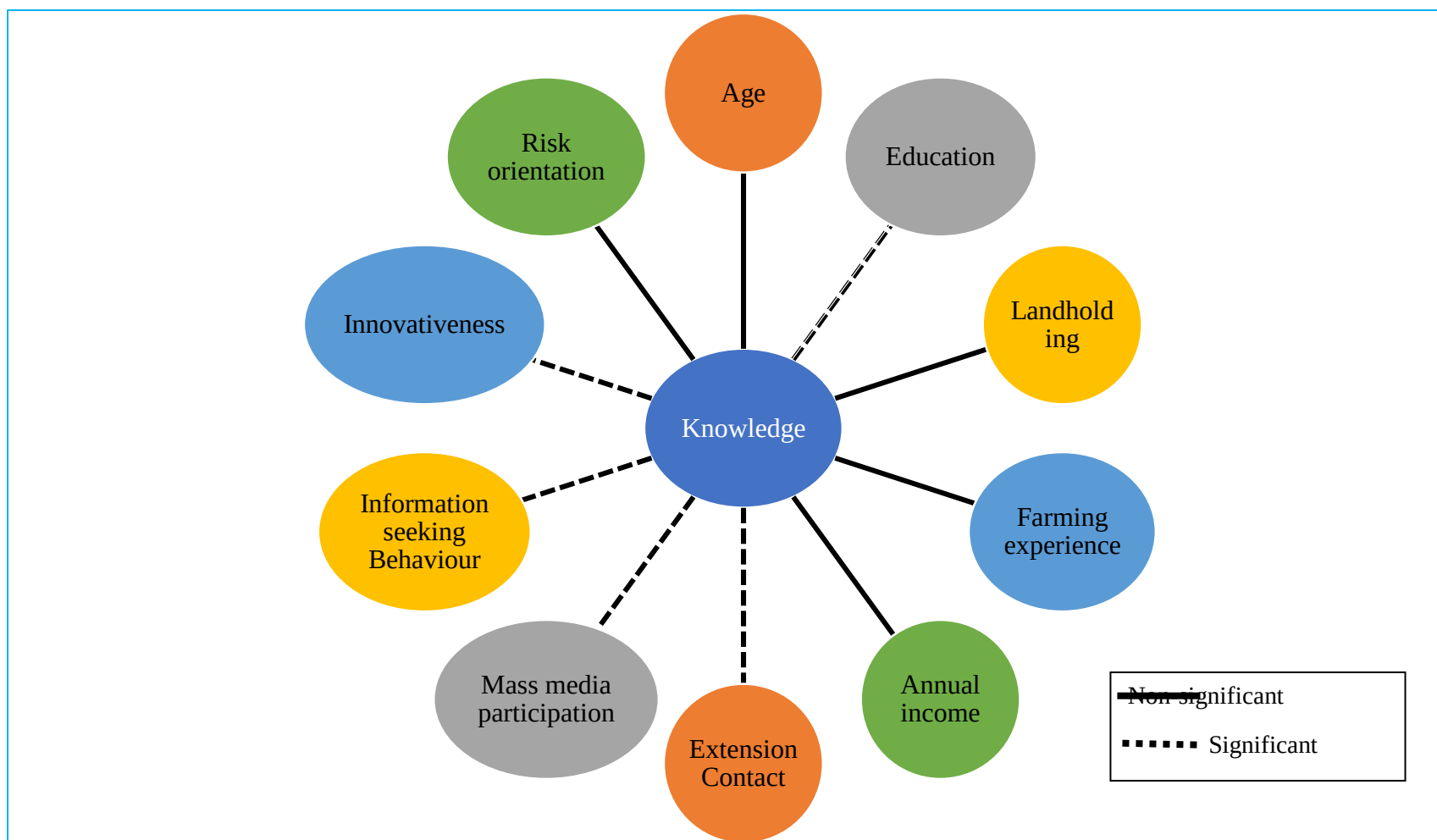


Fig:4.3Pictorial representaion of relationship between Independent variables and knowledge level of the respondents

Table 4.18 Relationship between independent variables and adoption level of respondents (#)

Sl. No	Variables	Beta	Std. Error	t statistic
1	Age	-0.039	0.049	-0.789 ^{NS}
2	Education	0.005	0.053	0.101 ^{NS}
3	Land holding	0.288	0.061	4.756**
4	Farming experience	0.051	0.045	1.133 ^{NS}
5	Annual income	0.433	0.131	3.311**
6	Extension contact	0.297	0.101	2.950*
7	Mass media Participation	0.021	0.045	0.465 ^{NS}
8	Information seeking behaviour	0.014	0.057	0.252 ^{NS}
9	Innovativeness	0.269	0.065	4.123**
10	Risk orientation	0.391	0.097	4.041**
$R^2=0.756$				

*Significant at 5% level of significance

** Significance at 1% level of significance

^{NS}Non-Significant

= Number of respondents =120

4.6 Constraints in relation to betel vine cultivation practices

With respect to constraints regarding cultivation practices of betel vine, Table 4.19 indicates that 77.50 per cent of the respondents facing non-availability of skilled labour as the major constraints, whereas 75.00 per cent of the respondents are facing high cost of technology as the constraint, 60.00 per cent, 56.66 per cent, 52.50 per cent, 50.00 per cent, 39.16 per cent, 35.83 per cent, 29.16 per cent, and 16.67 per cent of the respondents are facing Pest and disease problem, Lack of technical guidance, Lack of capital, Traditional belief, Lack of knowledge, Inadequate market facilities, , Lack of plant material for raising of wind breaks and Non availability of packing material as the constraints in relation to cultivation practices.

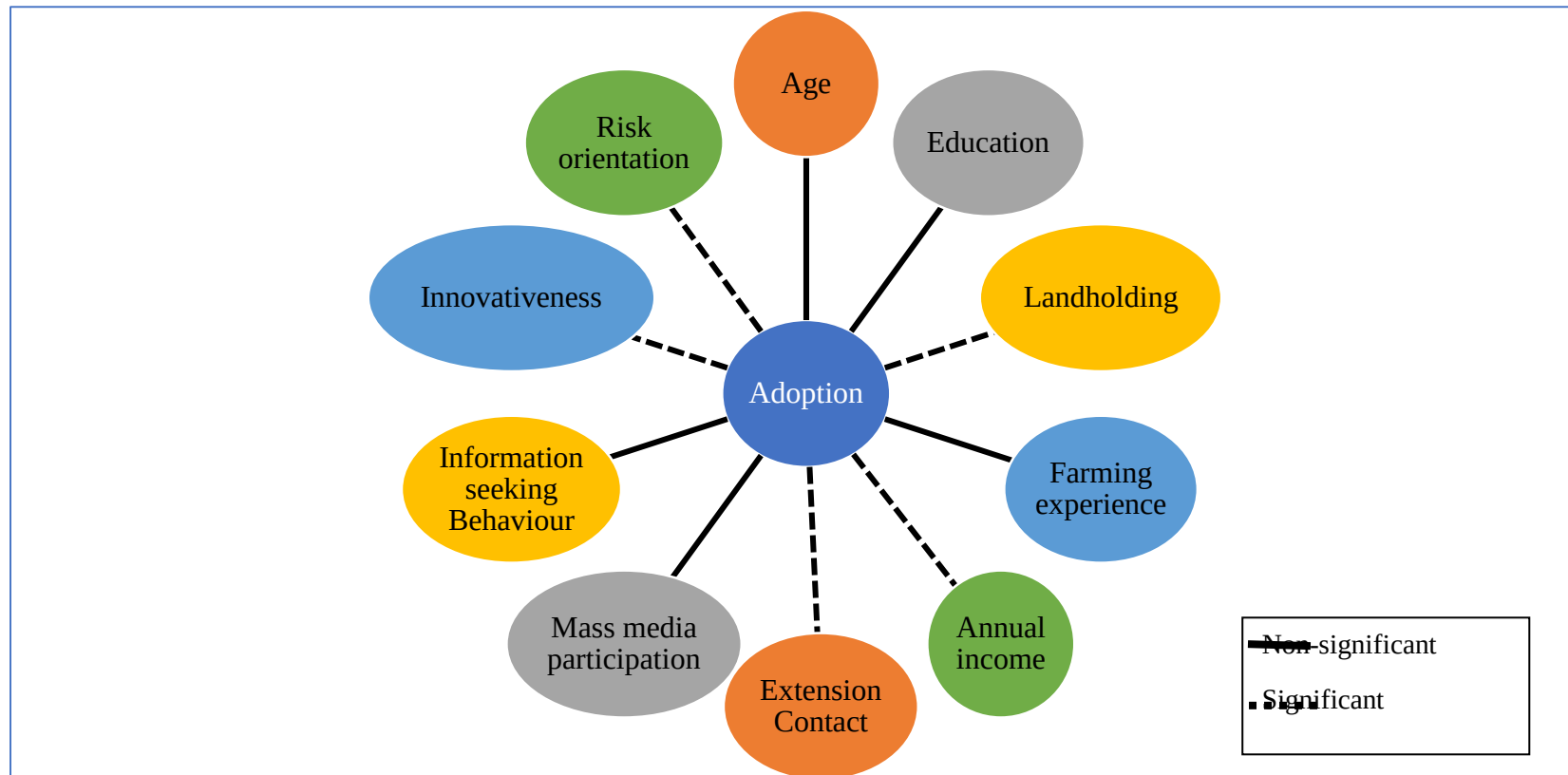


Fig:4.4 Pictorial representaion of relationship between Independent variables and Adoption level of the respondents

Table 4.19 Constraints faced by the respondents (#)

Sl. NO	Constraints	Frequency	Percentage	Rank
1	Non availability of skilled labour	93	77.50	I
2	High cost of inputs	90	75.00	II
3	Pest and disease problem	72	60.00	III
4	Lack of technical guidance	68	56.66	IV
5	Lack of capital	63	52.50	V
6	Traditional belief	60	50.00	VI
7	Lack of knowledge	47	39.16	VII
8	Inadequate market facilities	43	35.83	VIII
9	Lack of plant material for raising of wind breaks	35	29.16	IX
10	Non availability of packing material	20	16.67	X

= Number of respondents =120

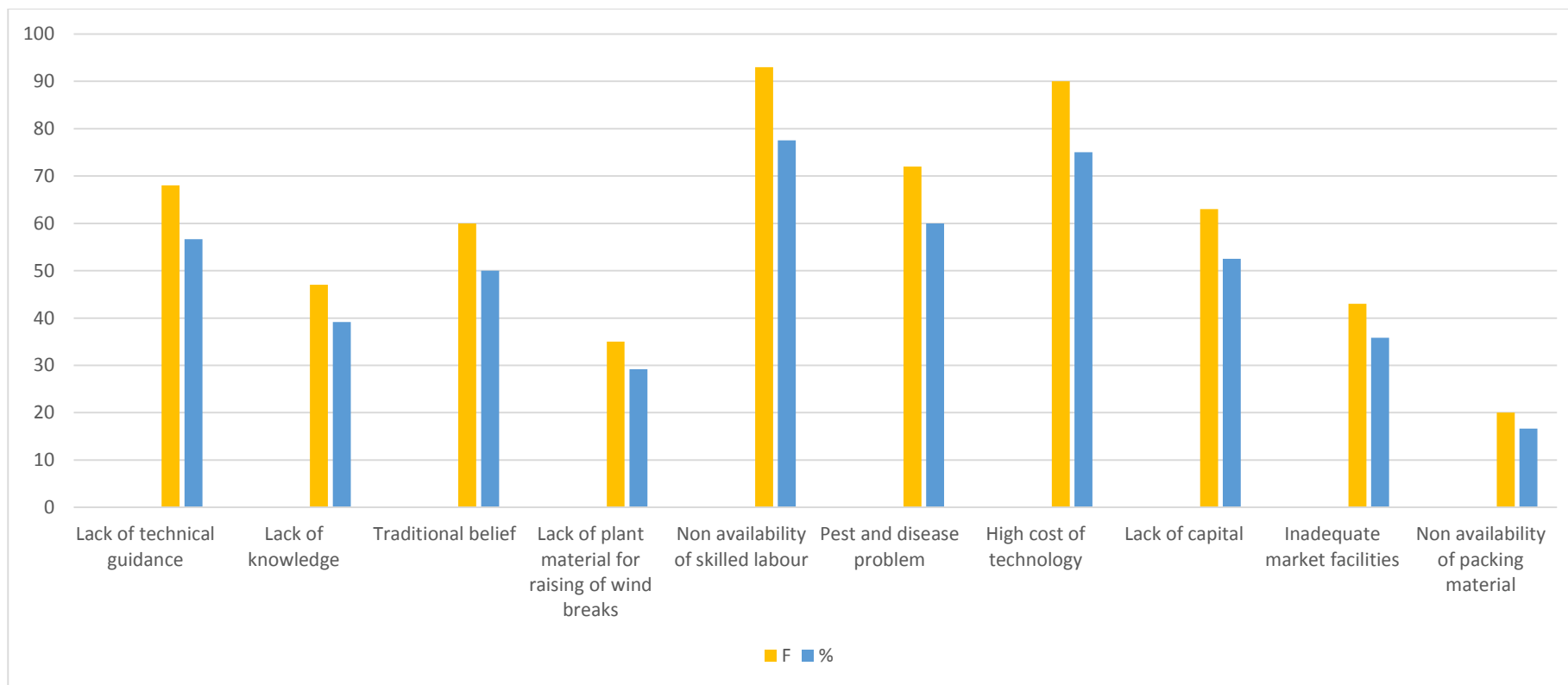


Fig :4.5 Pictorial representation of Constraints in relation to cultivation practices.

DISCUSSION

V DISCUSSION

The findings of the present study are discussed in this chapter under following headings.

- 5.1 Knowledge level of Betel vine growers on cultivation practices
- 5.2 Adoption level of Betel vine growers on cultivation practices
- 5.3 Socio-economic characteristics of Betel vine growers
- 5.4 Contribution of Independent variables to their Knowledge level
- 5.5 Contribution of Independent variables to their Adoption level
- 5.6 Constraints in relation to cultivation practices of Betel vine

5.1 Knowledge level of Betel vine growers on cultivation practices.

5.1.1 Overall knowledge level of farmers and Knowledge level of the betel vine growers about individual recommended cultivation practices

As the data furnished in Table 4.1 reveals that majority of the respondents belonged to the medium level (76.67%) of knowledge whereas 15.83 percent of the respondents belonged to low level of the knowledge and 7.50 percent of the respondents belonged to the high level of knowledge.

It is also observed from Table 4.2 that 100.00 per cent of the respondents have knowledge about Irrigation and Harvest, 93.75 per cent of the farmers have knowledge about land preparation, 76.67 percent of the farmers are aware about Transplanting, 72.50 percent and 72.22 percent of the farmers have knowledge about soil requirement and nursery preparation, whereas 79.16 percent and 66.67 percent of the farmers have knowledge about Lowering of the vines and plant protection measures, whereas only 49.72 per cent and 40.83 per cent of the farmers have knowledge about nutrient application and Spacing practices.

It is due to majority of the respondents belongs to the middle and young age group and the respondents have medium level of education and also the respondents have good extension contact with Techno promoters, scientist from AHRS Kathalagere, UAHS, NGO's and Horticulture officer. The majority respondents have medium level of mass media participation, Information seeking behaviour, Farming experience in betel vine cultivation and the majority of the respondents are belonged to medium level of Innovativeness might have influenced the knowledge level of the respondents. These findings are in line with Venkateshwarlu *et al.*(1992).

5.2 Adoption level of Betel vine growers on cultivation practices

5.2.1 Overall Adoption level of farmers and Adoption level of the betel vine growers about individual recommended cultivation practices

With respect to overall adoption of respondents regarding betel vine cultivation practices, Table 4.3 indicates that majority of the respondents belonged to medium level (65.00 %) of adoption whereas 18.33 per cent of the respondents belonged to the high level of adoption and 16.67 per cent of the respondents belonged to low level of adoption.

It is observed from the Table 4.4 that 100.00 per cent of the respondents had adopted Irrigation and Harvest practices, whereas 78.75 per cent, 72.36 per cent, 71.33 per cent, 68.67 per cent, 52.22 per cent and 50.83 per cent of the respondents adopted Lowering of vines, Nursery preparation, Soil requirement, land preparation, Nutrient application and Transplanting and only 38.48 per cent and 1.67 per cent of the respondents had adopted recommended Plant Protection and spacing practices.

It is due to majority of the respondents belonged to medium knowledge group, medium annual income, medium extension contact, medium innovativeness, medium risk orientation and medium betel vine cultivating experience. These findings are in line with Venkateshwarlu *et al.*(1992)

5.3 Socio-economic characteristics of Betel vine growers

5.3.1 Age

The data furnished in Table 4.5 indicates that the majority (47.50%) of the respondents were belonged to middle age group whereas 40.83 per cent respondents belonged to the young age and 11.66 per cent of the respondents belonged to the old age group. As it seen majority of the respondents are middle age group and they possess medium level of betel vine cultivating experience, it is necessary to encourage young farmers and middle age farmers to cultivate betel vine as the future agriculture is depended on them. These findings are in line with Sen P. K. (2013) and Pawaret *al.* (2015).

5.3.2 Education

The data furnished in Table 4.6 indicates that 40.83 per cent of the respondents were educated up to high school followed by 25.83 per cent of the respondents were educated up to middle school, 13.33 per cent, 10.83 per cent, 9.17 per cent, 0.00 per cent and 0.00 per cent were educated up to PUC, primary school, graduate, illiterate and post graduate respectively. Here majority (40.83%) of the farmers are educated up to high school and only 9.17 per cent of the respondents are educated up to Graduation the reason for this result might be lack of awareness about

education by elders and financial problems so it is necessary to educate the farmers about betel vine farming through Adult education, Agri Tourism, night schools and other related programs. These findings were in conformity with the findings of Venkateshwarlu *et al.*(1992).

5.3.3 Land holding

It is observed from the Table 4.7 that 42.50 per cent of the respondents were belonged to small farmers whereas 31.67 per cent of the respondents were belonged to marginal farmers followed by medium farmers (22.50%) and big farmers (3.33%). Most of the respondents are cultivating betel vine in 0.5 to 1 acers of land in their total land holding it might be due to high cost of cultivation, non-availability of skilled labours, lack of capital, inadequate market facilities etc. These findings are in line with Venkateshwarlu *et al.*(1992).

5.3.4 Farming experience

The results presented in Table 4.8 shows that the majority of the respondents had medium level (67.50%) of betel vine cultivating experience followed by high (16.67%) and low (15.83%) betel vine cultivating experience. It because the respondents are from the betel vine cultivating region and they are cultivating betel vine since 200 to 100 years so the respondents have medium betel vine cultivating experience and some of the respondents are started cultivating betel vine recently so some respondents have less experience. These findings are in line with Venkateshwarlu *et al.*(1992).

5.3.5 Annual income

The data furnished in Table 4.9 indicates that majority of the respondents belonged to medium annual income category (76.67%) whereas 13.33 per cent and 10.00 per cent belonged to high and low annual income category. This might be due to majority of the farmers possess small land holdings and majority of the respondents are not practicing allied activities. This finding was in line with the findings of Lakshmi (1990), Reddy (1986) and Venkateshwarlu *et al.*(1992).

5.3.6 Extension contact

It was observed from Table 4.10 that majority of the respondents had medium level (68.33 %) of the extension contact while, 16.67 per cent of the respondents had low extension contact and 15.00 per cent of the respondents had high extension contact. This might be due to weak extension link and lack of extension professionals. The majority of the respondents have extension contact with RSK's, techno promoters and NGO's like Techno serve and Cargill Pvt Ltd as they provide inputs needed by the respondents and also they give technical advice to the farmers and also the

respondents have extension contact with AHRS Kathalagere, as it is situated in the study area some of the respondents get information and also some inputs from this station. These findings are in line with Venkateshwarlu *et al* (1992) and Pawar *et al.* (2015).

5.3.7 Mass media participation

With respect to mass media Participation of the respondents, results depicted in Table 4.12 clearly indicates that 60.83 per cent of the farmers belonged to medium utilization of mass media, followed by low (20.83%) and high (18.34%) utilization of mass media. This might be due to majority of the farmers are belonged to medium level of education and they may not aware about the importance of mass media which provide information. Majority of the respondents are using only television to get information regarding agriculture as television is available in every home and only few respondents are using farm magazines and WhatsApp/Facebook to get information so there is a need to educate the farmers about the mass media availability to get information fastly by establishing Information centres and screening educational films in villages. This finding was in line with the findings of Reddy (1986) and Venkateshwarlu *et al.*(1992).

5.3.8 Information seeking behaviour

With respect to Information seeking behaviour of the respondents, the Table 4.13 clearly indicates that 63.33 per cent of the farmers belong to medium level of Information seeking behaviour followed by high (25.00%) and low (11.67%) information seeking behaviour. Majority of the farmers are seeking information regarding betel vine cultivation from informal sources like Elder family members, progressive farmers, neighbours and friends/relatives this might be due that they will be available all time and they believe them as respondents have primary relationship with them. And also, some of the respondents are seeking information from Horticulture officer, contact farmers, and Scientists from AHRS Kathalagere or UAHS Shivamogga. This finding was in line with the findings of Reddy (1986) and Venkateshwarlu *et al.*(1992).

5.3.9 Innovativeness

It was observed from the Table 4.15 that the majority of the respondents were belonged to medium level (60.00%) of innovativeness whereas 21.67 per cent of the respondents belongs to low innovativeness category and 18.33 per cent of the respondents belonged to the high innovativeness category. As it is observed that majority of the farmers have medium education level, medium mass media participation, medium extension contact and medium information seeking behaviour and majority of the respondents belonged to middle and young age group this might

have helped the respondents to develop innovative ideas. This may be the reason for medium level of innovativeness. This finding was in line with the findings of Khatun (2016) and Bhagyalaxmi *et al.* (2003).

5.3.10 Risk Orientation

With respect to Risk orientation of the respondents, Table 4.16 clearly indicates that majority of the farmers belongs to the medium level (70.83%) risk orientation, whereas 25.00 per cent of the farmers belongs to low level of risk orientation and 4.17 per cent of the respondents belonged to the High level of risk orientation. As it is observed that majority of the farmers belonged to medium level of annual income, possess medium level of education, majority of the respondents had good extension contact, majority of the respondents belonged to middle and young age group due these reasons the respondents might have medium level of risk orientation. This finding was in line with the findings of Achutha (1998) and Shivashankary and Thivahary (2014).

5.4 Contribution of Independent variables to their Knowledge level

It is observed from the Table 4.17 that Education, extension contact are significant at one per cent level of significance, this might be due that the majority of the respondents belonged to middle and young age group so the respondents have good level of education this might be the reason for education to be significant with knowledge level of the respondents. Extension contact is significant with respect to knowledge level as the respondents have good extension contact with NGO's, RSK's, AHRS Kathalagere and Techno promoters so that the respondents can get information regarding betel vine cultivation practices so it might have helped to get knowledge regarding betel vine practices.

Mass media participation and information seeking behaviour are also significant at one per cent level of significance to knowledge level, as the respondents have good Mass media participation and Information seeking behaviour get information through various sources like TV, Radio, Farm magazine, Newspapers and Internet and also from Formal and informal sources like family members, friends, Progressive farmers, contact farmers, RSK's and from Agricultural Universities regarding betel vine cultivation practices so these might have contributed for positive and significant relationship.

Innovativeness was significant at five per cent level of significance to the knowledge level, this might be due to that respondents have medium level of extension contact, medium level of education and medium level of mass media participation these might have helped the respondents to be innovative so these might have contributed for positive and significant relationship.

Co-efficient of determination (R^2) obtained was 0.712. Which means that 71.20 per cent of the variation in knowledge level was due to the selected variables *i.e.*, Age, Education, Land holding, Farming Experience, Annual income, Extension contact, Mass media participation, Information seeking behaviour, Innovativeness and Risk orientation, and other variation might be due to other independent variables which are not included in the study. Significant change in knowledge level of the respondents regarding betel vine cultivation practices can be brought by bringing positive changes in these five independent variables. This finding was in line with the findings of Venkateshwarulu (1992) and Subhash (2018).

5.5 Contribution of Independent variables to their Adoption level.

The data furnished in table 4.18, depicts that Knowledge was positively significant to the adoption level of the respondents at one per cent level of significance as the knowledge helps the farmers to know and understand the technologies which might help in adoption of the cultivation practices of the betel vine crop this might be the reason for positive significant with respect to adoption level of the respondents.

Land holding and Annual Income are positively significant to the adoption level of the respondents as the land holding and annual income increases the respondents will have more potential to try the new technologies and adopt them fully in their field this might be the reason for positive significant with respect to the adoption level of the respondents

Innovativeness and Risk orientation are also positively significant to the adoption level of the respondents by one per cent level of significance as the respondents have good extension contact, Education and Mass media participation this might have helped the respondents to develop innovativeness and if land holding and annual income increases the farmers might develop risk taking ability to try and adopt the new cultivation practices of the betel vine crop these may be the reasons for positive significant of the innovativeness and risk orientation with respect to adoption level of the respondents.

Extension contact was positively significant to the adoption level of respondents at five per cent level of significance as the farmers have good extension contact with NGO's, RSK's, AHRS Kathalagere, Techno promoters to get reliable information and needed inputs from them these might have influenced the respondents to adopt the new cultivation practices in their field, these may be the reason for the positive significant of extension contact with adoption level of the respondents.

Co-efficient of determination (R^2) obtained was 0.756 which means that 75.60 per cent of the variation in the adoption level was explained by the variable included in the study. Remaining variation might be due to other variables which are not included in the study. This finding was in line with the findings of Venkateshwarulu (1992) and Subhash (2018).

5.6 Constraints in relation to cultivation practices of Betel vine

With respect to constraints regarding cultivation practices of betel vine, table 4.19 indicates that 77.50 per cent of the respondents facing non-availability of skilled labour as the major constraints this might be due to lack of training to the labours regarding cultivation practices in betel vine so there is a need to impart skill by giving training to the labours about betel vine cultivation techniques.

Whereas 75.00 per cent of the respondents are facing high cost of inputs as the constraint, for betel vine cultivation farmers require more inputs like manures, fertilizers, pesticides, fungicides, planting materials, packing materials etc, which are high cost so there is a need to provide the inputs in subsidised prices by forming cooperatives in villages.

60.00 per cent of the respondents are facing pest and disease as the constraint this might be due to that the respondents are having less knowledge regarding controlling pest and diseases in betel vine cultivation so the farmers have to be educated about the plant protection measures by giving training or by establishing Information centres near villages to give information about the plant protection measures.

56.66 per cent of the respondents are facing Lack of technical guidance as the constraint this might be due to that less extension activities in that area so there is a need to improve the extension activities by Agricultural department and Agriculture Universities by demonstrating the new techniques in the villages and also the extension personals can visit the farmers field so that farmers can get required technical guidance regarding the betel vine cultivation practices.

52.50 per cent of the respondents are facing Lack of capital as the constraints this might be due that majority of the respondents belonged to medium annual income category so it may not be sufficient for the farmers to buy inputs required for the cultivation so there is a need to provide loan to the farmers at lower interest rates and quickly and the concerned administration should also take a step to provide the inputs at lower and subsidised rates so that the farmers can purchase the required inputs.

50.00 per cent of the respondents are facing Traditional belief as the constraint as the majority of the respondents are not following the recommended package of practices as they follow what their ancestors are practicing this might be due they may

believe in their ancestors practices more, so there is a need to demonstrate to the farmers how profitable if they follow the recommended practices and make them to visit to the progressive farmers field.

39.16 per cent of the respondents are facing Lack of knowledge as the constraint this might be due that the majority of the respondents belonged to the medium level of the education, and also the respondents are having medium level of extension contact, medium level of mass media participation and medium level of information seeking behaviour so there is a need to improve the knowledge level of the respondents by imparting training programs in the villages.

35.83 per cent of the respondents are facing Inadequate market facilities as the constraint as there is no standard market for the farmers of this region for betel vine crop, there is a problem of middlemen and also there is a price fluctuation in marketing of the betel vine so that the concerned administration should solve the problem of the farmers by providing the market, by eliminating the middlemen, by fixing the price for the crop and providing the regular market information to the farmers.

29.16 per cent, and 16.67 per cent of the respondents are facing Lack of plant material for raising of wind breaks and Non availability of packing material as the constraints this might be due to that the majority of the respondents belonged to medium and low level of income group so they might have not able to purchase the required plant material for raising wind breaks and packing materials so there is a need to provide the credit facility to the farmers.

This finding was in line with the findings of Venkateshwarlu *et al* (1992) and Pawar *et al.* (2015).

Implications of the study

- The majority of the farmers are small farmers having medium level of knowledge about recommended cultivation practices of betel vine crop. Training programmes and demonstration should be conducted in villages to increase the knowledge level.
- The farmers are having medium level of adoption regarding recommended cultivation practices of betel vine crop. There is a scope to increase the level of adoption by conducting demonstration, organizing Exhibitions, Field days and bringing changes in the attitude of the farmers.
- The major constraints faced by the farmers are Lack of skilled labor so there is a need to organize the training programs to impart skills in the labor works so the state department of horticulture need to take action in this manner and other major constraint is high cost of inputs so there is a need to provide the credit facility to the farmers and provide the required inputs at lower and subsidized rates so that the farmers can try to adopt the important practices.

Future line of study

- The present study was limited only to two taluks of Davanagere district. Therefore, it is suggested that, further investigation may be taken up in other districts. Further, action research to demonstrate the technologies at farmers' field on a large scale may be organized to convince farmers about potential yield realizations with the existing technology itself.
- To make a meaningful generalization, there is a need for comprehensive research in other areas also and to make concrete recommendations to planners and policy makers in order to formulate an effective production strategy in betel vine crop.
- Few more independent variables may be selected to know the relationship with knowledge and adoption of betel vine growers.

SUMMARY

VI SUMMARY

Betel vine is an important plantation crop in India, as it is being cultivated on about 55,000 Hectares of land (Guha and Jain 1997) and also it generates about 20 million employment opportunities directly or indirectly from production, processing, handling, transportation and marketing of betel vine leaves (Biswas *et al.* 2019). In Karnataka also betel vine is cultivating in considerable area about 70000 ha with average production of 130115 lakh leaves. In Karnataka it is being cultivated in Haveri, Davanagere, Tumkur, Bangalore Rural, Mysore, Dharwad, Shimoga, Chikmagalur, North Canara, Belgaum and Vijayapura. Haveri district is leading in Betel vine production followed by Davanagere, Tumkur and Ramanagara during the last 3 years. Betel vine is being called in different names in different places like Paan in Hindi, Taambula in Sanskrit, Villyadale in Kannada, Vettilai in Tamil, Nagarbel in Gujarati, Tamalapaku in Telugu, Vettillakkoti in Malayalam. Betel vine leaves are having more importance in Hindu religion as no ceremony will be completed with absence of betel vine leaves and also it is having good health benefits by consuming the betel vine leaves. In recent years betel vine growing farmers are facing lot of problems in cultivation like diseases, pest, lower yield, and more technical problems as the farmers are not aware of the recommended cultivation practices of betel vine crop this may be due to many constraints in adopting the recommended cultivation practices. Farmers can get higher yield and income if they have knowledge and adopt the recommended cultivation practices, so there is a need to educate the farmers to acquire the knowledge about the recommended cultivation practices and help them to purchase needed inputs at lower rates so that the farmers can try and adopt the new technologies in their field.

In this context it is worthwhile to study the farmer's knowledge and extent of adoption by the farmers in view of suggesting the suitable strategies in transfer of technologies in betel vine cultivation.

Keeping these things in view the present study "A Study on Knowledge and Adoption of Betel Vine (*Piper betel*) cultivation practices followed by the farmers of Davanagere District of Karnataka" was conducted in eight villages of Honnali and Hariharataluks of Davanagere District. As Davanagere district was purposively selected and two taluks Honnali and Harihara was selected based on highest area under cultivation. Eight villages were selected and 15 respondents were selected randomly from each village making the maximum sample size 120. The data was collected by personal interview method by structured interview schedule. The study was conducted with following objectives.

1. To study the knowledge level of Betel vine growers on cultivation practices.
2. To study the Adoption level of Betel vine growers on cultivation practices.

3. To know the socio-economic characteristics of Betel vine growers.
4. To document the constraints in relation to cultivation practices of Betel vine.

Major Findings of the study

1. Majority of the respondents belonged to medium level (76.67 %) of the knowledge regarding the recommended betel vine cultivation practices, whereas in practice wise knowledge level the majority of the respondents had good knowledge regarding irrigation and harvesting practice and poor knowledge about spacing, nutrient application and plant protection practices.
2. Majority of the respondents belonged to medium level (65.00 %) of the adoption category regarding recommended betel vine cultivation practices, whereas in practice wise adoption category the majority of the respondents are fully adopted irrigation and harvest practices and only few respondents are adopted spacing, nutrient application and plant protection practices.
3. Majority (47.50 %) of the respondents were belonged to middle aged group in the study area.
4. Majority (40.83 %) of the respondents had high school level of the education in the study area.
5. Majority of the respondent are belonged to small farmers (42.50 %) category in the study area.
6. Majority of the respondents belonged to medium level (67.50 %) of the betel vine farming experience in the study area.
7. Majority of the respondents belonged to medium annual income category (76.67%) in the study area.
8. Majority of the respondents had medium level (68.33) of the extension contact in the study area.
9. Majority of the respondents belonged to medium level (60.83 %) of mass media participation in the study area.
10. Majority of the respondents belonged to medium level (63.33 %) of information seeking behaviour in the study area.
11. Majority of the respondents were belonged to medium level (60.00%) of innovativeness category in the study area.
12. Majority of the farmers belongs to the medium level (70.83%) risk orientation category in the study area.
13. It could be observed from the table 4.17 that, out of 10 independent variables 4 variables *i.e.* Education, extension contact, mass media participation and information seeking behaviour are positively significant at one per cent level of significance, whereas one variable *i.e.*, innovativeness was positively significant at five per cent level of significance for knowledge.

14. It could be observed from the table 4.18 that, out of 10 independent variables four variables *i.e.*, land holding, annual income, innovativeness and risk orientation were positively significant at one per cent level of significance, whereas one variable *i.e.* extension contact was positively significant at five per cent level of significance for adoption.
15. Non-availability of the skilled labour (77.50%), high cost of inputs (75.00 %), Pest and disease problem (60.00 %), Lack of technical guidance (56.66 %), Lack of capital (52.50 %), Traditional belief (50.00 %), Lack of knowledge (39.16 %), Inadequate market facilities (35.83 %), Lack of plant material for raising of wind breaks (29.16 %) and Non availability of packing material (16.67 %) are the constraints facing by the respondents in relation to adoption of recommended cultivation practices.

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APPENDIX

VIII APPENDIX

**UNIVERSITY OF AGRICULTURAL AND HORTICULTURAL SCIENCES
COLLEGE OF AGRICULTURE SHIVAMOGGA.
DEPARTMENT OF AGRICULTURAL EXTENSION.**

A Study on Knowledge and Adoption of Betel Vine (*Piper Betel*) Cultivation
Practices Followed By the Farmers of Davanagere District of Karnataka.

Interview Schedule

PART-A

RespondentNo:

1) GENERAL INFORMATION

1. Name of the respondent:
2. Village:
3. Taluk:

2) PERSONAL CHARACTERISTICS

1. Age (in completed years):
2. Formal Education:
 - a. Illiterate:
 - b. Primary school (1st-4th std.):
 - c. Middle school (5th -7th std.):d. High school (8th -10th std.):
 - e. PUC (10 + 12th std.):f. Graduation/PG:

3. Land holding: Please indicate details regarding land property

Sl.No	Type of land	Area (ha)	Area under betel vine
1	Dry land		
2	Irrigated land		
3	Garden land		
Total	Total		

4.Farming Experience (years)

Experience in farming	
Experience in betel vine cultivation	

5. Annual income

Sl.No	Source	Income (Rs)
1	Income from Agriculture and allied activities	
2	Other than agriculture	
	Total	

From betel vine:

6. Extension contact

Sl.No	Extension workers	Regular	Occasional	Never
1	Agricultural officer			
2	Horticultural Officer			
3	Bank Extension officer			
4	NGO Extension agent			
5	Extension scientists of UAHS, Shivamogga/ AHS, Katakhalager			
6	ATM/BTM'S (ATMA)			
7	Techno promoters			

7. Mass media participation

Sl. No	Activities	Subscribe / open	Programmes	Frequency of participation		
				Regular	Occasional	Never
1	Radio		Agricultural information			
			Information news			
			Entertainment			
2	Television		Agricultural information			
			Information news			
			Entertainment			
3	Newspaper		Agricultural information			
			Information news			
			Entertainment			
4	Farm magazine		Agricultural information			
			Information news			
			Entertainment			
5	Whats app/Facebook		Agricultural information			
			Information news			
			Entertainment			

8. Information seeking behaviour

Sl.No	Information sources	Degree of contact			
		Frequently	Occasional	Rarely	Never
A	Informal sources				
1)	Elder family members				
2)	Friends/relatives				
3)	Progressive farmers				
4)	Neighbours				
B	Formal sources				
1)	Contact farmers				
2)	Horticultural officer				
3)	Asst. Director of Horticulture				
4)	Scientists from UAHS, Shivamogga/AHRS Kathalagere				

9. Innovativeness

Sl. No.	Statements	SA	A	DA
1.	I search for different sources of information on new betel vine technologies			
2.	I am eager to try or adopt new farm technology that I have heard			
3.	I don't have any fear to try untried betel vine technologies			
4.	I am optimistic in adopting the innovations even if there is a threat of failure			
5.	The latest technologies will give higher benefits compared to the older ones			
6.	I do not want to be first to adopt new betel vine cultivation technologies			
7.	It is waste of time to keep on trying new betel vine cultivation practices			
8.	Since results of the new practices are not sure, I would like to wait till others adopt			

10. Risk orientation

Sl. No.	Statements	SA	A	DA
1.	Farmer should grow a greater number of crops to cope up with risk involved in growing only betel vine.			
2.	Farmer should give more emphasis in making big profits rather than making a lot of smaller profits by growing betel vine			
3.	It is better to take risk when the farmer knows his chance of success is high by cultivating betel vine.			
4.	A farmer who is willing to take greater risks than the average farmer usually have better financial condition			
5.	Trying an entirely new method in betel vine farming involves risk but it is worthy			
6.	It is better for a farmer not to try new farming methods unless most other farmers have used them with success			

PART-B

11. Knowledge inventory on betel vine cultivation practices

Please indicate the most appropriate answer from the alternatives given under each of the following statements.

- 1) Which type of soil is required to cultivate betel vine?
a) Clay loamy b) black soil c) sandy soil
- 2) Betel vine grows well in areas having mm of annual rainfall.
a) 750-950 b) 950-1150 c) 1250-4750
- 3) Planting time of betel vine seedlings is
a) Sep-Oct b) Nov-Dec c) June-July
- 4) The terminal cuttings should be obtained from
a) one-year old vine b) new vine c) 2-3-year-old vine
- 5) The length of the cuttings should be around
a) 10-15 cm b) 30-45 cm c) 20-25 cm
- 6) The recommended spacing for betel vine cultivation is
a) 1.5*0.45 m b) 1.5*1.5 m c) 0.45*1.5 m
- 7) The recommended plant population for one hectare is
a) 10000 vine/ha b) 20000 vine/ha c) 15000 vine/ha
- 8) The recommended FYM application per vine per year is
a) 25-50 kg b) 20 kg c) 10 kg
- 9) The recommended NPK application per vine
a) 25:25:25 gm b) 50:50:50 gm c) 100:100:100 gm

- 10) Which fertilizer is best suitable for betel vine cultivation?**
a) Ammonium sulphate of potash b) Urea c) Ammonium nitrate
- 11) Trees for shade and trailing are to be planted how many weeks before the planting of betel vine seedlings?**
a) 3 b) 8 c) 4
- 12) Trailing is done by tying the vines at intervals of cm along the standards**
a) 5-10 b) 15-20 c) more than 30
- 13) Tying the vines along the standards by using**
a) banana fibres b) synthetic wires c) cotton fibres
- 14) Trailing is done every days depending on the growth of vines**
a) 5-10 b) 20-30 c) 15-20
- 15) The best time for irrigation is**
a) morning b) evening c) both a & b
- 16) The standing water should be removed from the field with in minutes**
a) 30 b) 60 c) 120
- 17) Lowering of the vines has to be done at least**
a) twice in a year b) once in two years c) once in a year
- 18) Lowering should be done in the month of**
a) Aug-Sep b) Nov-Dec c) Jan- Feb
- 19) Coil the vines and burry the vines in the ground leaving cm length of top shoot**
a) 30 b) 15 c) 60
- 20) Which disease is the major problem in betel vine cultivation?**
a) Wilt b) Powdery mildew c) Anthracnose

Say True or False

- 1) In nursery, watering has to be done by splashing water on the vines by hand ()**
- 2) *Erythrinasubumbrans* can be used for trailing purpose ()**
- 3) Coconut leaves should not be used as shading material in nursery ()**
- 4) Betel vine requires low humidity and dry climate ()**
- 5) *Trichoderma viride* is used to control wilt disease ()**
- 6) Rooted vines should be transplanted near the base of standards or trees ()**
- 7) To control mites wettable sulphur 50 WP @ 1 g/lit is suitable ()**
- 8) Frequent light irrigation is not required for betel vine ()**
- 9) While planting more than two nodes shall be buried in the soil ()**
- 10) Giving proper drainage system helps in removal of excess water ()**

12.Extent of adoption of betel vine cultivation practices

Sl.No	Particulars	Adoption	
		Adopted	Not adopted
	Soil and climate requirement		
1	Well drained fertile clay loamy soil is required		
2	It cannot tolerate saline and alkaline conditions		
3	Soil should be tested		
4	It requires high humidity and shady areas		
5	It is suitable in areas having 1250-4750mm annual rainfall		
	Land preparation		
6	The land has to be dug well and laid out into furrows of 10-15mt length, 75cm width and 75cm depth.		
7	Build walls as wind breaks		
8	Plant drumstick, mulberry, monkeypod etc as wind breaks around the garden.		
9	Trees for shade and trailing standards are to be planted 4 weeks before the planting of betel vine seedlings		
10	Give proper drainage system to remove excess water		
	Nursery preparation		
11	Planting is done in June-July		
12	Terminal cuttings obtained from 2-3 old vine should be used		
13	The length of the cuttings used is 30-45 cm with 5-6 nodes		
14	While planting, two nodes shall be buried in the soil and the soil around the planted cuttings must be pressed firmly to encourage quick germination.		
15	Coconut leaves are used as shading materials.		
16	Watering has to be done by splashing water on the vines by hand.		
	Spacing and nutrients application		
17	1.5*0.45mt		
18	15,000 vine per ha		
19	N:P:K - 50:50:50 g/vine		
20	FYM 25-50 kg/vine		
21	Ammonium sulphate of potash is best for betel vine		

	Transplanting		
22	Rooted seedlings should be transplanted near the base of standards or trees		
23	Arecanutpalm can be used for trailing standard		
24	Bamboo sticks can be used as trailing purpose		
25	<i>Erythrinasubumbrans</i> can be used for trailing purpose as it is resistant to some insects		
26	Trailing is done by tying the vines at intervals of 15-20cm along the standards		
27	Tying loosely with banana fibres		
28	Trailing is done every 15-20 days depending on the growth of vines		
	Transplanting types		
29	Paathi system		
33	Belagavi system		
31	Aalaguli system		
32	Gulikaluve and sasimadi system		
33	Kirupata system		
	Irrigation		
34	Frequent light irrigation should be given		
35	Standing water should not be remained for more than half an hour		
36	The best time for irrigation is morning and evening		
	Lowering of vines		
37	It has to done at least once in a year		
38	It is done during the month, August-September		
41	Before lowering all the leaves in the basal portion of the vines to a height of 15cm are removed		
42	Coil the vines and burry it in the ground leaving 60cm length of top shoot		
	Plant protection		
	Pest	Control measures	
43	Scale insects	Select scale-free vines.	
		Spray Chlorpyriphos 20 EC 2 ml/lit	
		Spray NSKE 5 % / Malathion 50 EC 1 ml/lit.	
44	Mites	Wettable sulphur 50 WP @ 1 g/lit	
		Dicofol 18.5 EC 0.5 ml/lit.	
45	Aphids	Chlorpyriphos at 2 ml/lit	

46	Mealy bugs	Chlorpyriphos 20 EC at 2 ml/lit		
		Dimethoate 30 EC 2ml/lit.		
		Concentrate the spray towards the collar region.		
	Diseases	Control measures		
47	Phytophthora Wilt	Remove the affected vines away from the garden and burn them.		
		Application of <i>Trichoderma viride</i> @ 5 g/vine.		
		During winter season avoid frequent irrigation.		
		Drench the seed vines for about 30 minutes in Streptocycline 500 ppm or Bordeaux mixture 0.5 %.		
48	Bacterial leaf spot, blight and bacterial stem rot	Spray Streptocycline @ 400 ppm + Bordeaux mixture @ 0.25%.		
		Always spray the chemical after plucking the leaves.		
49	Anthrachnose	Spray 0.2 % Ziram or 0.5% Bordeaux mixture		
50	Powdery mildew	spraying 0.2% Wettable sulphur after plucking the leaves		
Harvest				
51	Mature betel leaves are plucked by hand			
52	Leaves has to be plucked with portion of petiole			
53	Harvested leaves has to be washed and cleaned			
54	Leaves has to be graded according to size for marketing			

13.Constraints in relation to cultivation practices

Sl.No	Problems	Tick
1	Lack of technical guidance	
2	Lack of knowledge	
3	Traditional belief	
4	Lack of plant material for raising of wind breaks	
5	Non availability of skilled labour	
6	Pest and disease problem	
7	High cost of inputs	
8	Lack of capital	
9	Inadequate market facilities	
10	Non availability of packing material	