

**ADOPTION AND ISSUES FACED IN BAY LEAF CULTIVATION IN THE
NORTHERN REGION OF WEST BENGAL**

TITU DAS

Research Scholar, Department of Economics,
University of North Bengal

KANCHAN DATTA

Associate Professor, Department of Economics,
University of North Bengal

DOI: <https://doi.org/10.63452/IJAFSSR.2026.4207>

ABSTRACT

Bay leaf (*Cinnamomum tamala*), a moderate sized evergreen tree, holds significant culinary and medicinal value while also contributing to rural economic development. The present study aims to assess the level of adoption of bay leaf cultivation and to identify the major challenges faced by farmers in the North Bengal region. A total of 70 bay leaf cultivators were selected through multi-stage purposive sampling across three blocks of North Bengal. The study utilised chi-square tests to examine the association between farmers' characteristics and their engagement in bay leaf cultivation, while Problem Confrontation Index (PCI) and Adoption Quotient Index (AQI) were used to measure problem severity and adoption levels, respectively. Findings indicate that variables such as age, education, and farming experience were highly significant in influencing bay leaf cultivation practices. The most important problems identified were high input costs (PCI score 142) and the non-availability of hybrid seeds (PCI score 135), ranking first and second among reported constraints. Overall, the adoption level of bay leaf cultivation was found to be medium (AQI = 54.09). Among the three study blocks, Rajganj had the highest adoption score (AQI = 59.03), followed by Phansidewa (AQI = 55.89) and Chopra (AQI = 46.47). These findings underscore the need for appropriate government interventions to enhance the availability of essential agricultural inputs, such as fertilizers, pesticides, and quality hybrid seeds, to promote the expansion and sustainability of bay leaf cultivation in these areas. The study contributes valuable empirical evidence to support policy formulation for improving the livelihood prospects of rural farmers through strengthened bay leaf production systems.

KEYWORDS: - Bay leaf, Cultivation, Chopra, Phansidewa, Rajganj Block, Problem Confrontation Index, Adoption Quotient Index.

1.0 INTRODUCTION

The Indian agricultural sector is one of the world's largest and forming a vital pillar of the national economy and employment, with approximately 58% of the workforce engaged in agriculture, contributing 17% to 20% to India's GDP (Kotishwar, 2018; Manida & Nedumaran, 2020; Singh et al., 2020). Despite India's status as a major producer of rice, wheat, pulses, fruits, spices, and vegetables, nearly 86% of farmers own less than two hectares of land (Chakravorty et al., 2019). Spices, an essential component of Indian cuisine, are produced, consumed, and exported in vast quantities by India, accounting for 75% of global spice production and 48% of global spice trade (Divakaran et al., 2018), exporting mainly to the USA, UAE, China, UK, Germany, and Southeast Asia (Bhardwaj et al., 2011).

The genus *Cinnamomum*, belonging to the Lauraceae family, includes 270 species that occur naturally in Asia and Australia, of which about 20 species are found in India (CSIR, 1948). Among the spices, Indian bay leaf (*Cinnamomum tamala*), locally known as 'Tejpata', is a moderate-sized evergreen tree valued for its culinary, medicinal, and economic importance. The leaf paste has applications in treating leprosy (Doley et al., 2009) and inflammation (Billore et al., 2004). Nutritionally, the leaves and bark are rich in ash, dietary fiber, protein, fat, vitamins (ascorbic acid, niacin, trace amounts of riboflavin and folates), and minerals including calcium, magnesium, phosphorus, potassium, sodium, iron, and zinc. The essential oil profile of bay leaf features high cinnamaldehyde concentrations in both bark and leaves, alongside the leaf has significant eugenol content (Haider et al., 2018). Several morphological variants have been recognized, with variants I, II, and III yielding essential oils containing 68% to 82% eugenol, while variant V, classified under *C. sulphuratum*, is characterized by high linalool content (60.7%). The most desirable variant, IV, is distinguished by smaller leaves and is commonly found in Meghalaya and Assam's North Cachar Hills (Baruah, 1998). Because of linalool's industrial demand, particularly in fragrances and pharmaceuticals, Uttarakhand state has prioritized the cultivation and marketing of bay leaf (Bisht, 2020). With its significant medicinal and culinary value, demand for bay leaf continues to rise (Sharma & Nautiyal, 2011). Ecologically, bay leaf trees contribute important habitat for various birds and small mammals, thereby supporting natural regeneration (Sharma et al., 2009).

1.1 Historical Context:

Cinnamomum tamala (hence forth *C.tamala*), commonly known as Indian bay leaf or Tejpata, has been an integral part of Indian culture, medicine, and trade for over 3,000 years. Classical Ayurvedic texts such as the *Charaka Samhita* and *Sushruta Samhita* from the Vedic period documented their therapeutic uses, and their export as a valued spice continued through the medieval and Mughal periods. Between 500 BCE and 1500 CE, bay leaves were actively exported to the Middle East and Europe, aligning with India's renowned spice trade. Under

Mughal rule (1526–1757), their application extended to Mughal cuisine, perfumes, and herbal preparations, influenced by Persian practices. During British colonial rule (1757–1947), the commercial significance of bay leaves expanded further as European merchants recognized its economic value (Tripathy & Pandav, 2017).

In ancient Greece and Rome, crowns were fashioned from real bay leaves to honor distinguished individuals, including kings and Olympians. The modern term *baccalaureate*, as well as the title *poet laureate*, finds their origins in these ceremonial practices. The name itself is rooted in the Greek *kinnamomon* (“spice”), a term borrowed from Phoenicians engaged in early Eastern trade. The specific epithet, *tamala*, reflects a local Indian name for the plant (WinLexis, 2015).

Cinnamomum tamala Nees and Eberm, a tree-borne spice, is botanically classified within the Lauraceae family. In India, it is traditionally referred to by several names, including ‘Tejpat’, ‘Tejapatta’, and ‘Tamalpatra’ (Kirtikar & Basu, 1935). *Tamalpatra* is a Sanskrit term, translates to “dark leaf.” This species features prominently in Ayurvedic medicine, where it is a component of the formulation of *Vajraka Taila* (Ayurvedic Pharmacopoeia of India, 2001), which has been used for its effectiveness in managing *Vrana* (wounds) (Singh et al., 2017).

According to the *Bhavaprakasha*, the leaves of *C. tamala* (tamalpatra) are utilised in the preparation of *trijata*, a classical compound formulation that also incorporates *Cinnamomum zeylanicum* (dalchini) and *Elettaria cardamomum* (elaichi). *Trijata* serves as a key Ayurvedic ingredient in the production of *asava* and *arista*, which are known for their aromatic qualities as well as their capacity to stimulate appetite and aid digestion. Additionally, in various regions where *C. tamala* is cultivated, growers produce a traditional crude drug known as *nagkesara* from the immature, unripe fruits of this species (Vaidya, 1971).

C. tamala is commonly identified as Indian bay leaf, Tejpat, Tejapatta, Malabar leaf, Indian bark, Indian cassia, or Malabathrum are a tree in the family Lauraceae, indigenous to India, Bangladesh, Nepal, Bhutan, and China. Its natural habitat includes the valleys and hill regions of the subtropical Himalayas and the foothills of Himachal Pradesh, typically between 750–1800 meters in elevation, as well as warmer areas such as Kashi (Kumar & Duggal, 2019). The species exhibits a broad geographical distribution, extending from the Indus basin to Bhutan (Hooker, 1988).

1.2 Sapling Propagation

Bay leaf (*Cinnamomum tamala*) is traditionally cultivated as a homestead crop in the northeastern states of India and as part of agro forestry in other regions. Its natural regeneration occurs through seed dispersal facilitated by birds and forest-dwelling animals, which consume

the fruits and deposit seeds elsewhere, enabling growth in forested areas, where it was historically considered a forest product. However, with increasing recognition of their economic and medicinal importance, bay leaf trees are now widely cultivated.

Cultivation generally begins with seeds sown in nursery beds during July to September. Seedlings are then transferred into polythene bags containing a mixture of forest soil, farmyard manure, and sand in a 3:3:1 ratio, where they remain until adequately developed. These seedlings are later transplanted into fields at a spacing of 2.2×3.5 meters just before the monsoon (Rema et al., 2006). Excessive sunlight or complete shade increases seedling mortality (Khanal et al., 2021). In Uttarakhand, seeds dispersed by frugivorous animals frequently appear beneath mature trees, and nursery workers collect and transplant these tender seedlings into poly bags to encourage further growth. These are ready for field planting after two to three years, with market prices ranging between Rs. 5.00 and Rs. 8.00 per seedling (Kuniyal et al., 2013).

In Nepal's Palpa district, propagation is also achieved through stem cuttings from one-year-old branches collected between February and March. Healthy, mature branches are selected, cut diagonally into 10–15 cm pieces long and 1 to 2cm in diameter with sterile tools, treated with a rooting hormone (Rutex No. 3), and planted in nursery beds with a compost, sand, and soil mixture (1:1:2). These cuttings are buried diagonally with a node inside the soil and kept under shaded conditions. Root formation generally begins within 50–60 days, after which the seedlings are ready for monsoon-season transplantation (DFO Palpa, 2069/70).

Field visits in the study area indicate that bay leaf cultivation has shifted from a homestead to a commercial crop, with grafting now employed to produce quality planting material. Grafting involves removing bark from sections of mature branches, tying a soil-organic mixture with plastic during the monsoon, and allowing new shoots to develop over two to three months. Once the shoots sprout, they are detached and planted in nursery beds or the field. The initial investment per plant ranges from Rs. 6 to Rs. 7, with a selling price between Rs. 40 and Rs. 60 after 8 to 12 months when the saplings reach a height of 2–3 feet.



Nursery of Bay leaf saplings.

1.3 Cultivation System of Bay Leaf

Data on bay leaf productivity is limited. During 2018 to 2019, the estimated production of bay leaf was around 5,000 tons (Thomas et al., 2017), with key states including Meghalaya, which yields 30–70 kg per tree annually. Other bay leaf-producing states are Arunachal Pradesh, Uttarakhand, Himachal Pradesh, Assam, Meghalaya, Mizoram, Sikkim, and West Bengal. In West Bengal, the main growing as well as exporting place of the spice crop is Hemtabad in Uttar Dinajpur (Burman, 2025). Seedlings, permanently planted after 4–5 years at 3×2 m spacing, take time of 6 to 9 years to grow, and harvesting of leaves can be started at 8–10 years and continuing up to a century. Leaves are usually harvested annually from young trees and every other year from older ones, dried in the sun, and marketed (Baruah & Nath, 2002). For long-term sustainability, harvesting should be conducted without debarking of trees or damage to branches (Choudhary et al. 2014). Cultivation of bay leaf follows either a mixed system (intercropping with tea) or a single system (monoculture).

1.4 Mixed Cultivation System

Mixed cultivation, interchangeably termed intercropping or polyculture, involves the simultaneous cultivation of two or more crops within the same field (Lizarazo et al., 2020). Farmers who engage in seasonal monoculture often face periods of unemployment and food insecurity during the agricultural



Mixed Cultivation System (Tea and Bay leaf)

Off season, exacerbating vulnerability. In this context, mixed cultivation emerges as a highly advantageous strategy to enhance agricultural productivity, generate employment, strengthen farmers' economic conditions, and contribute to both export potential and nutritional security (Awasthi et al., 2005).

Field observations reveal that, under mixed cultivation systems, tea and bay leaf are frequently grown together, with tea serving as the primary crop and bay leaf as the secondary crop. The

space between bay leaf plants typically ranges from 5 to 6 meters. Since bay leaf is grown within established tea gardens, additional irrigation and fertilizer applications are generally unnecessary, with only pesticide treatments required to manage insect pests.

1.5 Single Cultivation System

Conversely, single cultivation, also referred to as monoculture or monocropping, is the practice of cultivating a single crop species on the same land year after year (Rana & Rana, 2011). Field observations indicate that in monoculture bay leaf plantations, plants are generally spaced 2 to 4 meters apart. Unlike mixed systems, monoculture requires routine soil preparation, consistent irrigation, fertilizer application, and regular pesticide use for better production.

1.6 Maintenance.

- Weeding: Regular removal of weeds to prevent competition for nutrients. This is repeated 4 -5 times, when the trees are 2 -3 years, but for the older plants, weeding is done every once a year.
- Pruning: Periodic trimming encourages healthy leaf growth. Cutting of old branches is usually done when the plants have attained a height of about 3- 5 mts.
- Irrigation: Supplemental watering is required in dry spells. Watered once a week after planting new seedlings. As the plant grows, the amount of watering is gradually reduced.
- Fertilizing: Organic fertilizers and mulching are applied for better growth.
- Insecticide/Pests: Very few diseases have been reported on Bay leaf cultivation. Cinnamon butterfly, different species of leaf miner, chafer beetle, gall mite and cinnamon shoot and leaf Webber are the important pests of bay leaf whereas major diseases include leaf spot and dieback, grey leaf spot and blight and bark canker (Rayetal. 2022). So, the use of pesticides is very important to protect the leaves of the tree.

2.0 REVIEW OF LITERATURE

Cinnamomum Tamala or Indian bay leaf or Bay leaf is a medium sized growing or planted tree (Kuniyal et al. 2013) and it is distributed in Eastern Asia, Indo-Malayan and the Pacific Islands (Brandis 1998). In Nepal, Bay leaf trees are extensively managed for leaf and bark production, and are used in production of essential drugs under Ayurvedic system. Bay leaf is one of the highly traded medical plants in Nepal and has received a priority for research and management as this species forms a major part of the non-timber forest products trade both by volume and economic value (DoF 2010). Leaves of Bay leaf are widely used in northern India as a spice for flavouring meats, sausages and sauces. The bark is also used as a spice for flavouring food. The leaves are used in place of battle leaf for pan making (Rema et al. 2009). Ayurveda describes the use of leaves of Bay leaf in the treatment of ailments such as anorexia, bladder, disorders, dryness of mouth, coryza, diarrhea, nausea and spermathea (Kapoor 2007). The Bay leaf leaves

are used as a natural antioxidant, even though it has been used as food and also folk medicine in India and China for the treatment of inflammation, gastritis, blood circulation, liver and spleen disorders (Lee & Balick, 2005). The leaves of Bay leaf have reportedly been used in birth control (Vedavathy et al. 1991). The pharmaceutical industry uses Bay leaf for the production of antiseptic, stimulant, carminative, diuretic, analgesic, counter irritant, deodorants, pesticides and insecticides (Pandey 1984, Kirtikar & Basu 1935).

There are five bioactive compounds were identified in Bay leaf these are coumarin, cinnamyl alcohol, cinnamic acid, cinnamaldehyde and cinnamyl acetate (Champati et al. 2024).

In Nepal's Palpa district, other farmers attracted to cultivate Bay leaf so as to get more profit. At the same time, Bay leaf farmers earn 15 times more than maize and millet. The cost benefit ratio of Bay leaf cultivation was 1:16 which was highly effective. In addition, employment opportunities for rural people will be one of the attractions of rural farmers. Employment levels will increase significantly by providing additional activities such as tree planting, protection, maintenance, coppicing, leaf collection, crop product processing and transportation to local markets. All these activities require labour almost year-round unlike maize and millet cultivation which are seasonal (Parajuli 1997). Smallholder farmers of projected village in Udayapur district of Nepal were trained in establishing Bay leaf nurseries, planting Bay leaf tree, improving them for sustainable harvesting and the quality of Bay leaf leaves by grading, storing, and packaging before selling it in the market. As a result, the households of project villages planted 75 percent more Bay leaf trees, produced 170 percent more Bay leaf leaves and sold more quality leaves at higher prices and as a result, per capita income and share of C.tamala income in total household income were increased compare to comparison village (Shah et al. 2018). Seven factors are influences to increasing income of the Bay leaf farmers like as High price, improved market access, collective marketing, increased demand of Bay leaf leaves, reduced supply of Bay leaf leaves, training and grading (Choudhary et al. 2014). On the other hand, if the domestic demand for Bay leaf leaves were increased slowly then the price of Bay leaf leaves would increase even if the export was stopped (Olsen, 1998). Comparison of selling crude Bay leaf and processed essential oil indicate that sale of essential oil gives a 22% increment in the net income than crude Bay leaf leaves (Pandit et al. 2004).

The quantification of adoption of Bay leaf cultivation has been done for each area in the form of a 'Adoption Quotient Index (AQI)'. The underscores AQI need for improving infrastructure to increase adoption which would in turn increase per hectare crop productivity (Jain et al. 2009). Several factors can influence the extent of adoption of agriculture practices, such as the characteristics of farming system, extension workers, professionals, socio-economic condition, biological, physical and psychological condition of farmers play an important role in adoption

(Farid et al. 2015). Many of the farmers have rich traditional knowledge, which is in compliance and also high cost of production, inputs and lack of subsidies for cultivating poses a great challenge for them (Biswas & Islam 2009). Problem Confrontation Index (PCI) was used to determine the extent of problem confrontation of the farmers which they face in managing their farming (Ahmed & Hossain 2005). Hence, if we are able to know the nature and extent of problems then it would be very helpful for farmers to cultivate their practices (Hossain et al. 2011).

From the study of many literatures on Bay leaf cultivation any authors had not mentioned or examined about my queries; what are the problems being confronted by the farmers in cultivating Bay leaf? what are the adoption level of Bay leaf cultivation? And what are the farmers selected characteristics that directly related to Bay leaf cultivation? in my study area Chopra, Phansidewa and Rajganj block. Those gaps that must be overcome if we addressed the problem which mostly the farmers face in cultivating Bay leaf, it is to be improved productivity and increased adoption of Bay leaf cultivation. Therefore, this study bears prime importance to systematically examine the relationship between socio-economic characteristics of the farmers and bay leaf cultivation and also determine the respondent's problem confrontation scores and adoption level of Bay leaf cultivation.

3.0 OBJECTIVE

In view of the issues as stated above, the following specific objectives were formulated for giving proper direction to the study:

- I. To understand the status of Bay leaf cultivation in these three blocks, Chopra, Phansidewa and Rajganj.
- II. To describe the selected socio-economic and demographic characteristics of the respondents practicing on Bay leaf cultivation.
- III. To measure the extent of problem confrontation in Bay leaf cultivation.
- IV. To assess the adoption level of Bay leaf cultivation

The main focus of the study was to gain a better understanding of adoption level of Bay leaf cultivation and what was the main problem they face in cultivating Bay leaf in these three blocks.

4.0 METHODOLOGY

4.1 Study area and data

The study area was selected on the basis of where the bay leaves are cultivated. Phansidewa, Chopra and Rajganj block in North Bengal are selected where the bay leaves are cultivated mostly. From these three blocks the primary data are collected from 70 bay leaf cultivators, 30

from Phansidewa block, 20 from Rajganj block and 20 from Chopra block by the face-to-face interviews to the farmers with the help of questionnaire. Survey was conducted by multi purposive sampling method.



Chopra block is located in Uttar Dinajpur district, Phansidewa block is located in Darjeeling district and Rajganj block is located in Jalpaiguri district in West Bengal, India.

4.2 Empirical framework of the study

Problem Confrontation Index (PCI).

The Problem Confrontation Index (PCI) is used to identify the problems for bay leaf cultivator to producing bay leaf. Problem confrontation with each constraint was assessed using a 4-point rating scale such as high, moderate, low and not at all and the weights for these responses were assigned as 3, 2, 1 and 0 respectively (Hoque and Usami, 2008). The problem confrontation score was obtained by adding the weights of the problem responses and it is range between 0 to 210, where 0 indicates no problem and 210 indicates highest problem. The mean value of the problems was calculated and a rank order of the problems was prepared based on the individual mean values (Mithun et al. 2018).

The Problem Confrontation Index (PCI) was calculated to generate the rank order (Rahman and Rahman 2014). PCI was calculated using the following formula:

$$PCI = (N \times 0) + (L \times 1) + (M \times 2) + (H \times 3)$$

Where, N for Not at all, L for Low, M for Moderate and H for High respectively.

After getting the value of PCI, the severity of the problem was calculated by following formula:

$$\text{Severity of the Problem} = \frac{\text{Observation Score of PCI}}{\text{Possible Score of PCI}} \times 100$$

Adoption Quotient Index.

Adoption quotient for an individual farmer was computed from the adoption scores gained by the farmer for the adoption a practice. On the basis of adoption quotient, the farmers are classified into three categories as per Sengupta (1967) that is, High adopters (above 67), Medium adopters (33.01 to 67), Low adopters (up to 33). According to the Afrad (2025), the Adoption Quotient (AQ) formula is presented as...

$$AQ = (T2/T3) \times (T1/T3) \times (A1/A2) \times 100$$

Where,

AQ = Adoption Quotient

T1 = Year since the practice under study was introduced.

T2 = Year since the user became aware of the practice.

T3 = Year since the practice was adopted by the user.

A1 = Actual area (Bigha) under the practice during the surveyed year.

A2 = Potential area (Bigha) under the practice under study during the surveyed year.

According to Singhal &Vatta (2017), Overall adoption level in the area was also worked out by calculating the arithmetic mean of the adoption quotient of all the respondents as bellow...

$$\text{Overall adoption Level} = \frac{\sum AQ}{N}, N = \text{Total Number of respondents.}$$

The independents variable, age of a respondent is measured in actual years, education in years of schooling, annual income in based on their total income in a year, family size is total number of family members, farm size is based on their total firm land(Bigha) used for Bay leaf cultivation by the respondent, farming experience based on the respondent's period of time engaged in agriculture. All selected characteristics of the respondents were measured by following standard procedure and then categorized and arranged in simple tables for interpretation and discussion. Number, range, percentage, mean and standard deviation were carried out for statistical description. Chi-square test and p-vale was used to hypothesis test of the relationship between selected characteristics of the respondents, problem confrontation and cultivation of Bay leaf. Throughout the study, at least five percent (0.05) level of probability was used.

The Null hypothesis (H_0) = There is no relationship between selected characteristics and cultivation of Bay Leaf.

The Alternative hypothesis (H_1) = There is relationship between selected characteristics and cultivation of Bay Leaf.

5.0 RESULTS AND DISCUSSION.

5.1 Socio-Economical and demographic Characteristics of By Leaf Cultivators:

According to table-1, the age of the respondents ranged from 20-70 years. The overall Mean and standard deviation of age are 44.59 and 10.46 respectively. The education level of the respondents ranged from 0-18 years of schooling. The overall Mean and standard deviation of education level are 9.26 and 4.37 respectively. The family size of the respondents ranged from 3-10 members of a family. The overall Mean and standard deviation of family size are 6.04 and 1.82 respectively. The annual family income of the respondents ranged from 1 Lakhs-4 Lakhs per year. The overall Mean and standard deviation of income level are 213514.29 and 98105.74 respectively. The farm size of the respondents ranged from 0.2 to 80 Bigha. The overall Mean and standard deviation of farm size are 6.63 and 13.38 respectively. The farming experience of the respondents ranged from 10 to 50 years. The overall Mean and standard deviation of farming experiences are 20.8 and 8.94 respectively. Here age, education and farming experience have positive significant relationship with respect cultivation of Bay leaf. Education was found significant positive effect on adoption level i.e. highly educated farmers were more knowledge on cultivation compared to the less educated and experienced farmer has vast knowledge about the management practices due to learning by doing. On the other hand, family size, annual family income and farm size do not have significant relation with cultivation of Bay leaf. This indicates that Bay leaf cultivation practices are not determined by family size, annual family income and farm size of the respondents.

Table 1: Distribution of respondents according to socio economic characteristics.

Characteristic s	Attribute	Respondents						Mean	SD	Chi-square	P-value
		Chopra		Phansidewa		Rajganj					
		N	%	N	%	N	%				
Age	<35	4	20	6	20	7	35	44.59	10.46	13.26	0.01
	36-55	8	40	21	70	13	65				
	>55	8	40	3	10	0	00				
Education (Illiterate=0, Secondary=6-10, High Secondary and above=12≤)	<8	6	30	4	13.3	1	5	9.26	4.37	9.50	0.04
	8-12	9	45	24	80	16	80				
	>12	5	25	2	6.7	3	15				

Family Size	<5	7	35	5	16.7	3	15	6.04	1.94	3.37	0.50
	5-8	11	55	22	73.3	14	70				
	>8	2	10	3	10	3	15				
Annual Family Income	<1,50,000	4	20	8	26.7	5	25	213514 .29	98105. 74	3.97	0.41
	1,50,000-3,00,000	9	45	18	60	12	60				
	>3,00,000	7	35	4	13.3	3	15				
Farm Size	<10	16	80	26	86.7	16	80	6.63	13.38	1.29	0.86
	10-20	3	15	2	6.7	2	10				
	>20	1	5	2	6.7	2	10				
Farming Experience	<15	2	10	2	6.7	6	30	20.8	8.94	12.63	0.01
	15-30	13	65	26	86.7	14	70				
	>30	5	25	2	6.7	0	0				

Source: Field Survey, 2025.

*Significance level at $P < 0.05$

5.2 Problematic characteristics of Bay Leaf cultivators.

Table 2: Distribution of respondents according to personal problematic characteristics

Characteristics	Attribute	Respondents						Mean	SD
		Chopra		Phansidewa		Rajganj			
		N	%	N	%	N	%		
Lack of Suitable land for bay leaf cultivation.	Not at all	13	65	17	56.7	8	40	0.56	0.67
	Low	6	30	9	30	10	50		
	Moderate	1	5	4	13.3	2	10		
	High	0	00	0	00	0	00		
Limited availability of saplings at farming level.	Not at all	9	45	13	43.3	6	30	1.16	1.16
	Low	5	25	8	26.7	4	20		
	Moderate	2	10	4	13.3	5	25		
	High	4	20	5	16.7	5	25		

Non-availability of Hybrid seed	Not at all	0	00	6	20	2	10	1.93	1.07
	Low	6	30	7	23.3	5	25		
	Moderate	5	25	6	20	4	20		
	High	9	45	11	36.7	9	45		
Higher input cost (Seed, Fertilizers, Pesticide)	Not at all	2	10	3	10	2	10	2.03	1.02
	Low	4	20	6	20	4	20		
	Moderate	6	30	8	26.7	5	25		
	High	8	40	13	43.3	9	45		
Non-availability of Credit.	Not at all	6	30	4	13.3	1	5	1.47	1.02
	Low	8	40	14	46.7	9	45		
	Moderate	1	5	6	20	5	25		
	High	5	25	6	20	5	25		
Lack of irrigation facility	Not at all	12	60	15	50	8	40	0.9	1.02
	Low	1	5	7	23.3	4	20		
	Moderate	4	20	7	23.3	7	35		
	High	3	15	1	3.3	1	5		
Labour problem or shortage of labour	Not at all	7	35	8	26.7	4	20	1.46	1.13
	Low	3	15	7	23.3	6	30		
	Moderate	5	25	9	30	5	25		
	High	5	25	6	20	5	25		
Lack of technical information.	Not at all	2	10	6	20	3	15	1.61	1.04
	Low	10	50	7	23.3	6	30		
	Moderate	4	20	9	30	5	25		
	High	4	20	8	26.7	6	30		
Poor knowledge of bay leaf cultivation.	Not at all	4	20	7	23.3	2	10	1.29	0.89
	Low	7	35	15	50	9	45		
	Moderate	6	30	7	23.3	6	30		
	High	3	15	1	3.3	3	15		
Harvesting complexity.	Not at all	7	35	10	33.3	8	40	0.94	0.90
	Low	8	40	13	43.3	8	40		
	Moderate	3	15	5	16.7	3	15		
	High	2	10	2	6.7	1	5		
Lack of suitable	Not at all	5	25	5	16.7	3	15		
	Low	6	30	10	33.3	7	35		

machine.	Moderate	7	35	9	30	6	30	1.47	0.99
	High	2	10	6	20	4	20		
Can not eat as food.	Not at all	14	70	15	50	8	40	0.61	0.80
	Low	5	25	12	40	10	50		
	Moderate	0	0	1	3.3	1	5		
	High	1	5	2	6.7	1	5		
Lack of storage facility at firm level.	Not at all	6	30	6	20	5	25	1.59	1.15
	Low	1	5	9	30	5	25		
	Moderate	6	30	6	20	6	30		
	High	7	35	9	30	4	20		
Lack of marketing facility.	Not at all	5	25	7	23.3	7	35	1.14	0.92
	Low	8	40	13	43.3	7	35		
	Moderate	5	25	8	26.7	4	20		
	High	2	10	2	6.7	2	10		
Lack of packaging facility.	Not at all	11	55	15	50	6	30	0.70	0.75
	Low	8	40	11	36.7	9	45		
	Moderate	1	5	4	13.3	4	20		
	High	0	00	0	00	1	5		
Lack of demand of bay leaf.	Not at all	9	45	10	33.3	5	25	0.97	0.82
	Low	4	20	12	40	8	40		
	Moderate	7	35	8	26.7	7	35		
	High	0	00	0	00	0	00		

Source: Field Survey, 2025.

5.3 Problem Confrontation Index (PCI) of Bay Leaf cultivators.

The Problem Confrontation Index (PCI) was calculated to determine the extent of confrontation in the rank order of individual problems. According to rank order table (Table 3), the Problem Confrontation Index (PCI) of 16 selected problems related to Bay leaf cultivation were ranged from 39 to 142 against a possible range of 0 to 210. The top three problems with the highest scores are described here. Data presented in the Table 3 indicated that the respondents of this study faced all the selected problems to different extent. The findings of the study suggested that the problems like Higher input cost (Seed, Fertilizers, Pesticide) ranked 1st and got the highest scored 142, Non-availability of Hybrid seed ranked 2nd and got scored 135 and the problem, lack

of technical information ranked 3rd and got scored 113. On the other hand, the problem concerning to lack of Suitable land for bay leaf cultivation was the lowest rank and got the least scored 39 in rank order table.

Table 3: Comparison among the 16 selected problems of the bay leaf cultivators with Problem Confrontation Index (PCI) and Rank Order.

SL No	Category of Problem	Extent of Problems				PCI Score	Severity %	Rank
		Not at all (0)	Low (1)	Mod e-rate (2)	High (3)			
1.	Lack of Suitable land for bay leaf cultivation.	38	25	7	00	39	18.57	16 th
2.	Limited availability of saplings at farming level.	28	17	11	14	81	38.57	8 th
3.	Non-availability of Hybrid seed.	8	18	15	29	135	64.29	2 th
4.	Higher input cost (Seed, Fertilizers, Pesticide).	7	14	19	30	142	67.62	1 th
5.	Non-availability of Credit.	11	31	12	16	103	49.05	6 th
6.	Lack of irrigation facility.	35	12	18	5	63	30.00	13 th
7.	Labour problem or shortage of labour	19	16	19	16	102	48.57	7 th
8.	Lack of technical information.	11	23	18	18	113	53.81	3 rd
9.	Poor knowledge of bay leaf cultivation.	13	31	19	7	90	42.86	8 th
10.	Harvesting complexity.	25	29	11	5	66	31.43	12 th
11.	Lack of suitable machine.	13	23	22	12	103	49.05	5 th
12.	Can not eat as food.	37	27	2	4	43	20.48	15 th
13.	Lack of storage facility at firm level.	17	15	18	20	111	52.86	4 th
14.	Lack of marketing facility.	19	28	9	1	80	38.10	10 th
15.	Lack of packaging facility.	32	28	9	1	49	23.33	14 th
16.	Lack of demand of bay leaf.	24	24	22	0	68	32.38	11 th

Source: Field Survey, 2025.

5.5 Adoption of Bay Leaf Cultivation.

According to Table 4, indicated that the majority 72.86 percent of the farmers have medium level of adoption of Bay leaf cultivation compared to 20 percent having high level adoption while 7.14 percent had low level of adoption. The mean value and standard deviation of adoption level of

bay leaf cultivation were 54.09 and 17.97 respectively. It means, in this area where adoption score for Bay leaf cultivation was 54.09.

Table 4: Overall Adoption level of Bay Leaf cultivators.

Adoption Categories	Respondents		Mean	SD
	N	%		
Low (<33)	05	7.14	54.09	17.97
Medium (33.01-67)	51	72.86		
High (>67)	14	20		
Total	70	100	AQ = 54.09	

Source: Field Survey, 2025.

From Table 5, data revealed that adoption of Bay leaf cultivation in Rajganj block (with AQ = 59.03) was high compare to Phansidewa block (with AQ = 55.89) and Chopra block (with AQ = 46.47). It means the respondents of Rajganj block was very interested to cultivating Bay leaf followed by Phansidewa and Chopra block.

Table 5: Comparing of respondents Adoption of Bay Leaf cultivation according to their area.

Adoption Categories	Chopra				Phansidewa				Rajganj			
	N	%	Mean	SD	N	%	Mean	SD	N	%	Mean	SD
Low (<33)	03	15	46.47	17.49	02	6.67	55.89	16.65	00	00	59.03	18.76
Medium (33.01-67)	14	70			22	73.33			15	75		
High (>67)	03	15			06	20			05	25		
Total	20	100			30	100			20	100		

Source: Field Survey, 2025.

6.0 CONCLUSION

The study has focused to estimate the adoption level of Bay leaf cultivation by Adoption Quotient Index (AQI) and also estimated the rank order of problem which the cultivators faced to cultivate Bay leaf in these area by Problem Confrontation Index (PCI). Chi-square test was selected to test significant level of respondent’s characteristics. Here, Age, Education and Farming experiences of farmers were highly significant to Bay leaf cultivation. AQI find out

medium type of adoption level of Bay leaf cultivation of farmers. Between these three blocks Rajganj has dominated by the high adoption quotient score. It means the famers of Rajganj block have increased Bay leaf cultivation than other two blocks. According to PCI, higher input cost and non-availability of hybrid seed are the main problem of Bay leaf cultivation which are ranked 1st and 2nd respectively.

In addition to the problems mentioned above, many other problems seen during field visits, such as: low maintenance, climate sensitivity, leaf spot diseases or fungal infections, slow growth, drainage issues, improper harvesting, lack of organized marketing, lack of government initiatives and also lack of proper training which have become obstacles bay leaf cultivation process in this area. If they can get rid of these problems, its cultivation will continue to increases because there are many opportunities of cultivating bay leaves, such as: growing global demand for its culinary and medical purposes, require low inputs compared to other crops, can be earned income for longer period of time compared to other crops, sustainable agriculture initiatives, research and innovation potential and also bay leaf cultivation can help create employment opportunities for rural populations. So, here are some suggested government policies that can help solve the problems of bay leaf cultivation, such as:

- I. Established dedicated agricultural research programs for bay leaf cultivation.
- II. Develop improved, high-yield, disease-resistant bay leaf varieties.
- III. Promote research on pest control, organic farming methods and post-harvest technology.
- IV. Organize regular training programs and provide helpline support for farmers.
- V. Offer input subsidies to the farmers for bay leaf cultivation practices.
- VI. Provide low interest loans or credit facilities for small and marginal farmers.
- VII. Lunch crop insurance schemes to mitigate risks from natural disasters or price fluctuations.
- VIII. Develop storage and cold chain infrastructure to reduce post-harvest losses.
- IX. Improve rural transportation and logistics to connect farmers to markets.
- X. Encourage private sector investment in bay leaf processing, packaging and export and
- XI. Establish a task force for continuous monitoring of bay leaf sector development.

REFERENCES

- 1) Afrad, M. S. I., Islam, M. A., & Halim, A. (2025). Kaliganj Upazila under Lalmonirhat. Development Cooperation between India and Neighbouring Countries: Possibilities and Challenges, 27.
- 2) Ahmed, H. M. M., & Hossain, M. A. (2005). Problem confrontation of the smallholder farmers in managing goat. Journal of the Bangladesh Agricultural University, 3(2), 265-270.

- 3) Ayurvedic Pharmacopoeia of India (2001), Department of Ayush, Ministry of Health and Family Welfare, Govt. of India.
- 4) Baruah, A. 1998. Cinnamomum species associated with the livelihood of people in north-east India: a systematic census with emphasis to ethnobotany. Ph. D. Thesis. RRL, Jorhat.
- 5) Baruah, A., Nath, S.C. and Boissya, C.L. (2000)'Systematics and diversities of Cinnamomum species used as "Bay leaf" in Northeast India. J. Econ. Tax. Bot.
- 6) Bhardwaj, R. K., Sikka, B. K., Singh, A., Sharma, M. L., Singh, N. K., & Arya, R. (2011, March). Challenges and constraints of marketing and export of Indian spices in India. In Proc. International conference on technology and business management (pp. 28-30).
- 7) Bibhuti Bhusan Champati, Prabhat Kumar Das, Chiranjibi Sahoo, Asit Ray, Sudipta Jena, Ambika Sahoo, Sanghamitra Nayak, Swaran Lata, Pratap Chandra Panda. (2024). Chemical fingerprinting and multicomponent quantitative analysis for quality control of Cinnamomum tamala collected from Western Himalaya by HPLC-DAD. Heliyon.
- 8) Billore, K. V.; Yelne, M. B.; Dennis, T. J.; Chaudhari, B. G (2004). Data Base of Medicinal Plants in Ayurveda Used in Ayurveda, Central Council of Research in Ayurveda and Siddha, Department of Ayush, Ministry of Health and Family Welfare, Govt. of India.
- 9) Bisht, V.K (2020). Cinnamomum tamala (Buch.-ham.) T. Nees and Eberm.: an alternative source of natural linalool. Natl Acad Sci Lett.
- 10) Biswas, S., & Islam, M. M. (2019). Farmers' problem confrontation in organic farming at Magura Sadar upazila of Bangladesh. South Asian Journal of Agriculture, 19-24.
- 11) Chakravorty, S., Chandrasekhar, S., & Naraparaju, K. (2019). Land distribution, income generation and inequality in India's agricultural sector. Review of Income and Wealth, 65, S182-S203.
- 12) Chandra P. Kuniyal, Vineet Purohit, Jitendra S. Butola, Rakesh C. Sundriyal. (2013). Do the Seeds Plump and Storage Time Affects Seedlings Emergence in the Indian Bay Leaf (Cinnamomum Tamala) ? The National Academy of Science, India.
- 13) Choudhary, D., B. H. Pandit, S. P. Kala, N. P. Todaria, S. Dasgupta, and M. Kollmair. (2014). "Upgrading Bay Leaf Farmers in Value Chains – Strategies for Improving Livelihoods and Poverty Reduction from Udayapur District of Nepal." Society and Natural Resources.
- 14) CSIR, D. K. (1948). The wealth of India. Council of Scientific and Industrial Research, New Delhi.
- 15) Divakaran, M., Jayasree, E., Nirmal Babu, K., & Peter, K. V. (2018). Legacy of Indian spices: its production and processing. In Indian Spices: The Legacy, Production and Processing of India's Treasured Export (pp. 13-30). Cham: Springer International Publishing.
- 16) DoF. Hamro Ban. Extention division. Babarmahal, Kathmandu; 2010 [in Nepali].

- 17) Doley, B.; Gajurel, P. R.; Rethy, P.; Singh, B.; Hazarika, H (2009). Ethnomedicinal Uses of Different Species of *Cinnamomum Schaeffer* (Lauraceae) by Ethnic Communities in Arunachal Pradesh, India. *Pleione*.
- 18) Farid, K. S., Tanny, N. Z., & Sarma, P. K. (2015). Factors affecting adoption of improved farm practices by the farmers of Northern Bangladesh. *Journal of the Bangladesh Agricultural University*, 13(2), 291-298.
- 19) Ghulam Mahammad Shah, Apsara Karki Nepal, Golam Rasul, Farid Ahmad. (2018.). Value chain development of bay leaf in Nepal: an impact assessment. *Journal of Development Effectiveness*.
- 20) Gooderham, N. J., Cohen, S. M., Eisenbrand, G., Fukushima, S., Guengerich, F. P., Hecht, S. S., ... & Taylor, S. V. (2020). FEMA GRAS assessment of natural flavor complexes: Clove, cinnamon leaf and West Indian Bay leaf-derived flavoring ingredients. *Food and Chemical Toxicology*.
- 21) Hooker, J. D. (1888). *The Flora of British India*. Vol. V. Bishen Singh Mahendra Pal Singh, Dehra Dun (India).
- 22) Hoque, M. J., & Usami, K. (2008). Effects of training on skill development of agricultural extension workers in Bangladesh: a case study in four upazilas (sub-district) under Kishoreganj District. *Journal of Social Sciences*, 4(1), 21-28.
- 23) Hossain, K. Z., Rayhan, S. J., Arif, M. N., & Rahman, M. M. (2011). Farmers' problem confrontation towards seed potato production. *Dev. Ctry. Stud*, 1, 27-33.
- 24) Jain, R., Arora, A., & Raju, S. S. (2009). A novel adoption index of selected agricultural technologies: Linkages with infrastructure and productivity. *Agricultural Economics Research Review*, 22(1), 109-120.
- 25) Kapoor, I. P. S., Singh, B. and Singh, G. (2007). Essential oil and oleoresins of *Cinnamomum tamala* (Bay leaf) as natural food preservatives for pineapple fruit juice. *Journal of Food Processing & Preservation*.
- 26) Kirtikar, K. R.; Basu, B. D (1935). International Book Distributors, Dehradun, India. *Indian Med. Plant. Lauraceae*.
- 27) Kotishwar, A. (2018). A Study on Role of Agriculture in Indian Economy. *Journal of Economic Policy and Research*, 13(2), 37-46.
- 28) Kumar, G. and Duggal, S. (2019). Ethnomedicinal Diversity of Aromatic Plants in Foot Hill Regions of Himachal Pradesh, India. *International Journal of Theoretical and Applied Sciences*.
- 29) Kuniyal C.P, Purohit V, Butola JS, Sundriyal RC (2013) Do the seeds pulp and storage time affects seedling emergence in the Indian Bay Leaf (*Cinnamomum tamala*)? *Natl Acad Sci Lett*.
- 30) Kuniyal CP, Kuniyal PC, Butola JS, Sundriyal RC (2013) Trends in the marketing of some important medicinal plants in Uttarakhand, India. *Int J Biodivers Sci Ecosyst Serv Manag*.

- 31) Kuniyal, C.P, Bisht, V.K (2015) Impact of facilitation on marketing of Bay leaf (*Cinnamomum tamala*) from non-timber forest areas in Uttarakhand, Western Himalaya. *Natl Acad Sci Lett*.
- 32) Lamichhane, D. and Karna, N.K. (2010) 'Harvesting Methods of *Cinnamomum Tamala* Leaves in Private Land: A case study from Udayapur district, Nepal', *Banko Janakari* 19(2).
- 33) Lee, R., & Balick, M. J. (2005). Sweet wood — Cinnamon and its importance as a spice and medicine. *Explore: The Journal of Science and Healing*.
- 34) Lizarazo, C. I., Tuulos, A., Jokela, V., & Mäkelä, P. S. (2020). Sustainable mixed cropping systems for the boreal-nemoral region. *Frontiers in sustainable food systems*, 4, 103.
- 35) Manida, M., & Nedumaran, D. G. (2020). Agriculture in India: Information about Indian agriculture & its importance. SSRN.
- 36) Mithun, M. N. A. S., Hoque, M. J., & Rahman, M. H. (2018). Problem Confrontation in Participating Professional Trainings by the Sub Assistant Agriculture Officers. *Bangladesh Journal of Extension Education* ISSN, 1011, 3916.
- 37) O.P. Awasthi, J. Singh, P.L. Saroj. (2005). Yield and Economics of Mango Based Multi Species Cropping System in Bastar Plateau of Chattisgarh. *Indian Journal of Agroforestry*.
- 38) Olsen CS. 1998. The trade in medicinal and aromatic plants from central Nepal to northern India. *Econ Bot*.
- 39) Olsen, C.S. and Helles, F. (1997) 'Medicinal Plants, Markets, and Margins in the Nepal Himalaya: Trouble in paradise', *Mountain Research and Development*.
- 40) Pandey, B. P. 1984. *Economic Botany*. S. Chand and Company Ltd, New Delhi.
- 41) Pandit, BH; Thapa, GB; Zoebisch, M (2004). "Prospects of marketing cinnamon tree products in Palpa district of Nepal". Paper presented at an International Agroforestry Workshop organised by Hanoi Agricultural University, 21-24 February 2004, Hanoi, Vietnam.
- 42) Parajuli D. P, (1997) "Cultivation of *Cinnamomum tamala* on marginal lands for greater income at Palpa district," *Banko Janakari*.
- 43) Rahman, M. H., & Rahman, M. Z. (2014). Problems Faced by the Coastal People in Biodiversity Conservation and Management Activities in St. Martin's Island, Bangladesh. *Bangladesh Journal of Extension Education*, 26(1&2), 11-17.
- 44) Rana, S. S., & Rana, M. C. (2011). Cropping system. Department of Agronomy, College of Agriculture, CSK Himachal Pradesh Krishi Vishwavidyalaya, Palampur, 80.
- 45) Ranatunga, J., Senanayake, U. M., & Wijesekera, R. O. B. (2003). Cultivation and management of cinnamon. In *Cinnamon and Cassia* (pp. 137-145). CRC Press.
- 46) Ray, S., Sharma, D., & Banerjee, A. *Indian Bay Leaf (Cinnamomum tamala)–How to Protect the Tree Spice from the Ravages of Insect Pests and Diseases*.

- 47) Rema J, Leela NK, Krishnamoorthy B and Mathew PA (2005). Chemical composition of Cinnamomum tamala essential oil – a review. *Journal of Medicinal and Aromatic Plant Sciences*.
- 48) Rema, J., Leela, N. K., Jacob, T. K., & Krishnamoorthy, B. (2006). Cinnamon and Indian Cassia.
- 49) S. Khanal, B. K. Tiwari, L. Goutam. (2021). Assessment of Cinnamomum tamala (Bay leaf) Plantation in Community Forests: A case Study from Tanahun District. *International Journal of Forestry Research*.
- 50) S. Zafar Haider, Hema Lohani, Ujjwal Bhandari, Gaurav Naik & Nirpendra. (2018). Nutritional Value and Volatile Composition of Leaf and Bark of Cinnamomum tamala from Uttarakhand (India). *Journal of Essential Oil Bearing Plants*.
- 51) Sengupta, T. A. 1967. simple adoption scale for farmers for high yielding varieties of paddy. *Indian Jour. of Exten.Edu.*, 3: 107–115.
- 52) Sharma G, Nautiyal A.R, (2011). “Cinnamomum tamala: a valuable tree of Himalayas,” *International Journal of Medicinal and Aromatic Plants*.
- 53) Sharma G, Nautiyal BP, Nautiyal AR (2009) Seedling emergence and survival in Cinnamomum tamala under varying micro-habitat conditions: conservation implications. *Trop Ecol*.
- 54) Sharma, G., Nautiyal, B. P., & Nautiyal, A. R. (2009). Seedling emergence and survival in Cinnamomum tamala under varying micro-habitat conditions: conservation implications. *Tropical Ecology*, 50(1), 201-209.
- 55) Singh, A. K., Upadhyaya, A., Kumari, S., Sundaram, P. K., & Jeet, P. (2020). Role of Agriculture in making India \$5 trillion Economy under Corona Pandemic Circumstance: Role of agriculture in Indian economy. *Journal of AgriSearch*, 7(2).
- 56) Singh, R.; Priya, U.; Purvya, M. C (2017). Role of Vajraka Taila in the Management of Vrana. *J. Ayurveda Integr. Med. Sci*.
- 57) Singhal, S., & Vatta, L. (2017). Impact of Krishi Vigyan Kendra on adoption of improved agricultural production practices. *International Journal of Science, Environment and Technology*, 6(2), 993-1000.
- 58) Thomas, L., Bhat, A., Cheriyan, H., & Nirmal Babu, K. (2017). Value chain development and technology practices of spices crop in India (cardamom, ginger, turmeric, black pepper and cinnamon). Challenges and opportunities in value chain of spices in south Asia. Dhaka (Bangladesh): SAARC Agriculture Centre, Indian Institute of Spices Research, 56-115.
- 59) Tripathy, P., & Pandav, A. K. (2017). Bay Leaf. In *Vegetable Crop Science* (pp. 1009-1022). CRC Press.
- 60) Vaidya, B. G. (1971). Some controversial drugs of Indian medicine II. *Journal of Research and Education in Indian Medicine*.

- 61) Vedavathy, S., Rao, K. N., Rajaish, M. and Nagaraju, N. 1991. Folklore information from Royalaseema Region, Andhra Pradesh for family planning and birth control. Int. J. Pharmacognosy.

Online Database

- 1) [Cinnamomum tamala - Wikipedia](#)
- 2) DFO Palpa, 2069/70. Bay leaf ek chinari, Publication from District Forest Office Palpa.
- 3) <https://thebetterindia.com/427053/bay-leaves-cultivation-farmers-west-bengal-india>.