

**DOCUMENTATION OF NON TIMBER FOREST
PRODUCT COLLECTION, PROCESSING AND
VALUE ADDITION OF NARAYNPUR FOREST AREA
OF CHHATTISGARH**

M.Sc. (Forestry) Thesis

By

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**DEPARTMENT OF FORESTRY
COLLEGE OF AGRICULTURE
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INDIRA GANDHI KRISHI VISHWAVIDYALAYA
RAIPUR (C.G.)**

2017

**DOCUMENTATION OF NON TIMBER FOREST
PRODUCT COLLECTION, PROCESSING AND
VALUE ADDITION OF NARAYANPUR FOREST
AREA OF CHHATTISGARH**

Thesis

Submitted to the

Indira Gandhi Krishi Vishwavidyalaya, Raipur

by

Ramesh Kumar Dhurwe

**IN PARTIAL FULFILMENT OF THE REQUIREMENTS
FOR THE DEGREE OF**

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In

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CERTIFICATE - I

This is to certify that the thesis entitled "**Documentation of Non Timber Forest Product Collection, Processing and Value Addition of Narayanpur forest area of Chhattisgarh**" submitted in partial fulfillment of the requirements for the degree of "**Master of Science in Forestry**" of the **Indira Gandhi Krishi Vishwavidyalaya, Raipur**, is a record of the bonafide research work carried out by **Ramesh Kumar Dhurwe** under my guidance and supervision. The subject of the thesis has been approved by the Student's Advisory Committee and the Director of Instructions.

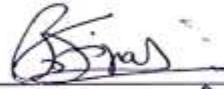
No part of the thesis has been submitted for any other degree or diploma or has been published/published part has been fully acknowledged. All the assistance and help received during the course of the investigations have been duly acknowledged by him.


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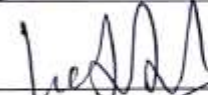
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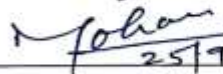
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CERTIFICATE - II

This is to certify that the thesis entitled “**Documentation of Non Timber Forest Product Collection, Processing and Value Addition of Narayanpur forest area of Chhattisgarh**” submitted by **Ramesh Kumar Dhurwe** to the Indira Gandhi Krishi Vishwavidyalaya, Raipur, in partial fulfilment of the requirements for the degree of **Master of Science** in the **Department of Forestry** has been approved by the external examiner and Student’s Advisory Committee after oral examination.

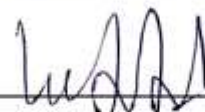

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Ramesh Kumar Dhurwe

Date 5/10/2017

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LIST OF ABBREVIATIONS/NOTATIONS

%	Percentage
<i>et al.</i>	And others
⁰ C	Degree Celsius
@	At the rate of
NWFP	Non Wood Forest Products
MFP	Minor Forest Products
FAO	Food and Agriculture Organization
No.	Number
q. ha ⁻¹	Quintals per hectare
Ha	Hectare
Kg	Kilogram (s)
Kg/yr	Kilogram per year
Fig.	Figure
i.e.	That is
Viz.	Namely
M	Male
F	Female
ST	Schedule tribe
SC	Schedule cast
&	and
cm	Centimeter
Mm	Millimeter
P	Population
H	Household
LIT	Literate
IL	Illiterate
IVI	Importance Value Index
BA	Basal Area
RF	Relative Frequency
RD	Relative Density
RBA	Relative Basal Area

THESIS ABSTRACT

- a. Title of the Thesis : "Documentation of Non Timber Forest Product Collection, Processing and Value Addition of Narayanpur Forest Area of Chhattisgarh"
- b. Full Name of the Student : Ramesh Kumar Dhurwe
- c. Major Subject : Forestry
- d. Name and Address of the Major Advisor : Dr. R. K. Prajapati, Professor, Department of Forestry, College of Agriculture, IGKV, Raipur (C.G.)
- e. Degree to be awarded : M.Sc. Forestry


Signature of Major Advisor


Signature of student

Date: 3/10/2017


Signature of Head of Department

ABSTRACT

The Study entitled "Documentation of Non Timber Forest Product Collection, Processing and Value Addition of Narayanpur Forest Area of Chhattisgarh" was carried out in two blocks namely Narayanpur block- Chhotedongar, Benoor, Bharanda and Orchha block- Orchha, Gudadi, Basing site Narayanpur, district of Chhattisgarh.

The study reveal that the Gond, Abujhmaria, Dandami Maria and Halba are the four major tribes dominating in the study area. Forest and tribals are mutually dependant on each other. The social and economic status of the people was very poor. The overall literacy percentage found in the study area was 42.95%. Tribals like to live in forest. The livelihood of tribes totally depends on forest in which

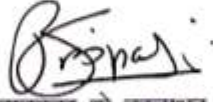
NTFPs and agriculture are the main source of their income. They also engaged in different occupation viz. Bani, Mazdoori and Rozgar Guaranty Yozna. The productions of agriculture crops were also low due to traditional cropping practice and lack of irrigation facilities. Most of the Tribals now practice some sort of settled agriculture; only those living in interior hill ranges such as the Marias of Abujhmar still do shifting cultivation. In the studied area all the types of farmer was found *i.e* landless, marginal, small and medium farmer respectively. Landless farmer was found in the Narayanpur block. The marginal farmer had 3.46 acre in the study area. A total of 45 NTFPs were marketed and catalogued from four different markets Narayanpur, Chhotedongar, Benoor and Orchha. The honey and tikhur fetches highest market rate Rs. 250-200 /kg. The contribution of NTFPs in household economy varied from Rs 14065.75-29514.75. Women play major role in the NTFPs collection. The percentage of women in NTFPs was recorded 47.69 % in all the study sites. The 112 NTFPs species were documented which constituted to 47 trees, 29 shrubs, 12 herbs 22 climber and 1 bamboo and one cane species. A variety of NTFPs *viz*, seeds, leaves used for plate making, Tans and Dyes, Gum and Resin, edible products, Oil yielding, Bamboo, Fiber, and Broom making, Medicinal plants and Biocides (fungicidal, insecticidal and nematicidal) were identified. The collection, processing and value addition of NTFPs were carried out by traditional crude method. The villagers collected NTFPs like leaves, flowers, seeds, fruits, bark, stem, fiber root and rhizomes for their livelihood in unsustainable ways because of this the regeneration of species is badly affected.

The phytosociological studies of the sites were conducted for tree, shrubs, climber and herbs species, using random sampling method through laying quadrats 10×10 m² (tree), 5X5 m² (shrub) and 1X1 m² (herb) to calculate their the Density, Frequency, Basal Area and Importance Value Index of the study sites. *Curculigo orchioides* (herb and climber) have highest importance value index (235.54) which was found in Gudadi site and *Costus speciosus* (herbs) have lowest importance value index (1.21) which was found in Orchha site. Total frequency for shrubs (820%) was found maximum in Chhotedongar site and maximum density of Shrubs was found in *Desmodium gangeticum* (1250 stem/ha) shrub species at Orchha site. Total frequency for trees was found maximum (840%) in Orchha site

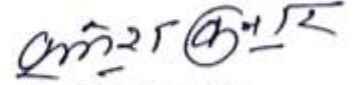
and lowest frequency was found (560%) in Chhotedongar site. *Shorea robusta* (tree) have maximum density (840 stem/ha) in Gudadi site. Total basal area were highest (53.08 m²/ha) in Orchha site and lowest (23.60 m²/ha) in Basing site.

शोध सारांश

- क. शोध का शीर्षक : "छत्तीसगढ़ के नारायणपुर वन क्षेत्र में अकाष्ठकीय वन उत्पादों का संग्रहण, प्रसंस्करण तथा मूल्य संवर्धन का दस्तावेजीकरण।"
- ख. छात्र का नाम : रमेश कुमार धुर्वे
- ग. प्रमुख विषय : वानिकी
- घ. प्रमुख सलाहकार का नाम व पता : डॉ. आर. के. प्रजापति, प्राध्यापक, वानिकी विभाग, इंदिरा गांधी कृषि विश्वविद्यालय, रायपुर, (छ.ग.)
- ड. प्रदान की जाने वाली उपाधि : एम.एस.सी. वानिकी



प्रमुख सलाहकार के हस्ताक्षर



विद्यार्थी का हस्ताक्षर

दिनांक: 31/10/17



विभागाध्यक्ष के हस्ताक्षर

सारांश

"छत्तीसगढ़ के नारायणपुर वन क्षेत्र में अकाष्ठकीय वन उत्पादों का संग्रहण, प्रसंस्करण तथा मूल्य संवर्धन के दस्तावेजीकरण" का अध्ययन किया गया। यह अध्ययन छत्तीसगढ़ नारायणपुर जिला के नारायणपुर ब्लाक के अंतर्गत छोटेडोंगर, बेनुर, भरण्डा क्षेत्र व ओरछा ब्लाक के अंतर्गत ओरछा, गुदाडी व बासिंग क्षेत्र में किया गया।

अध्ययन से पता चलता है कि गोंड, अबुझमाडिया, दंडामी माडिया और हल्वा चार प्रमुख जनजातियाँ हैं जो इस क्षेत्र में मुख्य रूप से पायी जाती हैं। वन और आदिवासी एक दूसरे पर परस्पर निर्भर रहते हैं। इस क्षेत्र में लोगों की सामाजिक और आर्थिक स्थिति बहुत खराब थी। अध्ययन क्षेत्र में कुल साक्षरता 42.95 प्रतिशत था। आदिवासी जंगल में रहना

दूसरे पर परस्पर निर्भर रहते हैं। इस क्षेत्र में लोगों की सामाजिक और आर्थिक स्थिति बहुत खराब थी। अध्ययन क्षेत्र में कुल साक्षरता 42.95 प्रतिशत था। आदिवासी जंगल में रहना पसंद करते हैं और इन जनजातियों की आजीविका पूरी तरह वन पर निर्भर करती है और इनकी आय का मुख्य स्रोत अकाष्ठकीय वनोपज व कृषि हैं। वे विभिन्न व्यवसायों जैसे - बनी, मजदूरी और रोजगार गारंटी योजना में भी संलग्न थे। पारंपरिक षस्य क्रियाओं और सिंचाई सुविधाओं की कमी के कारण कृषि फसलों का उत्पादन भी कम था। अधिकांश जनजातीय अब कुछ प्रकार के स्थायित्व वाली कृषि क्रियाएँ करते हैं केवल माडिया जनजाति जो अबुझमाड के पहाडी क्षेत्रों में रहते हैं वे ही अब भी झूमिंग (पेंदा) खेती करते हैं। अध्ययन क्षेत्र में भूमिहीन, सीमांत, छोटे और मध्यम सभी प्रकार के किसान पाये गये। भूमिहीन किसान नारायणपुर ब्लाक में पाया गया। अध्ययन क्षेत्र में सीमांत किसान कुल रकबा 3.46 एकड़ था। कुल 45 एनटीएफपी को चार अलग-अलग बाजारों जैसे नारायणपुर, छोटेडोंगर, बेनूर व ओरछा से सूचीबद्ध किया गया। उस क्षेत्र में सर्वाधिक बाजार दर 200 - 250 रु. प्रति किग्रा षहद व तिखुर के लिए दर्ज किया गया। घरेलू अर्थव्यवस्था में अकाष्ठकीय वनोपज का योगदान 14065.75 - 29514.75 रूपया था। अकाष्ठकीय वनोपज संग्रहण में महिलाएं प्रमुख भूमिका निभाती हैं सभी अध्ययन स्थलों में अकाष्ठकीय वनोपज संग्रहण में महिलाओं का 47.69% दर्ज किया गया। कुल 112 अकाष्ठकीय वनोपज प्रजातियों का दस्तावेजीकरण किया गया। जिसमें 47 वृक्षों, 29 झाड़ियों, 12 जड़ी-बूटियों 22 बेल प्रजातियों और 1 बांस व बेथ प्रजातियों थी। विभिन्न प्रकार के अकाष्ठकीय वनोपज जैसे दोना-पत्तल बनाने, टैन्स, रंजक, गोंद, राल, खाद्य उत्पादों, तेल उपज, बॉस, रेषा, पेय प्रदार्थ व झाड़ू बनाने, औषधीय पौधों और जीवनाषक (फफुंद संबंधी, कीटनाशक और कृमिनाषक) के लिए इस्तेमाल किए जाने वाली पत्तियों की पहचान की गई। अकाष्ठकीय वनोपज का संग्रहण, प्रसंस्करण और मूल्य संवर्धन पारंपरिक अपरिष्कृत विधि द्वारा किया जाता है। ग्रामीणों द्वारा अवैज्ञानिक विधियों के प्रयोग द्वारा पौध पुनरुत्पादन को बुरी तरह से प्रभावित करते हुए अपनी आजीविका के लिए अकाष्ठकीय वनोपज जैसे फूल, पत्ती, बीज, फलों, छाल, तना, रेषा और राइजोम एकत्रित करते हैं।

अध्ययन क्षेत्र में पौध समूहों के अध्ययन के लिए यादृच्छिक नमूना विधि का उपयोग किया गया। जिसमें विभिन्न प्रजातियों जैसे वृक्ष, झाड़ी व जड़ी बूटियों के घनत्व, आवृत्ति, आधारीय क्षेत्रों के अध्ययन के लिए 10x10, 5x5 व 1x1 चौकोर पद्धति का उपयोग किया गया। जिससे महत्वपूर्ण मूल्य सूचकांक की गणना की गई। जड़ी बूटियों व बेल प्रजातियों में सर्वाधिक महत्व मूल्य सूचकांक गुदाडी क्षेत्र में *कुरकूलीगो ऑर्चिओडेस* (235.54) प्रजाति में

पाया गया। और सबसे कम महत्व मूल्य सूचकांक ओरछा क्षेत्र के *कॉस्टस स्पेसिओसस* (1.21) प्रजाति में पाया गया। झाड़ियों में कुल आवृत्ति अधिकतम छोटेडोंगर क्षेत्र में (820%) और अधिकतम घनत्व ओरछा क्षेत्र में *डेस्मोडियम गांगेटिकम* (1250 स्टेम/हेक्टेयर) झाड़ी के प्रजाति में पाया गया। उसी प्रकार वृक्ष के लिए कुल आवृत्ति अधिकतम (840%) ओरछा क्षेत्र में और सबसे कम आवृत्ति (560%) छोटेडोंगर क्षेत्र में पाया गया। *षोरिया रोबस्टा* (वृक्ष) में अधिकतम घनत्व (840 स्टेम/हेक्टेयर) गुडादी क्षेत्र में पाया गया। सर्वाधिक कुल बेसल क्षेत्र (53.08 वर्ग मीटर/हेक्टेयर) ओरछा क्षेत्र में और सबसे कम (23.60 वर्ग मीटर/हेक्टेयर) बासिंग क्षेत्र में पाया गया।

CHAPTER-I

INTRODUCTION

Non-timber forest products (NTFPs) are an integral part of development and survival of people living in and around forests and depending on them. The potential economic value of NTFPs either in terms of utilization or their market value is often underestimated or unknown. Non-timber Forest Products (NTFPs) are important tools for addressing poverty issues for the marginalized, forest dependent communities, by contributing to livelihoods, including food security, income, health and sustainable human development Globally, about 350 million people mostly in developing countries depend on NTFPs as their primary source of income, food, nutrition, and medicine (UND, 2004; FAO, 2005).

Non wood forest products (NWFPs) consist of goods of biological origin other than wood derived from forests, other wooded land and trees outside forest. On the other hand Non-timber forest products embrace all materials of a biological origin excepting timber which is being extracted on an industrial scale. Non-timber forest products (NTFPs) are wild plant and animal products harvested from forests, savannahs and other natural vegetation types. This definition includes the use of wood for wood carvings, local house construction, fencing materials and firewood, but excludes industrial timber. The term ‘minor’ forest product underestimated the importance of NTFPs and hence created a biased impression on the mind of practicing foresters on their management (Vorgelegt Von, 2006). Non-timber forest products have been essential for subsistence and commercial activities all around the world. NTFPs are also among the oldest and most long standing of internationally traded commodities, dating back thousands of years to ancient times and continuing in the present day.

The NTFPs are of important forest products of especially in the dry land areas where they form alternative sources of livelihood. They also contribute to poverty alleviation through generation of income providing food and improved nutrition, medicine and foreign exchange earnings. Research done in six communities in Tanzania found that farmers were deriving up to 58% of their cash

income from the sale of honey, charcoal, fuel wood, wild fruits and vegetables (CIFOR, 1999). On the other hand, the value of NTFP contribution to the existing low value of woodlands in Tanzania can have quite a substantial addition to the national economy (O'Kting'ati and Monela 1990).

The United Nations Food and Agriculture Organization (FAO) estimated that 80 per cent of the developing world relies on Non-Timber Forest Products for nutritional and health needs. Studies on the role of NTFP in South India indicate that tribes in Western Ghats regions depend to an extent of 50 per cent on NTFP as a source of income also as the major source of employment (Girish, 1998: Ganapathy, 1998: Hegde *et al.* 1996, Suryaprakash, 1999). NTFP include all the products obtainable from forest other than timber. NTFP have been classified into fibers and flosses, grasses, cane and fodder, essential oils, tannins and dyes, gums and resins, drugs and medicines, edible products, oil seeds, leaves, animal, mineral and miscellaneous products.

Chopra (2006) estimated the NTFPs harvested in India and with an average of Rs 1,671.54/ha, the gross value was calculated to be 41.89 billion. Shiva and Mathur (1996) estimated that of the total 2.3 million men years of employment available in India in forestry sector annually, 1.6 million men years are created by activities related to NTFPs. It was also reported that NTFPs provide 50 per cent of the total forest revenue, 55 per cent of forest based employment and 70 per cent of forest based export earning in India. Thus it can be a potential source of employment for rural poor if tapped properly. It has been shown that the NTFP based small scale enterprises provide up to 50 per cent of income for 20 to 30 per cent of the rural labour force in India; where as 55 per cent of employment in the forestry sector is attributed to the NTFP sector alone (Joshi and Sapan 2003). The local communities managing these forests are heavily dependent on the rich biodiversity that is available in the sal forest.

Chhattisgarh is third largest state of India in terms of forest cover which is 5.6 million hectares which is 44.21% of state and 8.06% of the country. Madhya Pradesh and Arunachal Pradesh being at first and second in terms of forest cover (Forest Report, 2011). The Forest Department, Government of Chhattisgarh helps

the rural people financially, and by making SHGs for collection, procurement, processing and export of NTFPs through Chhattisgarh Minor Forest Products Marketing Federation (CGMFPPFED), which is very marginal as compared to the potential. Although NTFPs can be processed into a number of value-added products, it is usually sold in the raw form by the primary collectors. CGMFPPFED has a scheme to share 80% of profit from NTFP trading as incentive wages to collectors of tendu leaves, 15% for collection, sale and the warehousing and the remaining 5 out of the total population of Chhattisgarh, tribals constitute about 32.5% mostly living in dense forested areas in Sarguja and Bastar and are known for their unique lifestyle, rituals, traditions and superstitions. Some of the major tribes of Chhattisgarh include Gond, Baiga, Korba, Abhuj Maria, Bison Horn Maria, Muria, Halba, Bhatra and Dhurva tribes. Majority of the tribes of Chhattisgarh depend upon forestry, hunting, fisheries and some local cottage industries for their livelihood. Bastar is the land of tribes and about 70% of the total population of Bastar comprises tribals, which is 26.76% of the total tribal population of Chhattisgarh. The combined population of Scheduled Castes and Scheduled Tribes in Chhattisgarh is significantly higher at 44.7% for temporary reimbursement of costs to societies.

Narayanpur is a tribal District of Chhattisgarh. This district comprises 412 villages. Narayanpur district has an area of 20.98 km². The District is surrounded by Kondagaon, Antagarh and Bijapur districts of Chhattisgarh. District Narayanpur has population of 1,40,206 of which male and female are 70,189 and 58,379 respectively in census of 2011. Of the total population, more than 77 % are tribal people like Gond Tribe, Maria, Muria, Dhruva, Bhatra, Halba tribe, etc. Narayanpur District is divided into two Blocks namely Narayanpur and Orchha. The land of tribals and natural resources is also enriched with natural beauty and pleasant atmosphere. It is surrounded with dense forests, hilly mountains, streams, waterfalls, natural caves etc. Here the art and culture are the valuable ancient properties of the Bastariyas.

Narayanpur district have dense forests and are rich in Non-Timber Forest Produces (NTFPs). Because of having these NTFPs, the district is contributing a major revenue income to the state. The important NTFPs available in Narayanpur

district are Chironji, Amchur, Vaybidang, Karanji, Marorphali, Mango Kernal, Tamarind, Kosa Cocoons, Peng Seeds, Korkoti Seeds, Nirmali Seeds, Ambadi, Amla, Charota Seeds, Hara Chirayta, Mahua, Tora, Harra, Bamboo, Boda, Mushroom, Dhavai Phool, Bhelwa Seeds, Sal seed, Mahul (seed, leaf, rope), Tikhur, different type of tubers, medicinal plants, Cane (Beth), etc.

The institutional inefficiency and lack of proper marketing facilities are affecting the collection and trading of NTFPs in many forest areas of the state. No scientific and systematic collection is practiced, the collection is based on the demand and it fluctuates every year. The injudicious and unscientific exploitation will erode the rich diversity of NTFPs, which directly influence the lifestyle and economy of forest dwellers. More over the quantitative information on diversity of NTFPs and their collection pattern is most important for evolving suitable strategies for their conservation and sustainable utilization and also improving the livelihood and economy of forest dwellers. Information on diversity of NTFPs, their collection, utilization and marketing pattern is currently unavailable in many dry tropical forests of Chhattisgarh. Both qualitative and quantitative information is needed for sustainable management of non-timber forest resources. Therefore, the present study was undertaken with following objectives:

1. Documentation the NTFP and medicinal plants available in Narayanpur forest area.
2. Documentation of traditional collection methods of different NTFP in different seasons.
3. Documentation of post harvest methods and value addition, if any
4. The role of NTFPs in the livelihood of tribes and local residents in relation to economics.

CHAPTER-II

REVIEW OF LITERATURE

In this chapter an attempt has been made to review the work on “**Documentation of Non Timber Forest Product Collection, Processing and Value Addition of Narayanpur Forest Area of Chhattisgarh**”. The literature is broadly reviewed under the following aspects

1. **Documentation of NTFPs and medicinal plants availability.**
2. **Documentation of traditional collection methods of different NTFPs in different seasons.**
3. **Documentation of Post harvest methods and value addition, if any.**
4. **The role of NTFPs in livelihood of tribes and local residents in relation to their income.**

2.1 Documentation of NTFPs and medicinal plants availability

Pandit *et al.* (2004) carried out research work in Juldapara Wildlife sanctuary to enlist the NTFPs, their types and amount. A total of 132 species has been recognized as NTFPs produce which includes plants of different habit groups, occupying different strata and types of vegetation.

Rajasekaran and Prasad (2005) conducted a survey to collect information on Medicinal plants sold in local market at Velliyangiri Hills, Boluvamputti Reserve Forest by the Irula Tribes. There are twenty-five medicinal plant species, which include 9 shrubs, 3 herbs, 3 epiphytes and 2 climbers. These were recorded from the local market place without entering major market places and tribal cooperative societies.

Bansode *et al.* (2005) observed that the major problem faced by farmers for collection of medicinal plants was low rate to the produce, which they have collected from forest it was (85.55%) and lack of knowledge regarding species (68.89%). The availability of medicinal plants was far away from residence (63.33%). However, no other employment generation was found throughout the year (63.33%) while, form collection of medicinal plants (48.88%). Among the

species of medicinal plants studied maximum collection was observed for Gurvel (*Tinospora cordifolia*), followed by Harra (*Terminalia chebula*).

Kumari et al. (2012) reported that the NTFP utilized for the health care of mother and child in Himanchal Pradesh. They found that in case of cut wounds only three species are only used, while similar number of species used for muscular pain and also reported two species to kill the lice and one for small pox, chicken pox and urine problems of the infants. It was also observed in the study that area the local Vaid/Amchis and elder women practice many medicinal herbs in combination for the treatments of various ailments of women and children as mentioned.

Sinha et al. (2012) studied that total of 29 species of plants belonging to 20 families widely used as is it venom in northern part of Bastar. The plants species were documented on the basis of their phytochemicals and use in Antidote. Maximum of (03) species were belonged to the family Asclepiadaceae and (02) each to family Fabaceae, Acanthaceae and Liliaceae. 75.86 % of the observed plants were found to be propagated by their seeds while, 6.89 % by rhizome, 10.34% by stem cutting and 3.44 % each by other plant parts like tuber and bulb.

Jha (2015) studied that the Apatani, non-nomadic tribe, have evolved an ecologically sustainable system of rural forestry in Ziro Valley, a proposed heritage site of UNESCO. The Apatani used 112 priority NTFPs for food supplement, herbal medicine, house building material and other purposes. However, on the basis of ecological importance such NTFPs were categorized as very low, low, moderate, high, and very high vulnerable species. Twenty vulnerable species like including some of the species Antiitari ayi (*Actinidia callosa*), Biiling (*Choerospondias axillaris*), Henchi (*Rubus niveus*), Jojuru ayi (*Coccinia grandis*), Ngiilyang Khiiko (*Centella asiatica*) etc. should be conserved and seventeen not vulnerable species at this stage including Padii hamang (*Cardamine hirsute*), Sankhe (*Quercus griffithii*), Bije (*Phyllostachys manii*), Hiigu hamang (*Oenanthe javanica*), Kiira (*Quercus dealbata*), etc. could be commercialized.

Ahirwar (2015) reported that total 41 plants species belonging to 26 families and 37 plant genera were identified. A field survey was conducted at three different study sites in Boridand forest, district Korea, Chhattisgarh.

Singh and Bharti (2015) study was conducted in different area of Raigarh district of CG. (India). They documented ethno-botanical use of 89 plant species are described in which different parts of plants are used for different purposes by people for example medicine, food, fodder, furniture, fibre, cosmetics etc.

Islam & Quli (2016) documented the diversity, distribution, and pattern of utilization of edible non-timber forest products (NTFPs) among the tribes of Bundu block in Ranchi district of Jharkhand, India. The results reveal that the sample population consumes 59 edible NTFPs belonging to 39 genera and 45 species under 29 families. Of the edible NTFPs, fruit represents the highest (26) followed by leaf (10), seed (7), flower (6), tuber (3), gum (2), mushroom (2), entire plant (2) and rhizome (1). The growth form of the species includes trees (30) followed by herbs (5), shrubs (4), climbers (3), fungi (2) and bamboo (1).

Kumhar *et al.* (2017) studied that the medicinal plants used against diabetes in Gondwana of Vindhyan region of Madhya Pradesh. The district Sidhi, Shahdol, Umaria and Anuppur is taken for study. The name of plant, common name, family, habit plant parts used and formulation, 6 plants in Umaria and 11 plants in Sidhi district were observed.

2.2 Documentation of traditional collection methods of different NTFPs in different seasons

Malhotra *et al.* (1991) conducted a study in Jemboni Range Midanapore, district, West Bengal and reported that Sal leaves stood as the single largest (16.45%) contributor to the Non-Timber Forest Products (NTFPs) biomass Among the food items gatherers of Tendu leaves constituted the largest proportion (48.93%) followed by Mushrooms (27.14%), Mahua flower and fruit (17.34%), tuber (5.36%) and leafy vegetables (1.21%).

Marshall *et al.* (2003) studied the importance of non-timber forest products (NTFPs) to rural income in a highland community in the Sierra de Manantla'n Biosphere Reserve, Jalisco-Colima, Mexico. Rapid Rural Appraisal (RRA) techniques were used to interview 70% of households in the community of El Terrero. Of the nine plant species identified as NTFP sources, the two principal species traded by the community were tila (derived from the flowers and fruits of

the tree *Ternstroemia lineate*), and blackberry (*Rubus* species) collecting and selling of NTFPs was almost exclusively undertaken by women, with 80% of respondents participating. NTFP sale ranked as the most important source of cash income for 30% of women interviewed, and either second or third most important for the remainder. The research examined harvesting impact on populations of *T. lineata*, an understory tree species characteristic of cloud forest, which this was assessed in the four most-frequented collecting sites.

Hasalkar and Jadhav (2004) reported that women play a most prominent role in collection, processing and sale of NTFPs. Women involved in collection of NTFPs such as Tendu patta, Char, Sal seed, Palas, Bamboo, Chhind, Mahua /Dori, Harra, Kusum, Jamun etc. In West African Humid Region, women dominants in collection of NTFPs it is estimated that women constituted 51 percent of the total work force involved in forest based small-scale enterprises. Hence the women living in and near the forest are the major contributors of the family economy.

Giri et al. (2005) evaluated the major NTFPs items and their marketing potentials at Hazaribagh forest area in Jharkhand. This study focused on the availability of the selected economically important NTFPs, their collection pattern along with the marketing status and impact on the JFM system at two separate Forest Ranges under Hazaribagh Forest Division in Jharkhand.

Ahmad et al. (2006) conducted a research work in selected areas of Isakhel, Miawali. The interviews were held in local community and documented 55 plant species belonging to 52 genera of 30 families. These hills are rich with common plant species like *Rhazya stricta* (Verin), *Reptonia buxofolia* (Ganyer), *Prosopis juliflora* (Jana), *Zizyphus jujuba* (Beri), *Dalbergia sissoo* (Tali) and *Acacia nilotica* (Kiker).

Gubbi et al. (2008) studied in the Periyar Tiger Reserve, India, they examined whether NTFP collection can solve livelihood problems by analysing revenues obtained from various NTFP species, estimating the economic returns to collectors from various social backgrounds, and exploring the attitudes of collectors towards their profession. They found that black damar resin from the tree *Canarium strictum* (61.3%) and mace from *Myristica* spp. (35.5%) were the most commonly collected NTFPs, and the most valuable NTFPs were honey from

Apis cerana indica (USD 4.12 kg⁻¹), cardamom *Elettaria cardamomum* (USD 3.67 kg⁻¹) and *Myristica spp.* (USD 2.77 kg⁻¹). Mean daily revenue from NTFP collection was USD 3.15 ± SD 4.19 day⁻¹, and the lowest daily revenues were earned by part-time collectors with low socio-economic status such as migrants, forest-dwellers or those without access to agricultural land. Most collectors (82%) did not wish to continue harvesting NTFPs if alternative livelihoods from agriculture could be provided, and none wanted their children to be NTFP collectors.

Rout and Panda (2011) reported that the NTFPs are a major source of subsistence production, income, employment and great socio-economic significance especially the weaker section of the society. They reported that the 54 important NTFP species have been collected by the Gandigadha villagers for consumption. However, a few new species like ‘Sal’ (*Shorea robusta*) leaves, tooth stick and seeds, Mahua (*Madhuca indica*) flower and fruit, char (*Buchanania lanzan*) fruits, seeds and mushroom are collected and sold to local traders. They reported 54 NTFP species from the Gandigadha villagers. 49 numbers of NTFPs are sold and 5 numbers of NTFPs like fruits of *Baringtonia acutangula*, *Cassia fistula*, *Catunonegam spinosa*, etc. are used for self consumption.

Saha and Sundriyal (2012) recorded that total of 343 NTFPs used for diverse purposes by tribal communities. When species choice grouped as per used category, utilization for medicinal (163 species), edible fruits (75 species) and vegetables (65 species) purposes was reasonably high. Community dependence on forest resources was 100% for firewood and house construction material. 76 plant species were sold in three major local markets while an additional 22 species traded at commercial scale mainly outside the state. NTFPs contributed 19-32% of total household income for different tribal communities, which was significant. *Illicium griffithii*, *Rubia cordifolia*, *Oroxylum indicum*, *Swertia chirayita*, *Litsea sebifera*, *Taxus wallichiana*, *Valeriana jatamansi*, *Thalictrum foliolosum*, *Picrorhiza kurrooa*, *Everniastrum cirrhatum*, *Cordyceps sinensis*, *Aconitum fletcherianum*, *Nardostachys jatamansi*, *Picrorhiza kurrooa*, *Gymnadenia orchidis*, *Calamus*, *Quercus* and *Pinus roxburghii* were important commercial species.

Sarmah (2012) reported that non-timber forest products are an imperative part of the traditional life style in Arunachal Pradesh. Namdapha national park, the species-rich protected area is also effected by human interference. Similarity index indicated that there was very less similarity among the different forest stands. Least similarity among the trees (12.24%) and herbs (9.6%) were recorded between forest stand III and forest stand I. Evasion of 13 tree species of which 6 NTFP species and 10 shrub species were recorded in forest stand I in comparison to forest stand III. On the other hand, 21 herbaceous and 11 tree species were gain in forest stand II in comparison to forest stand III. However forest stand I lost 5 herb, 7 shrub and 24 trees species in comparison to forest stand II stand due to higher anthropogenic disturbance.

Sharma *et al.* (2015) studied that the state of Arunachal Pradesh having more than 80% of geographical area under forest cover and predominantly inhabited by tribal people. Purpose of this study was to document the status and utilization pattern and to assess the economic value of NTFPs of the state. 135 plants based and 36 animal based non-timber forest products were recorded. Among plant based NTFPs, 54 species were collected for leaves, 30 for stem and 22 for fruits. Most of the animal based NTFPs (93%) were collected/hunted for food. Average 20-40 kg of NTFPs was collected annually per household.

Bauri *et al.* (2015) studied to assess the diversity of non-timber forest products (NTFPs) and its resource potential in selected sites of Kanksa Forest Division of Burdwan District, West Bengal. 23 major categories of non-timber forest products were recorded during our survey work at the present investigation which includes different forms of dyes, grass, oil, wax, honey, gum, resin, food items (leaf, fruit, seed, herb, stem), bamboo, broom, basket, cotton, brush, paper, ornamental, worship, marriage rituals, leaves (Sal, Kendu, Datepalm), sap and flour. The forest dwellers are progressively dependent on NTFPs for sustaining their daily livelihood instead of utilizing it as a prospective income source and for their socio-economic development.

Zode *et al.* (2015) reported that Non-timber forest products (NTFPs) are much important worldwide for their significant role in livelihood, which include

any forest product other than timber like medicinal plants, dyes, mushrooms, fruits, nuts, bark, leaves, flowers, seeds, honey, roots and tubers, resins, fibers such as bamboo, rattans, palm and grasses. The present investigation scrutinized the most abundant NTFPs, their use pattern and current status of NTFPs in different villages of Tirora Tehsil. 45 different plant species extracted as most abundant NTFPs, which were used for food, fodder, fuel, medicine, household and commercial purpose. The present study reveals that among the entire 45 plant species, 26 plant species (57.00%) are food products, 4 plant species (8.88%) intended for construction purpose, 15 plant species (33.33%) for commercial use, 31 plant species (68.88%) plants having medicinal importance and all the forest dwellers depend on forest product other than timber at varying degrees.

Sinha et al. (2016) reported that total 44 plants producing NTFP were noted to be collected by tribals in 20 villages of Bastar district. Plant and plant produce collected by the tribals from the plants were seeds of 11 plants, fruits of 11, roots of 3, rhizomes of 4, flowers of 4, and secretory products from 3 plants, whereas 4 whole plants lac and cocoons were also collected by the tribals from the forest.

2.3 Documentation of Post harvest methods and value addition if any

Runk et al. (2004) studied on NTFP have often been restricted to a single species, year and human user community. However, a number of recent studies are challenging these simplifications. Here, we examine a suite of artisanal NTFP that are of increasing economic importance to Wounaan and Emberá households in Panamá. Artisans make carvings from seeds of a tagua palm (*Phytelephas seemannii*) and the wood of cocobolo (*Dalbergia retusa*), and weave baskets from the fibres of the chungu palm (*Astrocaryum standleyanum*).

Sundriyal and Sundriyal (2004) reported that the data on marketing, value addition and management concerns of the wild edible plants of the Sikkim Himalaya. A total of 44 wild edible species have been recorded. Other important species were *Machilus edulis*, *Diplazium esculentum*, *Eleagnus latifolia*, *Dendrocalamus hamiltonii*, *Agaricus* and *Baccaurea sapida*. Value addition was done to a few wild edible species, and cost-benefit analysis showed that the income

from the fruits could be increased by at least 3–5 times after making pickles, squash and jam.

Joshi and Joshi (2005) conducted a survey on Non-Timber Forest Products of Nepal, 48 species have been documented as raw materials of plant origin with their indigenous uses from the study areas (Okhami, Mulkhadka, Chaubas and adjoining areas of the Bagmati watershed and Syabru of the Langtang watershed) of Nepal. The Non-Timber Forest Products are utilized as raw materials in the manufacture of household utensils. *Rhododendron arboretum* and *Symplocos theifolia* find a particular use in manufacture of such household items as wooden paddles, spoons and bowls. *Arundinaria falcata*, *Dendrocalamus hamitonii* and *Dendrocalamus strictus* are used for mats, woven basket (doko) and open-air storage bin (baakari).

Velde et al. (2006) reported that certain key entrepreneurs are a driving force of success throughout several NTFPs value chains in both Bolivia and Mexico. It include the shopkeeper/organisation in Santa Cruz, Bolivia, who sources woven palm products from and supports several producers, and the entrepreneur in Mexico who established links between mushroom pickers in rural communities and brokers and consumers in Japan. Rather than criticising the monopolistic position of individuals, it is important to understand how the activity of key entrepreneurs can be supported in spreading successful commercialisation further and where necessary control negative impacts of their role.

Kandari and Omprakash (2009) studied 12 villages of Keonjhar district of Orissa and reported that the various NTFPs are collected by the local collector. The reported that capacity building in case of value addition and harvesting will be more beneficial to get more income from this trade. However marketing channels will be improved to obtain other profit to the collector of NTFPs.

Jagwan et al. (2010) reported that NTFPs especially in the Garhwal Himalayas, Uttarakhand, Garhwal Hills are an important source of wild non-timber fruit species. Many non timber fruits variety are eaten raw and used, but not yet it has been considered as a source of alternative food products. The results reported here are the outcome of extensive study of the literature on Garhwal flora, its uses

and futures benefits. Information has also been gathered from local people by an ethno botanical survey in parts of some Kedar valley villages like Triyuginarayan, Guptkashi, Phata Rampur, etc. district Rudraprayag, and Chamoli region of Garhwal Himalaya, Uttarakhand.

Geibler *et al.* (2010) reported that the optimization of value chains is an important process to promote sustainable development, since value chains are closely linked to the satisfaction of human needs and combine different driving forces for environmental change. Methodological approach for the participatory development of value-chain wide sustainability indicator sets and their integration into a decision support tool in the specific case study of the chain “construction and refurbishment with wood”. There are numerous indicator sets for sustainable development of forests and sustainable forestry available at different levels, ranging from local, regional and national to global scale assessments. Some efforts were also made to integrate later production stages of forest value chains (such as wood processing) in the assessment scope (*e.g.* for chain-of-custody certification).

Pandit (2011) reported the NTFP products of Jhargram in Purulia Bankura district. They observed that the knowledge regarding availability of NTFP its quantification, marketing proper utilization and sustainability is quit poor. In JFMCs formed and they have given certain rights on collection of some NTFP but no sustained control mechanism developed. However, several million rupees trade of NTFP is not scientifically utilized and processed.

Morsello *et al.* (2012) studied evaluated whether processing non-timber forest products (NTFP) and establishing trade partnerships between forest communities and companies enhance the outcomes of NTFP commercialization. In particular, we evaluated whether product processing, partnerships, or their combination was associated with a number of outcomes related to the well-being of forest inhabitants and forest conservation. We based our analyses on ethnographic and quantitative data (*i.e.*, survey and systematic observations) gathered at seven communities from five societies of the Brazilian and Bolivian Amazon. Our results indicated that product processing and partnerships do not

represent a silver bullet able to improve the results of NTFP commercialization in terms of wellbeing and conservation indicators.

Rath and Mohanty (2013) studied evaluated antifungal screening of *Curcuma longa L* and *Cassia tora L*. against two dermatophytes, rhizome and leaf of these plants were taken and extraction were made in different solvents like water, petroleum ether, chloroform and ethanol. Ethanol extract of the *Curcuma longa* rhizome and chloroform extract of *Cassia tora* leaf showed excellent antimycotic activity against *Trichophyton mentagrophytes* and *Epidermophyton floccosum*. Petroleum ether extract of *Cassia tora* showed zone of 10 mm and 20 mm against *Trichophyton mentagrophytes* and *Epidermophyton floccosum*. The antibiogram profile indicated that Terbinafine has the maximum activity as is shown by its zone of inhibition viz., 40 mm and 32 mm for *Trichophyton mentagrophytes* and *Epidermophyton floccosum*, respectively. Fluconazole was found to be ineffective against the two-test fungi. Lowest MIC in case of ethanolic extract of *Curcuma longa* against *Trichophyton mentagrophytes* and *Epidermophyton floccosum* is 6.575 µg/ml and the chloroform extract of *Cassia tora* against *Trichophyton mentagrophytes* is 13.15 µg/ml.

Shankar et al. (2014) conducted an investigation at Indira Gandhi Krishi Vishwavidyalaya, Shaheed Gundadhoor College of Agriculture and Research Station, Kumhrawand, Jagdalpur, Bastar, Chhattisgarh in Horticultural laboratory under AICRP. They concluded that the treatment or recipe combination 1:1.5:2.5 (Tikhur starch: Sugar: Water) was best for the preparation of tikhur *Barfi*. On the other hands tikhur *Barfi* prepared through the recipe 1:1.5 2.5 (Tikhur starch: Sugar: Water) had a pleasant flavour, texture, taste moisture, texture appearance and over all acceptability.

2.4 The role of NTFPs in livelihood of tribes and local residents in relation to their income

Gera and Baghel (2000) studied revealed that some NTFPs were collected for consumption within the village only and some NTFPs such as Mahua (*Madhuca indica*) flowers and oil, Tendu (*Diospyros melanoxylon*) leaves and Sal (*Shorea robusta*) leaves they sale in local market. The study concludes that the proportion of village income generated by NTFPs, about 11% could be raised

much collection and marketing by women and the activity, which most villagers engaged was the collection of Tendu leaves followed by Mahua flower.

Mahapatra *et al* (2005) studied the contribution of NTFPs to cash income in the dry deciduous forests of Orissa and Jharkhand, India. In its focus on cash income, this study sheds light on how the sale of NTFPs and products that uses NTFPs as inputs contribute to the rural economy. From analysis of a unique data set that was collected over the course of a year, the study finds that the contribution of NTFPs to cash income varies across ecological settings, seasons, income level, and caste.

Murthy *et al.* (2005) conducted a study in Uttara Karnnada district, Western Ghats of Karnataka, India. The study revealed that the number of species used as food is 17 (28.8%) and 19 (32.2%) respectively in these zones. About 50% of the species available in the evergreen zone about 40% in the semi evergreen and dry deciduous zones and only 13% in the moist deciduous zones. Significant quantities of NTFPs are collected in all the four zones and the estimated value of NTFPs per household varies between Rs. 3445 per household in evergreen zone and Rs.1233 per household in dry deciduous zone.

Mahapatra and Tewari (2005) reported that the Dry deciduous forests in India is one such typical case where forest valuation is yet to integrate the NTFP stock, widely used for subsistence and cash income. The net present value of revenues from NTFP was estimated to be US\$ 1016 ha⁻¹ in the coastal area and US\$ 1348 ha⁻¹ in the inland area, which proved to be significantly higher than the returns from alternative land uses. Dry deciduous forests were estimated to have more value than had been assumed previously and compared favourably against potential timber revenue (US\$ 268 ha⁻¹).

Acharya *et al.* (2009) observed that Non Timber Forest Products (NTFPs) as contributing resources for improving livelihoods of the rural people. Existing trend of NTFPs in Rolpa district reveals high level of its potentiality where a single Malagiri tree in the one of the VDCs of the district has yielded profit of 15,000 NRs. in gross. The study supports idea that the quality of life can be secured through the promotion of NTFPs as an additional resource for safety net. Major

outlet clusters for NTFP trade and marketing of the Rolpa district are Sulichaur and Holeri regions where mostly NTFP species were found to be traded. Malagiri, Timur, Ritha and Allo are major local species that have a high level of demand in the market. As a result, people have started cultivating a few species in their farmland too.

Surayya (2011) reported that over 80% of FD depends on Non-Timber Forest Products (NTFP) and 28 to 50% of income comes from NTFP trade, representing just 20% of end user price spread as trade is without value addition. Lack of microfinancial assistance, ineffective administration, hinders value additions. NTFP trade is seasonal; FDs need to borrow money from moneylenders at high interest rates/ NTFP distress of sale. These and non-regulated NTFP markets are contributing to poverty of this groups. Interventions like Self-Help Groups (SHG) movement, based on save and serve themselves. Creating social collateral and group Pressure are features of this approach. The emergence of microfinance is strategic option to alleviate poverty. FD now gets 38% of their microcredit from SHG. Studies show that adding value by way of making leaf plates can earn 100% average incremental benefit.

Joshi and Negi (2011) conducted a study in the western Himalayan region (Uttarakhand State in India) and reported that oak (*Quercus leucotrichophora*) and pine (*Pinus roxburghii*) are the two major forest ecosystems. The study revealed that oak forests provide a greater variety of provisioning services as compared to pine forests. Provisioning services such as fuel-wood, fodder, and natural fertilizers (leaf litter) provided by oak forests (Rs. 5676/person/year) were more valuable than those provided by pine forests (Rs. 4640/person/year). Stakeholder perceptions of the regulating services of oak forests, such as maintenance of soil fertility, soil moisture retention, prevention of soil erosion, air and water purification, was also more positive than for pine forests.

Sarmah and Arunachalam (2011) reported that the forests of Arunachal Pradesh support rich diversity of timber as well as non-timber yielding species. The non-timber forest products (NTFPs) possess imperative part of the traditional life style in Arunachal Pradesh and utilisation of these products has been

contributing much to the local livelihood. NTFPs such as fuel-wood, house building materials, wild edible vegetables and medicinal plants are mostly collected from natural habitat. The total contribution of NTFPs to annual household income was maximum (23% of the total income) in the villages of Miao circle followed by Diyun circle (21% of the total income) and Nampong circle and Vijaunagar circle (19% and 18% of the total income respectively). It was recorded minimum (11% of the total income) in the villages of Bordumsa circle.

Raufu *et al.* (2012) observed that the majority of the respondents (58.9%) supported non-availability of NTFPs as the significant effect of deforestation on NTFPs activities. The major problem encountered in NTFPs gathering and marketing are insufficient labour (38.9%), storage problem (23.2%), and thieves (14.4%).

Kar and Jacobson (2012) studied that the NTFPs' role in contributing to the household economy and how different socio-economic factors may influence this contribution. Field methods involved quantitative and qualitative data collection of forest-adjacent households of Chittagong Hill Tracts in Bangladesh. Results show that the contribution of different types of NTFPs to household economy varies in terms of subsistence and cash income. However, overall NTFP income is much higher than income from timber or firewood which indicates a larger dependence of the households on NTFPs. Income data analysis also finds that the poor households are relatively more dependent on NTFPs for their subsistence and cash income than the better-off households. Moreover, the study reveals that there are many other socio-economic factors at the household level such as number of members in household and total value of household implements and furniture that are significantly correlated with the NTFP income.

Kumar (2015) the present study attempted to assess the contribution of NTFPs to income and employment by ensuring food and livelihood security for the tribal economy in Dang's district of Gujarat. This indicates that most employment (42.51%) was generated by the wage sector followed by NTFPs collection (31.67%) and livestock rearing (15.85%) respectively. About 42 species of NTFPs were found to be collected and utilized for various purposes such as food,

medicines, and raw materials for making implements and also as a source of income. It suggested that alternate sources of income to the villagers to improve their socio-economic conditions as well as increasing the income level and employment opportunities by effective collection and selling of Non-Timber Forest Products.

Mukul *et al.* (2016) studied to explore the contribution of NTFPs in sustaining forest-based rural livelihood in and around a protected area (PA) of Bangladesh, and their potential role in enhancing households' resilience capacity. 27% households (HHs) of the area received at least some cash benefit from the collection, processing and selling of NTFPs, and NTFPs contribute as HHs primary, supplementary and emergency sources of income. NTFPs also constituted an estimated 19% of HHs net annual income, and were the primary occupation for about 18% of the HHs.

Moe and Liu (2016) reported that non-timber forest products (NTFPs) income plays an important role in the household economy in the rural forest dwelling communities. This study used the data from 60 sample households of the three villages in Tharwady District of Myanmar to analysis the significant of NTFPs income in the rural household economy. This study found that NTFPs income contributes 44.37%, and farm income and non-farm income contribute 32.55% and 23.07% to the total household income respectively. The lower and middle income level households derived more NTFPs income than high income level households. For low income households, share of NTFPs income in the total household income is over 75%. Major NTFPs include bamboo, thatch, firewood, charcoal, bamboo shoot, broom grass, bark and root, and others. Regression analysis showed that farm income, non-farm income and agricultural land own are scientifically and negatively correlated with the NTFPs incomes.

CHAPTER-III

MATERIALS AND METHODS

The present study on “**Documentation of Non Timber Forest Product Collection, Processing and Value Addition of Narayanpur forest area of Chhattisgarh**” was carried out at Orchha (Abujhmar) block - Orchha, Gudadi, Basing and Narayanpur block - Chhotedongar, Bharanda, Benoor forests of Narayanpur Forest Division in Narayanpur, Chhattisgarh. The details of the study site, climate, geology, soils, forest flora, fauna and other features of land along with the methodologies adopted are given below:

3.1 Study site

Narayanpur District of Chhattisgarh state was selected as a study site to undertake the investigation. Narayanpur is one of the tribal districts of the state. Narayanpur is the District and Jagdalpur is the Divisional Headquarter. Narayanpur District is divided into two Blocks namely Narayanpur and Orchha (Abujhmar) and two Tehsils namely Narayanpur and Orchha (Abujhmar). The district head quarter Narayanpur is situated on State road connecting Antagarh and Jagdalpur via Kondagaon. The proposed Jagdalpur to Raoghat Railway will pass through Narayanpur. Narayanpur District is situated in south western part of the State of Chhattisgarh in Central India. The District is surrounded by District Kanker in north, District Bijapur south, District Kondagaon in east, and in west by Gadchiroli district of neighboring Maharashtra state.

Narayanpur District has an area of 6922.68 square kilometers. Apart from Narayanpur, some of the major town/villages of the district are Benoor, Orchha, etc. District Narayanpur has population of 1,39,820 of which male and female were 70,104 and 69,716 of the total population more than 77 per cent are tribal people like Gond, Maria, Dandami Maria, Muria, Dhruva, Halba Tribe etc.

3.1.1 Geographical location and physiographic

Physiographically, the western part of the district exhibits landforms of Structural hills and valleys and pediment /pediplains with denudational hills and

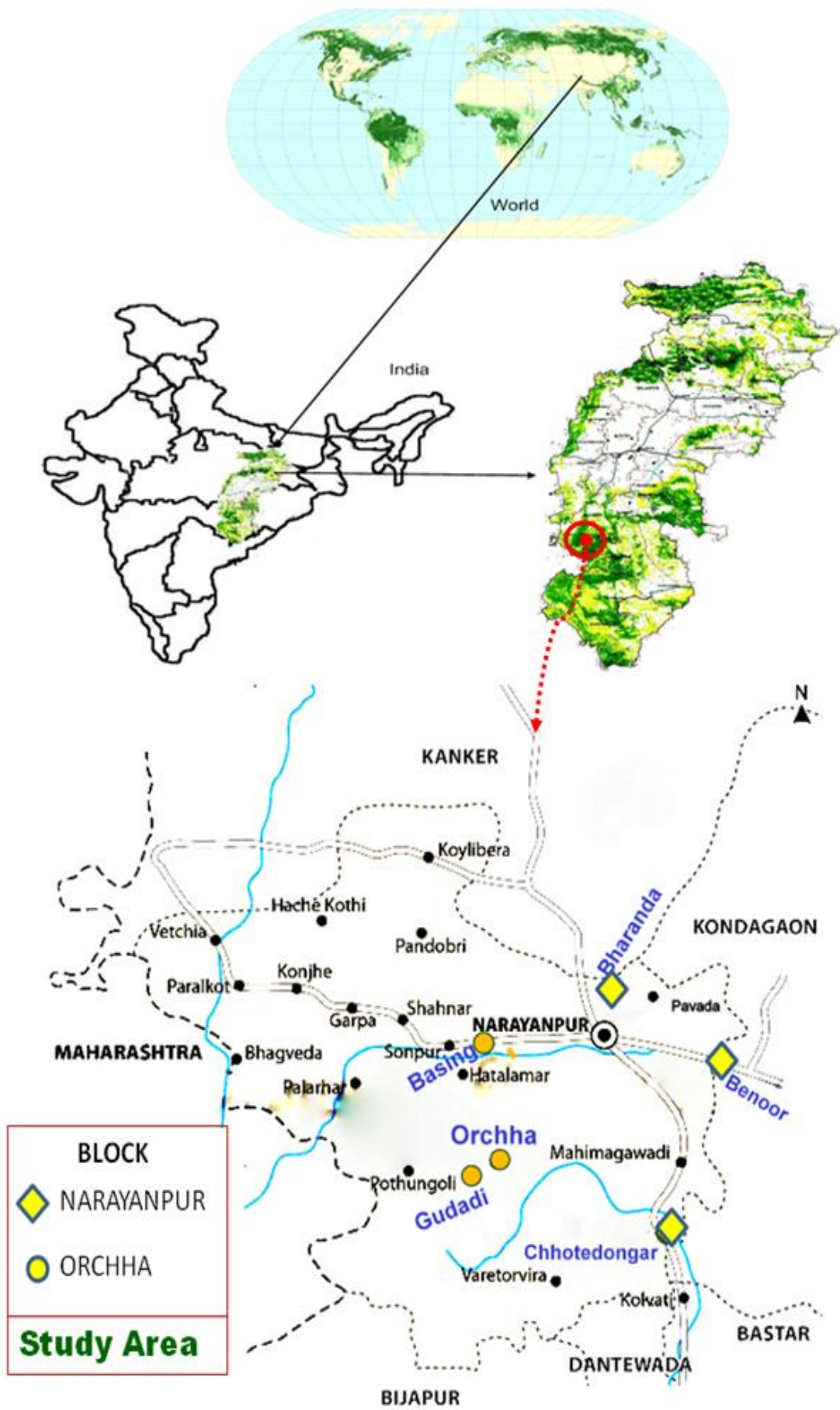


Fig. 3.1: Location map of study area

valleys. The northern part of district exhibits denudational plateau with denudational slopes, structural plains and pediments/pediaplains. Madin, Kukar, Maroli and Gudra rivers and their tributaries constitute the surface drainage system in most of the area with a general gradient towards east direction. Abujhmar area which came in Orchha tehshil of Narayanpur district have the highest dense forest in Chhattisgarh. It falls in Survey of India, toposheet Nos. 65 A and E and bounded between 19° 05' to 19° 55' North latitude and 80° 40' to 81° 30' East longitudes.

3.2 Soil

Soils of study area are grouped into three classes' viz. 1. Entisol (Bhata-gravelly) 2. Inceptisol (Matasi-Sandy loam) 3. Alfisols (Dorsa-clayloam) 4. Vertisols (Kanhar-clayey) 5. Bharri. The soils in the district are having wide variations. Most of the area is covered by red gravelly, red sandy and loamy Alfisols. As most of the area is covered by crystallines and metamorphic rocks the soils derived by weathering are red soils. At some places Ultisols in the form of laterites are also present. The trap rocks in the district are occurring as hills rather than plateaus and consequently the trap slopes developed light soils rather than the deep black cotton soil.

3.3 Climate

The climate of study area is dry humid tropical consists three major seasons viz. rainy, winter and summer. The rainy season commences from about the middle of June. The winter season, which commences from the beginning of November, lasts till the end of February. The summer commences from the beginning of March. It is quite prolonged and severe and lasts till monsoon sets in. The mean annual variations in rainfall, temperature and humidity are depicted in Fig. (3.2).

3.3.1 Rainfall

The average annual rainfall in the study area ranges from 1400 -1900 mm. It gradually decreases from south east direction to North West direction. About 80 percent of the annual rainfall in the study area is received from south west monsoon during June to August. The highest amount of rainfall occurs in Sep.738.4 mm. Number of rainy days varies from 90-100 days. Mean annual

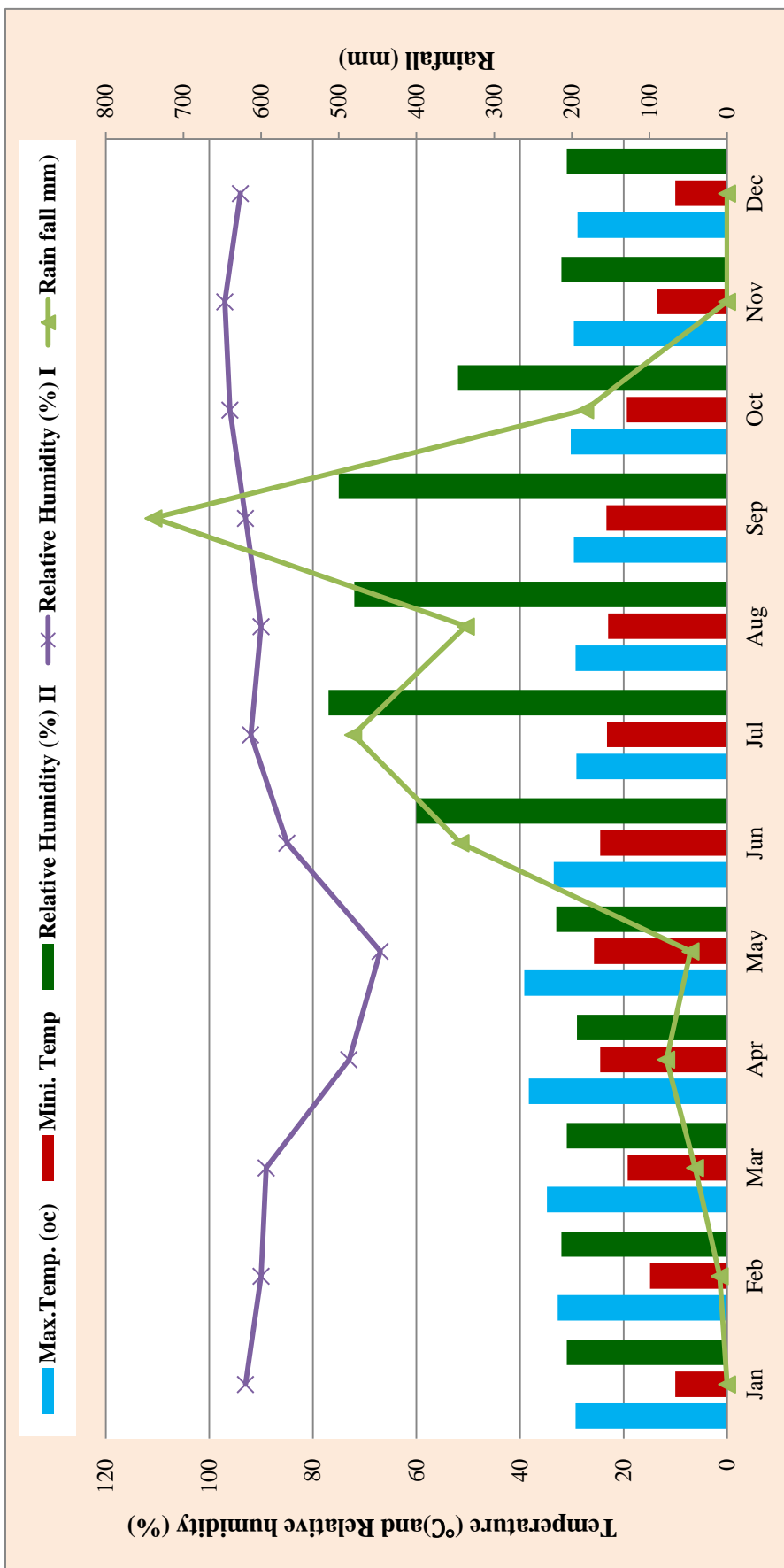


Fig. 3.2: Meteorological detail of the study area from April 2016 to March 2017

variation in the rainfall during last one year in study area is depicted in (Fig. 3.2).

3.3.2 Temperature

The mean monthly maximum temperature ranges from 10.0 °C in January to 39.2°C in May and mean monthly maximum temperature ranges from 28.9 °C in Dec. to 39.2°C in May. The mean annual maximum and minimum temperature of study area are 32.1°C and 20.0 °C, respectively (Fig. 3.2).

3.3.3 Humidity

Relative Humidity of study area increase with the onset of South-West monsoon and it generally becomes more than 97% in Nov. In the post monsoon and winter seasons the relative humidity lies between 50-65% in the morning (6:00 to 12:00 hrs.) and 30-40% in the afternoon (12:00 to 16:00 hrs.). Relative humidity is lowest during summer and drops below 30 percent in the afternoon in April and May. (Fig. 3.2)

3.4 Forest cover of study area

The land use pattern is an important index of the human, social, cultural, and economic developments. The forests include protected forests (5,42,984 ha), reserved forests (78,002 ha), revenue forests (17,815 ha) and others .Nearly 85.14 % of Narayanpur district (6,388.01 ha) is covered and also area wise Narayanpur district has the maximum forest cover (6,388.01 ha). Total cropped area in Narayanpur district is 33440 hectares, Irrigated (182 ha.) un-irrigated (32258 ha) and total agriculture cropped area 471 ha in Narayanpur District. (Source: Land Records, Collectorate, Narayanpur)

3.5. Flora and Fauna

3.5.1 Flora

It was observed during the study that the study Area, once known for its thick & extensive forest, existence, is now bereft of its jungle wealth. There has been large-scale destruction of forests in the past years. So the Subsistent agro based economy, which was earlier supplemented by forest and forest produce, has been badly affected.

In these forest of Sal, the following tree species are also found Mahua (*Madhuca indica*), Tendu (*Diospyros melanoxylon*), Karra (*Cleistanthus collinus*), Harra (*Terminalia chebula*), Kasahi (*Bridelia retusa*), Sal (*Shorea robusta*), Sagwan (*Tectona grandis*), Dhawda (*Anogeissus latifolia*), Bahera (*Terminalia bellirica*), Mango (*Mangifera indica*), Jamun (*Syzygium cumini*), Kusum (*Schleichera oleosa*), Semal (*Bombex ceiba*), Siris (*Albizia lebbek*). Among the codominant species found Tinsa (*Ougeinia oojeinensis*), Char (*Buchanania lanzan*), Amaltas (*Cassia fistula*), Anola (*Emblica officinalis*), Lendia (*Lagerstroemia parviflora*), Moyan (*Lannea coromondelica*), Kumbhi (*Careya arborea*), Saja (*Terminalia tomentosa*), Bijasal (*Pterocarpus marsupium*) Ghotia (*Zizyphus xylopyrus*), Bel (*Aegle marmelos*), Khamar (*Gmelinia arborea*) Beth, clums of bamboos are present which is conserved properly; they can take the form of good forest. Among the shrubs, Ainthi (*Helicteres isora*), Aak (*Calotropis procera*), Dhawai (*Woodfordia floribunda*), Katakuli (*Zizyphus rugosa*), Kanphuta (*Flemingia strobilifera*) Manhar (*Catunaregam spinosa*) are present in abundance. Among the herbs herbs Safed musali (*Chlorophytum tuberosum*) Kalimusali (*Curculigo orchioides*) Bhuineem (*Andrographis paniculata*) Tulsa (*Ocimum canum*), Charota (*Cassia tora*), Bhurbhusi (*Eragrostis tenella*), Latkanai (*Desmodium motorium*) are the main species present. The climbers which can be found here are, Anantmul (*Hemidesmus indicus*) Gudsakri (*Gerwia hirsuta*), Mahul (*Bauhinia vahlii*), Satawar (*Asaragus racemoisus*) Palasbel (*Butea superba*), Kalidudi (*Ichnocarpus frutescens*) Ramdatun (*Smilax zeylaxica*) Kalihari (*Gloriosa superba*) etc. among grasses Kans (*Saccharum spontaneum*), Phulbahari (*Thysanolacns maxima*), Doob (*Cynodon dactylon*), Bhurbhusi (*Eragrostis tenella*) are abundantly present in the study area.

3.5.2 Fauna

The core zone (ML 57 ha.) falls under the Narayanpur Forest Division which is subsisted on hillock which is Sal mixed forest area and it continues downward. Thus, it is obvious that, movement of common wild animals may takes place in the core zone from surrounding area. Major carnivore like Panther may be visited in the area in search of food. However, there is no migratory corridor of any schedule fauna as well as no national park or sanctuary within in Narayanpur

District. The reptiles observed in the study area include Common garden lizard, Common rat snake, House Gecko, Indian Cobra, Russell's Viper and Common Indian Krait. Birds observed in the study area include Common Swift, Little swift, Cattle Egret, Indian Pond-Heron, Small Indian/pariah kite, Red-wattled Lapwing, Little Cormorant, Red-napped Ibis, Rock Pigeon, Common King fisher, Indian Roller, Little Green Bee-eater, Asian Koel, Grey Francolin, Common moorhen, Black Drongo, House Crow, Indian Robin, Purple Sunbird, House Sparrow, Red-whiskered Bulbul, Bank Myna, Brahminy starling, Common Babbler, Common Tailorbird, Rose-ringed Parakeet, Spotted Owlet and Eurasian Hoopoe, etc.

As per IUCN RED list, some mammals like *Panthera pardus* (Vulnerable), *Cervus unicolor* (Vulnerable), *Tetracerus quadricornis* (Vulnerable), *Hyaena hyaena* (Near Threatened), *Melurus urisinus* (Vulnerable), other species of mammals belonging to least concern category. and in reptiles like *Python molurus* Near threatened, other species of reptiles belonging to least concern category and almost all encountered avid fauna are in least concern category.

3.5.3 Mixed forests

Mixed forests are present in Narayanpur forest study area. The mixed forests dominant species are Sal (*Shorea robusta*), Bijasal (*Pterocarpus marsupium*), Jamun (*Syzygium cumini*), Haldu (*Adina cordifolia*), Dhobin (*Dalbergia paniculata*), Tendu (*Diospyrous melanoxylon*), Kumbhi (*Careya arborea*), Bahera (*Terminalia bellirica*), Bargad (*Ficus bengalensis*), Saja (*Terminalia tomentosa*), Harra (*Terminalia chebula*), Mahua (*Madhuca indica*), Dhawda (*Anogeissus latifolia*), Kusum (*Schleichera oleosa*), Salai (*Boswellia serrata*), Siris/Karahi (*Albizia procera*), Semal (*Bombex ceiba*), Gular (*Ficus glomerata*), Kekad (*Garuga pinnata*), Mango (*Mangifera indica*), Kassi (*Bridelia retusa*), Bhirra (*Chloroxylon swietenia*) of certain places small groups of sagwan (*Tectona grandis*) are also presents as scattered patch in the forest. Among the co-dominant species Amaltas (*Cassia fistula*), Lendia (*Lagerstroemia parviflora*) Girch (*Casearia spp.*), Bel (*Aegle marmelos*), Papara (*Gardenia latifolia*), Tinsa (*Ougenia oojeinensis*), Kari (*Saccopetalum tomentosum*), Rori/sinduri (*Mallotus philippinensis*), Anola (*Emblica officinalis*) and Char (*Buchanania lanzan*) are



A View of Sal Forest at Study Area



A View of Mixed and bamboo Forest at Study Area

Plate 3.1: Forest types of study area

present. In the entire area, Bamboo species are also present here in patches. Among the shrubs Dhawai (*Woodfordia floribunda*), Ber (*Zizyphus mauritiana*), Aiti (*Helicteres isora*), Manhar (*Catunaregum spinosa*) Karonda (*Carissa carandus*), Vantulsi (*Ocimum basilicum*) Sidha (*Albizia amara*) Salparni (*Desmodium gangeticum*) Makoy (*Zizyphus oenoplia*) Aamti (*Antidesma Diandrum*) Mainphal (*Randia dumetorum*) Chind (*Phoenix acaulis*) species are present and among the herbs Safed musali (*Chlorophytum tuberosum*) Kalimusali (*Curculigo orchioides*) Tulsa (*Ocimum canum*), Charota (*Cassia tora*), Peng (*Celastrus paniculata*) Khereta (*Dononaea viscosa*), Ban-janti (*Glossogyne bidens*), Galfula (*Flemingia chapper*) Gudsakri (*Grewia hirsuta*) species are found. Among the climbers Mahul (*Bauhinia vahlii*), Jungali angur (*Vitis tiliifolia*), Jungali Kulthi (*Cajanus scarabaeoides*) Kalihari (*Gloriosa superba*) Paibel (*Combretum roxburghi*), Ramdatun (*Smilax zeylanica*), are available. The grasses species are Bhurbhusi (*Eragrostis tenella*), Doob (*Cynodon dactylon*), Sukal (*Heteropogon cantorus*) species are the major ones.

3.6 Sample and Sampling Procedure

3.6.1 Selection of village

The villages selected for study on the basis of block, three of villages of each block each were selected on the basis of maximum collection and utilization of Non-Timber Forest Products carried out by tribal communities residing in and around study areas after discussing with the DFO, forest range officer, forest guard and Panchayat Sachive and Sarpanch of the villages. Narayanpur district have two blocks *i.e.* Narayanpur block which consist of Chhotedongar, Benoor, Bharanda villages and Orchha (Abujhmar) block which consist of Orchha, Gudadi and Basing villages. Both the blocks were selected in such a way to cover and represent the Narayanpur forest division as a whole.

3.6.2 Selection of respondents

Out of total tribal families residing in each selected village, a representative sample of 20% respondents were selected by purposive sampling. The tribal respondents, which have been incorporated in this study for collection of data, are illustrated in Table 3.1.

Table 3.1: Village wise house hold selected in different study sites of Narayanpur, (C.G.)

S. No.	Village	Total household	No of Respondents selected (20%) of the total household of the village)
Narayanpur Block			
1.	Chhotedongar (Tarbhata)	90	20
2.	Benoor (Tushwalpara)	105	20
3.	Bharanda	88	20
Orchha Block			
1.	Orchha (Abujhmar)	115	20
2.	Gudadi	84	20
3.	Basing	39	10

Table 3.2: Details of the respondents selected in Narayanpur block - 01, village - Chhotedongar, Narayanpur (C.G.)

S. No.	Respondents name	No of family members	No of M/f	Education status	No. of children	Cast
VILLAGE - 01: CHHOTEDONGAR						
1.	Sukcharan Belsariya	8	4/4	Illiterate	6	Halba
2.	Chamanlal Korram	7	4/3	Middle	3	Gond
3.	Budhram Korram	5	1/4	Illiterate	3	Gond
4.	Jugbir Korram	6	2/4	Primary	4	Gond
5.	Mohan Usendi	5	3/2	Primary	2	Gond
6.	Sonadhar Rana	5	4/1	Middle	3	Halba
7.	Ganesh Belsariya	4	3/1	Illiterate	2	Halba
8.	Tamku Korram	6	3/3	Primary	2	Gond
9.	Shivlal Belsariya	4	2/2	Primary	2	Halba
10.	Umesh Nag	6	2/4	Primary	2	Halba
11.	Bashilal Baghel	4	3/1	Illiterate	2	Gond
12.	Duryodhan Nag	3	2/1	Illiterate	1	Halba
13.	Baratsingh Puran	2	1/2	Primary	1	Halba
14.	Babudas Baghel	6	4/2	Illiterate	2	Halba
15.	Bhageshwar Bhoyar	7	3/4	Primary	3	Halba
16.	Dulsingh Korram	5	3/2	Primary	2	Halba
17.	Pawan Ku. Pandey	3	1/2	Middle	1	Kalar
18.	Sukhadev Bhaghel	6	3/3	Illiterate	1	Kalar
19.	Govind Ram Gagda	6	3/3	Primary	4	Kalar
20.	Hemchand Manjhi	8	5/3	Illiterate	6	Halba

W-Woman, M-Man



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Plate 3.2: Respondents selected in Narayanpur Block, village - Chhotedongar

Table 3.3: Details of the respondents selected in Narayanpur block-01, village - Benoor, Narayanpur (C.G.)

S. No.	Respondents name	No of family members	No of M/f	Education status	No. of children	Cast
Village - 02: Benoor						
1.	Malu Kachlam	8	4/4	Primary	3	Gond
2.	Malsaay Potai	7	2/5	Illiterate	1	Gond
3.	Singray Kachlam	6	4/4	Primary	3	Gond
4.	Singalu Kachlam	4	2/2	Illiterate	1	Gond
5.	Somji Kachlam	8	5/3	Primary	4	Gond
6.	Prakash Kachlam	3	1/2	Illiterate	1	Gond
7.	Jailal Kachlam	4	3/1	Illiterate	2	Gond
8.	Sunder Kachlam	6	3/3	Illiterate	2	Gond
9.	Chander Potai	5	3/2	Primary	3	Gond
10.	Raysingh Mandavi	5	2/3	Primary	3	Gond
11.	Shyamlal Dugga	5	2/3	Illiterate	3	Gond
12.	Budhram Kachlam	5	1/4	Primary	3	Gond
13.	Nagduram Kachlam	7	3/4	Middle	5	Gond
14.	Sunil Mandavi	4	2/2	Illiterate	1	Gond
15.	Birsingh Kachlam	6	2/4	Illiterate	3	Gond
16.	Sanvaram Salam	4	2/2	12th	2	Gond
17.	Ginjruram Kachlam	8	4/4	Primary	3	Gond
18.	Phulsingh Mandavi	5	3/2	Primary	3	Gond
19.	Chainsingh Kachlam	6	3/3	Illiterate	4	Gond
20.	Santer Potai	3	2/1	Illiterate	1	Gond

W-Woman, M-Man



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Plate 3.3: Respondents selected in Narayanpur Block, village - Benoor

Table 3.4: Details of the respondents selected in Narayanpur block-01, village-Bharanda, Narayanpur (C.G.)

S. No.	Respondents name	No of family members	No of M/f	Education status	No. of children	Cast
Village - 3: Bharanda						
1.	Somaru Ram Kawade	7	4/3	Illiterate	3	Gond
2.	Chensingh Dugga	5	3/2	Illiterate	3	Gond
3.	Faganu ram Dugga	3	2/1	Illiterate	1	Gond
4.	Lachchu Ram Dugga	8	5/3	Primary	3	Gond
5.	Ranuram Karanga	6	4/2	Illiterate	4	Gond
6.	Mangdu Ram korram	10	5/5	Primary	3	Gond
7.	Noharu Kumeti	5	3/2	Primaya	3	Gond
8.	Ramlal Dugga	6	3/3	Primary	4	Gond
9.	Ghasiya Kumeti	7	3/4	Illiterate	3	Gond
10.	Maharu Kumeti	6	3/3	Illiterate	2	Gond
11.	Ramesh Ku. Korram	5	3/2	Illiterate	1	Gond
12.	Sukhdev Dugga	8	5/3	Illiterate	5	Gond
13.	Ramu Ram Kumeti	8	4/4	Illiterate	2	Gond
14.	Rajlal Karanga	8	4/4	Primary	2	Gond
15.	Budharu Kumeti	9	5/4	Primary	2	Gond
16.	Shopsingh Dugga	5	3/2	Illiterate	1	Gond
17.	Santuram Dugga	7	5/2	Primary	3	Gond
18.	Sukhduram Nureti	6	3/3	Primary	4	Gond
19.	Rajman Dugga	5	2/3	Illiterate	2	Gond
20	Mangaluram Kumeti	5	3/2	12 th	3	Gond

W-Woman, M-Man



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Plate 3.4: Respondents selected in Narayanpur Block, village - Bharanda

Table 3.5: Details of the respondents selected in Orchha (Abujhmar) block - 02, Village - Orchha, Narayanpur (C.G.)

S.No.	Respondents name	No of family members	No of M/f	Educational status	No. of children	Cast
Village - 01 : Orchha						
1.	Gangaram Kumeti	07	4/7	Illiterate	3	Maria
2.	Kamluram Usendi	06	2/3	Illiterate	4	Maria
3.	Mangluram Usendi	8	6/4	Middle	3	Maria
4.	Santuram Nureti	5	2/3	Illiterate	3	Maria
5.	Somaru ram Usendi	5	3/2	Middle	2	Maria
6.	Kolaram Usendi	6	2/4	Illiterate	4	Maria
7.	Munu ram Potai	2	1/1	Middle	-	Maria
8.	Papuram Wadde	5	1/4	Primary	3	Maria
9.	Juriya ram Usendi	4	2/2	Illiterate	2	Maria
10.	Sukadibai Usendi	6	4/2	Illiterate	5	Maria
11.	Jagguram Usendi	4	2/2	Primary	2	Maria
12.	Vadange Korram	10	5/5	Illiterate	7	Maria
13.	Mukesh Gota	6	4/2	Middle	3	Maria
14.	Suman Dhurw	5	1/4	Illiterate	3	Maria
15.	Bhikchand Patel	6	2/4	M.A	4	Marar
16.	Ranjeet Ku.Wadde	02	2/2	12 th	2	Maria
17.	Chaitu ram Usendi	4	1/3	Illiterate	2	Maria
18.	Sukay Potai	8	3/4	Illiterate	4	Maria
19.	Munna Wadde	5	2/3	Middle	3	Maria
20.	Wadange Wadde	6	3/3	Illiterate	4	Maria

W-Woman M-Man



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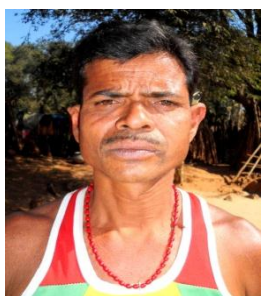
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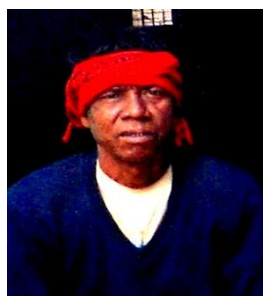
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Plate 3.5: Respondents selected in Orchha (Abujhmar) Block, village - Orchha

Table 3.6: Details of the respondents selected in Orchha (Abujhmar) block-02, village - Gudadi, Narayanpur (C.G.)

S.No.	Respondents name	No of family members	No of M/f	Education status	No. of children	Cast
Village - 02 : Gudadi						
1	Lakhama Korram	10	3/7	Primary	7	Maria
2	Keye ram Usendi	5	4/1	Primary	4	Maria
3.	Musra ram Podiyam	4	2/2	12 th	2	Maria
4.	Budharam Usendi	3	1/2	Metric	1	Maria
5.	Galaram Nureti	4	2/2	Illiterate	2	Maria
6.	Beju ram wadde	2	1/1	Illiterate	-	Maria
7.	Bajjuram Korram	3	2/1	12 th	1	Maria
8.	Sukhram Varda	8	4/4	Primary	6	Maria
9.	Ramesh Ku. Wadde	3	2/1	Primary	1	Maria
10.	Somaru ram Korram	5	2/3	Illiterate	3	Maria
11.	Tangari Usendi	7	3/4	Illiterate	6	Maria
12.	Gajendra Korram	9	4/5	Middle	-	Maria
13.	Aaytu ram Wadde	6	4/2	3 rd	4	Maria
14.	Sukaru ram Dorpa	5	2/3	Primary	2	Maria
15.	Sonu ram usendi	6	1/5	Middle	4	Maria
16.	Miriya Dorpa	4	2/2	Illiterate	2	Maria
17	Kamlu ram Usendi	3	1/2	Illiterate	1	Maria
18.	Juru ram Dorpa	9	4/5	4 th	7	Maria
19.	Laxman Potai	3	1/2	12 th	1	Maria
20.	Ramesh Wadde	5	3/2	Primary	3	Maria

W-Woman M-Man



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Plate 3.6: Respondents selected in Orchha (Abujhmar) Block, village - Gudadi

Table 3.7: Details of the respondents selected in Orchha (Abujhmar) block-02, village - Gudadi, Narayanpur (C.G.)

S.No.	Respondents name	No of family members	No of M/f	Education status	No. of children	Cast
Village - 03 : Basing						
1	Budru Ram	7	4/3	Primary	3	Gond
2	Chaitu Ram	8	3/5	Illiterate	4	Gond
3.	Sannu Ram	6	3/3	Illiterate	3	Maria
4.	Paater	5	3/2	Illiterate	3	Maria
5.	Raiju Ram	3	1/2	Illiterate	-	Gond
6.	Maansingh	9	3/6	Primary	6	Gond
7.	Rupsing	7	5/2	Illiterate	2	Gond
8.	Juriya Ram	6	3/3	Illiterate	4	Gond
9.	Kule Ram	5	3/2	Illiterate	2	Maria
10.	Pulsingh	5	2/3	Illiterate	4	Gond

W-Woman M-Man

3.6.3 Method of data collection

Random sampling methods were used for Socio-economic survey. Total 6 villages were selected. A total of 110 respondents were selected for collection of information. The primary data was collected from the sampled respondents through intensive personal interviews with the help of pre-tasted semi structured schedule. The schedule is given in Appendix-1. The schedules contains information on collection, utilization and post harvest techniques of tribal and villagers, infrastructure facilities are available at villages.

3.6.4 Data collection

Data was collected on winter and summer season when the NTFPs are extracted from forests and sold in the market. The data was collected on the basis of questionnaire developed for this experiment regarding, processing of the harvested NTFP before storage and marketing of the produce. The collection method of different NTFPs also documented. The income obtain from different

enterprises, like Agriculture, labour work, Job and any other business and contribution of different enterprises for their livelihood were recorded with the help of questionnaire developed.

3.6.5 Data collection of phytosociology

The phytosociological study was carried out in the month of October after the full vegetation is available in the forest stand to record the Density, Frequency, Basal Area and Importance Value Index of the study sites.

Quadrat sampling:

- 10X10 Meter quadrat size will be used for tree layer, in which DBH and Height of trees.
- 5X5 Meter quadrat size will be used for shrub layer, in which collar diameter & height.
- 1X1 Meter size of quadrat will be taken for herb layer, in which collar diameter will be taken.

Vegetation composition was evaluated by analyzing the frequency, density, abundance and importance value index (IVI) according to Curtis & McIntosh (1951) and Mishra (1968) and as given below:

Basal Area It is the area occupied by the base of a tree, is considered as a good indicator of the size, volume or weight of a tree. It provides information on the proportion or dominance of the larger and smaller trees in an ecosystem and is one of the most important parameters in estimating the standing biomass in an area.

$$\text{Basal area} = \text{Cbh}^2/4\pi$$

Where

Cbh = Circumference of the tree at breast height.

Usually after the quantitative estimation of relative values of density, frequency and dominance, the species are listed in order of decreasing importance.

$$\text{Density} = \frac{\text{Total number of Individuals in all sampling units}}{\text{Total number of sampling units studied}} \times 100$$

$$\text{Frequency} = \frac{\text{Number of sampling units in which species occur}}{\text{Total number of sampling units}} \times 100$$

$$\text{IVI} = \text{Relative Density} + \text{Relative Frequency} + \text{Relative Dominance}$$

$$\text{Relative density} = \frac{\text{Density value of species}}{\text{Sum of density value of all species}} \times 100$$

$$\text{Relative frequency} = \frac{\text{Frequency value of species}}{\text{Sum of frequency value of all species}} \times 100$$

$$\text{Relative dominance} = \frac{\text{Total basal area of the species}}{\text{Total basal area of all species}} \times 100$$

3.7 Important features of Ethnic Groups in the study areas

There are mainly four dominated tribes namely Gond, Abujhmaria, Muria Dandami Maria and Halba are living in and around Narayanpur forest areas.

Gond Tribes

The Gonds are one of the most famous and important tribes in India, known for their unique customs and traditions. They are mainly a nomadic tribe and call themselves as Koytria. The term 'Gond' is derived from the Telugu word 'Konda' which means hill? Gond Tribes are primarily located in Madhya Pradesh, Chhattisgarh, eastern Maharashtra, northern Andhra Pradesh and western Orissa. With a population of over 4 millions, Gonds also form the largest tribal group in central India. In Chhattisgarh, Gonds are the largest tribal group in terms of population and are mainly concentrated in the southern part of the state. More than 20% of Gonds in Chhattisgarh live in Bastar region only. There are 3 major sub-castes of Gonds in Bastar – Maria, Muria and Dorla. Gond men and women have strong and black skin because they always come in contact of sunlight. They live in the Geda (Forest), they worship the garia (heaps of stones worships as Gods and Goddess), pet pigs are sacrifice by them that is why they are called as Gudadharis (Guda pig shed or pig sacrifice) and thus they are called Gonda. There are more

than a dozen of subgroups in Gonds living in Chhattisgarh and M.P. and its border states.

The Gonds are predominantly Hindus and like to live in groups in small villages. The main language of the Gonds is Gondi but about half of Gond populations also speak Indo-Aryan dialects including Hindi. The Gonds are traditionally agriculturalists and some practice shifting cultivation even today. Other major activities of Gonds include collecting forest produce, fishing, hunting, forging metal goods in cottage industries and other primary sector activities. Gonds also have a special skill that has been passed down every generation and that is the secrets of the medicinal plants. As there are no proper health facilities in several areas, they still follow the traditional system of medicines and use plants and herbs for curing various ailments. Gonds are also known for practicing social hierarchy system like Hindus and the Gond society is regarded as highly stratified and not conforming to the usual image of egalitarianism among tribals.

Gonds have ruled successfully in a big area of Chhattisgarh. Geographically Dandkaranya, Chhattisgarh, Vindychal, Bundelkhand and Baghelkhand region are the areas in which the Gonds have ruled from 15th to 19th century. According to Hislip, Rajgonds sprinkle little amount of water on the wood before using them to cook food. Rajgonds occupy the highest position in the society.

In Mandla district four groups of Gonds are found. This subdivision of the groups as varnas is impressed by the Hindu Varna system. The four varnas are

1. Devgond - they are pure vegetarians.
2. Suryavananshi Rajgond - the Rajput khatiyas have the earlier people from Suryavanshi and Chandravanshi. They believe that they were originating from the sun.
3. Suryavanashi devghadi gond – these are Shryavanashi gond and originate from devgarh.
4. Rawanvanashi gond- they eat cow meat, drink alcohol and sacrifice pigs. Although gonds worship hindu Gods but they also give privilege to ancient deities and souls. Among these Dulhadev, Narayadev, Surajdev, Matabhai,



Dandami Maria tribes of Narayanpur district of C.G.



Gond tribes of Narayanpur district of C.G.

Plate 3.7: Dandami Maria and Gond tribes in study area



Abujhmaria tribes of Narayanpur district of C.G.



Halba tribes of Narayanpur district of C.G.

Plate 3.8: Maria and Halba tribes in study area

Khairmata, Thakurdev and Bagheshwerdev are the major ones. Bagheshwerdev is often gifted hen and goat.

Gonds live in the hills and that place, which are covered by dense forest. Their living area at 600 mt. above sea level covering the Narmada basin, Satpura, Mandla, Maikal and Amarkantak hills. They like teak trees and spread its ash in the fields to increase the fertility of land but do not cut Saja trees. They use nets, bows and arrows for hunting wild animals. Their food habit includes cereals, meat, roots of wild plants, fruits and fish.

Halba Tribes

Halbi or Halba is a tribal community of India. Halba They derives their name from the word hal, meaning a plough (Russell and Hiralal, 1916). The Halba were farmers and landlords. The Halba tribe is a popular tribe who has happily settled in the bucolic lands of Chhattisgarh. The Halba Tribals are widely dispersed all over Chhattisgarh, Maharashtra, Madhya Pradesh and Odisha. One of India's predominant tribes, the Halba tribals inhabits the districts of Durg, Bastar and Raipur in Chhattisgarh. Earliar the Halba tribes were active in the politics and military of Bastar State. The goddess of the Halba tribe is Ma Danteshwari. The language of the Halba tribe is Halbi, which is a combination of Chhattisgarhi, Odia and Marathi. The Halba/Halbi tribe has no sub-castes. The unique individuality of the Halbas is evinced by their apparels, dialects and traditional customs.

CHAPTER-IV

RESULTS AND DISCUSSION

This chapter will discuss from various aspects the results of the studies on **“Documentation of Non Timber Forest Product Collection, Processing and Value Addition of Narayanpur forest area of Chhattisgarh”** in the tropical dry deciduous forest of Narayanpur forest division. The Abujhmar area is the most isolated region of Narayanpur and there has been very little contact of this region with the outside culture. Most primitive condition of agriculture and food habits was witnessed in area. Communication to this area poses serious difficulty. The findings of the study are presented in six sections. The first section deals with educational status, social structure and division of labour in selected villages, second part deals with identification and documentation of NTFPs and medicinal plants species, third part deals with collection techniques of NTFPs and fourth one deal with socio-economic status of tribes. Fifth section of this chapter deals with phytosociological analysis of NTFP vegetation. The observations recorded in the present investigation are described under the following heads.

1. Documentation of NTFP and medicinal plants available in Narayanpur forest area.
2. Documentation of traditional collection methods of different NTFPs in different seasons.
3. Documentation of post harvest methods and value addition, if any.
4. The role of NTFPs in the livelihood of tribes and local residents in relation to economics.

4.1 Educational status, social structure and division of labour in selected villages

4.1.1 Details of Ethnic groups

The general category or forward communities were absent in all the studied villages. The study showed that majority of the forest dwellers belonged to schedule tribes followed by schedule cast. The population of schedule cast varied from 0-15.41%. Schedule cast are residing only in three villages namely

Chhotedongar, Benoor, and Orchha. The highest population of schedule cast was recorded in Chhotedongar (15.41%) and it was nil in three villages namely Bharanda, Gudadi, and Basing. The schedule tribes population varied from 51.60 to 98.05%. The highest schedule tribe population was recorded in villages Gudadi (98.05%) followed by Basing (82.24%) and lowest population of schedule tribes was in Benoor (51.60%) followed by Chhotedongar (60.76%). The percentage of male schedule tribes was highest in Gudadi (47.81%) followed by Basing (43.84%). However, the female schedule tribes percentage was highest in Gudadi (50.81%) followed by Basing (38.40%).

Verma and Paul (2016) reported that village Banalat has 217 households with a population of 1156, village Nirasi has 282 households with a total population of 1370. 83% of the population are scheduled tribes in Banalat village whereas, it has been 92% in Nirasi village (according to Census 2011, GOI). Islam *et al.* (2013) also reported that Bundu block in Ranchi district of Jharkhand, the majority (75.74%-100%) of the population in the villages are dominated by schedule tribes with an average sex ratio of 1028.22.

Choudhary *et al.* (2004) also reported that in Bastar plateau of Chhattisgarh total population of selected respondents were 33 out of which 67% belongs to schedule tribes category. However, in present study the population of schedule tribes was more as reported by above worker this may be because of location specific difference or selection of remote villages only selected where other communities do not reside. Another study carried out by Bhattacharya *et al.* (2004) reported that in Sarguja district of Chhattisgarh which is tribal majority district, the tribal population being 19.55%. Average rate of growth of tribal population in the nintes was 27.22%. The observation recorded is more or less tribal population growth rate is higher and confirms the similar results obtained in the present investigation and showed conformity. The growth rate of tribal population is observed higher in the present investigation this may be because of hot climatic condition and the district is surrounded by district Kanker in North, district Bijapur in South, district Kondagaon in East, and in west by Gadchiroli district of neighboring Maharashtra state. So the tribal residing in hot and humid

area had higher fertility and child birth rate as compared to cold climatic condition like Sarguja. The genetical character may also be responsible for birth rate in different tribes. The food habits, climate, etc. also affect the fertility rate in the woman.

4.1.2 Household and population of selected villages

Types of housing varied from thatched to pakka houses. 20% houses were in pakka form, 30% in semi pakka and 50% houses in kaccha form. The household and population of studied villages varied from 39 to 115. It was highest in Orchha (115) household followed by Benoor (105) and lowest in Basing (39) followed by Gudadi (84). The total population varied from 276 to 4302. It was highest in Chhotedongar (4302) followed by Orchha (3678) and lowest in Basing (276) preceded by Gudadi (366).

Islam *et al.* (2015) also reported that Bundu block in Ranchi district of Jharkhand the total population in the sample households is 881, of which 374 (42.45%) are male, 377 (42.79%) are female and rest 130 (14.76%) are children. Nath *et al.* (2006) also reported that in Dihing Patkai Wild life Sanctuary there are 9 villages with 856 household and 4837 population on Assam border and 4 villages with 102 households and 640 population of Arunachal Pradesh. The size of village related with the number of households and population related with the social structure and behaviour. The households in different villages vary in the number of households and population is lowest in the present investigation as reported by above worker at Assam while in Arunachal, the number of households and population is quite low as it was found in the present investigation, this shows confirmation with the present study. The study sites are quite remote areas the development is far away in the Abujhmar area people still resides in primitive way.

Basu *et al.* (2004) studied and concluded that tribal population of 29.9 percent contributed in the population of Jambani block of West Bengal during the survey conducted for knowledge, attitude and practice of family planning among tribals. The population of scheduled tribes in remote villages varies as per the social and livelihood character. The population of scheduled tribes was more as reported by above worker in the present study may be because of social and

livelihood of the people is forest based structure confirm the conclusion of above research. Murli *et al.* (1996) also reported that in dry deciduous forest of Kanneri, the total household was 92 and population of 478.

4.1.3 Infrastructure facilities available in selected villages

Among six studied villages only five villages *viz.* Chhotedongar, Benoor, Bharanda, Orchha, Gudadi had independent panchayat, while one village Basing had no independent panchayat but this village has been clubbed with other village to form Kundala panchayat. The biggest panchayat was Chhotedongar and it is 30 Km. away from headquarter Narayanpur (Table 4.1). All villages studied *i.e.* Chhotedongar, Benoor, Bharanda, Orchha, Gudadi, Basing had Primary school. Middle School was present in Chhotedongar, Benoor, Bharanda and Orchha villages and high school was present in Chhotedongar, Benoor, and Orchha. There were no Government or Private Colleges. During the survey, it was observed that diverse sources of drinking water supply existed in villages. Major source of drinking water in the study area was ground water (hand pumps, tap water and dug wells). Near about 30% villages were availing treated water through gram panchayat water supply through tap. During discussion with the villagers, it was revealed that in summer season water scarcity was faced by most of the villages.

The source of water depends on hand pump, well, pond and river for drinking, bathing and washing for people. The villagers mostly depend on hand pump and well for drinking water. Average 2 to 15 hand pumps were found in study area, these were highest in Chhotedongar (15) followed by Orchha (12) and lowest in Gudadi (2) preceded by Basing (3). All six studied villages had traditional well. The pond was present in six villages namely Chhotedongar, Benoor, Bharanda, Orchha, Gudadi, and Basing. The villagers used pond water for washing and bathing. There are only three rivers, which fall in all villages namely Chhotedongar, Benoor, Bharanda, Orchha, Gudadi and Basing. Most of the roads were pakka and connecting fair enough to villages. More than half the respondents reported that roads they frequently used were pakka. The villages *viz.* Chhotedongar, Benoor had metalled road. All six villages namely Chhotedongar, Benoor, Bharanda, Orchha Gudadi and Basing had cart track road and Kachha

Table 4.1: Infrastructure facilities available in study area, Narayanpur (C.G.)

Village	Panchayat	School facility				Water				Roads			Hospital Primary	Electricity
		P	M	H		1	2	3	4	a	b	C		
Narayanpur Block														
Chhotedongar	Chhotedongar	√	√	√	15	6	5	1	√	√	√	√	√	√
Bharanda	Bharanda	√	-	-	4	1	3	1	-	√	√	√	-	√
Benoor	Benoor	√	√	√	8	5	6	1	√	√	√	√	√	√
Orchha Block														
Orchha	Orchha	√	√	√	12	3	5	1	-	√	√	√	√	√
Gudadi	Gudadi	√	-	-	2	2	2	1	-	√	√	√	-	√
Basing	Kundala	√	-	-	3	1	2	1	-	√	√	√	-	√

P - Primary school

M - Middle school

H - High school

1- Hand pump

2- Well

3- Pound

4-River

a- Metal road

b- Cart track road

c- Kachha road

road. The electricity facility is available in all six villages namely Chhotedongar, Benoor, Bharanda, Orchha, Gudadi, Basing. There were few healthcare facilities available in the study area. In some of the villages primary health sub centers were available. Hospitals and other better health centers were available in the range of 5-10 km. Narayanpur District have a District Hospital and Orchha, Chhotedongar, Benoor have Primary health centers. The primary sources of cooking fuel were firewood, wood chips cow dung cake, coal etc. Very few villagers were using LPG facility. It was observed that, most of the households had LPG connection but they prefer cooking on wood/coal because it costs less and easily available in villages/farms. Toilet facility is one of the most basic facilities required in a house. It was observed that more than 80 per cent of the households were not having toilet facilities in their houses. There was no proper drainage line in the villages. Open defecation was in practice in most of the villages.

4.1.4 Educational status

Most of the villages had education facilities in the form of Aanganwadi and primary schools. Higher education facilities were available in the range of 5-10 km. According to the results on educational status of tribal people of selected villages (Table 4.2) showed that educational status of people in selected villages was good. The literacy percentage ranged from 30.41 to 51.16. It was highest in Orchha (51.16%) followed by Benoor (50.06%) and lowest in Bharanda (30.41%) followed by Gudadi (31.42%). The literacy percentage in men ranged from 19.94 to 30.08%. It was highest in Benoor (30.08%) followed by Chhotedongar (28.42%) and lowest in Gudadi (19.94%) followed by Bharanda (20.34%). However, the literacy in women ranged from 11.47-29.08%. It was highest in Bharanda (29.08%) followed by Orchha (24.06%) and lowest in Gudadi (11.47%) followed by Benoor (19.72%) The average literacy percentage was recorded to be 42.96% in the study area.

Verma and Paul (2016) reported that in Banalat and Nirasi villages district Jharkhand the literacy rate (according to Census 2011) are 43% and 41% respectively, which is much lower than the overall literacy of Jharkhand i.e. 67.6%. Sivakumar et al. (2006) reported that in Kancheepuram district of Tamilnadu

Table 4.2: Social structure, Education status and division of labour gender wise in study area of Narayanpur (C.G.)

S. No.	Village	H	P	SC			ST			Literate			Illiterate			Labour		
				M	F	Total	M	F	Total	M	F	Total	M	F	Total	M	F	Total
Narayanpur Block																		
1.	Chhotodongar (Tarbhata)	90	4302	336	327	663	1292	1322	2614	1223	870	2093	732	987	1724	489	350	839
				(7.81)	(7.60)	(15.41)	(30.03)	(30.72)	(60.76)	(28.42)	(20.22)	(48.65)	(17.02)	(22.94)	(40.07)	(11.37)	(8.14)	(19.50)
2.	Benoor (Tuswal para)	105	2393	50	56	106	600	635	1235	720	472	1198	370	566	936	456	231	687
				(2.08)	(2.34)	(4.42)	(25.07)	(26.53)	(51.60)	(30.08)	(19.72)	(50.06)	(15.46)	(23.65)	(39.11)	(19.06)	(9.65)	(28.71)
3.	Bharanda	88	526	0	0	0	206	200	406	107	153	160	117	161	278	250	170	420
							(39.16)	(38.02)	(77.18)	(20.34)	(29.08)	(30.41)	(22.24)	(30.61)	(52.85)	(47.53)	(32.32)	(79.85)
Orchha Block																		
4.	Orchha	115	3678	3	1	4	1166	1337	2503	997	885	1882	541	735	1276	560	362	922
				(0.08)	(0.02)	(0.10)	(31.70)	(36.35)	(68.05)	(27.10)	(24.06)	(51.16)	(14.71)	(19.98)	(34.69)	(15.23)	(9.84)	(25.07)
5.	Gudadi	84	366	0	0	0	175	186	361	73	42	115	106	145	251	86	56	142
							(47.81)	(50.81)	(98.05)	(19.94)	(11.47)	(31.42)	(28.96)	(39.62)	(68.58)	(23.50)	(15.30)	(38.80)
6.	Basing	39	276	0	0	0	121	106	227	68	59	127	57	49	106	111	48	159
							(43.84)	(38.40)	(82.24)	(24.42)	(21.37)	(46.01)	(20.65)	(17.75)	(38.41)	(40.22)	(17.39)	(57.61)

Note - Values in parentheses are in percentage, **H** - House hold, **P** - Population, **SC** - Schedule cast, **ST** - Schedule tribe, **LIT** - Literate, **M** - Male and **F**-Female

majority of the Scheduled tribes (50%) and above were mostly illiterate (57.78%). Basu *et al.* (2004) reported that in Santal and Lodha tribes the female literacy rate is only 15.8 per cent and 2.9%, respectively. Biswas and Kapoor (2003) reported that Saharia tribe of Madhya Pradesh literacy rate is only 23.3% as well as their socio - economic status also below poverty line. Islam *et al.* (2013) also reported that Bundu block in Ranchi district of Jharkhand that the literacy rate is very low varying between 24.52 to 44.87%. Similar study carried out by Sharma (2007) reported that in Primitive group of tribes in Sarguja district of Chhattisgarh extremely low level of literacy below 2.64% has been recorded in his study. The data of literacy % is quite high as studied by the above workers this indicates that the economic condition, education facilities and opportunities are high in the study area. This may be due to awareness about education and good sign of economic development in the Narayanpur district of Chhattisgarh.

4.1.5 Distribution of labour in selected villages under study area

The percentage of labour ranged from 19.50 to 79.85 percent. The percentage of population working as labour was recorded highest in village Bharanda (79.85%) followed by Basing (57.61%) and lowest in village Chhotedongar (19.50%) followed by Orchha (25.07%). The percentage of male labour ranged from 11.37 to 47.53 percent. It was recorded highest in village Bharanda (47.53%) followed by Basing (40.22%) and lowest was recorded in village Chhotedongar (11.37%) followed by Orchha (15.23%). The percentage of female labour ranged from 8.14 to 32.32%. It was recorded highest in village Bharanda (32.32%) followed by village Basing (17.39%) and lowest in village Chhotedongar (8.14%) followed by Benoor (9.65%). The average percentage of labour was (38.38 %) in the study area.

Islam *et al.* (2015) also reported that Bundu block in Ranchi district of Jharkhand the total labour force of 751 (49.81% male and 50.19% female), the work force is 413 (50.39% male and 49.61% female) and unemployment is 338 (49.11% male and 50.89% female). The percentage of work force to labour force constituted around 55.62 per cent and 54.38 per cent among male and female.

Bansod *et al.* (2005) reported that about half of the family members were engaged in collection of medicinal plant products from the forest. Similar research was observed in the present investigation that in case of NTFPs collection 47.05% average people engaged in collection.

4.2 Documentation of medicinal and NTFPs species available in study area of Narayanpur (C.G.)

The results of identification and documentation are depicted in Table 4.3. The villagers mainly depend on some NTFPs species for their livelihood and subsistence. Among all these Medicinal and NTFPs species enlisted and identified some are the source of their income such as *Madhuca latifolia* (Mhaua) flower, *Bauhinia vahlii* (Mahul) leaves, *Diospyros melanoxylon* (Tendu) leaves *Tamarindus indica* (Imli) fruit *Mangifera indica* (fruit), *Phoenix acaulis* (Chhind) and *Caryota urens* (Salfi) Juice *Thysanolaena maxima* (Phul bahari) and *Dendrocalmus strictus* Bamboo product. In total 112 NTFPs were identified and documented during present investigation. The identified 112 NTFPs species belonged to 47 trees, 29 shrubs, 12 herbs, 22 climbers, bamboo 1 and 1 Cane (beth) species. A variety of NTFPs viz. seeds, leaves used for plate making, tans and dyes, gum and resin, edible products, oil yielding, bamboo, fiber, thatching, broom making, medicinal plants, biocides (fungicidal, insecticidal and nematicidal) and *Salacia oblonga* and *Tamilnadia uliginosa* fish poison were identified. The forest of the study area has abundant different NTFPs plants species, which are used by villagers for various purpose viz. food, medicine, tans & dyes, oil, fuel, fodder, construction, etc. Maximum NTFPs species are used for medicinal purpose. Among identified 112 plants species 108 species came under medicinal plant. About 25 plant species was edible. About 8 gum yielding plant species was identified. 7 plate, Broom and rope making plant species were identified. 10 fire wood plant species were identified. 9 biocides (fungicidal, insecticidal and nematicidal) plant species were identified. The *Madhuca longifolia* (Mhaua) *phoenix acaulis* (Chind) and *Caryota urens* (Salfi) used for beverage making and *Tamarindus indica* (Imli), *Mangifera indica* (Aam), *Asteraeus hygoromericus* (Boda) *Termitomyses strictus* (Mushroom) and *Dendrocalmus strictus* (Bamboo product) are playing a significant role in the income of the people residing in study

area. Twenty one tans and dyes yielding plant species were identified. Two oil yielding tree species were identified. Two lac yielding plant species were also identified. *Shorea robusta* (Sal) and *Terminalia tomentosa* (Saja) are used as species as host trees for cocoon (Kosa) production in this study area.

Similar study carried out by Islam and Quli (2016) documented the diversity, distribution, and pattern of utilization of edible non-timber forest products (NTFPs) among the tribes of Bundu block in Ranchi district of Jharkhand, India. The results reveal that the sample population consumes 59 edible NTFPs belonging to 39 genera and 45 species under 29 families. Of the edible NTFPs, fruit represents the highest (26) followed by leaf (10), seed (7), flower (6), tuber (3), gum (2), mushroom (2), entire plant (2) and rhizome (1). The growth form of the species includes trees (30) followed by herbs (5), shrubs (4), climbers (3), fungi (2) and bamboo (1). Singh and Bharti (2015) worked in different areas of Raigarh district of CG. (India). They documented ethno-botanical use of 89 plant species and described that different parts of plants are used for different purposes by people for example medicine, food, fodder, furniture, fiber, cosmetics etc.

Ahirwar (2015) recorded that total 41 plants species belonging to 26 families and 37 plant genera were identified. A field survey was conducted at three different study sites in Boridand forest, district Korea, Chhattisgarh. Phanikumar and Chaturvedi (2006) reported that thin rope made by ambadi (*Hibiscus cannabinus*) bark, sumbh (*Cyprus rotundus*) and ainthi (*Helicteres isora*). Most of the fallen branches and leaves of the forest are used as fuel and fodder. In this investigation also various uses of the plants were recorded for their day to day work in their life. So many other uses of plants by these tribes are reported by above workers which confirm the results obtain in these studies.

Pandit *et al.* (2004) reported the diversity of NTFPs found in Jaldapara Sanctuary North Bengal. About 91 species were used as medicine while 3 species were used for decorative articles, 24 and 22 species were used as edible and fodder purposes, respectively. Similarly, Murthy *et al.* (2005) also reported that in Uttara Kannada district of Western Ghats, products of medicinal value were obtained from the bark of five different species, including *Cinnamomum zeylanicum*. Buds

of 3 species, roots of about 23 species including *Rauwolfia serpentina* and *Glycyrrhiza glabra*. The fresh or dry leaves are used as manure or mulching material and grasses are extracted exclusively for fodder. The results showed that the people use 38 species NTFPs for their livelihood. However, other documented species are not in use for market point of view in the particular locality. The use of different species for various purposes related with the social need as well as market demand as per industries available in the area. Total documented NTFPs are 52. However only 41 are used and collected for livelihood. The results of NTFPs vary as per location and forest type. Therefore, the observations are in conformity with the observations reported by other workers. The documented NTFPs species were less in the present investigation as reported in the above study. This difference in plant diversity and number of species is related to climatic conditions, soil and forest type. The result confirms the observations recorded in this investigation.

4.3 To study the collection method techniques of NTFPs

Information was collected with the help of questionnaire developed for present study. Information recorded with oral interview from the respondents selected for the study. The data recorded regarding NTFPs availability and collection methods. There were total 65 plant species and their traditional collection techniques methods were documented (Table 4.3).

Table 4.3: List the medicinal and NTFPs Species in study area of Narayanpur (C.G.)

S. no.	Local Name	Botanical Name	Status	NTFPs Use	Medicinal Use	Other Use
1.	Bel	<i>Aegle marmelos</i>	Tree	Whole plant, bark, fruits, leaves, twigs and root.	Diarrhoea, dysentery, haemorrhoids aphrodisiac laxative, diuretic astringency and peptic ulcers.	Fruit rind is used in making perfumes and soap unripe seeds are used as adhesive and household glue.
2.	Haldu	<i>Adina cordifolia</i>	Tree	The bark contains 7 - 9% tannins. Root.	Antiseptic, febrifuge, kill worms in sores, Pain killer, diarrhoea and dysentery.	Pulp and paper it is also used for construction, window frames, furniture, bobbins, boxes, piano keys, rulers.
3.	Dhaura	<i>Anogeissus latifolia</i>	Tree	Leaves, bark, Gum (ghatti gum)	Treating snake bites and scorpion Stings.	Used in calico printing for sweetmeats, dye processes, and as a binding agent in pharmaceuticals and timber wood, tanning, gum used Food industry.
4.	Sheetaphal	<i>Ammona squamosa</i>	Tree	Edible fruit, Leaves, shoots, bark and roots	Diarrhoea, ulcer, wound, dysentery, aid digestion, rheumatism, sleeplessness, cough, diabetes and hair tonic.	The tree is a good source of firewood, pesticide in agriculture and horticulture.
5.	Neem	<i>Azadirachta indica</i>	Tree	Seed and leaves	Heart problems, eczema, arthritis, white discharge, ear and tooth ache, malaria, anti-toxic, anti-microbial, tooth washing, furniture making, chicken pox, blood purification.	Timber wood. Seed and leaves used for Pest and disease control and cosmetics.

6.	Kachnar	<i>Bauhinia purpurea</i>	Tree	Root, leaves, flower, buds, gum, seeds and flower	Amoebic dysentery, diarrhoea and other stomach disorders, cuts and wounds, skin diseases, scrofula, ulcers, piles, dysentery, worms and dyspepsia.	The bark is a source of tannins. It is used for dyeing in various shades of brown. Wood used making household and agricultural implements. Fuel wood The calorific value is 4800 kcal/kg.
7.	Kasi	<i>Bridelia retusa</i>	Tree	Bark and fruit	Hypoglycaemic, hypotensive, cuts and wounds.	The bark contains 16-40% tannins. it's used for construction, railway ties and floorboards, wheel and agriculture implements, wood is used for fuel.
8.	Semal	<i>Bombax ceiba</i>	Tree	Flowers, floss, buds, leaves, bark, seeds, roots - raw or roasted Rich in starch Gum	Cholera, Tuberculo fistula, coughs, urinary complaints, nocturnal pollution, abdominal pain due to dysentery, impotency. The gum is astringent, demulcent and tonic. It dysentery, hemoptysis in pulmonary tuberculosis, influenza menorrhagia hypotensive and hypoglycemic.	The seed is used as a stuffing material for pillows, cushions. It is considered to be vermin-proof. Waterproof and buoyant, it can be used as the filling in life jackets. It is sometimes also as an insulating material in refrigerators, packing material sound-proofing properties, fiber cordage, making ropes.
9.	Chironji	<i>Buchanania lanzan</i>	Tree	Seed, Gum and bark is used in tanning.	Gum for Leprosy. Roots for acrid, astringent, cooling, depurative, constipating and diarrhoea. Leaves for skin diseases and Fruits for coughs and asthma.	Fire wood and charcoal.
10.	Palas	<i>Butea monosperma</i>	Tree	Young roots, rope	A powerful astringent, it is used in the treatment of diarrhoea and wounds. The seeds show anthelmintic, antifungal and	Dye, tannin, oil, sandals, ropes, charcoal, cordage, caulking the seams of boats and making paper.

					antibacterial activities. The flowers are useful in the treatment of liver disorders. The seeds act as an anthelmintic.	
11.	Amaltas	<i>Cassia fistula</i>	Tree	Flower, fruit, Bark, stem, root, Leaves and seed.	Malaria, blood poisoning, anthrax, diabetes and dysentery Ring worm, wound, fever, leprosy, cough.	Tanning and dyeing. Wood used for buildings, carts, fence posts, agricultural implements etc.
12.	Kumbhi	<i>Careya arborea</i>	Tree	Flower, fruit, bark, juice, seed and calyx.	Body swellings astringent, mucilaginous coughs and colds embrocation.	Used for general construction (house posts, planking), furniture and cabinet work, carts, mouldings, turnery, piling and agricultural implements.
13.	Karra	<i>Cleistanthus collinus</i>	Tree	Fertilizer, fodder	The stem bark is chewed for its tonic properties.	Washing agent for clearing septic wound, cure fungal diseases. Fencing pole, timber. The wood is used to make household utensils and for temporary constructions.
14.	Dhobin	<i>Dalbergia paniculata</i>	Tree	The bark is astringent	The sweet blackish pulp of the seedpod is used as a mild laxative.	The heartwood is dull brown the sapwood pale brown with a grayish tinge. The wood is of moderate weight; fairly hard; strong; and durable. It takes a high polish with a satiny lustre. The wood is used in house construction.
15.	Karmota	<i>Dillenia indica</i>	Tree	Fruit are used raw or cooked. They can be	Bark is used as a mouthwash to treat thrush, Juice with sugar used as cooling beverage in fever and cough. Bark and	Soap, hair wash. scalp to prevent baldness, house-building or gunstocks polish ivory.

				used in curries or made into drinks, jellies and sherbet.	leaves: Taken to cure diarrhoea and dysentery.	
16.	Tendu	<i>Diospyros melanoxylon</i>	Tree	Fruits, leaves. Fuel wood the calorific value of the sapwood is 4957 kcal/kg and of the heartwood, 5030 kcal/kg.	Mental disorders, diarrhoea, nervous breakdowns palpitations of the heart, astringent effect urinary, and skin and blood diseases.	The leaves are used as the wrapping around tobacco to make bidi cigarettes in India. Wood used for building, shoulder poles, mine props and shafts of carriages.
17.	Amala	<i>Emblca officinalis</i>	Tree	Fruit, Bark and leaf for Tannin. Leaves may yield 22 - 28% tannin.	Eye problems, joint pain, diarrhoea and dysentery, diabetics. The sour fruits are one of the ingredients of 'Triphala'.	Commonly used to make jams, jellies, tarts, chutneys etc.
18.	Gular	<i>Ficus glomerata</i>	Tree	Fruit, Bark and leaf, latex, edible fruit	Fever, reduces inflammations, pain, Swelling, Mouth ulcers, mouth infections, Boils, Pimples, freckles, Burn marks on skin, haematuria, menorrhagia, and haemoptysis.	Pickled, food, leaves are eaten as vegetable, The powder from roasted fruits forms a valuable breakfast food, remedy for dyes entry, tannin, latex, minor construction, cheap furniture, packing cases, mouldings, laundry tubs, fruit crates etc.

19.	Tado	<i>Ficus semicordata</i>	Tree	Used for food	Fevers, menstrual disorders, gastric troubles peptic ulcer and fevers.	The bark yields a fiber used in making ropes.
20.	Pipal	<i>Ficus religiosa</i>	Tree	Leaf, bark, edible fruit, root	Skin diseases, rheumatism, ulcers, and scabies, healing of wounds, improve fertility and treat poisoning.	Latex and Tannins, transport-ing box and packaging.
21.	Bad	<i>Ficus benghalensis</i>	Tree	Leaf, root, and latex	Dysentery, sores, boils, diuretic, epilepsy, fever, head ache, hydrocycle, kidney disease, leucorrhoea.	Tannins, temporary binding materials, latex, cart yokes, furniture and to line wells.
22.	Kakai	<i>Flacourtia indica</i>	Tree	Bark, leaves and root.	Asthma, pain relief, gynaecological complaints worms, anthelmintic, hydrocele, pneumonia, and snake bites, gargle for hoarseness.	Agricultural implements such as ploughs, posts, building poles, rough beams, walking sticks and the manufacture of turnery articles. Wood used for fuel and for making charcoal.
23.	Kekar	<i>Garuga pinnata</i>	Tree	The fruits are eaten raw or pickled.	Stomachic, expectorant, astringent and antiasthmatic.	The tree is used as a support for growing pepper plants (<i>Piper nigrum</i>). There bark is a source of tannins. used for the manufacture of furniture
24.	Kuru	<i>Gardenia latifolia</i>	Tree	Fruit, bark, flower	Teeth treatment, cutaneous diseases flies, worms, plant fever, epilepsy, pimples, haemat tubercular fistula, ringworm, cholera, pleur smallpox, dysen, neuralgia, snake bite and microbial infections.	Hedge and windbreak.

25.	Gamhar	<i>Gmelina arborea</i>	Tree	Flower, root.	Fruit and bark used against bilious fever. roots as a blood purifier, laxative, stomachic, tonic and as an antidote to poison and, leaf: gonorrhoea and cough, and is also applied to wounds and ulcers.	Dye and manufacture of furniture, plywood core stock, mine props, matches and timber for light construction, canoes, musical instruments, for carving images . The flowers are mixed with rice to make a delicious cake-like festive dish that is eaten on the traditional.
26.	Dhaman	<i>Grewia tiliifolia</i>	Tree	Edible fruits The bark yields fibre cordage.	This tree is used in treating non healing wounds, ulcerative colitis, menorrhagia, cough etc.	It used for the wood is close-grained, hard. shafts, shoulder poles, masts, golf clubs, tool handles, oars and all purposes for which elasticity, strength and toughness are required, twigs are lopped for fodder.
27.	Chhena	<i>Lagerstroemia parviflora</i>	Tree	Bark and gum. Black dye.	-	Wood used for making furniture, interior joinery, boat building, general construction, parquet flooring and panelling.
28.	Moyan	<i>Lannea coromandelica</i>	Tree	Bark and leaves.	Bruises, Bursitis, heart disease, Muscle Sprains, neuralgia, analgesic, anti-inflammatory.	Wood used for spear shafts, scabbards, wheel-spokes, oil presses, grain pounders etc. Gum used for calico printing. A soluble resin, called 'Jingan gum' is obtained from the stems.
29.	Maida	<i>Litsea glutinosa</i>	Tree	Whole plant	Fever, reduce swelling, and treat diarrhoea, dysentery, furunculosis, boils.	Candles, soap bark, wood contain gluten and may be used as binders, rope, furniture, plywood paper and pulp.

30.	Mahua	<i>Madhuca indica</i>	Tree	Flower and Whole plant	Anti-bacterial, carpentry work, pain killer, wine/liquor, worship.	Timber
31.	Mundi	<i>Mitragyna parvifolia</i>	Tree	Bark and root	Fresh leaf juice used to treat jaundice bark and roots used for fevers colic, muscular pains, stomach burning, poisoning, gynecological problems, cough and edema.	A useful wood, esteemed for many purposes, it is used in construction, furniture making, agricultural implements, combs, cups, spoons, plates and for turned and carved articles.
32.	Son padar	<i>Oroxylon indicum</i>	Tree	Pod, seed, bark	Blood purifier stomach complaints, diarrhoea and dysentery, fever, cough, diarrhoea cancer.	Tanning and dyeing, making matches, fibers, pulping to make paper. The wood is used for fuel for poor quality.
33.	Bija sal	<i>Pterocarpus marsupium</i>	Tree	Leave and brak. The tree yield a red gum know as "kono"	The gum, which contains 75% kinotannic acid, has medicinal uses diarrhoea, vitiligo, eczema, psoriasis, obesity and diabetes. Skin Problems gum exudation is used against body pain. Exudation from the stem is used as tongue cleaner;	The wood is strong, tough, very hard, durable and fine-grained, takes a fine polish and seasons well. It is used for door and window frames, posts, agricultural implements, boat building, carts, railway carriages, railway ties.
34.	Girchi	<i>Salacia oblonga</i>	Tree	Bark of the tree.	Improves blood sugar, Protects heart, Liver protective, Inhibits weight gain, Kidney tonic.	-
35.	Kosum	<i>Schleichera oleosa</i>	Tree	Seed, Bark and lac.	Wounds and ulcers of cattle. Leprotic ruptures, ulcers, skin inflammations and malaria.	House construction, ship building and musical instruments.

36.	Paral	<i>Stereospermum colais</i>	Tree	Root flower, seed, leaf, kshara.	Otalgia, odontalgia, rheumatism, malarial fever, wounds, chronic dyspepsia, asthma and cough.	Furniture, construction, tea boxes, canoes, fuel, charcoal.
37.	Nirmali	<i>Strychnos potatorum</i>	Tree	Leaf, fruit, root	Epilepsy, cough, liver, kidneys, stomach gonorrhoea, leucorrhoea, bronchitis, chronic diarrhoea, strangury, kidney, bladder stones, diabetes and eye diseases.	Clearing water, termite resistant, carts, shafts, agricultural implements, tool handles. Water clearing purpose.
38.	Bhelwa	<i>Semecarpus anacardium</i>	Tree	Seed, fruit, gum and oil.	Aphrodisiac, digestive, stimulant, bronchitis, dysentery, fever, asthma, haemorrhoids, astringent, sterility in women, headaches, skin diseases and scabies.	Floor dressing as additive substances to lacquers, dyes and insulating material in the plastics industry for regenerating rubber materials and to protect wood from white ants.
39.	Sal	<i>Shorea robusta</i>	Tree	Seed, Gum, Resin and Tannin	Treatment of dysentery, gonorrhoea, boils and toothaches.	The leaves are widely used for making plates, cups and for wrapping.
40.	Amra	<i>Spondias mangifera</i>	Tree	Fruit, bark	It is used in the treatment of bilious dyspepsia. Treatment of stomach aches and dysentery. A paste of the bark is applied topically in the treatment of rheumatism and swollen joints.	Packing cases, floats, matches, non-ornamental plywood, canoes, pulp, interior finishing, drawers, match boxes, boxes, crates, carvings, fuel chutneys, stews, pickles and jams.
41.	Jamun	<i>Syzygium cumini</i>	Tree	Leaves fruits and bark.	Ailments, cough, diabetes, dysentery, inflammation and ringworm.	Timber wood, as a plank well.
42.	Kalikakri	<i>Tamilnadia uliginosa</i>	Tree	Fruits, root,	Used as astringent, cholera, diarrhoea, eye	The unripe fruit is employed as fish

							poison and tree are used in ornamentally.
43.	Imli	<i>Tamarindus indica</i>	Tree	pulp. Flower, fruit, root, bark, stem, seed and leaves.	complaints, dysentery, headache, cooling. Sores, ulcers, boils, rashes, asthma, cardiac, blood sugar, cough, fever, Inflammations, swelling, relieve pain, malaria and intestinal worms.	Sizing textiles, paints varnishes tannins can be used in ink or for fixing dyes. Carpentry, sugar mills, wheels, hubs, wooden utensils, agricultural tools, mortars, boat planks, toys, panels and furniture.	
44.	Behara	<i>Terminalia bellirica</i>	Tree	Bark, fruit, seed, whole plant.	Ascariis, gray hair, hoarseness, weak eyesight, anemia, asthma, piles, leprosy, liver disease, diarrhoea, hair fall and dyspepsia.	Natural dyes.	
45.	Harra	<i>Terminalia chebula</i>	Tree	Seed, fruit and bark.	Bronchitis, cold, constipation, diuretic, eczema, dysentery, measles, sore, pneumonia, stomach and spleen problem abnormal uterine bleeding coughs worms and asthma. Main ingredient of triphala.	Tannins, construction timber, dyes, ink, furniture, carts implements and it is used for various preparation.	
46.	Saja	<i>Terminalia tomentosa</i>	Tree	Bark and Gum.	Blood disorder, Burns, dandruff, anti oxidant, antiseptic, astringent.	Source tree for Cocoon (kosa) production.	
47.	Sagon	<i>Tectona grandis</i>	Tree	Whole plant	Burning sensation, arthritis, kidney, skin disease, diabetes and ulcer.	Timber wood.	

Shrubs

S. No.	Local Name	Botanical Name	Status	NTFPs Use	Medicinal Use	Other Use
1.	Jungali bhindi	<i>Abelmoschus moschatus</i>	Shrubs	Seed, Bark, leaves.	Diuretic, demulcent, antiseptic, anti-spasmodic, cramp cooling, tonic, carminative, aching joints, aphrodisiac, antispasmodic digestive system, feverish patient, and poor circulation.	Pesticide, food, luxury aromatic, cosmetic products, sweets, alcoholic and non-alcoholic beverage, aroma. Oil obtained from seeds contains 18.9% linoleic acid. Oil is of high economic value. Bark is used for make ropes and sails. Leaves are sometimes used as wrappers for parcels.
2.	Kangi	<i>Abutilon indicum</i>	Shrubs	Bark, seed, leaves.	Demulcent, diuretic, treat fever, colic, cleaning wounds, ulcers hemorrhoids and cooling remedy for coughs and fevers.	Making cordage, twine and rope, whilst that from younger stems can be woven into fabrics, dyes readily the stems are easy to ret.
3.	Rohani	<i>Acacia pennata</i>	Shrubs	Bark, leaves, roots	Asthma, Bronchitis Snake bite, Indigestion, Flatulence, Digestive disorder, antiseptic for scalding of urine and for curing bleeding gums. Leaf use in cholera treatment.	The bark contains tannin 9%, lupeol and alpha-spinasterol. Stem yields sitosterol.
4.	Sidha	<i>Albizia amara</i>	Shrubs	Leaves, fruits and root.	Malaria, coughs, infusion is drunk to treat pneumonia, tuberculosis, infertility of women and as an aphrodisiac, oedema, uterus, diarrhoea complaints, wounds, jaundice and mouth	Soil binder, deterring soil erosion roots, washing hair, Tannins, furniture making, agricultural implements, construction, firewood and charcoal.

5	Amti	<i>Antidesma diandrum</i>	Shrubs	Leaf and fruits	inflammation. Dropsy, dysentery, bile complaints muscular pains, pneumonia, sores and the bites of rapid.	The wood is used for construction of ships, vehicles, posts agricultural tools and vegetable or curries, food.
6.	Satawar	<i>Asparagus racemosus</i>	Shrubs	Rhizome and shoot	Digestive, respiratory, female reproductive organs, diarrhoea, rheumatism, diabetes brain complaints, diuretic, antispasmodic, aphrodisiac, demulcent, galactagogue.	Root are used for washing clothes, Tender young shoots cooked as a vegetable.
7.	Salparni	<i>Desmodium gangeticum</i>	Shrubs	Root and leaves.	Stones, kidneys or bladder, headache, diuretic, toothache, oedema, swellings, chronic fever, coughs, biliousness, diarrhoea and dysentery.	Green manure, cover crop The fibrous stems are used for paper production.
8.	Lodara	<i>Desmodium pulchellm</i>	Shrubs	Bark and roots, red gum.	Antichloristic, diuretic, weight loss, hemorrhages, diarrhoea, cure eye diseases, rheumatic fevers; to cure toothache, dissolve internal blood clots.	A fiber are suitable for making rope, making agricultural implements, makes excellent furniture, is useful for carriage building and construction.
9.	Duling / biabidang	<i>Embelia ribes</i>	Shrubs	Seed, leaves, bark	Cooling, diuretic and laxative, mouth wash to treat ulcers and sore throats, coughs and diarrhoea.	The crushed fresh bark is used to repel leeches.
10.	Kanputa	<i>Flemingia strobilifera</i>	Shrubs	Seed, roots leaves	Tuberculosis, bath after childbirth, epilepsy, contraceptive, induce sleep and to relieve pain.	The dried bracts are used for stuffing pillows and cushions.

11.	Kurru	<i>Gardenia resinifera</i>	Shrubs	Stem, buds and gum.	Cutaneous diseases, utaneous diseases and to keep off flies and worms.	The resin contains a bitter substance and essential oils Insecticide.
12.	Gudsukari	<i>Grewia hirsuta</i>	Shrubs	Roots, fruits and leaves.	Tuberculosis, chronic respiratory diseases wasting of muscles, bleeding disorders like nasal bleeding, Ulcerative colitis, menorrhagia, urination, fever Dysentery, Suppurative constipation gastritis, aphrodisiac, heart disease, cough, wounds and dyspnoea, diarrhoea and dysentery.	A good quality fibre is obtained from the bark. It is used for making ropes.
13.	Kankara	<i>Ixora indica</i>	Shrubs	Roots, fruits and leaves.	Piles, diuretic, purgative, tonic, used in intestinal obstructions, intestinal disorders, dysentery, jaundice, headache, toothache, urinary diseases, itch and dropsy.	Cosmetic, green mulch.
14.	Duddi	<i>Holarrhena pubescens</i>	Shrubs	Seed, leaves, bark and juice.	Diarrhoea oestrogens, progestrogens and androgens stimulate milk production, to treat constipation, asthma, abdominal pains and infertility, toothache, scabies, boils, ulcers and haemorrhoids.	Dye, ash are used as a mordant, combs, picture frames, carved boxes, toys, spoons, knives, walking sticks, beads, furniture and ploughs and make paper.
15.	Kutaj	<i>Holarrhena antidysenterica</i>	Shrubs	Seed, leaves, bark and juice.	Holarrhena, antidysenterica, dropsy, skin disorders, psoriasis, nonspecific dermatitis fevers, diarrhoea dysentery and intestinal worms.	-

16.	Marorphali	<i>Helicteres isora</i>	Shrubs	Bark, root and fruit.	Cures dysentery, stomach pain, expectorant, demulcent, astringent, galactofuge, diarrhoea and a remedy for scabies.	Bark used as cordage for making cots, tying cattle and ploughs. bark fibre is good for making ropes and clothing.
17.	Nilmi	<i>Indigofera tinctoria</i>	Shrubs	Leaf flower are used for vegetable	Epilepsy, nervous disorders, asthma, bronchitis, fever, complaints of the stomach, liver, kidney, spleen, rabies prophylactic, skin diseases, wounds, sores, ulcers, haemorrhoids, worm-infested wounds, toothache, syphilis, gonorrhoea, kidney stones hair fall and grey hair problems.	Cover crop, green manure and dye
18.	Chameli	<i>Jasminum polyanthum</i>	Shrubs	Leaf, root, flower,	Ulcer, headache, mouth disease, impotency, skin disease, ear problem, worm and fever.	Oil cosmetic industry, perfume and soap.
19.	Banchalita	<i>Leea asiatica</i>	Shrubs	Root and leaves	Guinea worms and snake-bite.	A leaf extract is mixed with water and used for washing the hair.
20	Ramphool	<i>Lantana camara</i>	Shrubs	Seed, flower, fruit, bark and root,	Influenza, cough, mumps, incessant high fever, malaria, cervical lymph node tuberculosis, asthma, toothache, headache, inflammation, gonorrhoea and leucorrhoea. Dermatitis, eczema pruritus, measles and chickenpox rashes.	Biocides (fungicidal, insecticidal and nematocidal) firewood fencing, windrows, woodlots or natural bush. Erosion control, hedge, mulch material, produce pulp for paper suitable for writing and printing, firewood
21.	Harsigar	<i>Nyctanthes arbor - tristis</i>	Shrubs	Flowers is used for	Provoke menstruation, cholagogue, laxative, diaphoretic and diuretic, skin	Hedges, dyeing silk, tanning, polishing wood and ivory oil perfume.

					diseases, cough, ringworm, pain fever and hair fall.	
22.	Harduli / lal kosum	<i>Olax scandens</i>	Shrubs	colouring food.	Anaemia, diabetes; fever, Ring worms.	-
23.	Chind	<i>Phoenix acaulis</i> <i>Phoenix sylvestris</i>	Shrubs	Leaves, fruit and juice.	Abdominal complaints, fevers, vomiting, loss of consciousness toothache, gonorrhoea, respiratory diseases fevers, diarrhoea.	The leaves are used to make mats, ropes, bags umbrellas, fences as well as for thatching roofs. The juice, drunk, obtained from the tree is considered to be a cooling beverage. The stems are used in making local house roofs and walls of huts, fencing and fuel.
24.	Menphal	<i>Randia dumetorum</i>	Shrubs	Fruit, seeds and Roots,	Malaria, dysentery, stop bleeding, fever cough, skin diseases, ulcers, asthma, flatulence, pain of bruises, colic, abortion, inflammation reducing abortifacient and rheumatism.	Latex, blue dye, ink, fuel wood calico - printing, and dyeing as a colour intensifier.
25.	Gotia	<i>Ziziphus xylopyra</i>	Shrubs	Fruit, bark, seed and root.	Diabetes, diarrhoea, digestive, urinary disorders, abscess, acne.	Suitable for the production of veneer and plywood.
26.	Dhawaiphul	<i>Woodfordia fruticosa</i>	Shrubs	Flower	Dysentery, menorrhagia, Heart diseases wounds fever, ulcers, acne, digestive disorders, blood impurity, gout, skin diseases.	Tannins and dye.

27.	Katakuli	<i>Ziziphus rugosa</i>	Shrubs	Whole plant	Menorrhagia, hypotensive, after-birth pains, stomach-ache, snakebite, abortion, pneumonia.	Hedges, dye, fuel, charcoal, furniture, interior work, carving, building poles and tool handles.
28.	Makoy	<i>Ziziphus oenoplia</i>	Shrubs	Whole plant	Anthelmintic, digestive, antiseptic, hyperacidity, ascariis infection, stomachalgia and healing of wounds.	Fuel wood and tannin
29.	Ber	<i>Ziziphus mauritiana</i>	Shrubs	Leaves, fruits and bark.	Indigestion, Diabetes, diarrhoea, urinary disorders.	Construction, furniture, cabinet work, tool handles, agricultural implements, tent pegs, golf clubs, gun stocks, sandals, yokes, harrows, toys, turnery, household utensils, bowling pins, baseball bats, chisels, packaging, veneer and plywood.

Herbs

S. no.	Local Name	Botanical Name	Status	NTFPs Use	Medicinal Use	Other Use
1.	Phul ghangri	<i>Abutilon indicum</i>	Herbs	Leaves, seed, root, flower	Demulcent, diuretic, colic, for cleaning wounds, ulcers, haemorrhoids, leprosy and cough,	Fiber making cordage, twine, rope and whilst.
2.	Chirchita	<i>Achyranthes aspera</i>	Herbs	Root, seed, leaf, whole plant	Diuretic, antispasmodic, dropsy, rheumatism, stomach problems, cholera, skin diseases, rabies, scorpion stings, diarrhoea, dysentery, pyorrhea and toothache, nervous disorders, hysteria, insect and snake bites	Tooth powder, washing clothes and toothbrushes

3.	Mahkuwa	<i>Ageratum conyzoides</i>	Herbs	Leaf and flower	Constipation, infective hepatitis, eczema, epilepsy, fresh wounds, dizziness, diarrhoea, dysentery, sore eyes, fever, headaches, intestinal worms, filariasis, vomiting and nausea, wounds and cuts, coughs and colds	The leaves and the flowers yield 0.2% essential oil with a powerful nauseating odour. A decoction of the fresh plant is used as a hair wash, leaving the hair soft, fragrant and dandruff free.
4.	Kalmegh	<i>Andrographis paniculata</i>	Herbs	Whole plants	Joint pain, jaundice, head ache, malaria, anti-helm, antic fever, itching skin eruption, (HIV), snake bites, stomach-ache, dysentery, typhus, cholera, influenza and bronchitis, diuretic, female disorders, dyspepsia, hypertension, rheum-atism, gonorrhoea, amenorrhoea, torpid liver and jaundice.	Insecticide.
5.	Satawar	<i>Asparagus racemosus</i>	Herbs	Whole plant	Piles, fever, wound, anti-toxic, weakness, cough, Diarrhoea, headache, asthma, urinary disorder.	The squeezed root is used for washing clothes.
6.	Mahul	<i>Bauhinia vahlii</i>	Climber	Leaves, stem, and seed.	Demulcent and mucilaginous tonic and aphrodisiac.	Ropes, stems are used for matting, basketry and wickerwork. Leaves used as plates, cups, rough tablecloths, umbrellas, cloaks, and rain capes.
7.	Palasbel	<i>Butea superba</i>	Climber	Leaf, root, stem.	A gum obtained from the bark is astringent.	Tannin, kino gum, fiber.
8.	Dhanwanti	<i>Cissampelos pareira</i>	Climber	Leaf and root	diarrhoea, dysentery, ulcers, colic, intestinal worms and digestive	A thin rope can be made from the rhizomes.

					complaints, urogenital problems, menstrual problems, venereal diseases, infertility, uterine bleeding, threatening miscarriage, stomachic, cough, heart trouble, rheumatism, jaundice, snake bites and skin infections sores, boils, scabies and childhood eczema.	
9.	Charota	<i>Cassia tora</i>		Seed and leaves	Ringworm and skin diseases rid the body of parasites, vomiting and stomach-ache, skin infections, sores, ulcers, insect bites and eye complaints.	<i>Cassia tora</i> tea is a herbal, pure, natural and non-polluted green health beverage (coffee-tea), substitute for coffee and sodas. Natural pesticide.
10.	Jugali kulthi	<i>Cajanus scarabaeoides</i>	Climber	Leafs and seed	Diarrhoea in cattle, diabetes, sore throats, excessive production of urine.	Green manure, fodder, food.
11.	Nagbel	<i>Cryptolepis buchanani</i>		Roots, bark, stems and leaves	Bone fracture, Blood-purifier, alterative, paralysis	Roof
12.	Bodal	<i>Cucumis melo agrestis</i>	Climber	Seed, flower, root and fruit.	Expectorant and emetic burns and abrasions antitussive, digestive, febrifuge and vermifug.	-
13.	Kali musli	<i>Curculigo orchioides</i>	Herbs	Root, juice.	Dysentery, peptic ulcers, piles, gonorrhoea, leucorrhoea, asthma, jaundice, chronic nephritis, diarrhoea, lumbago and headache.	-
14.	Tikur	<i>Curcuma angustifolia</i>	Herbs	Rhizome.	Demulcent and dislocated bones, chronic diseases, fevers, breast-milk,	Tikhur barfi and cooling squash.

15.	Genji	<i>Curcuma zedoaria</i>	Herbs	Rhizome	urinary apparatus, acidity, bronchitis and soothe coughs, asthma, ulcers. Indigestion, nausea, flatulence, bloating, anti-cancer properties, cervical cancer, bad breath. Rhizome is used to clean, cure ulcers, wounds and other skin disorders.	An essential oil obtained from the rhizome is used in perfumery.
16.	Safed musli	<i>Chlorophytum tuberosum</i>	Herbs	Root.	Tuberculosis, male impotency and tonic.	-
17.	Peng	<i>Celastrus paniculatus</i>	Climber	Seed, root, leaves, stem, bark, wood and fruit.	Mental disorders and ophthalmia, anaemia, abortifacient, backache, gout, headache, paralysis, stomachache, wounds, swollen veins, rheumatism, leprosy, diarrhoea, bone fracture, bronchitis, cold, cough, body ache, eczema, fever, digestive complaints.	The seed contains 52% oil, and the fruit 30%. It is used as an illuminant in lamps and also for soap making.
18.	Kewkanda	<i>Costus igneus</i>	Climber	Leaves And rhizome	Diuretic, colds with a fever, Diabetes, asthma, bronchitis skin disease,	Chutney and ornamental uses.
19.	Kosakanda	<i>Dioscorea esculenta</i>	climber	Tuber	Dispepsia, swelling, ulcers, menopause, beriberi, Rheumatism.	Use as a vegetable.
20	Karukanda	<i>Dioscorea bulbifera</i>	Climber	Leaves, tuber and roots.	Fever, diarrhoea, haemorrhoids, purulent, ophthalmia, and for snake-bite.	Use as a vegetable.
21.	Kargaya kanda	<i>Dioscorea opposita</i>	Climber	Lives, tuber,	Spleen -stomach, loss of appetite, body fatigue, diarrhoea, kidney, cough, blood sugar, stomach pain, arthralgia,	Edible

					amenorrhoea.			
22.	Baichandi	<i>Dioscorea hispida</i>	Climber	Tuber	Diabetes.	The chips of Baichandi are eaten during fast. Its nutritious chips.		
23.	Jangali Kundaru	<i>Diplocylus palmatus</i>	Climber	Whole plant	Stomach-ache, expectorant, laxative, vitiated vata, pitta, inflammation, cough, flatulence, skin diseases and general debility.	-		
24.	Jungali tambakhu	<i>Elephantopus scaber</i>	Herbs	Roots and leaves	Anthelmintic, diaphoretic, diuretic, emmenagogue, emollient, febrifuge, Asthma, coughs and pulmonary diseases; dyspepsia, diarrhoea and dysentery; oedema; urethral discharges, venereal diseases, fungal skin diseases malaria, tonic during parturition, toothache.	Young leaves - cooked and eaten like spinach. A powder made from the plant is added to 'marcha', a fermentation cake used in the preparation of local alcoholic drinks.		
25.	Kalihari	<i>Gloriosa superb</i>	Climber	Leaves, seed, tuber.	Ulcers, leprosy, piles, inflammations, abdominal pains, itching, thirst, bruises, colic, haemorrhoids, cancer, arthritic conditions, swellings of the joints, sprains, dislocations, smallpox, leprosy, eczema, itch, and ringworm. Gums used to treat painful teeth.	Colchicine, obtained from all parts of the plant but particularly the seeds, inhibits cell division and is used in plant breeding to produce polyploidy. strong nematocidal.		
26.	Anant mul	<i>Hemidesmus indicus</i>	Climber	Roots.	Blood purifier, demulcent, diaphoretic, diuretic, appetite loss, dyspepsia, fever,	The fibrous bark is used to make rope		

					skin diseases, syphilis, leucorrhoea, genitourinary diseases, chronic coughs and tonic.	
27.	Kali dudhi	<i>Ichnocarpus frutescens</i>	Climber	Root, leaves, woody part	Diuretic, fevers, headaches, wounds, dental caries, scabies rheumatism, asthma, cholera, and fever.	The fibrous bark is used to make rope.
28.	Koroti	<i>Ipomea nil</i>	Climber	Leaves, seed,	Oedema, oliguria, ascariasis, constipation, contraceptive, mental disorders, rid of lice.	-
29.	Khekhshi	<i>Momordica dioica</i>	Climber	Shoots, leaves, fruit and tuber.	bleeding piles and urinary complaints, fever, asthma, leprosy, excessive salivation, prevent the inflammation lizzard, snake bite, elephantiasis, fever, mental disorders, digestive disorders, heart treatment, pimples and acne.	Vegetable.
30.	Bankumra	<i>Pueraria tuberosa</i>	Climber	Tuber	Reproductive tonic, menstrual disorders, menopause syndrome and uterus weakness, abortion. Aphrodisiac and improves sperms in males, fevers and swellings.	-
31.	Ramdatun	<i>Smilax macrophylla</i>	Climber	Root	Dental abscesses, edema, gingivitis, urinary tract infection. Sexually transmitted diseases.	Rope.

32.	Chikti	<i>Triumfetta rhomboidea</i>	Shrubs	Flower, fruit, root, bark, and leaves.	Internal ulcerations, gonorrhoea, antihypertensive, astringent, diuretic, mucilaginous, emollient, diarrhoea, dysentery, internal haemorrhages, and leprosy. The water obtained from the stem is reputed diuretic and efficacious as a remedy for venereal diseases.	A soft, glossy fibre is obtained from the bark. The fibre is rather similar to Jute (Corchorus spp).
33.	Jangali angur	<i>Vitis tiliifolia</i>	Climber	Fruit, stem.		The tough stems are used for temporary cordage in gathering firewood and for other purposes, grown as a forest crop in Mayan agriculture, and is used for food or drink
34.	Pitai / lal bel	<i>Ventilago madaraspatnam</i>	Climber	Root, bark, seed.	Itch, cutaneous eruptions.	Seed are used for oil extract.



Khekhsi (*Momordica dioca*)



Peng (*Celastrus paniculatus*)



Ramdatun (*Smilax macrophylla*)



Kosha kanda (*Dioscorea esculenta*)



Kargaya kanda (*Dioscorea opposita*)



Mahul (*Bauhinia vahlii*)

Plate 4.1: NTFP Species of the study area



Harsingar (*Nyctantches arbotristis*)



Banchalita (*Leea asiatica*)



Katakuli (*Ziziphus rugosa*)



Dhawaiphul (*Woodfordia fruticosa*)



Lalbel (*Ventilago madraspatnam*)



Lodhrah (*Desmodium pulchellm*)

Plate 4.2: NTFP Species of the study area



Kalimusli (*Curculigo orchioides*)



Safed musli (*cholrophytum tuberosum*)



Jungali kochai (*Colocasia esculenta*)



Kalihari (*Glorisa superba*)



Satawar (*Asparagus racemosus*)



Anantmul (*Hemidesmus indicus*)

Plate 4.3: NTFP Species of the study area



Sal (*Shorea robusta*)



Karra (*Cleistanthus collinus*)



Bija sal (*Pterocarpus marsupium*)



Amra (*Spondias pinnata*)



Saja (*Terminalia tomentosa*)



Kullu (*Sterculia urens*)

Plate 4.4: NTFP Species of the study area



Tendu (*Diospyros melanoxylon*)



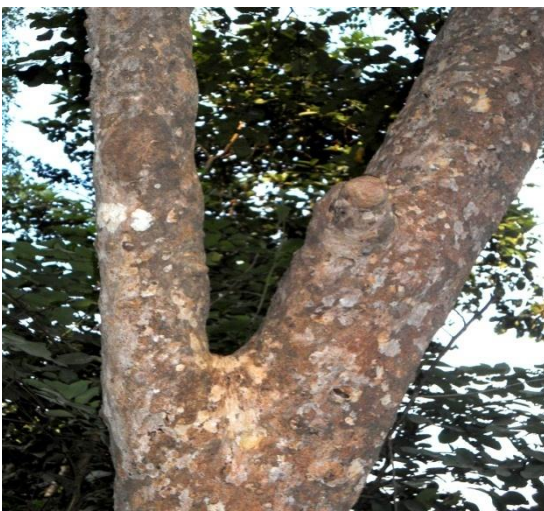
Semal (*Bombax ceiba*)



Dumar (*Ficus glomerata*)



Tado (*Ficus semicordata*)



Dhaura (*Anogeissus latifolia*)



Haldu (*Adina cordifolia*)

Plate 4.5: NTFP Species of the study area

4.3.1 Traditional collection methods of NTFPs

The collected 65 plants as NTFPs in which 21 tree, 9 shrubs, 17 herbs, 6 grasses, 10 climbers and 5 bio-products are collected and sold in the market as well as their own use. As evident from Table 4.4 mostly fruits were collected by using crude method like cutting of branches or shaking of tree. The fruit of *Terminalia bellirica*, *Semecarpus anacardium*, *Syzygium cumuni*, *Diospyros melanoxylon*, *Aegle marmelos*, *Tamarindus indica*, *Schleichera oleosa*, *Emblica officinalis*, *Buchanania lanzan*, *Mangifera indica*, *Terminalia chebula*, *Strychnos potatorum*, *Litsea sebifera* and *Azadirachta indica* were collected by the people. The medicinal plant Kalmegh was uprooted before maturity of seed thus next year production declines. The most of the trees, shrubs, herbs and grasses were used for medicinal purposes. Tribal people use the roots of many trees, shrubs, herbs and grasses as medicine. The fresh leaves of plants were also used as vegetable and climber medicine such as *Bauhinia variegata* (Kachanar) *Cassia tora* (Charota) leaves. The people used to cut the branches of *Bauhinia variegata* for collecting its leaves and pods. The leaves of *Cassia tora* were also collected maximum before maturity of plants for the use of vegetable purpose thus seed production affected. Lac and cocoons were also collected by the tribals from the forest from two major source tree species *Shorea robusta* and *Terminalia tomentosa* found in study area for rearing Cocoon (Kosa), and another source tree species *Schleichera oleosa* was found in study area for lac production for Kusumi lac. The bio-product honey was also collected by the people in the study area but the collection of honey was high in rates/kg Narayanpur site but low price in Orchha site this may be due to high production of honey.

Table 4.4: Collection techniques of NTFPs used by local inhabitants and scientific methods for sustainable utilization

Trees

S. No.	Local name	Traditional Collection method	Scientific Collection method
1.	Char (<i>Buchanania lanzan</i>)	<ul style="list-style-type: none"> i) People collected seed from March-April when it is immature. ii) People used to cut its branches and tree cut from ground surface for collection of seeds. iii) Cut the branches, Ripped fruits are edible and sold in the market. 	<ul style="list-style-type: none"> i) Completely ripen black colour seed should be selected for collection. ii) Sickled bamboo stick should be used for collection of fruits.
2.	Kachnar (<i>Bauhinia variegata</i>)	<ul style="list-style-type: none"> i) Pods and leaves were collected after cutting the branches. And pinching the top of leaf 	<ul style="list-style-type: none"> i) Collection should be done by hand plucking.
3.	Bahera (<i>Terminalia bellirica</i>)	<ul style="list-style-type: none"> i) Unripe green fruits were also collected and Sometimes cut the branches for collection. The ripped fruit collected from ground. 	<ul style="list-style-type: none"> i) Completely ripen brown colored fruits selected for collection. ii) Sickled bamboo sticks should be used to collect the fruits from trees.
4.	Aonla (<i>Embllica officinalis</i>)	<ul style="list-style-type: none"> i) Immature green fruits were also collected with ripen fruits. ii) People used to cut branches & tree for collecting fruits and sometimes fruits are also damaged. The damage fruit is not sold in the market. 	<ul style="list-style-type: none"> i) Completely ripen yellow fruits should be selected for collection. ii) Fruits should be collected with the help of sickled bamboo stick.
5.	Tendu leaves (<i>Diospyros melanoxylon</i>)	<ul style="list-style-type: none"> i) During collection of tendu leaves branches were also cut which affects the leaves production of next year. ii) Leaves, which are not suitable for the purpose, were 	<ul style="list-style-type: none"> i) Only undamaged and disease free leaves should be collected. ii) All diseased and damaged leaves should be removed before drying.

	Tendu fruit	also collected. iii) Branches were cut to collect fruits. and collect the fruits fallen on the ground	iii) Fruits should be collected without cutting the branches with the help of sickled bamboo stick.
6.	Bhelwa (<i>Semecarpus anacardium</i>)	i) People collect complete ripening fruit and seed. Collection by cut the branches.	i) Collection should be done with bamboo sticks when tree has maximum ripen fruits.
7.	Mahua Flower (<i>Madhuca indica</i>)	i) People put fire to clean floor below. when the fire burn in below when flower fall fast then collect flower fallen on the ground.	i) Brooms should be used to clean floor. It is very easy practice.
8.	Jamun (<i>Syzygium cumuni</i>)	i) During collection, unripe fruits also collected. The shaking of tree to fall the fruits mostly fruits were damaged.	i) Shake only selected branches to collect fruits or use bamboo stick and net go the fruits not damaged.
9.	Kusum (<i>Schleichera oleosa</i>)	i) Collection of fruits start early even unripe fruits also collected result low oil percentage in seed. ii) During collection of fruits they also cut the branches therefore next production is affected.	i) Fruits should be collected when its colour becomes light yellowish. ii) Sickled bamboo stick should be used to collect the fruits form tree.
10.	Imli (<i>Tamarindus indica</i>)	i) Fruits are not collected properly even unripe and diseased fruits also collected and put together. The destructive fruit collection methods were used like they cut the big branches during collection of fruits.	i) Collection should be done with sickled bamboo stick and ripen fruits may be collected with care. ii) Use of net below the tree is best option to collection undamaged fruits.
11.	Mango (<i>Mangifera indica</i>)	i) Fruits not collected properly people used bamboo stick for breaking the fruit. ii) During fruit collection they damaged the plant by cutting the branches.	i) Well mature fruits are collect for preparation of pickle. ii) Sickled bamboo sticks should be used for collection of selected fruits so that fruit may not

			damage.
12.	Sal (<i>Shorea robusta</i>)	<ul style="list-style-type: none"> i) Green leaves are collected directly from the trees and sapling plant. ii) Gums are collected by scraping it from the tree bark. 	<ul style="list-style-type: none"> i) Sharp knife is used for collecting leaves. ii) Clean gums free from dirt are collected. iii) Deep cut / wound may not be made to ooze out the gum.
13.	Harra (<i>Terminalia chebula</i>)	<ul style="list-style-type: none"> i) Unripe green fruits were collected and sometimes cut the branches for collection. 	<ul style="list-style-type: none"> i) Completely ripen brown colored fruits selected for collection. ii) Sickled bamboo sticks should be used to collect the fruits from trees.
14.	Neem (<i>Azadirachta indica</i>)	<ul style="list-style-type: none"> i) Fallen Unripe green fruits are collected from ground; leaves are collected directly from stem. 	<ul style="list-style-type: none"> i) Ripen; sound fruits need to be collected. Leaves are collected without harming the branches and twinge.
15.	Chind (<i>Phoenix aculis</i>)	<ul style="list-style-type: none"> i) Unripe fruits are collected. 	<ul style="list-style-type: none"> i) Ripen and dried fruits are collected.
16.	Kuwe phal (<i>Randia dumetorum</i>)	<ul style="list-style-type: none"> i) Unripe fruits are collected. 	<ul style="list-style-type: none"> i) Ripen and dried fruits are collected.
17.	Nirmali (<i>Strychnos potatorum</i>)	<ul style="list-style-type: none"> i) Unripe green fruits were also collected and sometimes cut the branches for collection. 	<ul style="list-style-type: none"> i) Completely ripen brown colored fruits selected for collection. ii) Sickled bamboo sticks should be used to collect the fruits from trees.
18.	Salfi (<i>Caryota urens</i>)	<ul style="list-style-type: none"> i) Inflorescence is removed and liquor beverage is collected. 	<ul style="list-style-type: none"> i) Some part of inflorescence must be kept remained in the tree for seed production
19.	Maida (<i>Litsea glutinosa</i>)	<ul style="list-style-type: none"> i) Tree is felled and bark is extracted 	<ul style="list-style-type: none"> i) Tree is not felled and bark is extracted from the mature portion of the tree. ii) After extraction the tree is given time for

			healing
20.	Kullu gum (<i>Sterculia urens</i>)	i) The gum extraction process is destructive the deep cut is made to ooze out more gum	i) The scientific method of gum extraction is to be applied which may not harm the tree and more amount of green will be collected.
21.	Gular/ Dumar (<i>Ficus glomerata</i>)	i) Branch is removed and fruits are collected. Latex is also collected	i) Bamboo made instrument should be used for collecting fruits. Only ripen fruits should be collected.

Shrubs

S. No.	Local name	Traditional Collection method	Scientific Collection method
1.	Marorphalli (<i>Helicteres isora</i>)	i) During collection of fruit, twig and branches are also cut.	i) Leaves should be collected by hand plucking ii) Fruit is medicinal value will be collection fully ripen pod and properly dried.
2.	Ber (<i>Zizyphus mauritiana</i>)	i) The collection started before complete ripens the fruits. ii) They shake all branches thus unripe fruit also fall down.	i) Shake only selected branches for collection of fruits or use bamboo sticks. ii) The only ripe good quality fruit will be collected and sold in the market or sun dried fruits properly stored.
3.	Chhind (<i>Phoenix acaulis</i>)	i) At the time of cutting leaves people also cut new or young branches. ii) For their convenience they prune some branches then cut selected branches. iii) During collection of leaves the stem portion also destroyed.	i) Choose only useful mature branch before cutting. ii) Branches which has matures leaves should be selected for harvesting. iii) Selected branches should be cut without disturbing other branches with sharp knife.
4.	Karonda	i) Fruit collection starts before complete maturity.	i) Only ripen fruits should be selected for

	(<i>Carissa hialis</i>)	ii) The branches also cut during collection of fruit this is destructive method.	collection. ii) Hand pricking is the best option for this species.
5.	Jangli chameli (<i>Jasminum arborescens</i>)	i) During collection of leaves and flowers the branches also cut.	i) Collection should be done by hand plucking and post harvest drying or oil extraction will be done within week.
6.	Katakuli (<i>Ziziphus rugoisa</i>)	i) The collection started before complete ripens the fruits. ii) They shake all branches thus unripe fruit also fall down.	i) Shake only selected branches for collection of fruits or use bamboo sticks.
7.	Nilni (<i>Indigo feratinctoria</i>)	i) Flower and Pods were collected after cutting the branches and pinching the top of leaf	ii) Collection should be done by hand plucking.
8.	Duling (<i>Embeli aribes</i>)	i) Fruits were collected after cutting the branches and unripe fruits collected.	i) Collection should be done by hand plucking.
9.	Amti (<i>Antidesma diandrum</i>)	ii) Unripped Fruit and leaves were collected after cutting the branches. And pinching the top of leaf	ii) Only ripen fruits and leaves should be selected for collection by hand plucking.

Herbs

S. No.	Local name	Traditional Collection method	Scientific Collection method
1.	Charota (<i>Cassia tora</i>)	i) Before maturity leaf collection started resulted that seed production affected. ii) The whole plants were also harvested before seed maturity.	i) When plant has 70 percent leaves that time its collection should be done. ii) The seed should be collected when seed colour turns green to light brown.
2.	Mushroom/Boda	i) People put fire to clean forest floor for collection of	i) Forest floor should be clean with Bamboo

		mushroom, which may cause forest fire	sticks or Broom for collecting mushroom.
3.	Kalmegh (<i>Andrographis paniculata</i>)	i) Leaves and fruits were harvested sometimes before maturity also. ii) Immature rhizomes are collected.	i) Harvesting should be carried out at maturity of plants and seed. ii) Mature rhizomes are collected.
4.	Tikhur (<i>Curcuma angustifolia</i>)	i) Whole parts of rhizomes are collected by digging the soil without leaving any part of it for future regeneration. ii) Immature roots and tuber are collected.	i) Some part of rhizome is left in the soil for future regeneration. ii) Mature roots and tuber are collected.
5.	Safed musli (<i>Chlorophytum tuberosum</i>)	i) Whole parts of roots and tuber are collected by digging the soil without leaving any part of it for future regeneration. ii) Immature roots and tuber are collected.	i) Some part of tuber or roots and tuber is left in the soil for future regeneration. ii) Mature roots and tuber are collected.
6.	Kali musli (<i>Curculigo orchioides</i>)	i) Whole parts of roots and tuber are collected by digging the soil without leaving any part of it for future regeneration. ii) Immature roots and tuber are collected.	i) Some part of tuber or rhizome is left in the soil for future regeneration. ii) Mature roots and tuber are collected.
7.	Gengi (<i>Curcuma zedoaria</i>)	i) Whole parts of rhizomes are collected by digging the soil without leaving any part of it for future regeneration. ii) Immature rhizomes are collected.	i) Some part of rhizome is left in the soil for future regeneration. ii) Mature rhizomes are collected.

Grasses

S. No.	Local name	Traditional Collection method	Scientific Collection method
1.	Munsel (<i>Iseilema nervosum</i>)	i) For collecting whole plants were dug-outs with root.	i) Some plants should be left. ii) Uprooting should be avoided.
2.	Kans	i) The whole spikes of Kans cut from the base.	i) Only those spikes should be harvest, which

	(<i>Saccharum spontaneum</i>)		are suitable for broom making.
3.	Sukul (<i>Heteropogon cantortus</i>)	i) Continuous grazing is used.	i) Compartment grazing should be allowed.
4.	Phulbahari (<i>Thysanolacns maxima</i>)	i) The whole spikes of Phulbahari cut from the base to obtain more material.	i) Only those spikes should be harvest, which are suitable for broom making.
5.	Bans (<i>Dendrocalamus strictus</i>)	i) During bamboo extraction young culms destroyed. ii) For their convenience in cutting of Bamboo they cut immature other culms.	i) Only mature old culms select for harvesting ii) Culms should be cut in inverted u shape (∩) so that old culms cut at first.
6.	Motha (<i>Cyprush rotandus</i>)	i) The rizome of plant uprooted directly due to this the normal regeneration affected.	i) The plants cut and collect in sustainable manner so the regeneration will take place properly

Climbers

S.No.	Local name	Traditional Collection method	Scientific Collection method
1.	Mahul (<i>Bauhinia vahlii</i>)	i) Immature leaves are also collected to obtain more material. ii) They cut the climbers from the base to obtain large quantity and save time. iii) Immature fruits are collected and where the fruit is roasted on fire. It bursts loudly exposing the seed which may cause forest fire.	i) Only mature leaves should be selected for collection ii) Sharp knife should be use to harvest leaves. iii) Branches should be cut from those places which give more new branches for further leaf collection. iv) Open roots should be covered with soil. v) The leaves should not be collected from damaged climbers at least one year. vi) Bukles should be used for tying mahul leaves.

2.	Baichandi (<i>Dioscorea hispida</i>)	<p>i) Immature Tubers are collected.</p> <p>ii) Whole parts of Tubers are collected by digging the soil without leaving any part of it for future regeneration.</p>	<p>i) Mature Tubers are collected.</p> <p>ii) Some part of tubers is left in the soil for future regeneration.</p>
3.	Ramdatun (<i>Smilax macrophylla</i>)	<p>i) Immature climbers also collected with the mature material.</p> <p>ii) Poor quality instrument used to cut climbers.</p>	<p>i) Only those climbers should be cut with sharp knife, which can give good fiber.</p>
4.	Karukand (<i>Dioscorea bulbifera</i>)	<p>i) Immature leaves, tuber and roots are collected.</p> <p>ii) Whole parts of tuber and roots are collected by digging the soil without leaving any part of it for future regeneration.</p>	<p>i) Mature leaves, tuber and roots are collected.</p> <p>ii) Some part of tuber or roots is left in the soil for future regeneration.</p>
5.	Kosa kanda (<i>Dioscorea esculenta</i>)	<p>i) Immature leaves, tuber and roots are collected.</p> <p>ii) Whole parts of tuber and roots are collected by digging the soil without leaving any part of it for future regeneration.</p>	<p>i) Mature leaves, tuber and roots are collected.</p> <p>ii) Some part of tuber or roots is left in the soil for future regeneration.</p>
6.	Kargaya kanda (<i>Dioscorea opposita</i>)	<p>i) Immature leaves, tuber and roots are collected.</p> <p>ii) Whole parts of tuber and roots are collected by digging the soil without leaving any part of it for future regeneration.</p>	<p>i) Mature leaves, tuber and roots are collected.</p> <p>ii) Some part of tuber or roots is left in the soil for future regeneration.</p>
7.	Rsana jari (<i>Blepharispermum subsessil</i>)	<p>i) Immature roots are collected.</p> <p>ii) Whole parts of tuber and roots are collected by digging the soil without leaving any part of it for future regeneration.</p>	<p>i) Mature roots are collected.</p> <p>ii) Some part of tuber or roots is left in the soil for future regeneration.</p>
8.	Palas bel (<i>Butea superb</i>)	<p>i) Immature climbers and leaves are collected.</p> <p>ii) Trees are felled for collecting flower.</p>	<p>i) Mature leaves and climbers should be collected. Flowers must be collected without felling the tree.</p>

9.	Satawar (<i>Asparagus racemosus</i>)	<p>i) Immature rhizome is collected.</p> <p>ii) Whole parts of tuber and roots are collected by digging the soil without leaving any part of it for future regeneration.</p>	<p>i) Mature rhizome is collected.</p> <p>ii) Some part of tuber or roots is left in the soil for future regeneration.</p>
10.	Peng (<i>Celastrus paniculatus</i>)	<p>i) Cut the plant and immature seed is collected.</p>	<p>i) Mature seed is collected.</p> <p>ii) Sickled bamboo sticks should be used to collect the fruits from climber.</p>
11.	Korkoti (<i>Ipomea nil</i>)	<p>i) Immature seed are collected.</p>	<p>i) Mature seed are collected.</p>
12.	Khekhsi (<i>Momordica dioica</i>)	<p>i) Immature fruit and tuber are collected.</p> <p>ii) Whole parts of tuber and roots are collected by digging the soil without leaving any part of it for future regeneration.</p>	<p>i) Mature leaves, tuber and roots are collected.</p> <p>ii) Some part of tuber or roots is left in the soil for future regeneration.</p>
13.	Kalihari (<i>Gloriosa superba</i>)	<p>i) Immature leaves, tuber and roots are collected.</p> <p>ii) Whole parts of tuber and roots are collected by digging the soil without leaving any part of it for future regeneration.</p>	<p>i) Mature leaves, tuber and roots are collected.</p> <p>ii) Some part of tuber or roots is left in the soil for future regeneration.</p>
14.	Lal bel (<i>ventilago madarapatnam</i>)	<p>i) Cut the climber and immature seed are collected.</p>	<p>i) Mature seed are collected.</p>
15.	Anantmool (<i>Hemidesmus Indicus</i>)	<p>i) Immature leaves and roots are collected.</p> <p>ii) Whole parts of tuber and roots are collected by digging the soil without leaving any part of it for future regeneration.</p>	<p>i) Mature leaves, tuber and roots are collected.</p> <p>ii) Some part of tuber or roots is left in the soil for future regeneration.</p>
16.	Bodal (<i>Cucumis melo agrestis</i>)	<p>i) Continuous cutting of climbers for fodder purpose.</p> <p>ii) Immature fruits are collected.</p>	<p>i) Climbers should be cut in fixed interval.</p> <p>ii) Only mature fruits are collected.</p>

17.	Amarbel (<i>Cuscuta reflexa</i>)	i) Collect whole climbers.	i) During collection some climbers should be left.
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Bio- product

S. No.	Local name	Traditional Collection method	Scientific Collection method
1.	Honey (<i>Apis dorsata</i>)	i) Smoke used for collection of honey. In the process of putting smoke to protect them -self from honeybees attack, some honey bees also die.	i) A special dress should be worn during collection honey and apply water on honeycomb. i) All the honeybees should be carefully separated from honey comb then cut the upper portion of the comb with sharp knife. Collected honeycomb should be squeezing for honey collection.
2.	Kosha (cocoon) (<i>Antheraea mylitta</i>)	i) Trees are felled and Cocoons are collected and sold in the market.	i) Cocoons are boiled in water; then, Kosa fibbers are extracted by rupturing the cocoon
3.	Lac (<i>Laccifer lacca</i>)	i) The branches are felled unsustainable manner due to this the host tree die.	i) The sustainable harvesting method is used to collect the lac from branches of host tree.
4.	Chind kira (<i>Rhynchophorus ferrugineus</i>)	i) Weevil are collected by dissecting the plant	i) Weevils should be reared for sustainable production.
5.	Chapora (<i>Solenopsis invicta</i>)	i) Trees are shacker the branches for collecting the ant.	i) Trees should not be shackers the ant will be collected through climbing on trees.



Plate 4.6: Collection and processing of NTFPs in the study area



Chhind (*Phoenix acaulis*)



Salfi (*Caryota urens*)



Mahua flower (*Madhuca longifolia*) collection process



Plate 4.7: Collection and processing of NTFPs in the study area

The collection has been done by traditional crude method, which may call as destructive harvesting of NTFPs. The material like leaves, flowers, seeds, fruits, and rhizomes of different NTFPs is collected for their livelihood in unscientific manner and because of this the regeneration of species is badly affected. The quality of produce is also not good as demanded in the market therefore, the produce do not fetch good price in the market. The collection of produce and its post harvest technique is playing a positive role to preserve quality of the material for longer duration and fetching good price in market.

Similar study carried out by Sinha *et al.* (2016) reported that total 44 plants producing NTFP were collected by tribals in 20 villages of Bastar district. Plant and plant produce collected by the tribals from the plants were seeds of 11 plants, fruits of 11, roots 3, rhizomes 4, flowers 4, and secretory products from 3 plants, whereas, 4 whole plants. Lac and Cocoons were also collected by the tribal's from the forest. The destructive harvesting method and unscientific processing methods deteriorate the quality of price and lowering the price in market.

Rout and Panda (2011) reported that the NTFPs are a major source of subsistence production, income, employment and great socio-economic significance especially for the weaker section of the society. They reported that the 54 important NTFP species have been collected by the Gandigadha villagers for consumption. However, a few new species like 'Sal' (*Shorea robusta*) leaves, tooth stick and seeds, Mahua (*Madhuca indica*) flower and fruit, char (*Buchanania lanzan*) fruits, seeds and mushroom are collected and sold to local traders. They reported the 54 NTFP species from the Gandigadha villagers 49 numbers of are sold and 5 numbers of NTFP like fruits of *Baringtonia acutangula*, *Cassia fistula*, *Catunonegam spinosa* etc. are used for self consumption.

Gubbi *et al.* (2008) reported in the Periyar Tiger Reserve, India, they examined whether NTFP collection can solve livelihood problems by analysing revenues obtained from various NTFP species, estimating the economic returns to collectors from various social backgrounds, and exploring the attitudes of collectors towards their profession. They found that black damar resin from the tree *Canarium strictum* (61.3%) and mace from *Myristica spp.* (35.5%) were the

most commonly collected NTFPs, and the most valuable NTFPs were honey from *Apis cerana indica* (USD 4.12 kg⁻¹), cardamom, *Elettaria cardamomum* (USD 3.67 kg⁻¹) and *Myristica spp.* (USD 2.77 kg⁻¹). Mean daily revenue from NTFP collection was USD 3.15±SD 4.19 day⁻¹, and the lowest daily revenues were earned by part-time collectors with low socio-economic status such as migrants, forest-dwellers or those without access to agricultural land. Most collectors (82%) did not wish to continue harvesting of NTFPs if alternative livelihoods from agriculture could be provided, and none wanted their children to be NTFP collectors. Similarly the income of tribes residing in the study area differ in different sites due to species variation and socio economics reasons to the earn money from different enterprises.

Maikhuri (2003) also concluded that the basic causes of unsustainable harvesting are ignorance, poverty and lack of alternative livelihood support system accompanied by encroachments by outsider. Sustainable harvest with proper buy back guarantee will provide better employment opportunities to the local inhabitants. The similar result regarding unscientific collection methods were recorded by the above workers showed conformation with the present investigation. NTFPs collectors need to be trained for sustainable harvesting method so that the natural regeneration of these species is promoted for conservation.

4.4 To study the Post harvest techniques and value additions of NTFPs

Information was collected with the help of questionnaire developed for present study. Information recorded with oral interview from the respondents selected for the study. The data recorded documentation of 51 plant species regarding availability, collection methods, and post harvest techniques, etc.

4.4.1 Traditional methods of processing and value additions of NTFPs

The collected 51 plants as NTFPs included 19 trees, 5 shrubs, 8 herbs, 5 grasses, 10 climbers and 4 bio-products. These were collected, processed and sold in the market as well as for own consumption. As evident from Table 4.5 mostly fruits were collected and processed by using sun dryer, air dryer and electric dryer. The fruit processing technique was carried out for *Syzygium cumuni*, *Diospyros*

melanoxyton, *Aegle marmelos*, *Tamarindus indica*, *Semecarpus anacardium*, *Schleichera oleosa*, *Emblica officinalis*, *Buchanania lanzan*, *Mangifera indica*, *Terminalia chebula*, *Terminalia bellirica*, *Strychnos potatorum*, *Litsea sebifera* and *Azadirachta indica* etc. The medicinal plant Kalmegh was kept for 2-3 days in sunlight for drying. The most of the trees, shrubs, herbs and grasses were used for medicinal purposes. People used processing techniques to produce value added products like preserve, candy, jam, RTS, nectar squash/leather/slab, powder of *Aegle marmelos*, herbal oil, nutraceutical ingredients, fruits powder, and vegetable powder of *Bauhinia variegata*, Jams, jellies, tarts, chutneys, beverages (nectar, squash and syrup) pickle and candy of *Emblica officinalis*, jellies, candy of *Tamarindus indica*, amchur, juices, nectars, concentrates, fruit bars, flakes dried fruits pickle, candy of *Mangifera indica* etc. Dry karil (*Dendrocalamus strictestrus*) and mushrooms are used as vegetables. The liquor prepared from *Madhuca longifolia* is the common beverage consumed in varying quantities by all the Adivasis of the study area. Salphi obtained from *Caryota urens* is used for baverage. Bio-product, food and chutneys from *Rhynchophorus ferrugineus*, *Solenopisis invicta* and many types of value added product are made by people.

The collected material like leaves, flowers, seeds, fruits, juices and rhizomes are processed for making plates, rope, broom, medicines, basket, baverage and many types of value added products. The collection of produce and its post harvest technique is playing a positive role to preserve quality material for longer duration. Similar study carried out by Sundriyal and Sundriyal (2004) reported that the data on marketing, value addition and management concerns of the wild edible plants of the Sikkim Himalaya. A total of 44 wild edible species have been recorded. Other important species were *Machilus edulis*, *Diplazium esculentum*, *Eleagnus latifolia*, *Dendrocalamus hamiltonii*, *Agaricus* and *Baccaurea sapida*. Value addition was done to a few wild edible species, and cost-benefit analysis showed that the income from the fruits could be increased by at least 3-5 times after making pickles, squash and jam. The information obtained in the present investigation can be compared with the scientific methods which can play a significant role to increase the income of collectors. It will it result in the increasing the income and improvement in their livelihood. Similar study carried

Table 4.5: Processing, storage techniques and value addition of NTFPs used by local inhabitants and scientific methods for sustainable utilization

Trees

S. No.	Local name	Traditional method		Scientific method		Value addition
		Processing	Storage	Processing	Storage	
1.	Bel (<i>Aegle marmelos</i>)	<p>i) Collected fruits kept in clean place in sunlight for 5-6 days for drying.</p> <p>ii) After drying its fruit skull automatically crack down.</p>	<p>After drying people sold it immediately.</p>	<p>i) Collected fruits should be kept for 3-4 days on clean cloth or tarpolean or polysheet for sun drying.</p> <p>ii) Fruits are put in extremely hot water for few minutes then remove. This process is repeated for 2-3 times for removing its hard cover.</p> <p>iii) The pulp of fruit should be cut in four parts then pulp spread on clean cloth or bamboo mats for drying. Fruits completely dry in 15-25 days.</p>	<p>The dry orange and pulp should be packed in plastic bags.</p>	<p>After extraction of bel pulp used for the preparation of various fruit products viz., preserve, candy, jam, RTS, nectar squash/leather/slab, powder etc. which can be commercially exploited.</p>
2.	Char (<i>Buchanania lanzan</i>)	<p>i) Collected seed kept for 2-3 days in sunlight for drying after removing its pulp from fruit.</p>	<p>Dried seed kept in an open room before selling.</p>	<p>i) Collected fruits should be put in a tank which is filled with fresh water than fruits rubbed under water so that pulp come out and float, which could be removed by decantation and seeds settled down on the bottom.</p>	<p>Well-dried seeds should be packed in jute bags for storage.</p>	<p>Roasted seeds are used as dry fruit. Seeds are used as condiment and to increase flavor in various sweets.</p>

					ii) To test healthy seeds for storage seeds are put in a tank full of water, seed settled in bottom would be considered as sound seed.			
3.	Kachnar (<i>Bauhinia variegata</i>)	i) Fresh flower buds and leaves were used as vegetable. ii) Sometimes the leaves are dried for 2-3 days in sunlight to use in lean period.	Dried leaves were stored in any moisture proof container or plastic bag.	Not commercialized.		The product range consists of Herbal Extract, Herbal Oil, Nutraceutical Ingredients, Fruits Powder, Vegetable Powder and many more.		
4.	Bahera (<i>Terminalia bellirica</i>)	i) Selected fruits spread in clean place to dry in sunlight for 4 -5 days.	Well-dried brown fruits were stored in simple jute bags.	i) Collected fruits should be spread on clean cloth for 10-15 days then its hard portion should be separated from mingi (seeds). ii) This separate hard cover/pulp again keeps it for 4-5 days to dry.	Completely dried pulp should be packed in Jute bag, which has plastic cover in inner part.	Triphala churn.		
5.	Aonla (<i>Emblica officinalis</i>)	i) Collected fruits were boiled 10 min. for removing seeds. ii) Then seeds are removed and kept for 4-5 days in sunlight for drying. iii) Its colour should be	Dried fruits were kept in jute bags or clay pot.	i) Collected fruits washed in plenty of running water properly. ii) For commercial production, rotary washers, or fitted with moving conveyor belt and soft roller brushes are generally employed. i) Blower fan, solar dryer or pressure less dehydration process is used	Completely dried reddish brown coloured fruits should be packed in plastic bags for storage. During packing time mouth of	Jams, jellies, tarts, chutneys, beverages (nectar, squash and syrup) Pickle and candy etc.		

		reddish brown after drying.		for drying. ii) Vacuum dehydration process is used at commercial level to maintain its original value.	bags should be kept little open to avoid smell.	
6.	Tendu leaves (<i>Diospyros melanoxyton</i>) Tendu fruit	i) Collected leaves were kept in sunlight for 3-4 days to dry. ii) Fresh fruits are sold in market thus no need of any process.	For storage leaves were tied in bundles. No need of storage.	i) The collected leaves should be dried in partial shade. ii) 20-40°C temperature is good to dry the leaves.	Well-dried leaves of same size should be tied with soft rope in bundles then stored.	Bidi, cigarettes.
7.	Bhelwa (<i>Semecarpus amacardium</i>)	i) Generally people used the fruits as it is, but sometimes they dry in sunlight for storage and separates from seed.	Dried fruits were stored in bamboo baskets or clay pots.	Not commercialized	-	Ink and medicines.
8.	Mahua Flower (<i>Madhuca indica</i>)	i) Collected flowers are spread in clean place evenly for 3-4 days in sunlight for drying.	Dried flower were kept in open and bamboo basket before marketing.	i) Collected flowers should be spread as thin layer on polythene sheet for drying in sunlight.	Well-dried flowers should be packed in jute or plastic bags immediately after last drying.	Food material (laddu, kismis, biscuit), bio diesel and wine.
9.	Jamun (<i>Syzygium cumuni</i>)	i) Fresh fruits are sold in market.	No need of storage.	i) Not commercialized	Fresh fruits of the washing smashed pulp after filter converted in	Jamun juice is prepared and preserved then sold in the market.

10.	Kusum (<i>Schleichera oleosa</i>)	<p>i) Collected fruits kept as it is for 6-7 days and then it could be uncovered.</p> <p>ii) After collection of fruits pulp is removed and seeds were separated.</p> <p>iii) Seed were kept in sunlight for drying.</p>	Dried seeds were stored openly in room.	<p>i) First uncover the collected fruits then crushed by means of fluted wooden roller or crushers are used to remove its pulp.</p> <p>ii) Collected seed evenly spread on clean cloth or polythene sheet for 4-5 days for drying.</p>	<p>juice.</p> <p>Dried seeds should be packed in jute bags for storage.</p>	Edible oil, pickled. The ripe fruits are sold in the market.
11.	Imli (<i>Tamarindus indica</i>)	<p>i) Collected fruits were spread for 2-3 days in room then uncovered.</p>	Uncovered fruits were kept in bamboo baskets.	<p>i) Collected fruits were spread on polythene sheet for 2-3 days to dry then uncovered.</p> <p>ii) Uncovered fruits fiber and seed should be removed, which is called Phool Imli.</p> <p>iii) Imli with seeds and fiber called auti Imli.</p>	Phool Imli should be packed in plastic bags and Auti Imli packed in Jute bags for storage.	Jellies, chutneys, beverages (nectar, squash and syrup) Pickle and candy etc.
12.	Mango (<i>Mangifera indica</i>)	<p>i) Fresh fruit are collected and sold in the market.</p> <p>ii) Damaged fruit are cut into small pieces and dried in the sun light and sold in the</p>	Seeds kernels and dry fruits are stored in small container.	<p>i) Fresh fruit are collect for aamchur preparation.</p> <p>ii) Fruits are chopped, and seeds are dried in sunlight</p>	Aamchur should be packed in plastic bags. Dried seed and fruits packed in Jute bags for storage.	Aamchur, juices, nectars, concentrates, jams, jelly powders, fruit bars, flakes dried fruits pickle, candy.

13.	Sal (<i>Shorea robusta</i>)	market. i) The resin is collected from tree trunk with the help of wounds made the resin secreted wounds ii) Fire used then collecting the seeds and sold in the market.	Gum stored in bamboo basket.	i) Gum is collected from the cut part of the plant and dried in the sunlight known as dhoop.	Gum should be stored in aluminum and steal container.	Soap, sal butter which is used for cooking, sal seed cake are used as feedstuffs. The resin sold in the name of lobhan.
14.	Harra (<i>Terminalia chebula</i>)	i) Selected fruits spread in clean place to dry in sunlight for 4 -5 days.	Fruits stored in dry place. Well-dried fruits were stored in simple jute bags.	i) Collected fruits should be spread on clean cloth for 10-15 days then its hard portion should be separated from mingi (seeds).	Completely dried fruit should be packed in Jute bag, which has plastic cover in inner part.	Triphala churn.
15.	Nirmali seed (<i>Strychnos potatorum</i>)	ii) Collected seed kept for 2-3 days after removing its pulp from fruit.	Dried seed kept in an open room before marketing.	i) Collected fruits should be put in a tank which is filled with fresh water than fruits rubbed under water so that pulp come out and flot, which could be removed by decantation and seeds settled down on the bottom. ii) To test healthy seeds for storage seeds are put in a tank full of	Well-dried seeds should be packed in jute bags for storage.	Roasted seeds are used as dry fruit. Seeds are used as condiment and to increase flavor in various sweets.

				water, seed settled in bottom would be considered as sound seed.			
16.	Maida chhal <i>Litsea sebifera</i>	i) Tree is felled and bark is extracted	Dried bark in sunlight packed in jut bag.	i) Tree is not felled and bark is extracted from the mature portion of the tree. ii) After extraction of bark time is given for healing.	Well-dried seeds should be packed in jute bags for storage.	Bark is used as a medicine	
17.	Karanj seed <i>(Pongamia piñnata)</i>	i) Immatured pads are also collected	Dried seed kept in an open room before selling	i) Mature pods are collected and dried in a scientific way	Well-dried seeds should be packed in jute bags for storage.	Oil is extracted and used as an insecticide and medicine. Plant part is also used as manure.	
18	Salfi <i>(Caryota urens)</i>	i) Inflorescence is removed and liquor beverage is collected	Stored in earthen pot	i) Some part of inflorescence must be kept remained in the tree for seed production.	-	-	
19.	Kullu	i) The insicion in the tree trunk made too deep some time the tree die	The collected gum is not kept in clean surface for drying due to this the gum quality affected	i) The incision in tree is made superficial and the chemical treatment is done so that the tree trunk is safe for another harvesting of the gum from some tree.	The collected gum is kept and dried in clean surface so that that the dirt is not stacked in gum and quality will be superior.	The Kullu gum fetches good market price because it is used in pharmaceutical industry	

Shrubs

S. No.	Local name	Traditional method		Scientific method		Value addition
		Processing	Storage	Processing	Storage	
1.	Ainhi (<i>Helicteres isora</i>)	i) Fruit and twig were used for medicine purpose.	Fruits were dried in sunlight one week and then stored. .	i) Fresh fruits are collected and dried in sunlight.	Dried fruits should be packed in jute bags for storage.	Medicine, ropes and cloth.
2.	Ber (<i>Zizyphus mauritiana</i>)	i) Fruits were kept 3-4 days in sunlight. ii) Ber fruit were generally sold fresh in market. iii) Sun dried fruits also sold in market.	Dried fruits were kept in jute bags or bamboo basket.	ii) Undamaged and disease free fruits are selected then washed in plenty of water and spread on clean cloth or polythene sheet for drying in sunlight for 5-6 days. iii) Dried fruit pulp should be grinded to get powder form.	The fruit pulp powder should be packed in plastic packets for safe storage.	Chuhara, jam, candy, beverages ber roti etc.
3.	Chhind (<i>Phoenix acaulis</i>)	i) Leaves and fruit were properly dried 2-3 days in sunlight.	Leaves are stored in dry place.	Not commercialized.	-	Juice is a good beverage, broom, mat, baskets are made from the leaves, and fruits are edible.
4.	Karonda (<i>Carissa carandus</i>)	i) Fresh fruits and flower are used and sold in the market.	No need of storage.	Not commercialized.	-	Pickle and chutneys.
5.	Chameli (<i>Jasminum arborescens</i>)	i) Fresh fruits and leaves were used as medicine.	No need of storage.	Not commercialized.	-	Cosmetic perfume, oil, soap.

Herbs

S. No.	Local name	Traditional method		Scientific method		Value addition
		Processing	Storage	Processing	Storage	
1.	Charota (<i>Cassia tora</i>)	<p>i) Its leaves were dried in sunlight for 2-3 days.</p> <p>ii) The collected pods of charota are kept in sun light to crack the pods for easy separation of seeds.</p> <p>iii) Separated seeds are again kept 1 day in sunlight for drying.</p>	Dried leaves and seeds were kept separately in bamboo baskets or any other container.	i) Tray drier or electric drier should be used for drying seeds.	Leaves and seeds should be stored separately in plastic bags.	Cassia tora tea is a herbal, pure, natural and non-polluted green health beverage (coffee-tea), substitute for coffee and sodas.
2.	Mushroom	<p>i) Fresh mushroom used as vegetable and sold in market.</p> <p>ii) Some types of mushroom are sun dried and fire (fume) for storage.</p>	Dried mushroom are kept in any container such as clay pot or bamboo basket.	i) The caned mushrooms with saline water are processed.	The can of mushroom stored in room temperature it is available in shops.	Pickle, papad, health power powder, and use as a vegetable.
3.	Kalmegh (<i>Andrographis paniculata</i>)	i) Collected leaves, fruits or whole plant were kept 2-3 days in sunlight for drying.	Dried leaves, fruits and stems were placed in open room.	i) Fresh plants are collected and cleaned with water, chopped into large pieces then dried in the sunlight.	The grinded producer from churan is packed in plastic bottles or poly pack.	Medicine. Aurvedic medicin preparation purpose.

4.	Tikhur (<i>Curcuma angustifolia</i>)	i) Rhizomes are collected and sold in market.	Dried rhizomes were kept in jute bags or bamboo basket in dry place.	i) Rhizomes are collected and cut it into small pieces and grind, Five to Ten-times rinsed in water, then dried in sunlight white solid powder is obtained as known as Tikhur.	Powder should be packed in plastic bags.	Food material Barfi, sweets, sarbat are prepared for fast.
5.	Safed musli (<i>Chlorophytum tuberosum</i>)	i) Collected tubers are cleaned and dried.	Dried rhizomes were kept in jute bags or bamboo basket in dry place.	i) Collected tubers are cleaned and dried.	Powder should be packed in plastic bags or in plastic bottles.	Allopathic medicines, sex tonic, Immunity-improving drug.
6.	Kali musli (<i>Curculigo orchioides</i>)	i) Collected tubers are cleaned and dried.	Dried rhizomes were kept in jute bags or bamboo basket in dry place.	i) Collected tubers are cleaned and dried	Powder should be packed in plastic bags.	Ayurvedic medicine
7.	Gengi (<i>Curcuma zedoaria</i>)	i) Rhizomes are collected and sold in market.	Dried rhizomes were kept in jute bags or bamboo basket in dry place.	i) Rhizomes are collected and cut it into small pieces and grind, Five to Ten-time rinsed in water, then dried in sunlight.	Powder should be packed in plastic bags.	Ayurvedic medicine
8.	Satawar (<i>Asparagus racemosus</i>)	ii) Rhizomes are collected and sold in market.	Dried rhizomes were kept in jute bags or bamboo basket in dry place	i) Rhizomes are collected and cut it into small pieces and grind, Five to Ten-times rinsed in water, then dried in sunlight and powder prepared.	Powder should be packed in plastic bags.	Ayurvedic medicine

Grasses

S. No.	Local name	Traditional method		Scientific method		Value addition
		Processing	Storage	Processing	Storage	
1.	Munsel (<i>Iseilema nervosum</i>)	Fresh leave are use.	No need of storage.	Not commercialized.	-	-
2.	Kans (<i>Saceharum spoutaneum</i>)	Collected spikes kept 3-4 days in sunlight for drying.	Dried spikes tied in bundles and broom manufactured during rainy season.	Not commercialized.	-	Broom.
3.	Phulbahari (<i>Thysanotacns maxima</i>)	Collected spikes kept for 3-4 days in sunlight to dry.	Dried spikes tied in bundles and Broom manufactured.	The spikes are fixed in steel/plastic tube tightly and sold in the market.	Stored in godown	The handle of broom plying a gigrificat role in extra price.
4.	Bans (<i>Dendrocalamus strictus</i>)	Harvested bamboo culms keep in sunlight for drying it may cause cracks.	Dried bamboo stored only for few days before selling.	Seasoning process is used for its long life and strength. Air seasoning is generally used.	Bamboo stored in such a way that equal length and thick stem stored in grade basis for sale.	Making bamboo box, bamboo container and other bamboo product. Lot of handicraft articles are available in the market.
5.	Kusal (<i>Heteropogan contortus</i>)	Collected spikes kept 3-4 days in sunlight for drying.	Dried spikes tied in bundles and broom manufactured during rainy season.	Not commercialized.	-	Broom.

Climbers

S. No.	Local name	Traditional method		Scientific method		Value addition
		Processing	Storage	Processing	Storage	
1.	Mahul (<i>Bauhinia vahlii</i>)	i) Collected leaves tied in bundles of 100 leaves.	Collected leaves kept in closed room before selling.	i) Collected leaves kept in a well-closed room before making plate ii) With the help of machine leaves are joint or stitched. iii) Molding machine is used for press the Dona and Plates.	Plates and Donas tied separately in bundles and packed in thin polythene bags carefully for storage	Making Plates, donas storage box, malt and rope. The attractive and moulded dona pattal fetches good price.
2.	Ramdattoon (<i>Smilax zeylanica</i>)	i) Harvested twig beated by wooden rollers then removed its fiber and kept 2-3 days for drying.	Dried fiber rolled in bundles for storage.	Not commercialized.	-	Rope.
3.	Baichandi (<i>Dioscorea hispida</i>)	i) Fresh root are used for medicinal purpose.	No need of storage.	The chips of baichandi is prepared after boiling then dried in sunlight then packed in plastic bags.	Stored in room/godown.	Attractive neat and clean thin chips with smart packing fetches good price
4.	Karukand (<i>Dioscorea bulbifera</i>)	i) Rhizomes are collected from soil and cleaned with water and sold in market as a vegetable.	Rhizome stored only for few days before selling.	i) Rhizomes are collected from soil and cleaned with water then the upper surface is removed and dried in the sunlight.	Rhizome should be packed in jute bags for storage.	Use as a vegetable and medicine.
5.	Bodal (<i>Cucumis</i>)	i) Fruits are collected and cut into small	Dried material stored in plastic	i) Not commercialized.	-	Food material (chips) badi, papad, pickle and mushroom

	<i>meloagrestis</i>)	pieces and dried in the sunlight.	container.			powder.
6.	Amarbel (<i>Cuscuta reflexa</i>)	i) Collected climbers kept 2-3 days in sunlight for drying. ii) Fresh climber used as medicine.	Dried climbers tied in bundles for storage.	i) Not commercialized.	-	Use as a medicine.
7.	Anantmool (<i>Hemidesmus Indicus</i>)	i) Roots are collected from soil and cleaned.	Dried root should be packed in jute bag for storage.	i) Roots are collected from soil and cleaned with water then dried in the sunlight and made powder.	Powder should be packed in plastic bags for storage.	Medicine tablet.
8.	Peng (<i>Celastrus paniculatus</i>)	i) Seeds are collected. Climber is collected by forcefully snatching the climber. So the immature fruits are damaged.	Dried root should be packed in jute bag for storage.	i) Mature seeds should be collected.	Powder should be packed in plastic bags for storage.	Oil is extracted. Also used as a medicine.
9.	Khekshi (<i>Momordica dioica</i>)	i) Fruit are collected.	Sun dried fruit should be packed in polythene bag for storage.	i) Some plants may be left with fruit so that mature seed spread for next year regeneration	-	Medicine value and used as vegetable.

Bio- product

S. No.	Local name	Traditional method		Scientific method			Value addition
		Processing	Storage	Processing	Storage	Storage	
1.	Honey (<i>Aphis dorsata</i>)	The local collection method honey extracted from honeycomb.	Collected honey kept in container like clay pot.	All dirt and unwanted material removed from honey.	Well-processed honey should be stored in bottles with smart packing and labeled sold in market.	It has attractive chemical properties for baking and a distinctive flavor when used as a sweetener.	
2.	Kosa (<i>Cocoon</i>) (<i>Antheraea mylitta</i>)	Trees are felled and Cocoons are collected and sold in the market.	Should be stored in open room.	Cocoons are boiled in water; then, Kosa fibres are extracted by rupturing the cocoon	After processing cocoon should be packed in jute bags for storage.	Silk saris, cloth and various dress material prepared.	
3.	Chind kira (<i>Rhynchophorus ferrugineus</i>)	Weevil are collected by dissecting the plant	Roasted in fire and stored by wrapping in Mahul leaves.	Weevils should be reared for sustainable production.	-	Salt, turmeric powder is used for giving longevity and chutney is eaten.	
4.	Chpora (<i>Solenopsis invicta</i>)	Trees are felled for collecting the ants.	Sun dried and stored.	Trees should not be felled. Bamboo made instrument is used for collecting ants.	-	Salt, turmeric powder is used for giving longevity and chutney is eaten.	

out by above workers confirms the findings of present study.

Shankar *et al.* (2014) concluded that the treatment or recipe combination 1:1.5:2.5 (Tikhur starch: Sugar: Water) was best for the preparation of tikhur Barfi. On the other hands tikhur Barfi prepared through the recipe 1:1.5 2.5 (Tikhur starch: Sugar: Water) had a pleasant flavour, taste moisture, texture appearance and over all acceptability. The value addition technology with training can change the livelihood of the tribes after scientific training.

Pethiya and Surayya (2005) concluded that value addition to NTFPs can be carried out at three stages, pre-harvesting, during harvesting and post harvesting stages. He revealed that primary processing (FD level), secondary processing (at traders level) and consumer industry (industry level) will be the best chain with the help of this system and better price can be given to the primary collector. Similar observations have been recorded with this experiment where, collection, post harvest and marketing are very poor, this shows confirmation with findings of the above worker. *Mangifera indica* and *Emblica officinalis* could be harvested by shaking branches, hitting the fruit with stick, plucking fruit by hand plucking and with knitted net attached at the end of a bamboo stick. The first two methods are destructive harvesting techniques, which damage the tree and reduce the value of harvested fruit through physical damage. The fruit of *Emblica officinalis* (Aonla) can be boiled to remove the seeds and extract the pulp. The pulp dried for 4-5 days and grind to obtain powder form.

The present study also reveals that the sustainable harvesting and processing with small value addition the better price can be obtained by the local inhabitants in the study area which is in confirmation with the results of above workers.

4.5 The role of NTFPs in livelihood of tribes and local residents in relation to their income.

4.5.1 Collection of NTFPs in study area

All NTFPs are not harvested and collected in the study area, a few NTFPs, which have commercial and domestic values in the market, are collected by local people. The products, which are collected by people, are flower, fruit, rhizome,

tuber, mushroom, leaves, bamboo shoots, seed, juice, etc. Among all these viz. fruits, seeds and leaves especially of *Mangifera indica* (Mango), (*Tamarindus indica*) (Imli), *Buchanania lanzan* (Char fruit), *Diospyros melanoxylon* (Tendu), *Casaia tora* (Charota seed), *Helicteres isora* (Maror phalli) and *Bauhinia vahlii* (Mahul) are largely collected. Most of the people involved in collection of Tendu leaves during summer, when there was no agriculture work. *Diospyros melanoxylon* is a nationalized product. Maximum women and childrens were involved in collection of *Diospyros melanoxylon* leaves. Next to *Diospyros melanoxylon* (Tendu) leaves, *Bauhinia vahlii* (Mahul) leaves were collected to prepare dona and plates for local sale or industrial purpose. *Madhuca indica* (Mahua) flower, *Phoenix acaulis* (Chind) and *Caryota urens* (Salfi) are also important NTFPs for their own consumption and also to get cash income. The liquor extracted from dried flower was used in cultural functions and their rituals. The results of major NTFPs species and their average collection pattern and their quantity collected in selected villages presented in (Table 4.6) revealed that *Diospyros meloanoxylon* (Tendu) leaves (94,750 bundles) were the main source of NTFPs income followed by *Bauhinia vahlii* (Mahul) leaves (1616.66 bundle), *Madhuca indica* (Mahua) flower (2800 kg), *Buchanania lanzan* (Chironji) (245 kg), *Tamarindus indica* (Imli) (1983.33 kg), *Mangifera indica* (Mango dry) (156.66 kg), *Astraeus hygromericus* (Boda) (113.33 kg) and mushroom (116.66 kg), korkoti (*Ipomiea nil*) (183.33 kg), sal seed (*Shorea robusta*) (436.66 kg) and harra (*Terminalia chebula*) (210 kg). The average collection of *Diospyros melanoxylon* from 0 to 2,52,000 bundles. The highest collection of *Diospyros melanoxylon* (Tendu) leaves were carried out in Benoor (2,52,000 bundle) followed by Chhotedongar (180500 bundle). However, in Orchha and Gudadi collection was not recorded followed by Basing (20,000 bundle). *Bauhinia vahlii* (Mahul) leaves were collected only in five villages namely Chhotedongar, Benoor, Orchha, Gudadi and Basing. The highest collection *Bauhinia vahlii* (Mahul) leaves was in Orchha (2,800 bundle) followed by Chhotedongar (2,500 bundle) and lowest in Gudadi, Benoor (1,200 bundle) followed by Basing (2,000 bundle). The highest collection of *Madhuca indica* (Mahua) flower was carried out Benoor (4,800 kg) followed by Chhotedongar (3,600 kg) and lowest in Basing (900 kg)

followed by Gudadi (1,800 kg). The highest collection (350 kg) of *Buchanania lanzan* (Chironji) was carried out from Benoor and Orchha followed by Chhotedongar (300 kg) and lowest in Basing (100 kg) followed by Bharanda (120 kg). The highest collection of (*Ipomoea nil*) Korkoti was carried out from Chhotedongar, Orchha (250 kg) followed by Benoor (210 kg) and lowest in Basing (90 kg) preceded by Gudadi and Bharanda (150 kg). The highest collection of *Tamarindus indica* (Imli) was carried out from Orchha (3,600 kg) followed by Gudadi (2,600 kg) and lowest in Bharanda (1,100kg) followed by Basing (1200 kg). Honey was also source of income but collected in low quantity. The highest collection of *Mangifera indica* (Mango) dry was carried out from Gudadi (250 kg) followed by Chhotedongar and Orchha (160 kg) and lowest in Bharanda (100 kg) preceded by Basing (120 kg). *Curcuma angustifolia* (Tikhur) was collected by some people only despite its highest density in this forest. The highest collection of Mushroom was carried out from Bharanda (160 kg) followed by Benoor (150 kg) and lowest in Basing (50 kg) followed by Gudadi (90 kg). The highest collection of *Astraeus hygromericus* (Boda) was carried out in Bharanda and Chhotedongar (130 kg) followed by Benoor and Orchha (110 kg) and lowest in Basing (80 kg) preceded by Gudadi (120 kg). The highest collection of (*Shorea robusta*) Sal seed was carried out from Orchha (570 kg) followed by Gudadi (520 kg) and lowest in Bharanda (280 kg) followed by Benoor (350 kg). The highest collection of (*Terminalia chebula*) Harra was carried out in Orchha (2800 kg) followed by Gudadi (320 kg) and lowest in Bharanda (120 kg) preceded by Basing (1800 kg).

Murthy *et al.* (2005) reported that in Yellapur division large quantities of *Diospyros melanoxylon* (Tendu) leaves and *A. sinuata* are collected. The collected quantity during 1993-1994 was 3 and 8 tons respectively. Kavwar division with 1712.95 km². products gathered are *A. sinuata*, *G. indica*, *S. emarginatus*, *T. chebula*, Honey and Wax. The quantity of *A. sinuata* collected during 1990-1991 was about 64 tons. The quantity of *G. indica* gathered in same year was about 2 tons. In the present study the village wise annual collection of NTFPs is very low because of its availability in the forest near the village is limited but overall produce is higher. There is wide variation in collection of material in different

Table 4.6: Family wise NTFPs collection in different study site during (2016-17)

Village	Haraa <i>Terminalia chebula</i> (kg./year)	Sal Seed <i>Sorea robusta</i> (kg/year)	Mushroom <i>(Termitomyces spp.)</i> (kg/year)	Boda <i>(Astraeus hygromericus)</i> (kg/year)	Mango dry <i>(Mangifera indica)</i> (kg/year)	Imli <i>(Tamarindus indica)</i> (kg/year)	Korkoti <i>Ipomeia nil</i> (kg/year)	Chironji <i>(Buchanania lanzan)</i> (kg/year)	Mahua flower <i>(Madhuca longifolia)</i> (kg/year)	Mahul leaves <i>(Bauhinia vahlii)</i> (bundle/year)	Tendu leaves <i>(Diospyros meloanoxylon)</i> (bundle/year)
Narayanpur Block											
Chhotedongar	200	430	140	130	160	1800	250	300	3600	2500	180500
Benoor	160	350	150	110	150	1600	210	350	4800	1200	252000
Bharanda	120	280	160	130	100	1100	150	120	3200	0	116000
Average	160.00	353.33	150.00	123.33	136.67	1500.00	203.33	256.67	3866.67	1233.33	182833.33
Orchha Block											
Orchha	280	570	110	110	160	3600	250	350	2500	2800	0
Gudadi	320	520	90	120	250	2600	150	250	1800	1200	0
Basing	180	470	50	80	120	1200	90	100	900	2000	20000
Average	260.00	520.00	83.33	103.33	176.67	2466.67	163.33	233.33	1733.33	2000.00	20000.00
Total average	210	436.66	116.66	113.33	156.66	1983.33	183.33	245	2800	1616.66	94750

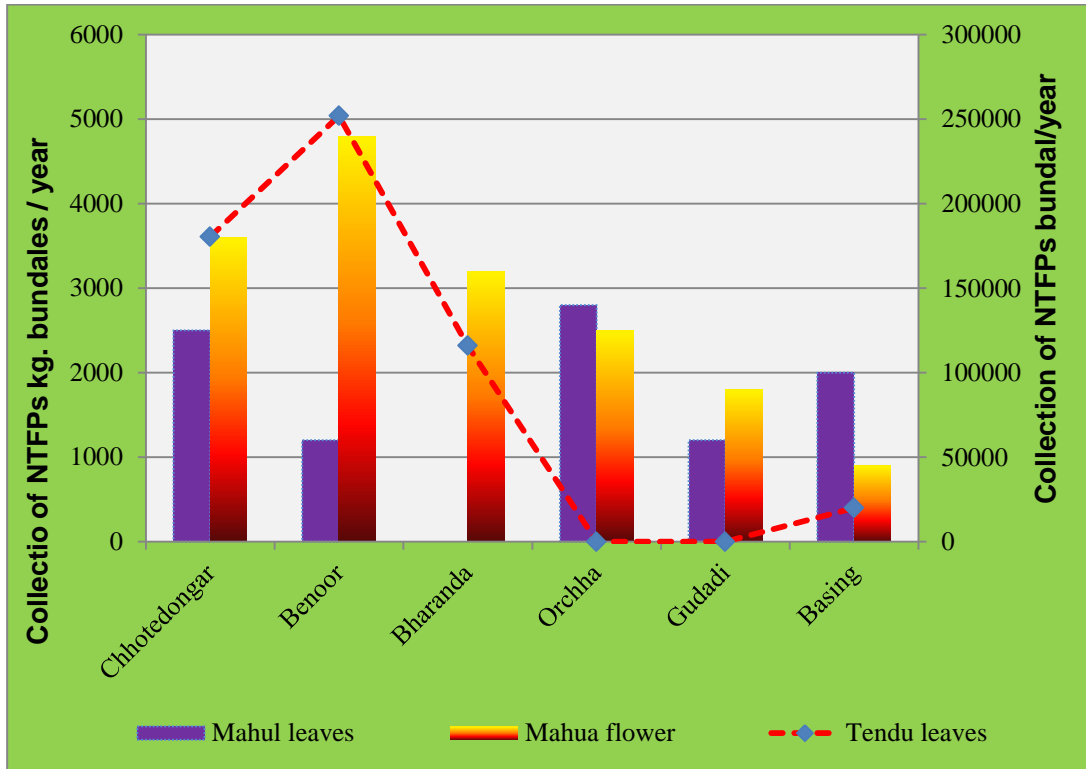


Fig. 4.1: Village wise collection of various NTFPs in Bunda/ kg per year

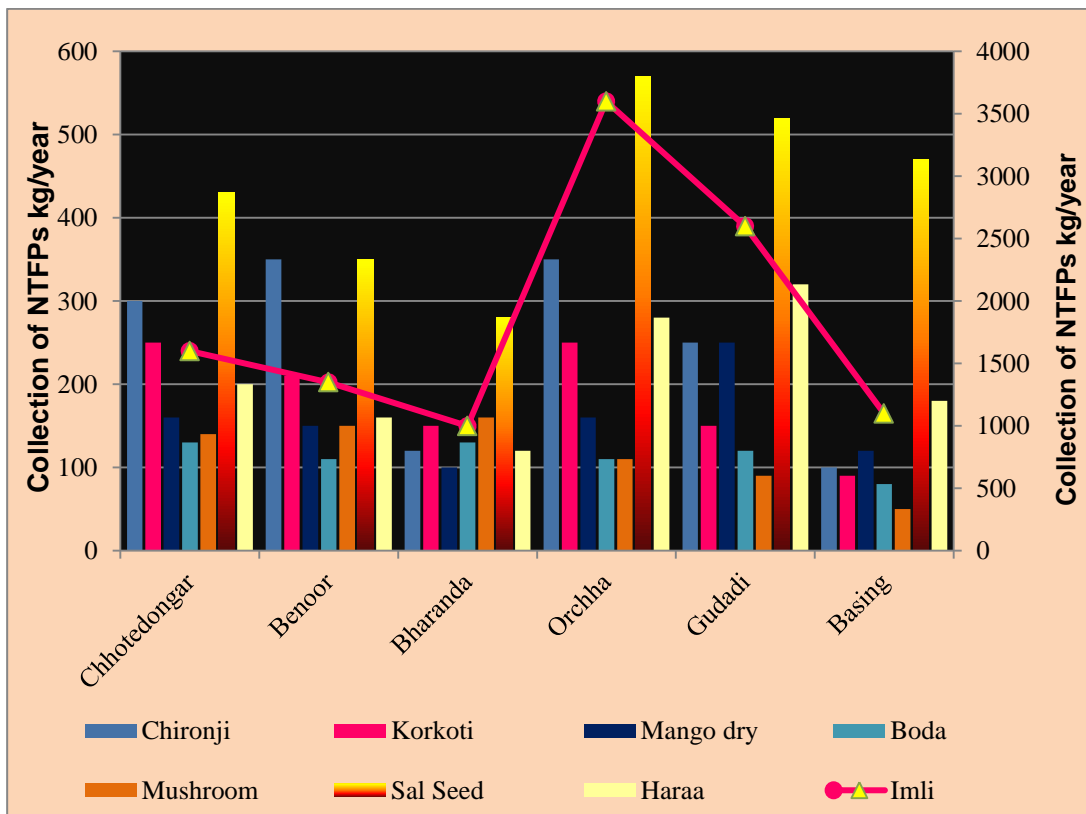


Fig. 4.2: Village wise collection of various NTFPs in kg per year

villages because of the density of the particular plants. If we compare with division wise the quantity may be high as reported by above workers confirms the result of present investigation.

Similar study was carried out by Choudhary *et al.* (2004) and reported that *Diospyros melanoxylon* leaves (42.60%) is the main source of forest income followed by *Dendrocalamus strictus* (12.20%), *Tamarindus indica* (10.13%), *Madhuca indica* (6.97%), *Shorea robusta* (4.60%) etc.

Kinhal (2006) reported that in Amadob, 816 q of *Bauhinia vahlii*, 1,22,050 bundles of *Diospyros melanoxylon*, and 198.61 q *Madhuca indica* (Mahua) flower, 0.17 q *Embelica ribes* (Baibidang), 467 q are collected. Honey is collected in surplus quantity. *Bauhinia vahlii* and *Diospyros melanoxylon* leaves, *Madhuca indica* flower and seed are the major NTFPs. The orders of NTFPs species produce prove species wise almost same as in the present study the honey is also collected in similar manner as reported by the above worker.

4.5.2 Local market rates of various NTFPs in study area

Study area was predominantly rural. In villages, small shops were available for daily need things. Weekly market facility was available in some villages *eg.* Chhotedongar, Benoor, Orchha, Basing. People from Bharanda village come to Narayanpur market which is the biggest market of district.

Marketing is an important part to obtain proper return of money. It connects what the consumer wants, supply the produce and profit. Analysis of collected data and marketing information indicated season wise NTFPs rates are enlisted and discussed. Narayanpur and Orchha (Abujhmar) market is biggest market of this area. A total of 43 NTFPs market rate are cataloged from four different markets Narayanpur, Benoor, Chhotedongar, Orchha (Abujhmar). The market Orchha (Abujhmar) was 60 km, Benoor 20 km, Chhotedongar 30 km away from district headquarters Narayanpur and connected with Tar road, after that forest road was found. In Orchha (Abujhmar) weekly market held on Wednesday where people Narayanpur market. The rate of *Buchanania lanzan* (chironji) Rs 90/kg in Narayanpur Benoor and Rs 85/kg in Orchha and Chhotedongar. *Tamarindus indica* (Imali) Rs 25 to 40/kg in all market. The rate of *Phoenix aculis* (Chhind) was Rs



Plate 4.8: Different NTFPs are displayed for marketing in the Narayanpur district

Table 4.7: Market rate of different NTFPs in study area of Narayanpur (C.G.)

S. No.	Product	Botanical name	Narayanpur (Rs./kg)	Benoor (Rs./kg)	Orchha (Rs./kg)	Chhote - dongar (Rs./kg)
1.	Mahua flower Seed	<i>Madhuca indica</i>	30	30	30	30
			15	15	10	15
2.	Tendu leaves	<i>Diospyros meloanoxylon</i>	100 bundle @180 Rs.(1 bundle = 100 leaves) Govt. rate	100 bundle @180 Rs.(1 bundle = 100 leaves) Govt. rate	-	100 bundle @180 Rs.(1 bundle = 100 leaves) Govt. rate
3.	Tendu fruit	<i>Diospyros meloanoxylon</i>	30	20	20	20
4.	Mahul leaves	<i>Bauhinia vahlii</i>	100 bundle @120	100 bundle @120	100 bundle @120	100 bundle @120
5.	Mahul seed	<i>Bauhinia vahlii</i>	30	-	20	20
6.	Mahul rassi	<i>Bauhinia vahlii</i>	30-60 per bundle	-	20-40	30-60
7.	Hony		250	200	180	-
8.	Kalmegh	<i>Andrographis Paniculata</i>	100	80	-	80
9.	Kachanar	<i>Bauhinia variegata</i>	20	20	10	10
10.	Anola	<i>Emblica officinalis</i>	Fruit G 40 Fruit D 50	40 50	30 45	30 45
11.	Sal seed	<i>Shorea robusta</i>	10	10	10	10
12.	Kuwe phal	<i>Randia dumetorum</i>	35	-	40	40
13.	Chironji	<i>Buchanania lanzan</i>	90	90	85	85
14.	Imli	<i>Tamarindus indica</i>	25-40	25-40	25-40	25-40
15.	Chhind	<i>Phoenix acaulis</i>	20	20	15	15
16.	Bamboo Shoot	<i>Dendrocalamus strictus</i>	60	60	40	40

17.	Mushroom	<i>Termitomyces spp.</i>	100-120	50-80	50-80	50-80
18.	Kusum seed	<i>Schleichera oleosa</i>	5	5	5	5
19.	Harra	<i>Terminalia chebula</i>	10-15	10-15	10-15	10-15
20.	Behra	<i>Terminalia bellirica</i>	15	15	15	15
21.	Ber	<i>Ziziphus mauritiana</i>	20	20	10	10
22.	Kosh (cocoon)		5/-pic	5/-pic	5/-pic	5/-pic
23.	Kosha kanda	<i>Dioscorea esculenta</i>	20	20	20	20
24.	Kargaya kanda	<i>Dioscorea opposita</i>	20	20	20	20
25.	Phool bahari	<i>Thysanolaena maxima</i>	40-60	40-60	40-60	
26.	Nilni flower	<i>Indigofera tinctoria</i>	30	30	25	25
27.	Chapora	<i>Solenopsis invicta</i>	20 (50 g)	10	10	10
28.	Rasna jari	<i>Blepharispermu m subsessile</i>	12	-	10	10
29.	Amchur	<i>Mangifera indica</i>	50-60	50-60	50-60	50-60
30.	Nirmali	<i>Strychnos potatorum</i>	50-60	-	50-60	50-60
31.	Peng	<i>Celastrus Paniculatus</i>	200	180	180	180
32.	Koroti seed	<i>Ipomoea nil</i>	60	60	60	60
33.	Charota seed	<i>Cassia tora</i>	5-7	5-7	5-7	5-7
34.	Bamboo prod.	<i>Dendrocalamus strictrus</i>	-	-	-	-

35.	Salfi	<i>Caryota urens</i>	40/liter	40	30	30
36.	Chhind juse	<i>Phoenix acaulis</i>	30/ liter	30	20	20
37.	Boda	<i>Astraeus hygromericus</i>	100	100	80	80
38.	Kheksi karela	<i>Momordica dioica</i>	60	60	40	40
39.	Bhelwa seed	<i>Semecarpus anacardium</i>	5	5	5	5
40.	Jamun	<i>Syzygium cumini</i>	20	10	10	10
41.	Marod phalli	<i>Helicteres isora</i>	15-20	-	15-20	15-20
42.	Tikhur	<i>Curcuma angustifolia</i>	250	250	-	-
43.	Sal gum	<i>Shorea robusta</i>	80	80	75	80
44.	Lac	<i>Laciffer lacca</i>	120	100	-	-
45.	Koting	<i>Solanum xanthocarpum</i>	20	20	20	20

G - Green, **D** - Dry, **Proc.** -Process, **Prod**- Product

20 /kg in Narayanpur and Benoor and Rs 10 /kg in Chhotedongar and Orchha market. The rate of *Dendrocalmus strictus* (Bamboo shoot) was Rs 60/kg in Narayanpur and Benoor Rs 40/kg in Chhotedongar and Orchha market. The rate of *Termitomyces spp.* (Mushroom) was Rs 100-120/kg in Narayanpur and Rs 50-80/kg in Chhotedongar, Orchha and Benoor market. The rate of *Terminalia chebula* (Harra) and *Terminalia bellirica* was Rs 10-15/kg in all four markets. The rate of *Ziziphus mauritiana* (Ber) was Rs 20/kg in Narayanpur and Benoor and Rs 10/kg in Orchha and Chhotedongar market. The rate of Kosha (Cocoon) was Rs 5 per piece in all markets. The rate of *Dioscorea esculenta* (Kosha kanda) and *Dioscorea opposita* (Kargiya kanda) was Rs 20/kg in all markets. The rate of *Indigofera tinctoria* (Nilni flower) was Rs 30/kg in Narayanpur, Benoor and Rs 25/kg in Orchha and Chhotedongar markets. The rate of *Solenopsis invicta*

(Chapora) was Rs 20/50g in Narayanpur and Rs 10/50g in Chhotedongar, Orchha and Benoor markets. The rate of *Blepharispermum subsessile* (Rasana jari) was Rs 12/kg in Narayanpur and Rs 10/kg in all three markets. The rate of *Solanum xanthocarpum* (Koting) was Rs 20/kg in all the markets. The rate of *Laciffer lacca* was Rs 120/kg in Narayanpur and Rs 100/kg in Benoor market. The rate of *Mangifera indica*, *Strychnos potatorum*, *Celastrus paniculata*, *Ipomoea nil*, *Cassia tora*, *Caryota urens*, *Phoenix acaulis*, *Astraeus hygromericus*, *Momordica dioica*, *Syzygium cumini*, *Helicteres isora* and *Curcuma angustifolia* was Rs 50-60 /kg, Rs 50-60 / kg, Rs 180-200 /kg, Rs 60 / kg, Rs 5-7 /kg, Rs 30-40 /lit., Rs 20-30 /kg, Rs 80-100 / kg, Rs 40-60 /kg Rs 10-20 /kg, Rs 15-20 /kg, Rs 250 /kg, respectively (Table 4.7).

Masih *et al.* (2001) reported that prices of various NTFPs sold in markets of Madhya Pradesh. *viz.* Aonla (*Emblica officinalis*), Harra (*Terminalia chebula*), Honey, Imli (*Tamarindus indica*), Tendu (*Diospyros melanoxylon*), Mahua flower (*Madhuca indica*), Mahul leaves (*Bauhinia vahlii*), Karonda (*Carissa carandas*) were @ Rs 7.41 kg, Rs 3.29 kg, Rs 32.22 kg, Rs 2.33 kg, Rs 3.92 kg, Rs 6.32 kg, Rs 3.46kg and Rs 2.83 kg, respectively. The various NTFPs prices were quite low due to lack of institutional arrangements and good market facilities. The market rate definitely varies as per the locality of the market. The price is low in remote area markets as compared to district market it also varies on yearly availability basis. The rates are low in the present investigation that is because of information and role of middle men in the channel of marketing so the results are almost similar.



Imli (*Tamarindus indica*)



Chhind kira (*Rhynchophorus ferrugineus*)



Bamboo dry (*Dendrocalamus strictus*)



Chapora (*Solenopsis invicta*)



Boda (*Astraeus hygromericus*)



Phutu (*Termitomyces* spp.)

Plate 4.9: Different NTFPs are displayed for marketing in Orchha and Chhotedongar local market of Narayanpur district



Phool bahari (*Tysonolaena maxima*)



Kosha kanda (*Dioscorea esculata*)



Kargaya kanda (*Dioscorea opposita*)



Phutu (*Termitomyces spp.*)



Kolyar Bhaji (*Bauhinia viriegata*)

Plate 4.10: Different NTFPs are displayed for marketing in Chhotedongar and Narayanpur local market of Narayanpur district



Nilni flower (*Indigofera tinctoria*)



Anola (*Emblica officinalis*)



Karil (*Dendrocalamus strictus*)

Plate 4.11: Different NTFPs are displayed for marketing in Orchha local market of Narayanpur district



Bhooni neem (*Andrographis paniculata*) sell in the market



Koting (*Solanum xanthocarpum*)

Sal and Karanj Datoon



Mahul leaf and seed (*Bauhinia vahlii*) sell in market

Plate 4.12: Different NTFPs are displayed for marketing in the local market of Narayanpur district



Bans Jhadu



Dholagi



Supa



Gopli



Gopa



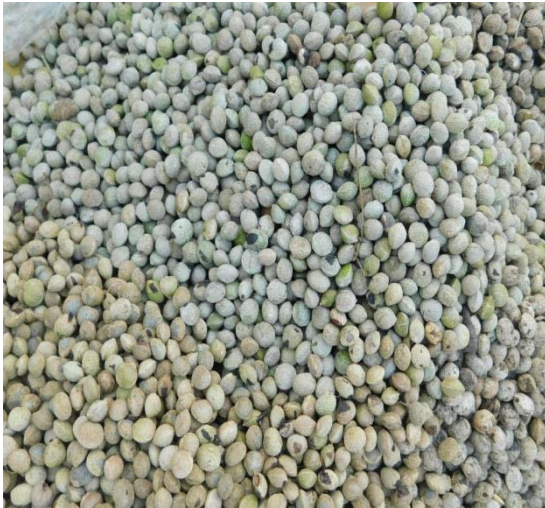
Sakari Butti



Chatai



Plate 4.13: Value added bamboo and broom products sold in local market



Chironji seed (*Buchanania lanzan*)



Aamchur (*Mangifera indica*)



Bhelwa seed (*Semecarpus anacardium*)



Mahua (*Madhuca longifolia*)



Dhup (*Shorea robusta*)



Nirmali seed (*Strychnos patatorum*)

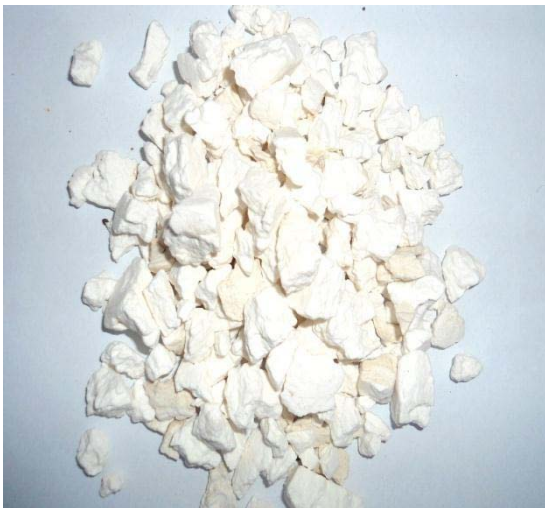
Plate 4.14: Final processed value added NTFPs ready for marketing in local Hat Bazar



Koroti seed (*Ipomoea nil*)



Kuwe phal (*Randia dumetorum*)



Tikhur (*Curcuma angustifolia*)



Maror phalli (*Helicteres isora*)



Peng (*Celastrus paniculatus*)



Kosha (*Antheraea mylitta*)

Plate 4.15: Processed Tikhur and other NTFPs are displayed in the local market of Benoor, Narayanpur and Orchha



Ber (*Ziziphus mauritiana*)



Aama gohi (*Mangifera indica*) Karnel



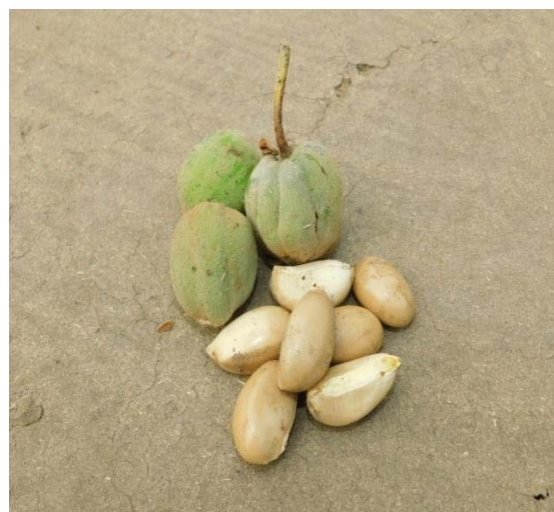
Rasna jari (*Blepharispermum subsessil*)



Tendu (*Diospyros meloanoxylon*)



Chironji fruit (*Buchanania lanzan*)



Tora (*Madhuca longifolia*)

Plate 4.16: Different NTFPs displayed in the study area



Lac (*Laccifer lacca*)



Jungali Khekhsi (*Momordica dioca*)



Koting (*Solanum xanthocarpum*)



Dheta (*Grewia tiliifolia*)

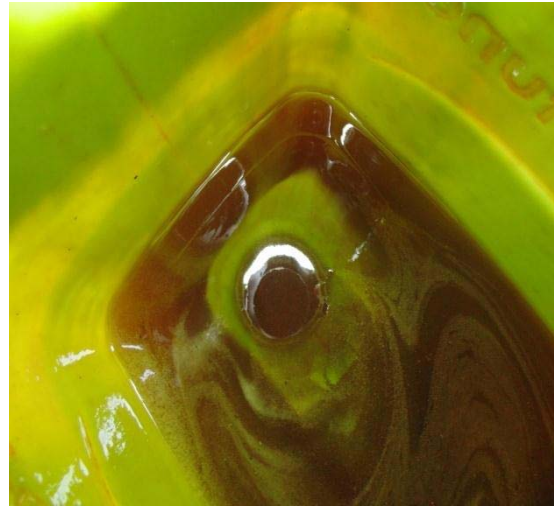


Kusum seed (*Schleichera oleosa*)



Charota seed (*Cassia tora*)

Plate 4.17: Different NTFPs are displayed for marketing in Narayanpur and Benoor local market of Narayanpur district



Honey sells in the market



Collection of wood and Bamboo



Plate 4.18: Collection of wild mushroom and other NTFPs displayed in the market of Narayanpur local market



Plate 4.19: Display the local market of Narayanpur and Orchha



Plate 4.20: NTFPs Mahua rash and Rice malt selling in the local market



Mahul leaves make for store bin by tribal



Plate 4.21: Value added Mahul leaves store bin and Phul jhadu by SHG

Kinhal (2006) reported that *Bauhinia vahlii* (Mahul) leaves are sold at the rate of Rs 5-6 per kg. Muraleedharan *et al.* reported the price of honey was Rs25 per kg. during 1982-1983, which was enhanced to Rs 45 per kg during 1996-1997. Similarly most of the NTFPs prices have increased over a period of time. The variation in prices definitely changed with the so many factors responsible for price hike or lowering the fluctuation in price is also found in the marketing of present investigation which confirms the results of above study.

4.5.3 Land holding status of selected villages

The study showed that majority of marginal and small farmers are found in the study area (Table 4.8). The numbers of marginal farmers are more than landless and small farmers. Marginal farmer does not possess patta lands. The population of marginal farmer was higher than landless labour. The percentage of landless labours ranged from 0 to 20%. It was highest in Benoor (20%) followed by Bharanda (10%) and lowest in Orchha, Gudadi, Basing and Chhotedongar (5%). The percentage of marginal farmer ranged from 10 to 30%. It was highest in villages namely Chhotedongar and Basing (30%) followed by Bharanda (25%) and lowest in Orchha and Benoor (10%) preceded by Gudadi (15%). The average percentage of landless labour was recorded 5.83 % and for marginal farmer it was 20%. The average size of land holding size was from 2.50 to 4.47 acres. It was highest in Orchha (4.47 acres) followed by Basing (4.175 acres) and lowest in Bharanda (2.5 acres) followed by Benoor (2.755 acres). Mono-cropping practice was found in all villages and some farmers also take double cropping in the study area. Lack of irrigation facilities and traditional practices attributed to low cropping intensity and poverty in the study area.

Islam *et al.* (2015) also reported that Bundu block in Ranchi district of Jharkhand, a considerable percentage (46.95%) of the respondents was marginal farmers followed by small (26.22%), medium (17.68%) and large (9.15%) farmers

Islam *et al.* (2013) also reported that Bundu block in Ranchi district of Jharkhand, the average size of land holding per household was found to be 1.89 ha. Bansode *et al.* (2005) reported that where the land holding of farmer was very low i.e. 0.64 ha and the collectors were landless labourers the total employment

generation due to collection of medicinal plant products was 24.88 man days per family per year. In present investigation the land holding was recorded to be 0.80 ha to 0.456 ha. The land holding was higher this may be because of the social system where the number of family members may be less.

Table 4.8: Land holding status of respondent selected in study sites Narayanpur (C.G.)

S. No.	Village	Landless farmer (in %)	Marginal farmer (in %)	Small farmer (in %)	Medium farmer (in %)	Average size of land (in acre)
Narayanpur block						
1	Chhotedongar	5	30	60	5	3.04
2	Benoor	20	10	70	0	2.755
3	Bharanda	10	25	65	0	2.5
Orchha block						
4	Orchha	0	10	80	10	4.47
5	Gudadi	0	15	75	10	3.845
6	Basing	0	25	60	15	4.175
	Average	5.83	19.17	68.33	6.67	3.46

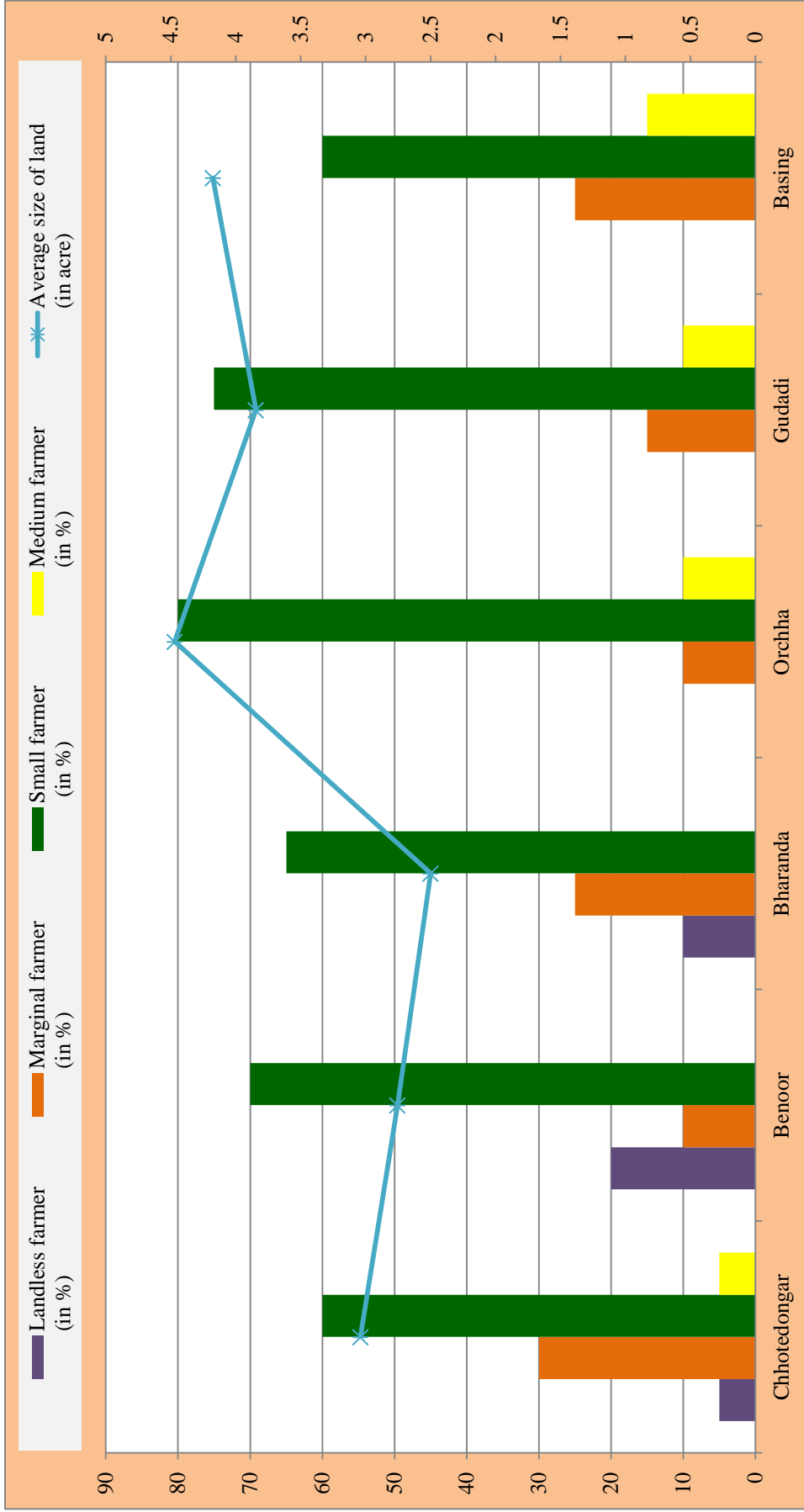


Fig. 4.3: Village population of landless farmer marginal farmer and Average Land holding status

4.5.4 Production of agricultural crops in selected villages

About 58 per cent of the land area is under forest and only about 19 per cent land is under cultivation. Most of the tribals now practice some sort of settled agriculture; only those living in interior hill ranges such as the Mariyas of Abujhmar still do shifting cultivation. The principal crops grown in agricultural farms were rice, maize, pulse, tubers, pearl millet, *etc.* The people of the study area are engaged in an agriculture occupation. Table 4.9 showed that highest production of agriculture crops in quantity was recorded in Orchha (531 q.) followed by Chhotedongar (451 q) and lowest in Bharanda (345.5 q) preceded by Benoor (378.5 q). The highest production of *Oryza sativa* (rice) was in Orchha (371 q) followed by Basing (335 q) and lowest in Bharanda (245 q) followed by Benoor (253 q). The highest production of *Zea mays* (maize) was in Orchha (110q) followed by Chhotedongar (102 q) and lowest in Bharanda (57 q) preceded by Benoor (67 q). The highest production of *Cajanus cajan* (arhar) was in Chhotedongar (16 q) followed by Benoor (14 q) and lowest in Basing (8.5q) followed by Gudadi (9 q). The highest production of *Elusine coracana* (Ragi) was in Benoor (36 q) followed by Orchha (35 q) and lowest in Basing (12 q) preceded by Gudadi (16 q). The highest production of *Vigna mungo* was in Benoor (8.5 q) followed by Chhotedongar (8 q) and lowest in Gudadi (2 q) followed by Orchha (3q). The average production of *Oryza sativa* (paddy), *Zea mays* (Maize), *Cajanus cajan* (arhar), *Elusine coracana* (ragi), *Vigna mungo* (black gram) and was recorded 304.00 q, 85.67 q, 11.58 q, 26.17 q, 5.50 q, respectively, in the study area.

Choudhary *et al.* (2004) reported that in Bastar plateau of Chhattisgarh Paddy is the main crop besides, nizer, torai, arhar, maize, urd and musturd. The productivity is very low of all the crops. Crops other than paddy have negligible area. The production of paddy, maize, arhar and nizer and urd was 216.50 q, 47 q, 2.05 q, 13 q and 2.75 q, respectively. The productivity of agriculture is also recorded quite low in the present investigation, it was lower than the above worker this may be the location specific factors and social system may be responsible for the same. The ignorance of information infrastructure may be the reason for lower the production of agriculture crop.

Table 4.9: Crop production pattern of study site of Narayanpur, (C.G.)

S.No.	Crops	Chhotedongar	Benoor	Bharanda	Orchha	Gudadi	Basing	Average
1.	Paddy (<i>Oryza sativa</i>)	293	253	245	371	327	335	304.00
2.	Maize (<i>Zea mays</i>)	102	67	57	110	95	83	85.67
3.	Arhar (<i>Cajanus cajan</i>)	16	14	10	12	9	8.5	11.58
4.	Ragi (<i>Eleusine coracana</i>)	32	36	26	35	16	12	26.17
5.	Black gram (<i>Vigna mungo</i>)	8	8.5	7.5	3	2	4	5.50
	Total	451	378.5	345.5	531	449	442.5	432.92

Bhattacharya and Patra (2002) showed that primitive tribal groups are dependent on agriculture for food. The total consumption from agriculture was 5313 kg/year in his study. The maximum production and intake was of rice or its products locally named 'pej.' Similar observations have been found in the present study where the production of paddy is high as compared to other crop. This is because of the food habit of the people and second the climatic conditions are responsible for the variation in production of crops. The present results are in confirmation above to work.

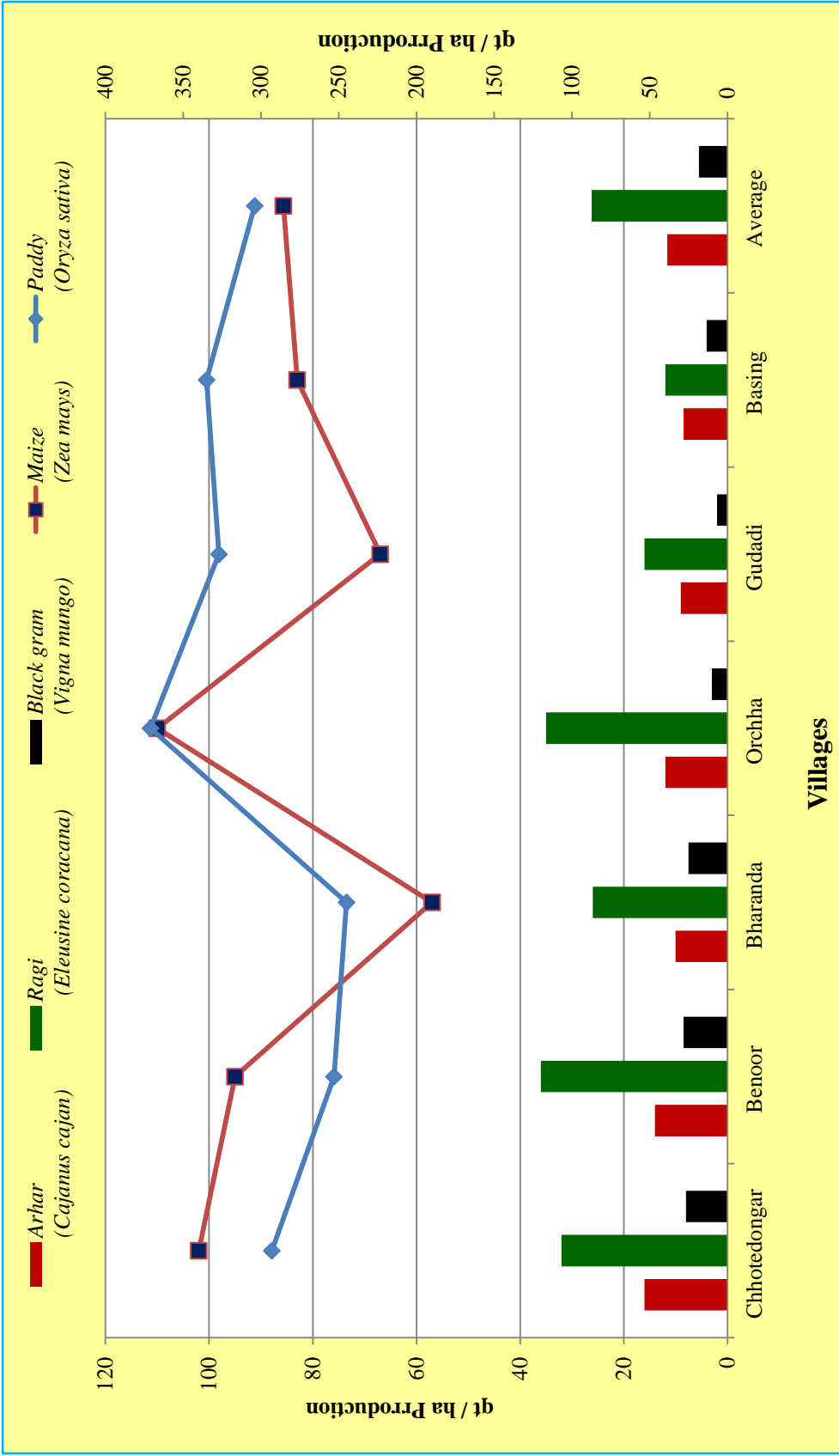


Fig. 4.4: Average food grain production in different villages at study area

4.5.5 Average money earning pattern in different villages per family

The average annual income earned by tribal from various enterprises is depicted in Table (4.10). The average household income for studied villages viz. Chhotedongar, Benoor, Bharanda, Orchha, Gudadi, Basing was Rs 28,537.45, Rs 29,514.75 Rs 14,113.75, Rs 21,406.75, Rs 14,063.75 and Rs 14,812.50 respectively. The maximum share of household income was contributed by agriculture crops followed by NTFPs and labour. The average household income was recorded maximum in Benoor Rs 29,514.75 followed by Chhotedongar Rs 28,537.45, and lowest in Gudadi Rs 14,063.75 followed by Bharanda Rs 14,113.75. The income from NTFPs was highest in Orchha Rs 9,931.75 followed by Chhotedongar Rs 8,752.45 and lowest in Bharanda Rs 2,773.75 followed by Basing Rs 5,572.50. The income from agriculture crops was highest in Benoor Rs 12,480 followed by Chhotedongar Rs 11,595 and lowest in Gudadi Rs 3,120 followed by Basing Rs 5,250. The income from labour was highest in Benoor Rs 8,990 followed by Chhotedongar Rs 8,190 and lowest in Gudadi Rs 3,020 followed by Basing Rs 3,990.

Table 4.10: Average annual income form different source of individual families of Narayanpur study area, (C.G.).

S. No.	Village	Income from Argil. crops (in Rs.)	Income from NTFPs (in Rs.)	Income from labour (in Rs.)	Total
Narayanpur Block					
1	Chhotedongar	11595	8752.45	8190	28537.45
2	Benoor	12480	8044.75	8990	29514.75
3	Bharanda	6750	2773.75	4590	14113.75
	Average	10275.00	6523.65	7256.67	24055.32
Orchha Block					
1	Orchha	6525	9931.75	4950	21406.75
2	Gudadi	3120	7923.75	3020	14063.75
3	Basing	5250	5572.5	3990	14812.5
	Average	4965	7809.33	3986.66	16761.00
	Total average	7620	7166.49	5621.66	20408.15

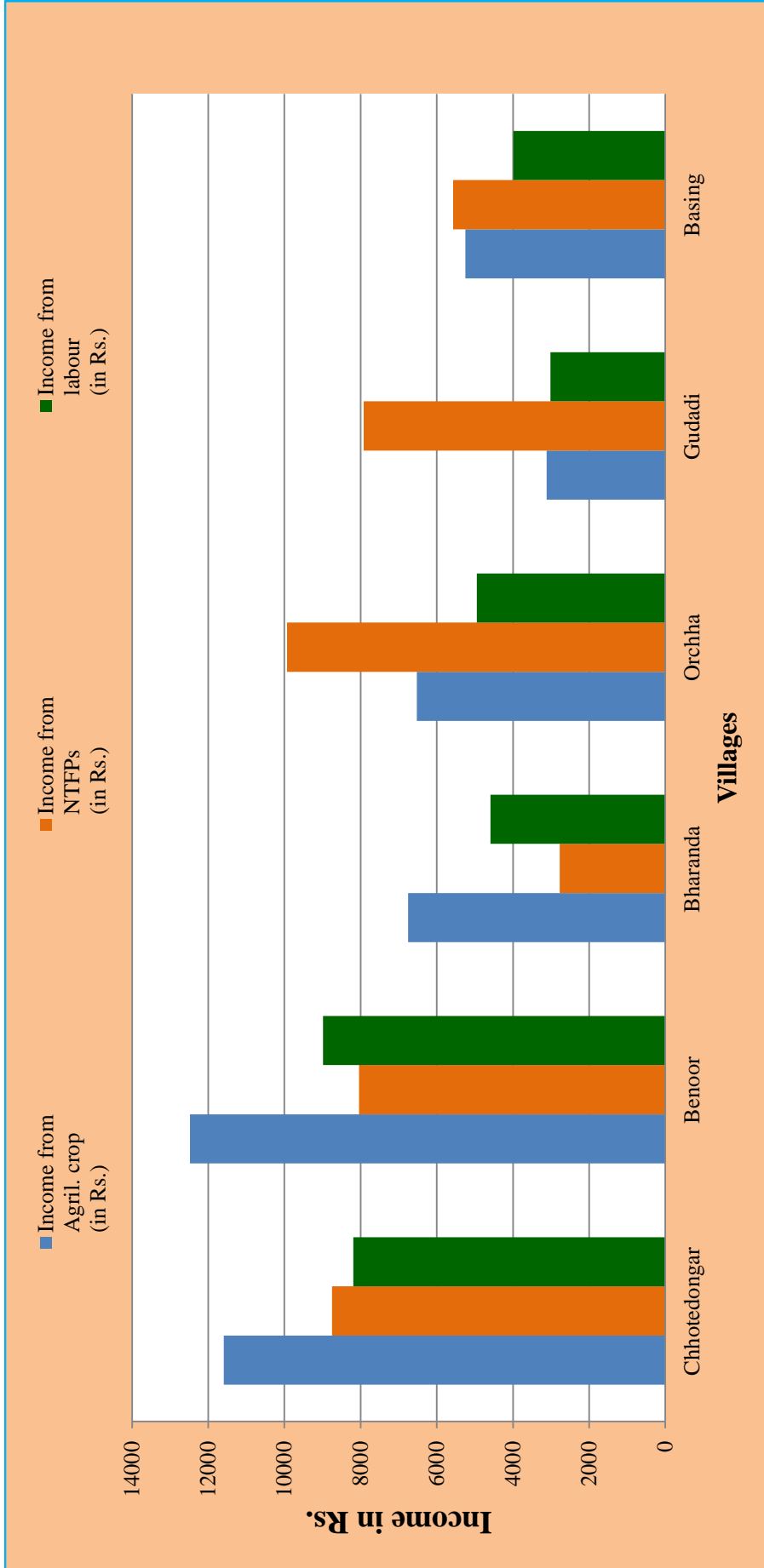


Fig 4.5: Average annual earning pattern of income from different sources of individual family of study area

Similar study carried out by Moe and Liu (2016) reported in their study in Tharwady District of Myanmar that the NTFPs income contributes 44.37%, and farm income and non-farm income contribute 32.55% and 23.07% to the total household income respectively.

Melaku *et al.* (2014) reported in their study in Southwestern Ethiopia that the contribution of NTFPs to annual household income is 47%. 50% of the income was from agriculture and remaining 3% was from off-farm in.

Islam *et al.* (2013) also reported that Bundu block in Ranchi district of Jharkhand that the agriculture contributed major share (36.23%) of total household annual income followed by forest resources (25.05%), labour (9.74%), livestock (8.86%), business/ shop (8.72%), service (6.77%) and others (4.63%).

Maske *et al.* (2011) reported that Gondia district of Maharashtra the contribution of average income obtained from agriculture per households of villagers is Rs 8847.57 (33.62%), Rs 14310.20 (47.16%) and Rs 7520.26 (19.22%) from Asalpani, Bagadband and Timezari respectively. And income generated from non timber forest produce was Rs 917600, Rs 917000 and Rs 499000 which contribute 39.32 percent, 39.30 percent and 21.38 percent with Rs 8847.57, Rs 14310.20 and Rs 7520.26 average income per households from Asalpani, Bagadband and Timezari.

Saha and Sundriyal (2011) revealed that high dependence on wide variety of NTFPs in humid tropics of northeast India and NTFPs contributed to 19-32% of total household income for different tribal communities in northeast India. Rawat and Jishtu (2006) reported that NTFPs are significant source of subsistence products. Employment and household income in forest areas and it is estimated that these are contributing 50% to state revenue.

Bansode *et al.* (2005) reported in Sindhududutga district of Maharashtra that total annual income received from collection of medicinal plant products was about Rs 8,681.55 (34.32%) to the total income received of Rs 25,290 from all enterprises. The results are matches with some variation this may be because of location specific component and time span.

Bhattacharya and Hayat (2004) reported that in dry deciduous forest of Central India, Non-Timber Forest Products (NTFPs) are the major source of livelihood and income generation to local people. The livelihood of people is based on the NTFPs income in the current investigation confirms that the dependent and co existence of tribal with the forest vegetation.

Similar study carried out by Krishnamoorthy *et al.* (2003) reported that the average household income per household in Sathyamangalam (Tamilnadu) India Forest Range derived from NTFPs collection, which was Rs 17,088. Another similar study carried out in eight villages of Ghana, it was found that the percentage of households earning income from sale of NTFPs ranged from 49% in one village to 87% in another. The variations in village wise income mainly depends on the population and involvement of people in particular enterprise as well the social system also responsible for income in our study the income is high this may be because of the old and current year as well the other services of income also computed in the overall income of per family. So the major share in income gathered from NTFPs as mentioned by above worker also confirms the results of present investigation.

4.5.6 Men and women participation in NTFPs collection in selected villages

The role of women in collection of NTFPs and their marketing is very important. Most of the time women engaged in gathering the forest products, processing and either sell them to support family economically or use them for own consumption. Table 4.11 showed that women are mostly engaged in collection of NTFPs. The women involvement in NTFPs collection varies from 41.21-53.77%. It was highest in Orchha (53.77%) followed by Bharanda (50.11%) and lowest in Chhotedongar (41.21%) followed by Basing (42.46%). The participation of men in NTFPs collection varies from 25.16-35.02%. It was highest in Basing (35.02%) followed by Gudadi (31.32%) and lowest in village Bharanda (41.21%) followed by Orchha (26.99%). Children also played an important role in collection of NTFPs. The percentage of children engaged in collection of NTFPs varies from 8.71-13.54%. It was highest in Bharanda (13.54%) followed by Gudadi (12.13%) and lowest in Chhotedongar (8.71%) followed by Benoor (9.91%). The average

Table 4.11: Details of the men and women ratio in different villages in NTFPs collection Narayanpur area, (C.G.)

S. No.	Village	Men (in %)	Women (in %)	Children (in %)	Total (in %)
Narayanpur Block					
1	Chhotedongar	29.53	41.21	8.71	79.45
2	Benoor	28.79	48.83	9.91	87.53
3	Bharanda	25.16	50.11	13.54	88.81
Orchha Block					
4	Orchha	26.99	53.77	10.11	90.87
5	Gudadi	31.32	49.78	12.13	93.23
6	Basing	35.02	42.46	10.49	87.97
	Average	29.47	47.69	10.82	87.98

involvement trend was observed Women >Men > Children 47.69%, 29.47%, 10.82% in NTFPs collection respectively.

Similar study carried out by Haslkar and Jhadav (2004) reported that in West African region Women dominates in collection, trade and processing of majority of NTFPs. Women constituted 515 of total work force involved in forest based small industries. The women are playing a major role in collecting, processing and marketing in the present study also confirm results as it was concluded in above workers investigation.

Gera and Baghel (2000) reported that in Orissa two village studied and village income generated by NTFPs, about 11%, could be raised much collection and marketing was primarily undertaken by women. The Baiga and Gond community also responded the similar trend as observed by the above worker with the above tribes. Vettivel (1997) concluded in his study that mostly womens are engaged in collecting different types of NTFPs and they start the collection from early morning. They form small group of ladies and work together. However, they collects the products individually like Tendu leaves, Char, Sal seed, Palas, Mahua, Bahera, Jamun and Ber etc. The rate of 100 bundles of tendu leaves they may get Rs35. The FAO (1992) also reported in his study that nearly 90% of the population depends on NTFPs products from forest. FAO also concluded that NTFPs are the major source of livelihood in forest villages where 2,50,000 women are engaged in

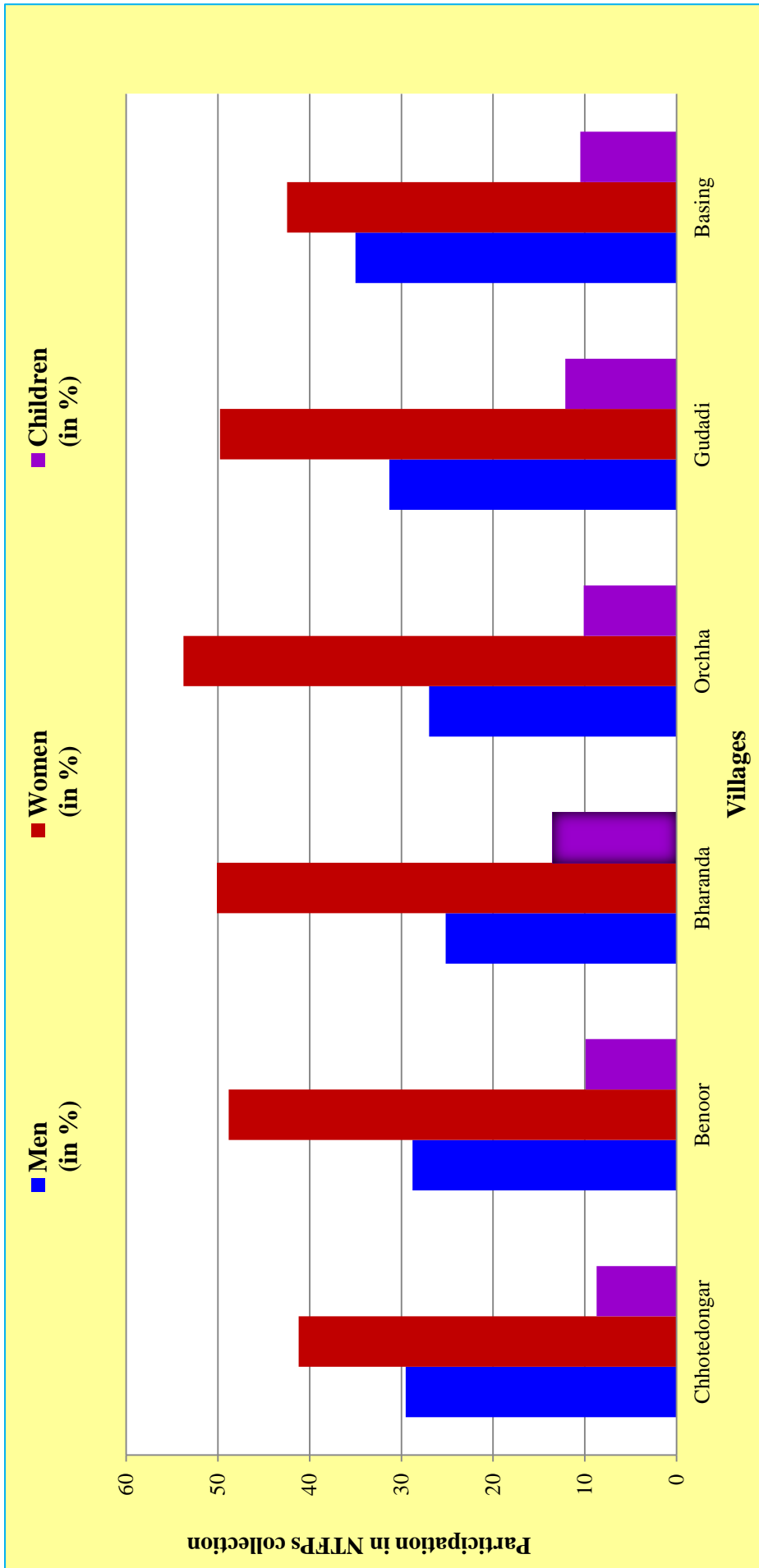


Fig. 4.6: Gender wise participation of men and woman in NTFPs collection

collection of NTFPs products. In the present investigation it was found that the women playing a major role in NTFPs collection and marketing confirms the statement given by FAO and above worker. Jadhav (2006) reported in Ratlam district of Madhya Pradesh, NTFPs are mainly collected by women and children. The traders are generally women in all the age group of 30-70 years. These traders are illiterate with no formal education. Women contributed over 90% of the traders in market. Phanikumar and Chaturvedi (2006) also reported that most of the tribal Women collected Non- Timber Forest Products to generate income. The major income generator products are leaves of *Butea monosperma* for making plates, *Diospyros melanoxylon* for Bidi making. The similar trend that maximum NTFPs are collection by the women in present investigation.

4.5.7 Occupational status

Main occupation in the study area was agriculture and NTFPs collection its allied activities eg. NTFPs Collection, Cattle rearing, Dairy farming and labour work. Agricultural activity was mainly depending on monsoon season. Other income generation sources of the area were NTFPs, labour work, small business, private jobs etc. The labours were getting daily wages in the range of 100-250 Rs, depending on type of work they set. During discussion it was found that due to lack of irrigation facilities in summer season, farmers did not having any work for 2-3 months, this indicates unemployment for few months.

There are three types of employment found in study area namely Bani, Mazdoori and Rozgar Guaranty Yozna. The rate of RGY was highest Rs (172/day) followed by Mazdoori Rs (138.33/day) and Bani Rs (116.67/day). Mazdoori is a type of work in which people do any type of work like building, road, pond construction etc. it may be private or Government. The Rozgar Guaranty Yozna was a programme started by Government to provide work to rural or poor people throughout the year under 5-7 km. distance. Under this programme people first registered his name in Panchayat. Bani is a type of work in which the main aim is not to earn money but cooperate each other.

The people of selected villages involved in different work to earn money for their livelihood. In studied area nearly 3-4 months people engaged in different

occupation when they free from agriculture work. Generally during summer men and women engaged in different occupation such as Bani, Mazdoori and Rozgar Guaranty Yozna. The study area villagers income from Bani were ranges from 100-140 Rs/day. It was highest in the village Benoor (140Rs/day.) followed by Three villages Chhotedongar, Bharanda, Orchha, (120 Rs/day.) and lowest income in two Villages Gudadi, Basing (100 Rs/day.) In income from Mazdoori ranges from (100-160 Rs/day). It was highest in five villages namely Chhotedongar (160Rs/day). Followed by Benoor, Bharanda (150Rs/Day) lowest in Gudadi (100Rs/day.) followed by Basing (Rs120/Day) Orchha (Rs140/Day). Income from RGY 172 Rs/day. In all village (Table 4.12).

Table 4.12: The variation in wages fixed by the Govt. and wages fixed by the local people in study area Narayanpur (C.G.)

S. No.	Village	Bani (in days)	Mazdoori (in days)	Rojgar Guaranty Yozna (in days)
Narayanpur Block				
1	Chhotedongar	120	160	172
2	Benoor	140	150	172
3	Bharanda	120	150	172
	Average	126.67	153.33	172
Orchha Block				
4	Orchha	120	140	172
5	Gudadi	100	100	172
6	Basing	100	120	172
	Average	106.67	120	172
	Total Average	116.67	136.67	172

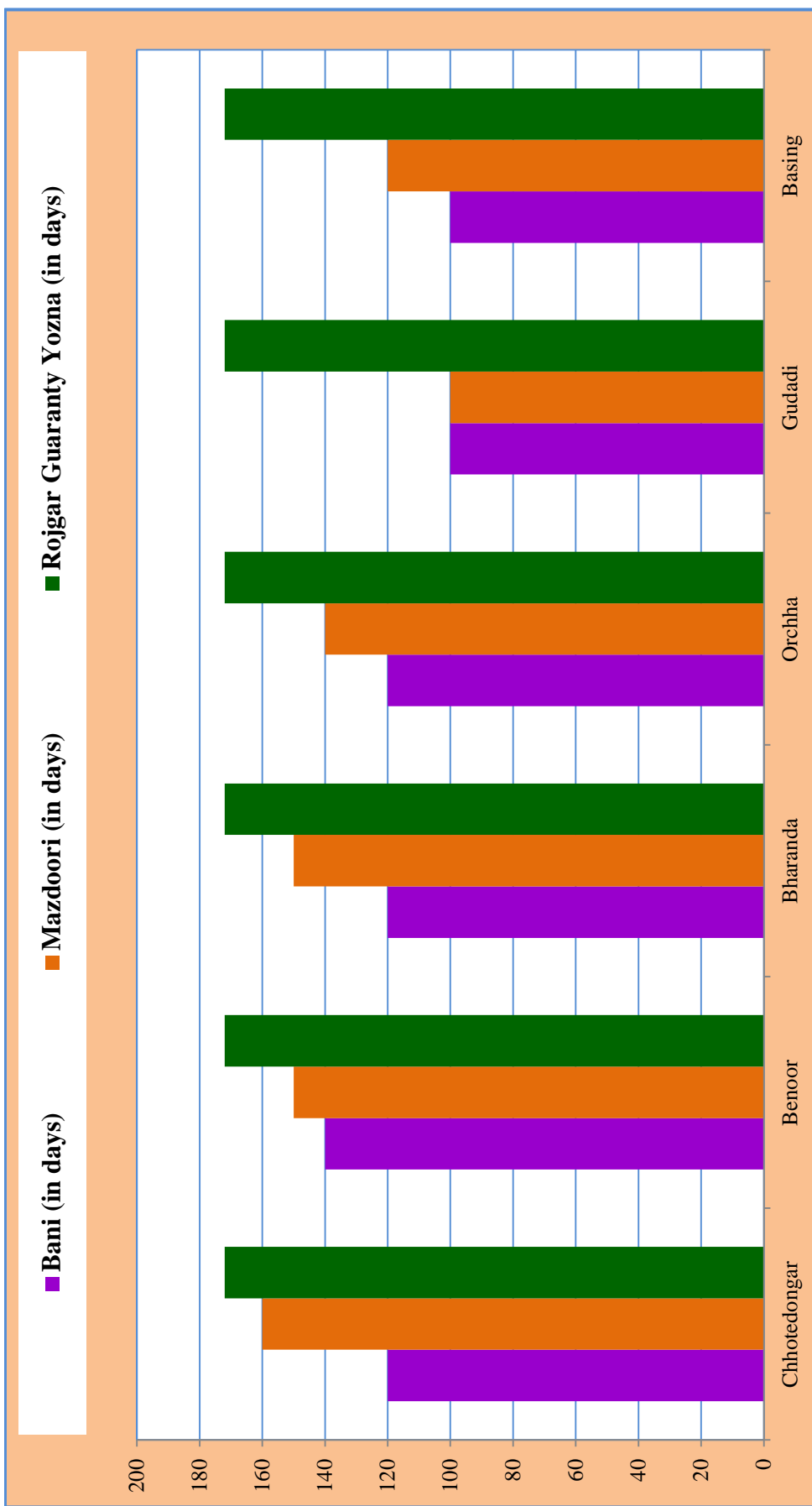


Fig. 4.7: The daily wages rate fixed by Govt. and local wages of study site in Narayanpur Dist. (C.G.)

Basu *et al.* (2004) reported that Lodhas tribes were working as daily wages labourers and their (99.7%) household income ranged from Rs 500-999 only. Household income of (80%) Santal was also Rs 500-999. Only 3.6% of Santals had a monthly income of more than Rs 2000 because they had their own land. Sivakumar *et al.* (2006) reported that in Kancheepuram district Tamilnadu 57.78% of farmers were working as laboures followed by 31.11% of the farmers involved in pig farming as cast occupation. Poffenberger (1994) reported that NTFPs generate some of lowest wages of the rural employment sector. The minimum wages in most states ranges from Rs 30 to 40 per day, most of the NTFPs collectors people earn from Rs 5 to 15 per day. Similar trend was recorded in the present study where different type of employment is available with the season. People work in different type of employment in this area. The livelihood of tribes is better as compared to other worker reported this may be of because of the employment opportunities are higher in the present study area.

4.5.8 Utilization pattern of income in different sector

The tribal people expenditure of total income in various sectors was food, education, medicine, clothes, festivals, and others like festivals gift, celebration, marriages and tours etc. The Table 4.13 showed that total average expenditure was highest in Benoor (Rs 48155) followed by Chhotedongar (Rs 42630) and lowest in Gudadi (Rs 10,260) followed by Basing (Rs 20,770). The average investment on Food, Education, Medicine, Festivals Clothes, and other activities was Rs 12,000, Rs 1,512.50, Rs 1,255.00, Rs 3,169.17, Rs 2,675.00, Rs401167, respectively. The highest expenditure on Food among all studied villages was in Benoor Rs 30,950 followed by Chhotedongar Rs 27,900 and lowest in Basing Rs 10,050 followed by Bharanda Rs 20,125. The highest expenditure on Education was in Chhotedongar Rs 3,020 followed by Benoor Rs 1,850 and lowest in Basing Rs 580 followed by Gudadi Rs 830. The highest expenditure on Medicine was in Chhotedongar Rs 2,040 followed by Benoor Rs 1,740 and lowest in Basing Rs 830 followed by Gudadi Rs 570. The highest expenditure on Festival was in Benoor Rs 4,305 followed by Bharanda Rs 4,275 and lowest in Gudadi Rs 1,235 followed by Basing Rs 3,030. The highest expenditure on Cloth was in Benoor Rs 3,250 followed by Orchha Rs 3,000 and lowest in Gudadi Rs 1,600 followed by Basing Rs 2,550. The

Table 4.13: Distribution pattern of annual income utilized for different purposes of the respondents of study area Narayanpur, (C.G.)

S. No.	Village	Food	Education	Medicine	Festival	Clothes	other	Total
Narayanpur Block								
1	Chhotedongar	27900	3025	2040	3110	2750	3805	42630
2	Benoor	30950	1850	1740	4305	3250	6060	48155
3	Baranda	20125	1240	1200	4275	2900	5505	35245
	Average	26325	2038.33	1660.00	3896.67	2966.67	5123.33	42010.00
Orchha Block								
4	Orchha	20750	1550	1510	3060	3000	3785	33655
5	Gudadi	5200	580	570	1235	1600	1075	10260
6	Basing	10050	830	470	3030	2550	3840	20770
	Average	12000.00	986.67	850.00	2441.67	2383.33	2900.00	21561.67
	Total average	19162.50	1512.50	1255.00	3169.17	2675.00	4011.67	31785.83

Other - Festival gift, Celebration, Marriage and Tour etc.

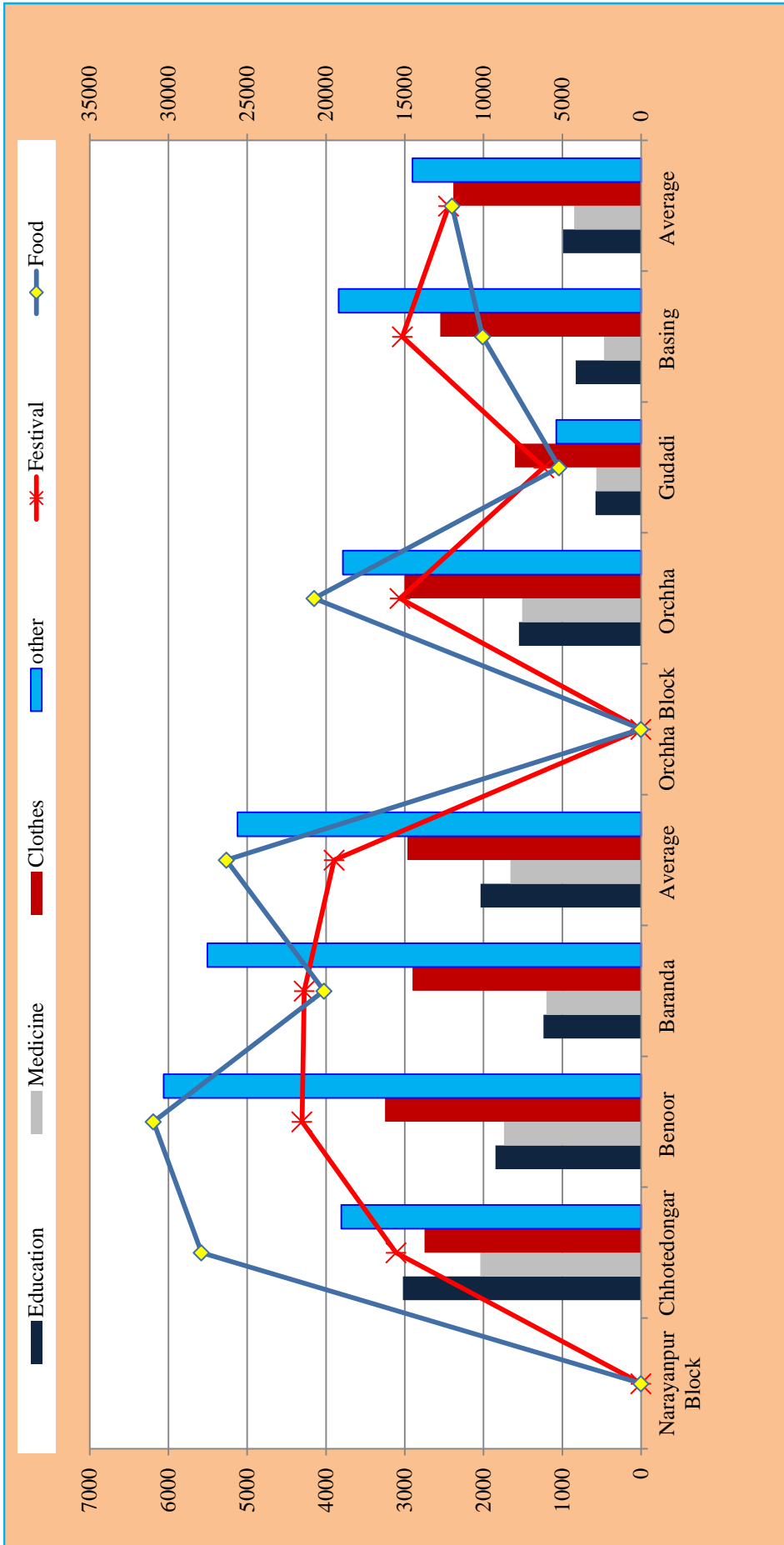


Fig 4.8: Village wise utilization of money for different purposes

highest expenditure on others was in Benoor Rs 6,060 followed by Bharanda Rs 5,505 and lowest in Gudadi Rs 1075 followed by Orchha Rs 3785. The variation in expenditure of their income as village wise clearly shows the social system of that village followed by the income earned. Almost half of the total income or more is spent on food > festival > clothes > medicine > education > other. The one fourth is spent on the other sector. The livelihood of people may be uplifted through sustainable harvest value addition and proper marketing of their produce. The average expenditure was recorded Rs 31785.83 in the study area.

4.6 Phytosociological vegetation analysis of NTFPs species in study area

The tree frequency was highest on Orchha site (840 %) followed by Benoor (720%) and lowest on Chhotedongar site (560 %). The shrubs density was highest on Orchha site (810 %) followed by Chhotedongar site (820 %) and lowest on Bharanda site (360 %). The herbs and climber density was highest on Orchha (1140 %) followed by Gudadi site (690 %) and lowest on Bharanda site (430 %).

The tree density was highest on Orchha site (1920 stem ha¹) followed by Gudadi site (1711 stem ha¹) and lowest on Basing site (1290 stem ha¹). The shrubs density was highest on Orchha site (3480 stem ha¹) followed by Chhotedongar site (3230 stem ha¹) and lowest on Basing site (740 stem ha¹). The herbs and climber density was highest on Orchha site (3480 stem ha¹) followed by Gudadi site (2030 stem ha¹) and lowest on Bharanda site (720 stem ha¹).

The tree basal area was highest on Orchha site (53.08 m²/ha) followed by Gudadi site (44.45 m²/ha) and lowest on Basing site (23.60 m²/ha). The shrubs basal area was highest on Basing site (12.41 m²/ha) followed by Benoor site (6.74 m²/ha) and lowest on Chhotedongar site (1.23 m²/ha). The herbs and climber basal area was highest on Benoor site (8.79 m²/ha) followed by Gudadi site (8.71 m²/ha) and lowest on Basing site (2.95 m²/ha).

Importance Value Index of trees at Chhotedongar site

Shorea robusta was the dominant species in the Chhotedongar site, with the IVI value 105.66. The Co-dominant species are *Oroxylon indicum* and *Cassia fistula* with IVI value 25.24 and 21.04 respectively. A total of 21 tree species are

aaa



Observation of tree diameter



Observation of chhind diameter



Observation of tree diameter



Observation of satavar diameter



Observation of jungali kulti diameter

Plate 4.22: Measurement of diameter tree at breast height, shrubs, climber & herbs

recorded from the Chhotedongar site. 100 % frequency was reported by the *Shorea robusta* and 10% frequency was recorded for eight species. Highest Basal area was recorded for *Shorea robusta* 13.76. Lowest Basal Area was observed for the *Oroxylon indicum* 0.07. The minimum IVI value (2.74) was reported for the *Oroxylon indicum*. *Shorea robusta* has the 35.22 % share in the forest of the Chhotedongar site. Density of 1370 tree stems ha⁻¹ was recorded in the Chhotedongar site. The density was recorded highest (560 stems ha⁻¹) for *Shorea robusta* followed by *Cleistanthus collinus* (110 stems ha⁻¹) and lowest was recorded for *Schleichera oleosa* (10 stems ha⁻¹), (Table 4.14).

Importance Value Index of Shrubs at Chhotedongar site

The maximum IVI (46.30) was observed for the *Phoenix acaulis*. *Desmodium gangeticum* and *Asparagus racemosus* has the IVI value of 39.31 and 32.48 respectively. 100% Frequency was recorded for the *Phoenix acaulis* and *Desmodium gangeticum*. Lowest Frequency 10% was observed for the four species *Ixora indica*, *Antidesma diandrum*, *Olex scandens*, and *Nyctantches arbor-tristis*. Highest Basal Area was recorded for the *Ziziphus rugosa* 0.981 while Lowest Basal Area was observed for the *Olex scandens* 0.011. A Density of (3230) Shrubs and Climber stems ha⁻¹ was recorded in the Chhotedongar site. The density was recorded highest (850 stems ha⁻¹) for *Desmodium gangeticum* followed by *Phoenix acaulis* (640 stems ha⁻¹) and lowest was recorded two species for *Olex scandens* and *Nyctantches arbor-tristis* (50 stems ha⁻¹). The minimum IVI Value (1.79) was recorded for the *Olex scandens* (Table 4.15).

Importance Value Index of Herbs and Climber at Chhotedongar site

The maximum IVI (159.21) was observed for the *Curculigo orchioides*. *Elephantopus scaber* and *Cissampelos pareira* has the IVI value of 121.80 and 81.28 respectively. 100% Frequency was recorded for the two species *Curcuma angustifolia*. Lowest Frequency 10% was observed for *Asparagus racemosus*. Highest Basal Area was recorded for the *Curcuma angustifolia* 3.89. Lowest Basal Area was observed for the *Andrographis paniculata* 0.03. A Density of (1910) herbs stems ha⁻¹ was recorded in the Dugli range. The density was recorded highest (670 stems ha⁻¹) for *Curcuma angustifolia* followed by *Andrographis paniculata*

Table 4.14: Vegetation analysis of trees in Chhotedongar, Narayanpur Block

Common Name	Botanical Name	Frequency (%)	Density (Stem/ha)	Basal Area (m ² /ha)	Relative Frequency (RF)	Relative Density (RD)	Relative Basal Area (RBA)	IVI
Dhaura	<i>Anogeissus latifolia</i>	50	120	2.22	8.93	8.76	7.55	25.24
Chironji	<i>Buchanania lanzan</i>	30	50	0.40	5.36	3.65	1.36	10.36
Amaltas	<i>Cassia fistula</i>	20	30	0.81	3.57	2.19	2.77	8.53
Karra	<i>Cleistanthus collinus</i>	50	110	1.20	8.93	8.03	4.08	21.04
Tendu	<i>Diospyros melanoxylon</i>	10	20	0.23	1.79	1.46	0.78	4.03
Anola	<i>Embllica officinalis</i>	10	20	0.23	1.79	1.46	0.77	4.02
Gamhar	<i>Gmelina arborea</i>	10	10	0.32	1.79	0.73	1.11	3.62
Dhaman	<i>Grewia tiliifolia</i>	10	20	0.28	1.79	1.46	0.94	4.19
Chhena	<i>Lagerstroemia parviflora</i>	10	20	0.26	1.79	1.46	0.90	4.15
Moyan	<i>Lannea coromandelica</i>	20	30	0.32	3.57	2.19	1.11	6.87
Mahua	<i>Madhuca latifolia</i>	30	30	0.34	5.36	2.19	1.16	8.71
Mundi	<i>Mitragyna parvifolia</i>	10	10	0.08	1.79	0.73	0.26	2.78
Son padar	<i>Oroxylon indicum</i>	10	10	0.07	1.79	0.73	0.23	2.74
Bijasal	<i>Pterocarpus marsupium</i>	30	80	3.16	5.36	5.84	10.79	21.98
Girchi	<i>Salacia oblonga</i>	20	30	0.24	3.57	2.19	0.80	6.56
Bhelwa	<i>Semecarpus anacardium</i>	10	20	0.12	1.79	1.46	0.40	3.65
Sal	<i>Shorea robusta</i>	100	560	13.76	17.86	40.88	46.92	105.66
Jamun	<i>Syzygium cumini</i>	20	20	0.13	3.57	1.46	0.46	5.49
Sagon	<i>Tectona grandis</i>	40	90	1.82	7.14	6.57	6.21	19.92
Harra	<i>Terminalia chebula</i>	40	50	0.91	7.14	3.65	3.11	13.91
Saja	<i>Terminalia tomentosa</i>	30	40	2.43	5.36	2.92	8.29	16.57
Total		560	1370	29.33	100	100	100	300

Table 4.15: Vegetation analysis of shrubs in Chhotedongar, Narayanpur Block

Common Name	Botanical Name	Frequency (%)	Density (stem/ha)	Basal area (m ² /ha)	Relative Frequency (RF)	Relative Density (RD)	Relative Basal Area (RBA)	IVI
Gudsukari	<i>Grewia hirsuta</i>	50	110	0.041	6.10	3.41	0.96	10.47
Harsigar	<i>Nyctanthes arborristis</i>	10	10	0.384	1.22	0.31	9.03	10.56
Marophali	<i>Helicteres isora</i>	60	180	0.101	7.32	5.57	2.37	15.26
Nilni	<i>Indigofera tinctoria</i>	30	50	0.096	3.66	1.55	2.26	7.46
Gotia	<i>Ziziphus xylopyra</i>	40	50	0.049	4.88	1.55	1.15	7.58
Chind	<i>Phoenix acaulis</i>	100	640	0.608	12.20	19.81	14.29	46.30
Katakuli	<i>Ziziphus rugosa</i>	40	60	0.981	4.88	1.86	23.06	29.80
Dhawaiphul	<i>Woodfordia fruticosa</i>	30	30	0.025	3.66	0.93	0.59	5.18
Kanputa	<i>Flemingia strobilifera</i>	60	360	0.528	7.32	11.15	12.41	30.87
Salparni	<i>Desmodium gangeticum</i>	100	850	0.034	12.20	26.32	0.80	39.31
Satawar	<i>Asparagus racemosus</i>	80	520	0.282	9.76	16.10	6.63	32.48
Kankara,	<i>Ixora indica</i>	10	10	0.013	1.22	0.31	0.31	1.83
Amti	<i>Antidesma diandrum</i>	10	10	0.196	1.22	0.31	4.61	6.14
Mainphal	<i>Randia dumetorum</i>	30	60	0.153	3.66	1.86	3.60	9.11
Duling / biabidang	<i>Embelia robusta</i>	50	130	0.082	6.10	4.02	1.93	12.05
Rohani	<i>Acacia pennata</i>	40	60	0.23	4.88	1.86	5.41	12.14
Jungali bhindi	<i>Abelmoschus moschatus</i>	70	90	0.44	8.54	2.79	10.34	21.67
Lal kosum	<i>Olax scandens</i>	10	10	0.011	1.22	0.31	0.26	1.79
Total		820	3230	4.25	100	100	100	300

Table 4.16: Vegetation analysis of herbs and climbers in Chhotedongar, Narayanpur Block

Common Name	Botanical Name	Frequency (%)	Density (stem/ha)	Basal area (m ² /ha)	Relative Frequency (RF)	Relative Density (RD)	Relative Basal Area (RBA)	IVI
Jangali kundaru	<i>Diplocylus palmatus</i>	30	30	0.28	4.76	2.24	5.65	12.65
Ramdatun	<i>Smilax macrophylla</i>	40	60	0.86	6.35	4.48	17.34	28.17
Kosakanda	<i>Dioscorea esculenta</i>	100	280	0.95	15.87	20.91	19.15	55.94
Karukanda	<i>Dioscorea bulbifera</i>	100	220	0.91	15.87	16.43	18.35	50.65
Peng	<i>Celastrus paniculatus</i>	50	150	0.31	7.94	11.20	6.25	25.39
Tikhur	<i>Curcuma angustifolia</i>	100	360	0.39	15.87	26.89	7.86	50.62
Safed musli	<i>Chlorophytum tuberosum</i>	60	29	0.18	9.52	2.17	3.63	15.32
Kalmegh	<i>Andrographis paniculata</i>	50	100	0.41	7.94	7.47	8.27	23.67
Jugali kulthi	<i>Cajanus scarabaeoides</i>	60	60	0.11	9.52	4.48	2.22	16.22
Palasbel	<i>Butea superba</i>	10	10	0.12	1.59	0.75	2.42	4.75
Anant mul	<i>Hemidesmus indicus</i>	30	40	0.44	4.76	2.99	8.87	16.62
Jungali tambakhu	<i>Elephantopus scaber</i>	60	80	0.13	113.21	5.97	2.62	121.80
Kali musli	<i>Curculigo orchitoides</i>	70	250	0.42	132.08	18.67	8.47	159.21
Baichandi	<i>Dioscorea dremona</i>	20	40	0.52	37.74	2.99	10.48	51.21
Dhanwanti	<i>Cissampelos pareira</i>	40	40	0.14	75.47	2.99	2.82	81.28
Bankumra	<i>Pueraria tuberosa</i>	20	40	0.48	37.74	2.99	9.68	50.40
Total		630	1339	4.96	100	100	100	300

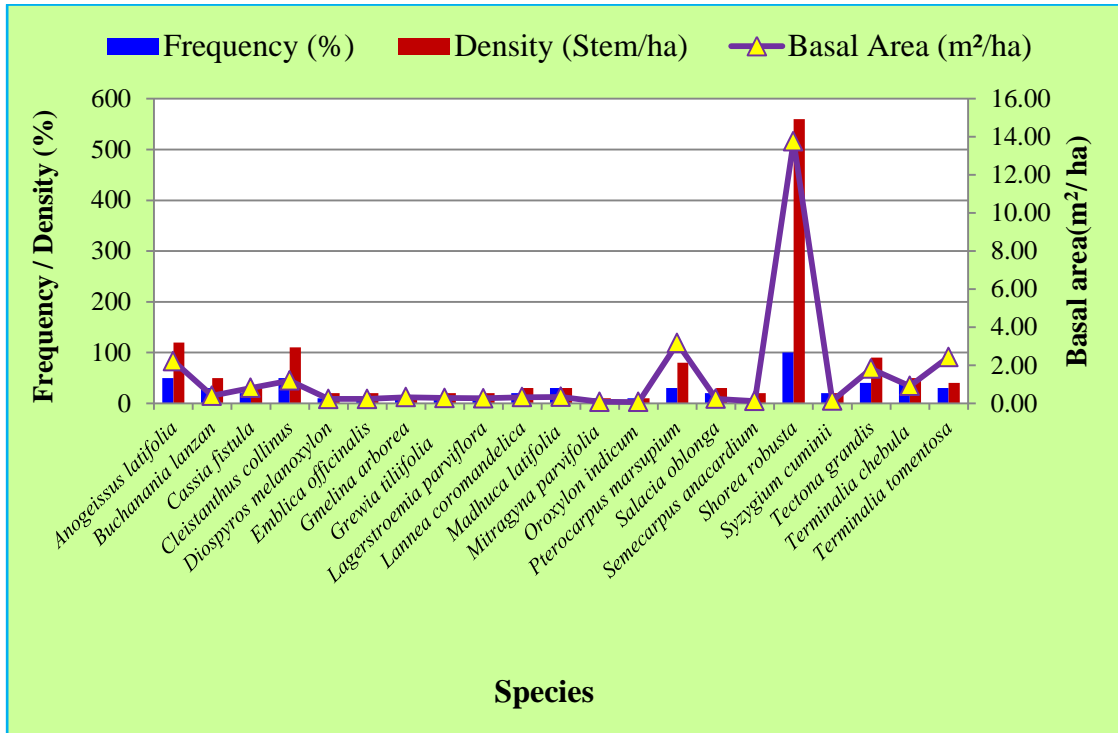


Fig. 4.9: Vegetation analysis of trees in Chhotedongar site

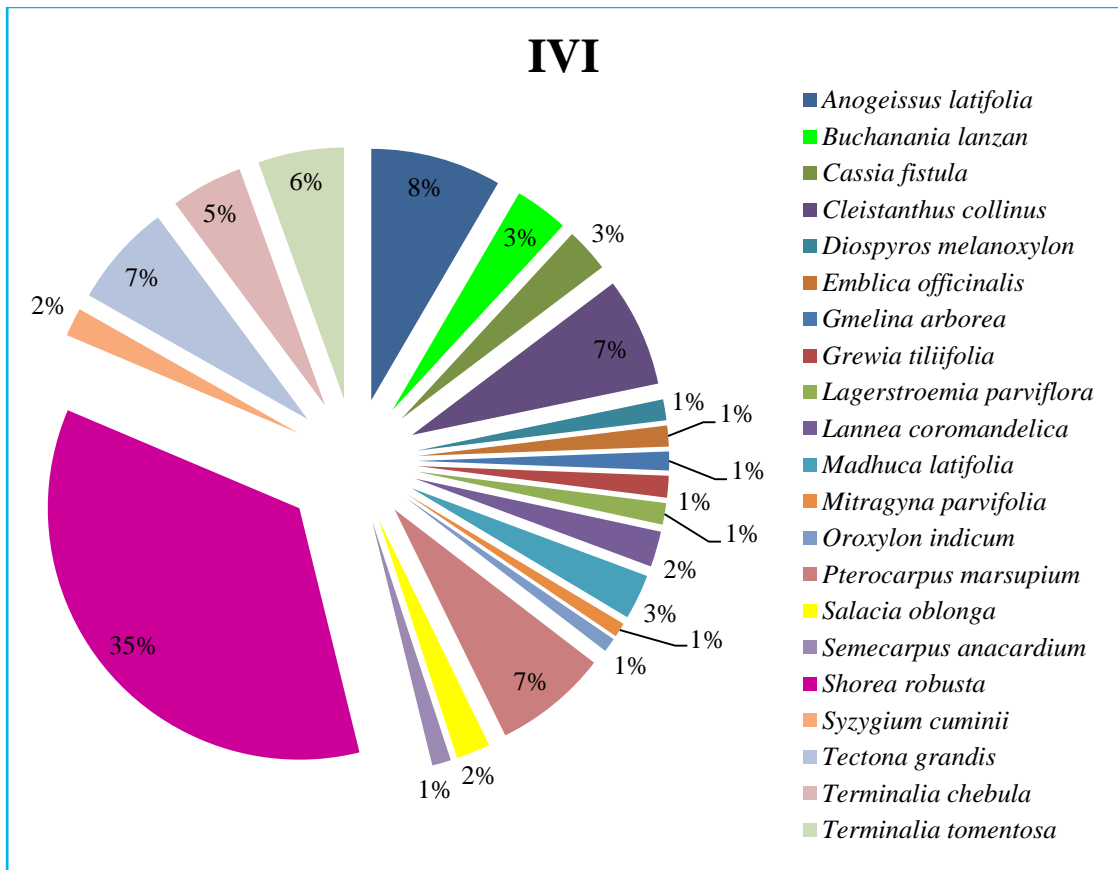


Fig. 4.10: Trees species based on IVI value in Chhotedongar site

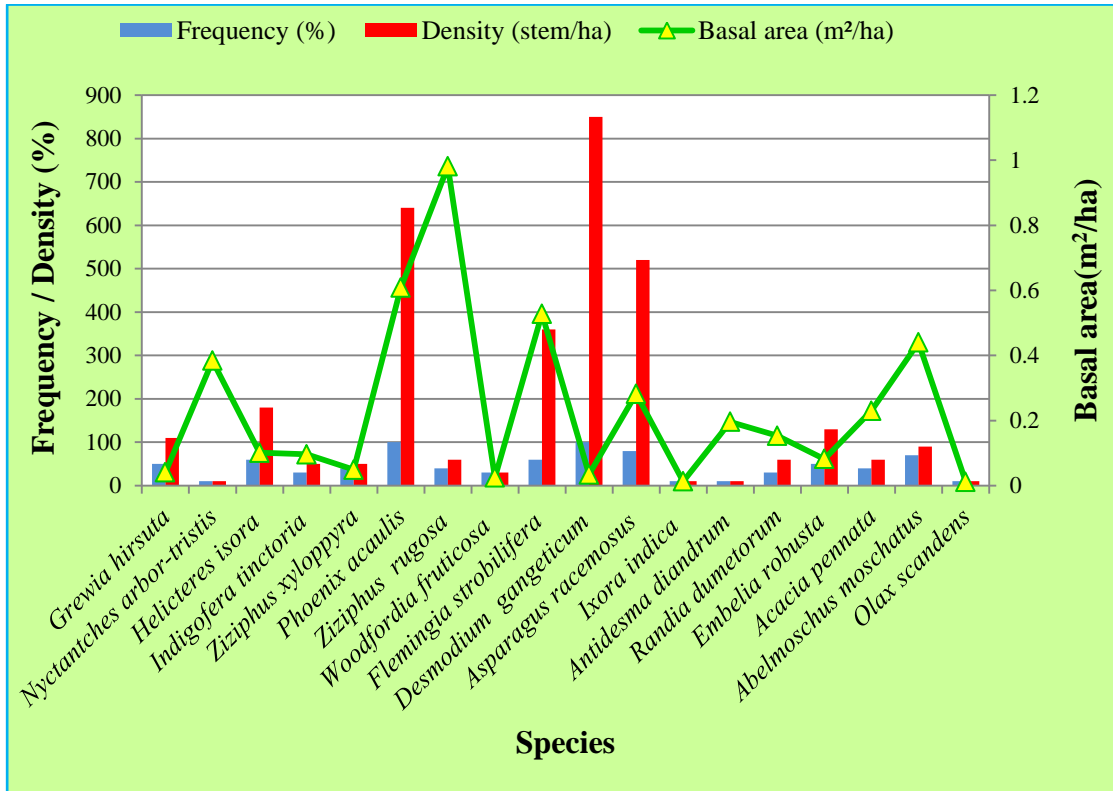


Fig. 4.11 Vegetation analysis of Shrubs in Chhotedongar site

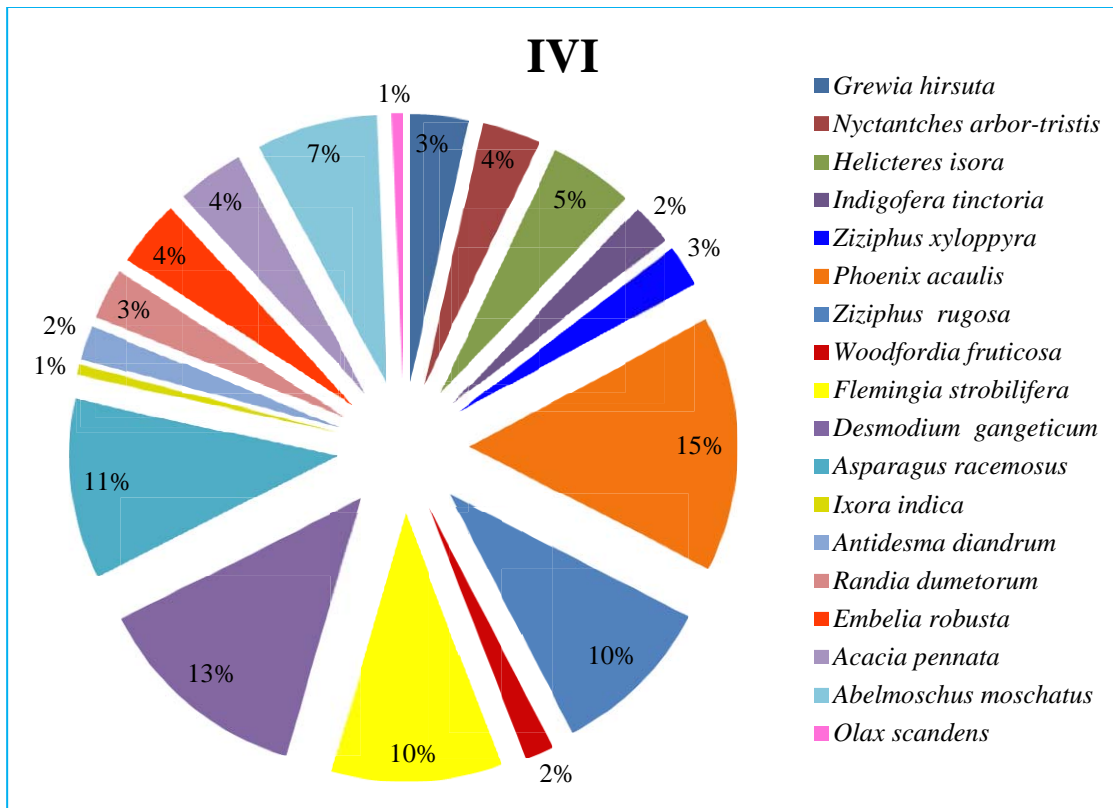


Fig. 4.12: Shrubs species based on IVI value in Chhotedongar site

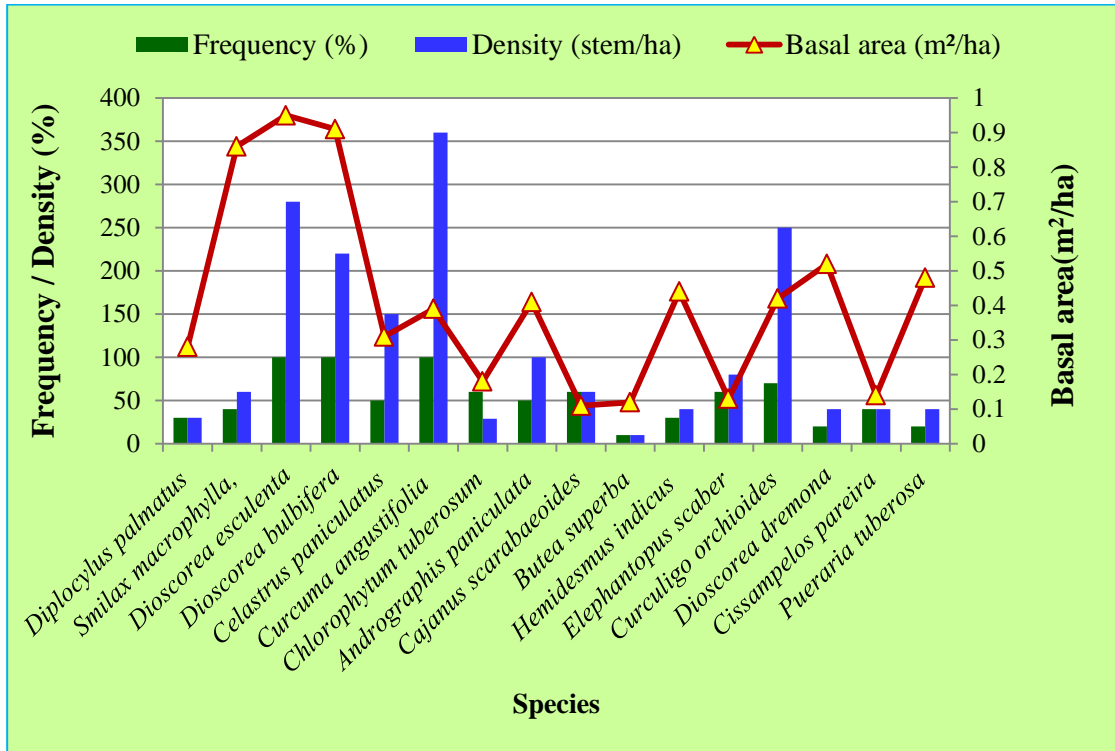


Fig. 4.13: Vegetation analysis of Herbs and Climbers in Chhotedongar site

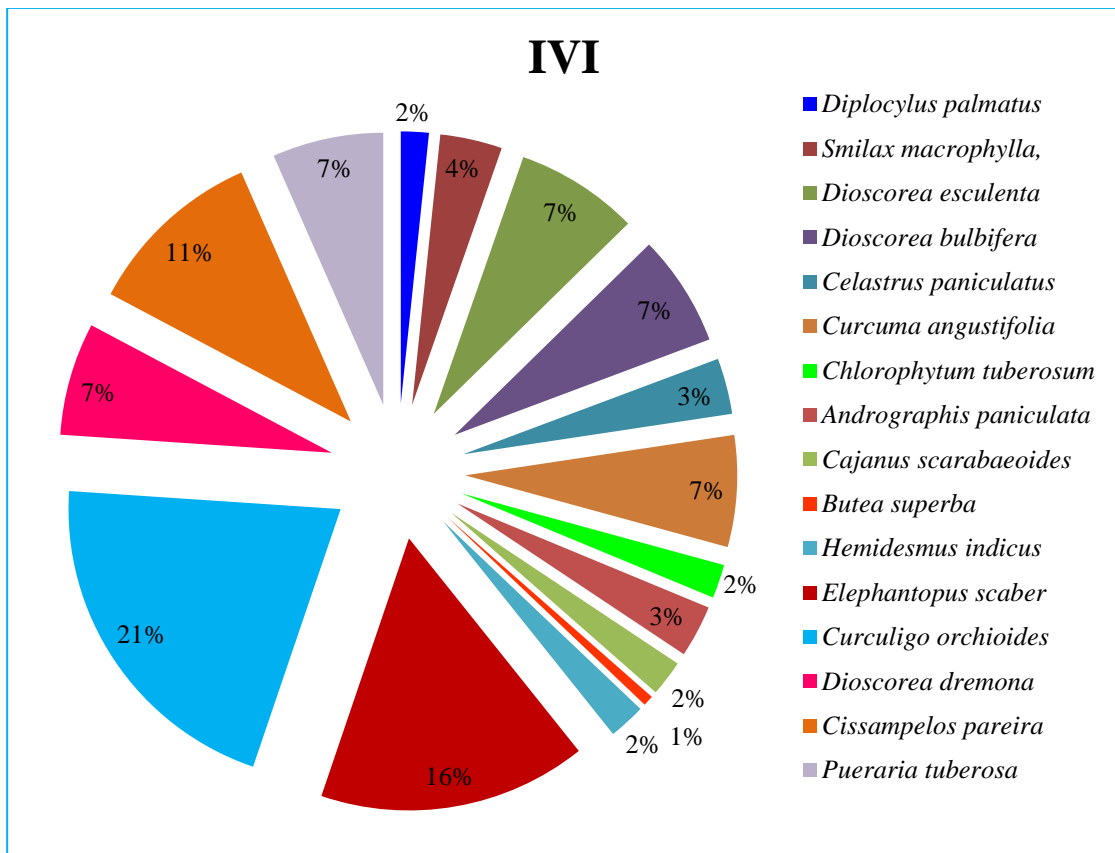


Fig. 4.14: Herbs and Climber species based on IVI value in Chhotedongar site

(330 stems ha⁻¹) and lowest was recorded for *Asparagus racemosus* (70 stems ha⁻¹). The minimum IVI Value (14.25) was recorded for the *Asparagus racemosus* (Table 4.16).

Importance Value Index of trees at Benoor site

Shorea robusta was the dominant species in the Benoor site, with the IVI value 113.50. The Co-dominant species are *Anogeissus latifolia* and *Tectona grandis* with IVI value 34.15 and 21.31 respectively. 100 % frequency was reported by the *Shorea robusta* and *Anogeissus latifolia*. 10% frequency was observed by the three species *Ficus semicordata*, *Ficus glomerata* and *Spondias mangifera*. Highest Basal Area was recorded for the *Shorea robusta* 26.28. Lowest Basal Area was observed for the *Buchanania lanzan* 0.05. The minimum IVI value (2.57) was reported for the *Ficus glomerata*. *Shorea robusta* has the 37.83% share in the forest of the Benoor site. A density of 1410 tree stems ha⁻¹ was recorded in the Benoor site. The density was recorded highest (460 stems ha⁻¹) for *Shorea robusta* followed by (50 stems ha⁻¹) one species *Anogeissus latifolia* and lowest was recorded (10 stems ha⁻¹) for two species, *Ficus semicordata* and *Spondias mangifera* (Table 4.17).

Importance Value Index of Shrubs at Benoor site

The maximum IVI (70.98) was observed for the *Phoenix acaulis*. *Desmodium gangeticum* and *Flemingia strobilifera* has the IVI value of 57.86 and 54.45 respectively. Highest Frequency 100% was recorded for the *Phoenix acaulis*. Lowest Frequency 10% was observed for the one species *Ziziphus rugosa* and *Ixora indica*. Highest Basal Area was recorded for the *Desmodium gangeticum* 2.08. Lowest Basal Area was observed for the *Ixora indica* 0.15. A Density of (1060) Shrubs stems ha⁻¹ was recorded in the Benoor site. The density was recorded highest (1060 stems ha⁻¹) for *Flemingia strobilifera* followed by *Phoenix acaulis* (250 stems ha⁻¹) and lowest was recorded for *Ixora indica* (10 stems ha⁻¹). The minimum IVI Value (5.55) was recorded for the *Ixora indica* (Table 4.18).

Importance Value Index of herbs and climbers at Benoor site

The maximum IVI (64.53) was recorded for the *Curcuma angustifolia*. *Dioscorea opposite* and *Smilax macrophylla* has the IVI value of 63.27 and 37.59

Table 4.17: Vegetation analysis of trees in Benoor, Narayanpur Block

Common Name	Botanical Name	Frequency (%)	Density (stem/ha)	Basal area (m ² /ha)	Relative Frequency (RF)	Relative Density (RD)	Relative Basal Area (RBA)	IVI
Dhaura	<i>Anogeissus latifolia</i>	100	190	2.66	13.89	13.48	6.78	34.15
Haidu	<i>Adina cordifolia</i>	20	30	0.66	2.78	2.13	1.68	6.58
Kachnar	<i>Bauhinia purpurea</i>	20	30	0.39	2.78	2.13	0.98	5.89
Chironji	<i>Buchanania lanzan</i>	20	30	0.05	2.78	2.13	0.13	5.04
Palas	<i>Butea monosperma</i>	40	60	0.21	5.56	4.26	0.54	10.35
Amaltas	<i>Cassia fistula</i>	30	40	0.10	4.17	2.84	0.26	7.26
Amala	<i>Embllica officinalis</i>	40	40	0.08	5.56	2.84	0.19	8.59
Gular	<i>Ficus glomerata</i>	10	10	0.18	1.39	0.71	0.47	2.57
Tado	<i>Ficus semicordata</i>	10	10	1.16	1.39	0.71	2.95	5.04
Chhena	<i>Lagerstroemia parviflora</i>	20	20	0.08	2.78	1.42	0.19	4.39
Moyan	<i>Lannea coromandelica</i>	20	30	0.24	2.78	2.13	0.61	5.51
Bijasal	<i>Pterocarpus marsupium</i>	70	100	0.35	9.72	7.09	0.88	17.70
Belwa	<i>Semecarpus anacardium</i>	30	40	2.39	4.17	2.84	6.09	13.09
Sal	<i>Shorea robusta</i>	100	460	26.28	13.89	32.62	66.99	113.50
Amra	<i>Spondias mangifera</i>	10	10	0.38	1.39	0.71	0.96	3.06
Jamun	<i>Syzygium cumini</i>	20	30	0.14	2.78	2.13	0.36	5.26
Harra	<i>Terminalia chebula</i>	40	50	0.92	5.56	3.55	2.35	11.45
Saja	<i>Terminalia tomentosa</i>	60	80	2.06	8.33	5.67	5.26	19.26
Sagon	<i>Tectona grandis</i>	60	150	0.92	8.33	10.64	2.34	21.31
Total		720	1410	39.23	100	100	100	300

Table 4.18: Vegetation analysis of shrubs in Benoor, Narayanpur Block

CommonName	Botanical Name	Frequency (%)	Density (stem/ha)	Basal area (m ² /ha)	Relative Frequency (RF)	Relative Density (RD)	Relative Basal Area (RBA)	IVI
Gudsukari	<i>Grewia hirsute</i>	30	40	0.84	7.14	3.77	12.46	23.38
Chind	<i>Phoenix acaulis</i>	100	250	1.59	23.81	23.58	23.59	70.98
Katakuli	<i>Ziziphus rugosa</i>	10	10	0.25	2.38	0.94	3.71	7.03
Dhawaiphul	<i>Woodfordia fruticosa</i>	20	30	0.51	4.76	2.83	7.57	15.16
Kanputa	<i>Flemingia strobilifera</i>	70	270	0.83	16.67	25.47	12.31	54.45
Salparni	<i>Desmodium gangeticum</i>	50	160	2.08	11.90	15.09	30.86	57.86
Kankara,	<i>Ixora indica</i>	10	10	0.15	2.38	0.94	2.23	5.55
Mainphal	<i>Randia dumetorum</i>	60	160	0.17	14.29	15.09	2.52	31.90
Duling / Biabidang	<i>Embelia robusta</i>	70	130	0.32	16.67	12.26	4.75	33.68
Total		420	1060	6.74	100	100	100	300

Table 4.19: Vegetation analysis of herbs and climbers in Benoor, Narayanpur Block

Common Name	Botanical Name	Frequency (%)	Density (stem/ha)	Basal area (m ² /ha)	Relative Frequency (RF)	Relative Density (RD)	Relative Basal Area (RBA)	IVI
Ramdatun	<i>Smilax macrophylla</i>	60	90	3.51	13.33	10.00	39.93	63.27
Kargaya kanda	<i>Dioscorea opposita</i>	60	120	0.96	13.33	13.33	10.92	37.59
Tikur	<i>Curcuma angustifolia</i>	100	220	1.57	22.22	24.44	17.86	64.53
Safed musli	<i>Chlorophytum tuberosum</i>	40	60	0.67	8.89	6.67	7.62	23.18
Satawar	<i>Asparagus racemosus</i>	30	50	0.65	6.67	5.56	7.39	19.62
Nagbel	<i>Cryptolepis buchmanii</i>	30	120	1.08	6.67	13.33	12.29	32.29
Kali musli	<i>Curculigo orchioides</i>	60	100	0.05	13.33	11.11	0.57	25.01
Satawar	<i>Asparagus racemosus</i>	40	80	0.24	8.89	8.89	2.73	20.51
Kalmegh	<i>Andrographis paniculata</i>	30	60	0.06	6.67	6.67	0.68	14.02
Total		450	900	8.79	100	100	100	300

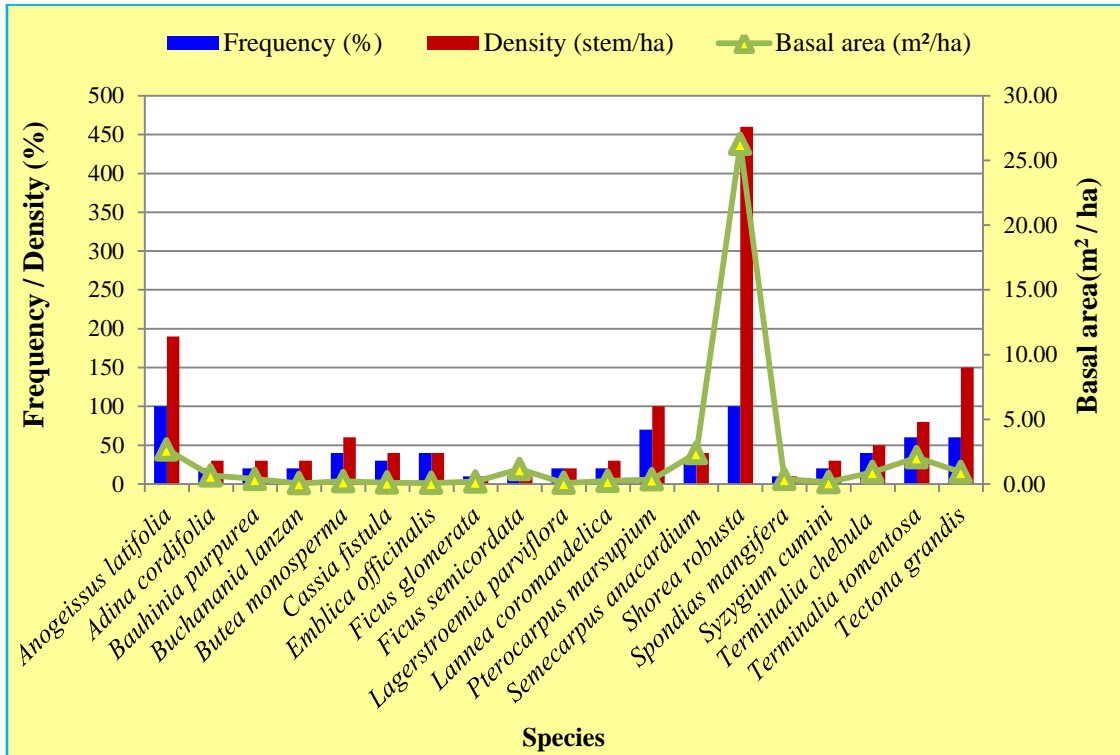


Fig. 4.15: Vegetation analysis of trees in Benoor site

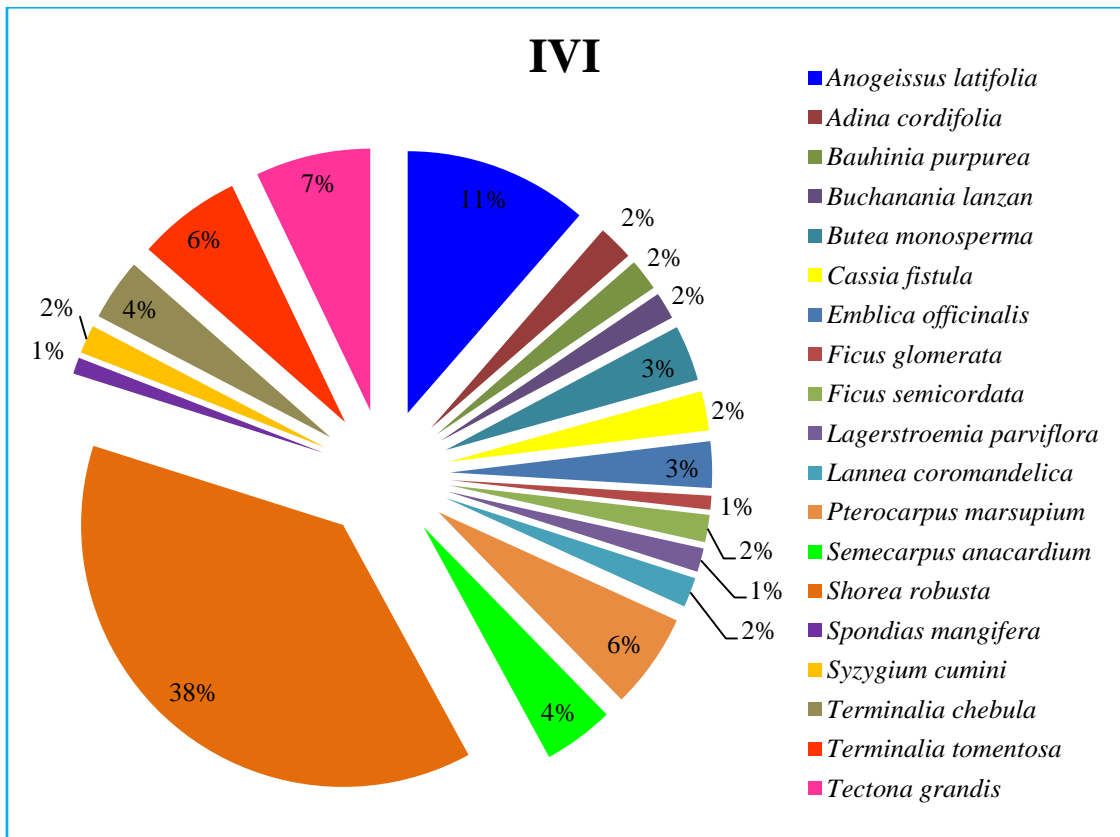


Fig. 4.16: Trees species based on IVI value in Benoor site

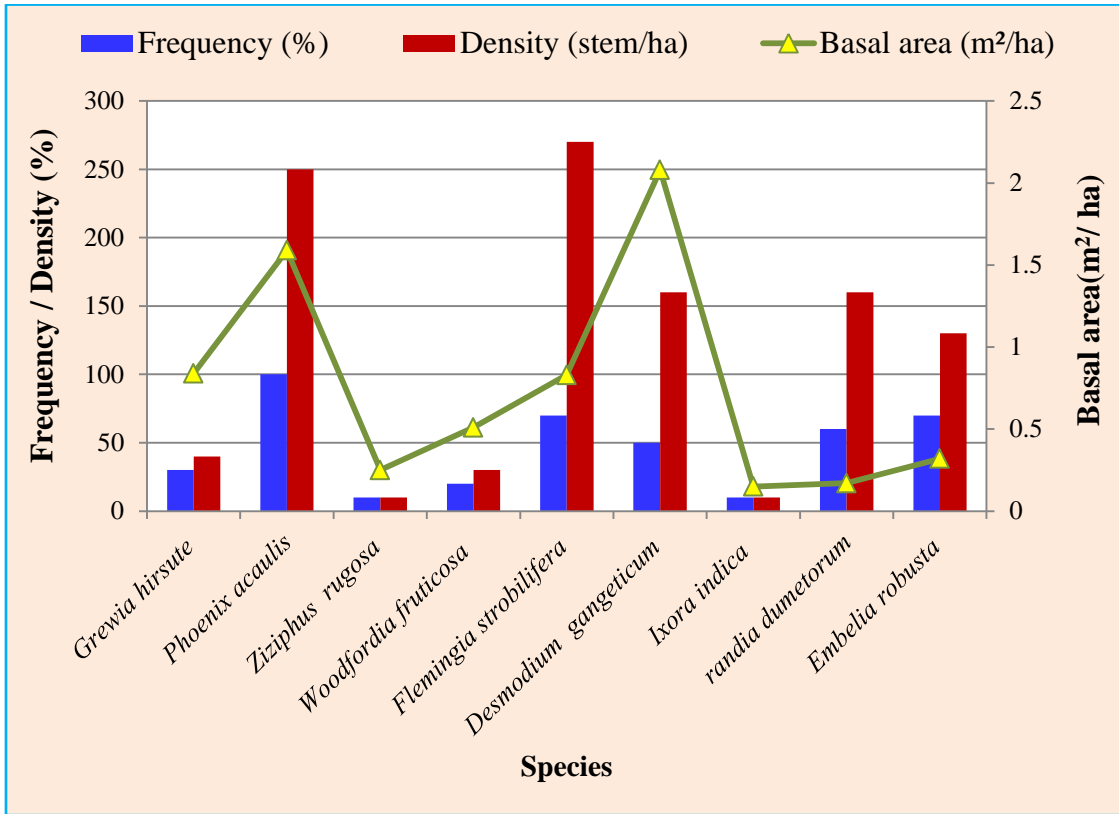


Fig. 4.17: Vegetation analysis of Shrubs in Benoor site

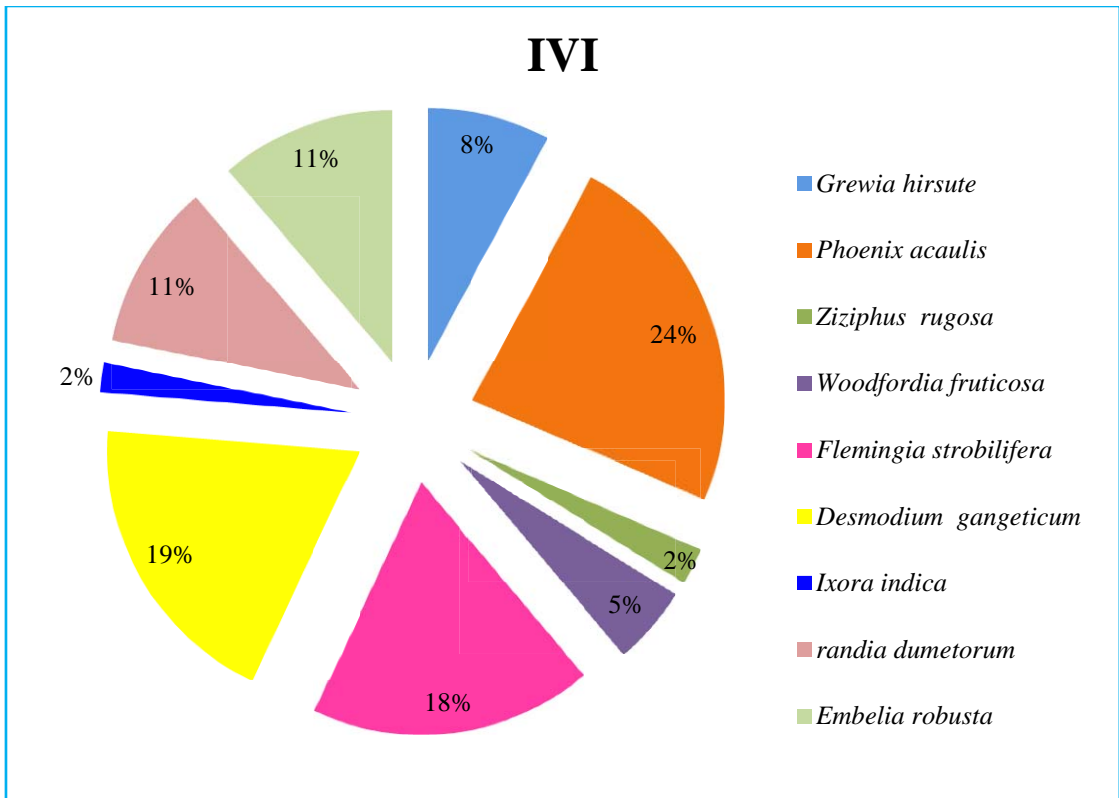


Fig. 4.18: Shrubs species based on IVI value in Benoor site

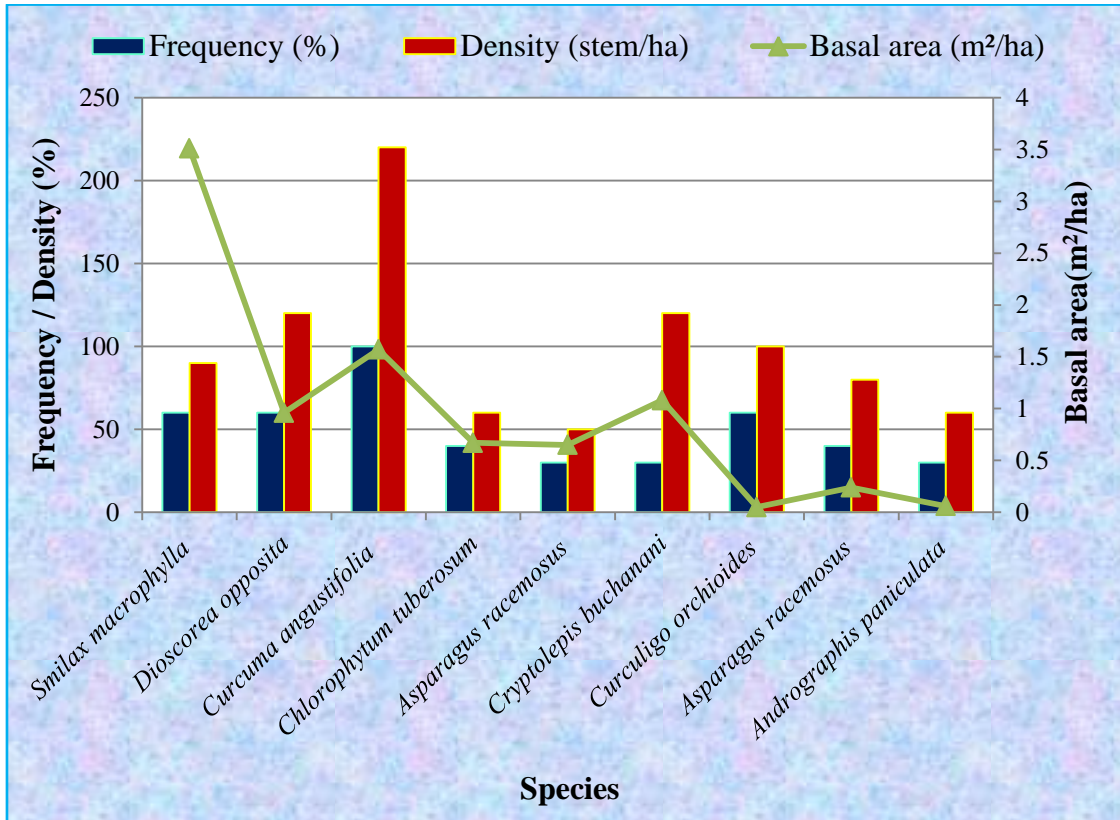


Fig. 4.19: Vegetation analysis of Herbs and Climbers in Benoor site

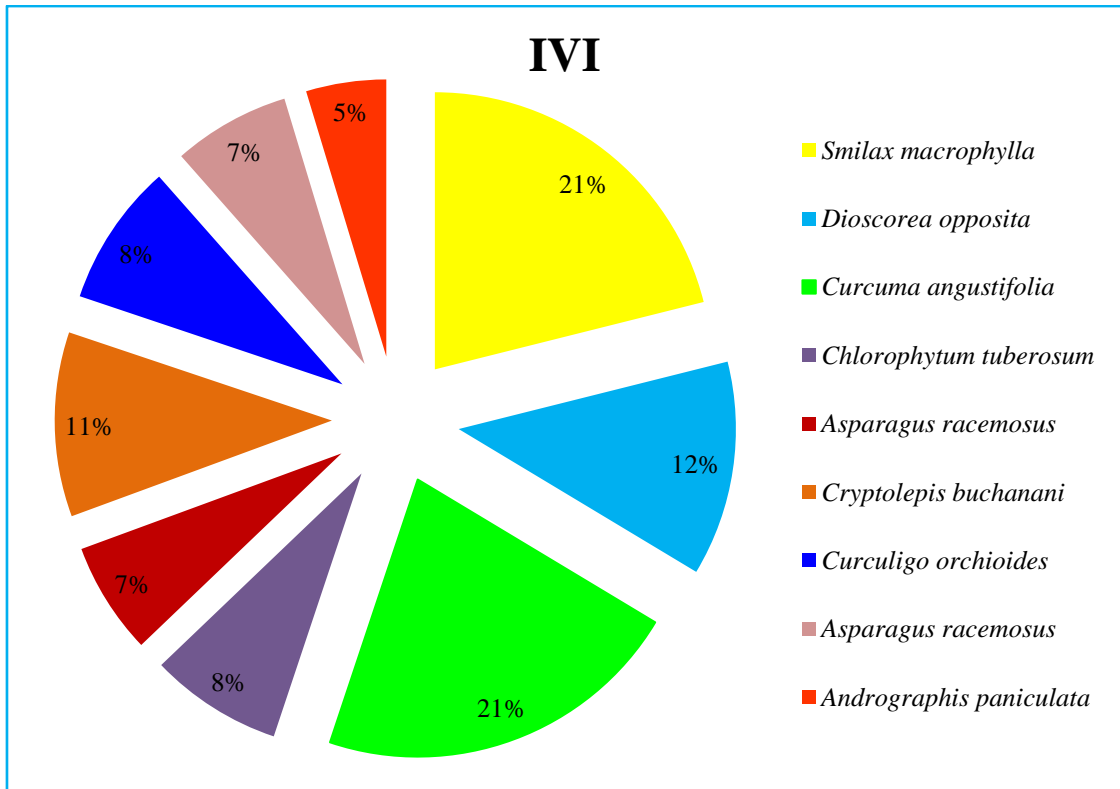


Fig. 4.20: Herbs and Climber species based on IVI value in Benoor site

espectively. 100% Frequency was recorded for the one species *Curcuma angustifolia*. Lowest Frequency 10% was observed for the three species *Asparagus racemosus*, *Cryptolepis buchanani* and *Andrographis paniculata*. Highest Basal Area was recorded for the *Smilax macrophylla* 3.51. Lowest Basal Area was observed for the *Curculigo orchioides* 0.05. A Density of (900 herbs and climber stems ha⁻¹) was recorded in the Benoor site. The density was recorded highest (220 stems ha⁻¹) for *Curcuma angustifolia* followed by *Dioscorea opposita* (120 stems ha⁻¹) and lowest was recorded for *Asparagus racemosus* (50 stems ha⁻¹). The minimum IVI Value (14.02) was recorded for the *Asparagus racemosus* (Table 4.19).

Importance Value Index of trees at Bharanda site

Shorea robusta was the dominant species in the Bharanda site, with the IVI value 124.68. The Co-dominant species are *Cleistanthus collinus* and *Anogeissus latifolia* with IVI value 22.53 and 15.79 respectively. 100 % frequency was reported by the *Shorea robusta*. 10% frequency was observed by the six species *Adina cordifolia*, *Dalbergia paniculata*, *Schleichera oleosa*, *Garuga pinnata*, *Terminalia chebula* and *Terminalia bellirica*. Highest Basal Area was recorded for *Shorea robusta* 26.78. Lowest Basal Area was observed for the *Mitragyna parvifolia* 0.04. The minimum IVI value (2.37) was reported for *Adina cordifolia*. *Shorea robusta* has 41.56 % share in the forest of the Bharanda site. A density of 1470 tree stems ha⁻¹ was recorded in the Bharanda. The density was recorded highest (490 stems ha⁻¹) for *Shorea robusta* followed by *Cleistanthus collinus* (210 stems ha⁻¹) and lowest was recorded for the six species *Adina cordifolia*, *Dalbergia paniculata*, *Garuga pinnata*, *Terminalia chebula*, *Schleichera oleosa* and *Terminalia bellirica* (10 stems ha⁻¹), (Table 4.20).

Importance Value Index of Shrubs at Bharanda site

The maximum IVI (58.42) was observed for the *Acacia pennata*. Followed by *Desmodium gangeticum* and *Asparagus racemosus* has the IVI value of 54.53 and 41.67 respectively. 100% Frequency was recorded for the two species *Phoenix acaulis* and *Desmodium gangeticum*. 10% Frequency was observed for the two species *Grewia hirsute* and *Ixora indica*. Highest Basal Area was recorded for

Table 4.20: Vegetation analysis of trees in Bharanda, Narayanpur Block

Common Name	Botanical Name	Frequency (%)	Density (stem/ha)	Basal area (m ² /ha)	Relative Frequency (RF)	Relative Density (RD)	Relative Basal Area (RBA)	IVI
Dhaura	<i>Anogeissus latifolia</i>	50	100	0.53	7.46	6.80	1.53	15.79
Chironji	<i>Buchanania lanzan</i>	40	70	0.25	5.97	4.76	0.70	11.43
Haldu	<i>Adina cordifolia</i>	10	10	0.07	1.49	0.68	0.20	2.37
Amaltas	<i>Cassia fistula</i>	30	60	0.31	4.48	4.08	0.87	9.43
Karra	<i>Cleistanthus collinus</i>	50	210	0.27	7.46	14.29	0.78	22.53
Dhobin	<i>Dalbergia paniculata</i>	10	10	0.14	1.49	0.68	0.39	2.56
Tendu	<i>Diospyros melanoxylon</i>	30	50	0.38	4.48	3.40	1.09	8.97
Amala	<i>Embllica officinalis</i>	20	30	0.11	2.99	2.04	0.30	5.33
Kekar	<i>Garuga pinnata</i>	10	10	0.11	1.49	0.68	0.31	2.48
Gambhar	<i>Gmelina arborea</i>	20	30	0.26	2.99	2.04	0.74	5.76
Dhaman	<i>Grewia tiliifolia</i>	30	30	0.20	4.48	2.04	0.57	7.09
Chhena	<i>Lagerstroemia parviflora</i>	50	70	0.49	7.46	4.76	1.40	13.62
Moyan	<i>Lansea coromandelica</i>	20	30	0.14	2.99	2.04	0.41	5.43
Mahua	<i>Madhuca latifolia</i>	20	30	0.94	2.99	2.04	2.67	7.70
Mundi	<i>Mitragyna parvifolia</i>	20	20	0.04	2.99	1.36	0.10	4.45
Bijasal	<i>Pterocarpus marsupium</i>	40	50	1.19	5.97	3.40	3.41	12.78
Girchi	<i>Salacia oblonga</i>	30	60	0.15	4.48	4.08	0.44	9.00
Kosum	<i>Schleichera oleosa</i>	10	10	0.35	1.49	0.68	0.99	3.16
Sal	<i>Shorea robusta</i>	100	490	26.78	14.93	33.33	76.42	124.68
Paral	<i>Stereospermum colais</i>	20	20	0.46	2.99	1.36	1.33	5.67
Harra	<i>Terminalia chebula</i>	10	10	0.13	1.49	0.68	0.37	2.55
Saja	<i>Terminalia tomentosa</i>	40	60	1.32	5.97	4.08	3.76	13.81
Behara	<i>Terminalia bellirica</i>	10	10	0.43	1.49	0.68	1.24	3.41
Total		670	1470	35.04	100.00	100.00	100.00	300.00

Table 4.21: Vegetation analysis of shrubs in Bharanda, Narayanpur Block

Common Name	Botanical Name	Frequency (%)	Density (stem/ha)	Basal area (m ² /ha)	Relative Frequency (RF)	Relative Density (RD)	Relative Basal Area (RBA)	IVI
Gudsukari	<i>Grewia hirsute</i>	10	20	0.041	1.82	0.84	0.77	3.43
Chind	<i>Phoenix acaulis</i>	100	280	0.608	18.18	11.76	11.37	41.32
Katakuli	<i>Ziziphus rugosa</i>	40	60	0.981	7.27	2.52	18.35	28.14
Dhawaiphul	<i>Woodfordia fruticosa</i>	30	30	0.025	5.45	1.26	0.47	7.18
Kanputa	<i>Flemingia strobilifera</i>	60	360	0.528	10.91	15.13	9.87	35.91
Salparni	<i>Desmodium gangeticum</i>	100	850	0.034	18.18	35.71	0.64	54.53
Satawar	<i>Asparagus racemosus</i>	80	520	0.282	14.55	21.85	5.27	41.67
Kankara,	<i>Ixora indica</i>	10	10	0.013	1.82	0.42	0.24	2.48
Mainphal	<i>Randia dumetorum</i>	30	60	0.153	5.45	2.52	2.86	10.84
Duling / biabidang	<i>Embelia robusta</i>	50	130	0.082	9.09	5.46	1.53	16.09
Rohani	<i>Acacia pennata</i>	40	60	2.6	7.27	2.52	48.63	58.42
Total		550	2380	5.347	100	100	100	300

Table 4.22: Vegetation analysis of herbs and climbers in Bharanda, Narayanpur Block

Common Name	Botanical Name	Frequency (%)	Density (stem/ha)	Basal area (m ² /ha)	Relative Frequency (RF)	Relative Density (RD)	Relative Basal Area (RBA)	IVI
Ramdatun	<i>Smilax macrophylla</i>	40	60	0.24	9.30	8.33	5.44	23.08
Kargaya kanda	<i>Dioscorea opposita</i>	30	60	0.31	6.98	8.33	7.03	22.34
Tikur	<i>Curcuma angustifolia</i>	60	150	1.57	13.95	20.83	35.60	70.39
Safed musli	<i>Chlorophytum tuberosum</i>	50	70	0.81	11.63	9.72	18.37	39.72
Satawar	<i>Asparagus racemosus</i>	20	30	0.38	4.65	4.17	8.62	17.43
Jugali kulthi	<i>Cajanus scarabaeoides</i>	30	70	0.07	6.98	9.72	1.59	18.29
Kali musli	<i>Curculigo orchitoides</i>	40	70	0.11	9.30	9.72	2.49	21.52
Jugali kulthi	<i>Cajanus scarabaeoides</i>	30	40	0.24	6.98	5.56	5.44	17.97
Kalmegh	<i>Andrographis paniculata</i>	30	60	0.06	6.98	8.33	1.36	16.67
Pitai	<i>Venilago madaraspatnam</i>	20	30	0.09	4.65	4.17	2.04	10.86
Jangali angur	<i>Vitex penduncularis</i>	30	30	0.11	6.98	4.17	2.49	13.64
Genji	<i>Curcuma zedoaria</i>	20	20	0.21	4.65	2.78	4.76	12.19
Anantmul	<i>Hemidesmus indicus</i>	30	30	0.21	6.98	4.17	4.76	15.91
Total		430	720	4.41	100	100	100	300

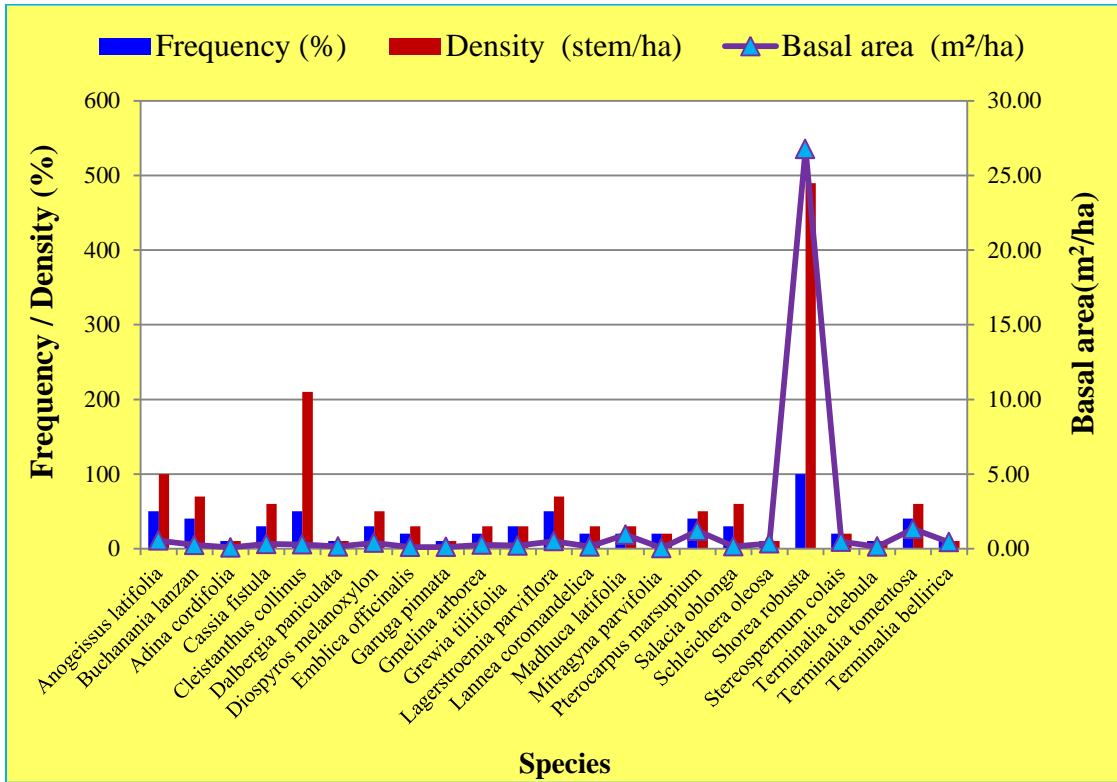


Fig. 4.21: Vegetation analysis of trees in Bharanda site

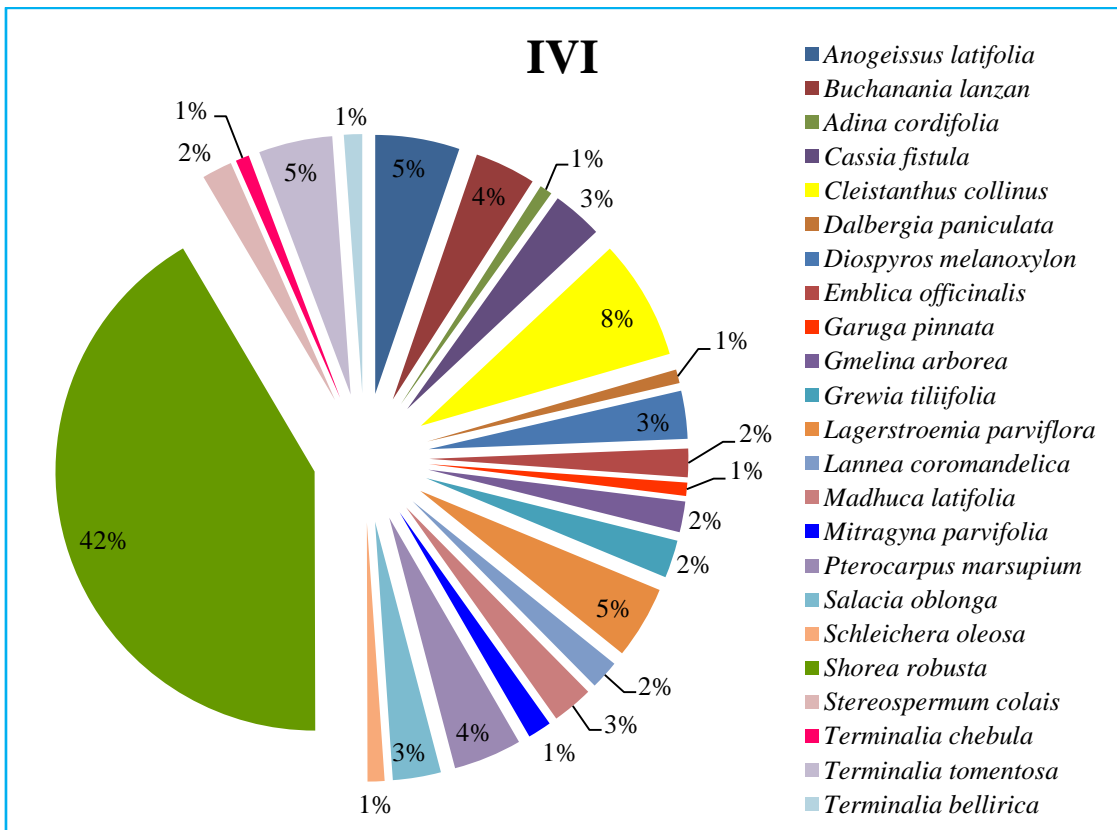


Fig. 4.22: Trees species based on IVI value in Bharanda site

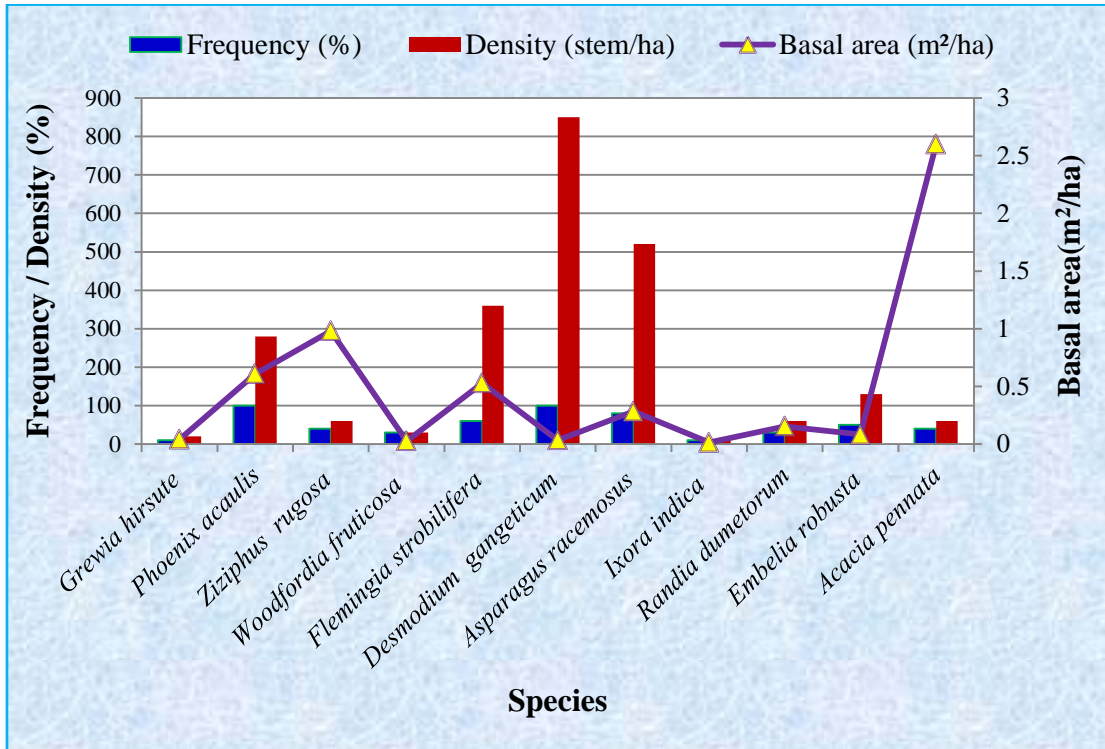


Fig. 4.23: Vegetation analysis of Shrubs in Bharanda site

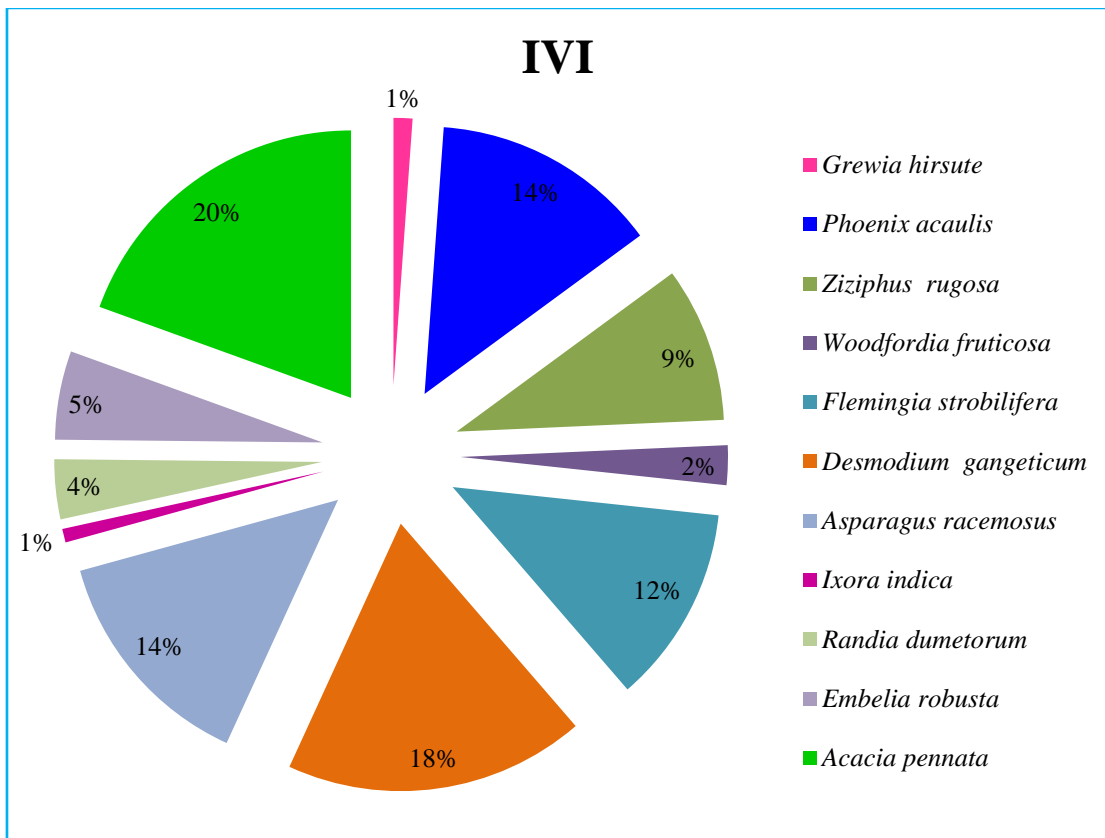


Fig. 4.24: Shrubs species based on IVI value in Bharanda site

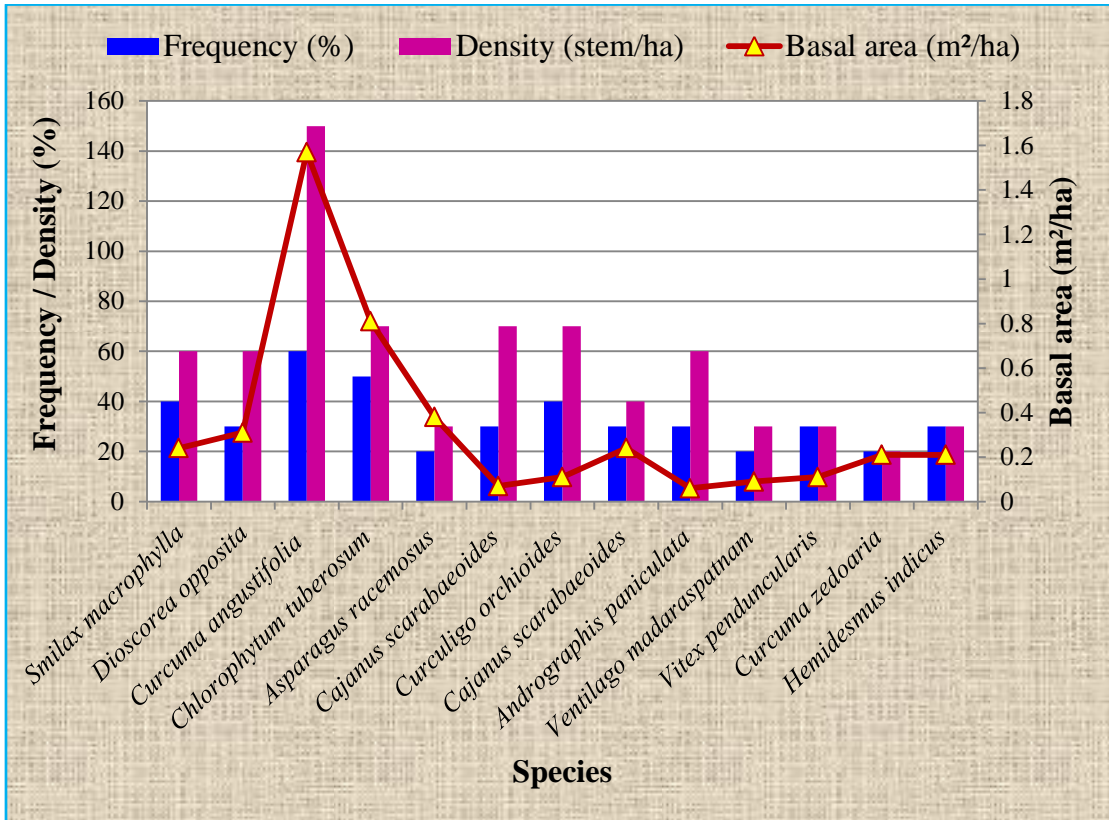


Fig. 4.25: Vegetation analysis of Herbs and Climber in Bharanda site

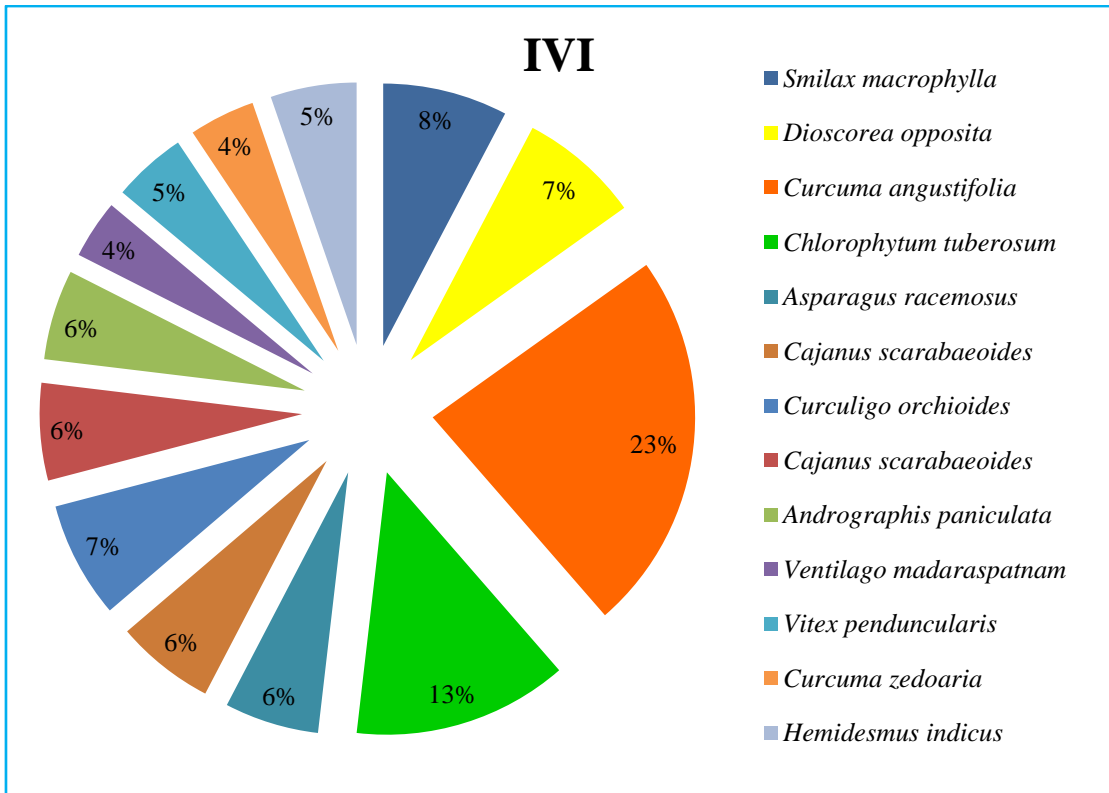


Fig. 4.26: Herbs and Climber species based on IVI value in Bharanda site

Acacia pennata 2.6 while, Lowest Basal Area was observed for the *Ixora indica* 0.013. A Density of (2380) Shrubs stems ha⁻¹ was recorded in the Bharanda site. The density was recorded highest (850 stems ha⁻¹) for *Desmodium gangeticum* followed by *Asparagus racemosus* (520 stems ha⁻¹) and lowest was recorded (10 stems ha⁻¹) for one species *Ixora indica*. The minimum IVI Value (2.48) was recorded for the *Ixora indica* (Table 4.21).

Importance Value Index of herbs and Climber at Bharanda site

The maximum IVI (70.39) was for observed *Curcuma angustifolia*. The Co-dominant species *Chlorophytum tuberosum* with the IVI value 39.72. 60% Frequency was recorded for the *Curcuma angustifolia*. Lowest Frequency 20% was observed for the three species *Asparagus racemosus* *Ventilago madaraspatnam* and *Curcuma zedoaria*. Highest Basal Area was recorded for *Curcuma angustifolia* 1.57. Lowest Basal Area was observed for the *Andrographis paniculata* 0.06. A Density of (720) herbs and climber stems ha⁻¹ was recorded in the Bharanda site. The density was recorded highest (150 stems ha⁻¹) for *Curcuma angustifolia* followed by the three species *Asparagus racemosus*, *Ventilago madaraspatnam* and *Curcuma zedoaria* (70 stems ha⁻¹) and lowest was recorded for *Curcuma zedoaria* (20 stems ha⁻¹). The minimum IVI Value (10.86) was recorded for the *Ventilago madaraspatnam* (Table 4.22).

Importance Value Index of trees at Orchha site

Shorea robusta was the dominant species in the Orchha site, with the IVI value 114.89. The Co-dominant species are *Anogeissus latifolia* and *Salacia oblonga* with IVI value 19.09 and 18.17 respectively. 100 % frequency was reported by the *Shorea robusta*. 10% frequency was observed by the three species *Ficus religiosa*, *Grewia tiliifolia* and *Syzygium cumini*. Highest Basal Area was recorded for the *Shorea robusta* 36.14. Lowest Basal Area was observed for the *Cassia fistula* 0.06. The minimum IVI value (2.23) was reported for the *Grewia tiliifolia*. *Shorea robusta* has the 38.28 % share in the forest of the Orchha site. A density of 1920 tree stems ha⁻¹ was recorded in the Orchha site. The density was recorded highest (670 stems ha⁻¹) for *Shorea robusta* followed by *Salacia oblonga*

(160 stems ha⁻¹) and lowest was recorded for the three species *Ficus religiosa*, *Grewia tiliifolia* and *Syzygium cumini* (10 stems ha⁻¹), (Table 4.23).

Importance Value Index of Shrubs at Orchha site

The maximum IVI (53.81) was for the *Desmodium gangeticum*. *Phoenix acaulis* and *Ziziphus oenoplia* has the IVI value of 45.78 and 30.44 respectively. 100% Frequency was recorded for the two species *Phoenix acaulis* and *Desmodium gangeticum*. 30% Frequency was observed for the two species *Indigofera tinctoria* and *Albizia amara*. Highest Basal Area was recorded for *Grewia hirsuta* 1.27. Lowest Basal Area was observed for the two species 0.08. A Density of (3210) Shrubs stems ha⁻¹ was recorded in the Orchha site. The density was recorded highest (1250 stems ha⁻¹) for *Desmodium gangeticum* followed by *Phoenix acaulis* (760 stems ha⁻¹) and lowest was recorded (30 stems ha⁻¹) for one species *Asparagus racemosus*. The minimum IVI Value (7.19) was recorded for the *Albizia amara* (Table 4.24).

Importance Value Index of herbs and Climber at Orchha site

The maximum IVI (38.86) was for the *Curcuma angustifolia*. The Co-dominant species *Bauhinia vahlii* with the IVI value 27.20. 100% Frequency was recorded for the five species *Smilax macrophylla*, *Dioscorea esculenta*, *Dioscorea bulbifera*, *Curcuma angustifolia* and *Celastrus paniculata*. Lowest Frequency 10 % was observed for the *Costus speciosus*. Highest Basal Area was recorded for the *Bauhinia vahlii* 1.27. Lowest Basal Area was observed for the *Costus speciosus* 0.003. A Density of (3480) herbs and climber stems ha⁻¹ was recorded in the orchha site. The density was recorded highest (760 stems ha⁻¹) for *Curcuma angustifolia* followed by the *Ichnocarpus frutescens* (350 stems ha⁻¹) and lowest was recorded for *Costus speciosus* (20 stems ha⁻¹). The minimum IVI Value (1.21) was recorded for the *Costus speciosus* (Table 4.25).

Table 4.23: Vegetation analysis of trees in Orchha, Orchha (Abujhmar) Block

Common Name	Botanical Name	Frequency (%)	Density (stem/ha)	Basal area (m ² /ha)	Relative Frequency (RF)	Relative Density (RD)	Relative Basal Area (RBA)	IVI
Dhaura	<i>Anogeissus latifolia</i>	70	130	2.12	8.33	6.77	3.99	19.09
Haidu	<i>Adina cordifolia</i>	20	20	0.14	2.38	1.04	0.26	3.69
Kachnar	<i>Bauhinia purpurea</i>	30	40	0.08	3.57	2.08	0.14	5.80
Chironji	<i>Buchanania lanzan</i>	60	110	0.08	7.14	5.73	0.16	13.03
Karra	<i>Cleistanthus collinus</i>	30	50	0.08	3.57	2.60	0.15	6.33
Amaltas	<i>Cassia fistula</i>	20	30	0.06	2.38	1.56	0.11	4.05
Karnota	<i>Dillenia indica</i>	20	30	0.07	2.38	1.56	0.13	4.08
Tendu	<i>Diospyros melanoxylon</i>	70	150	0.24	8.33	7.81	0.45	16.60
Amala	<i>Embllica officinalis</i>	60	100	0.19	7.14	5.21	0.36	12.71
Pipal	<i>Ficus religiosa</i>	10	10	0.37	1.19	0.52	0.69	2.40
Dhaman	<i>Grewia tiliifolia</i>	10	10	0.27	1.19	0.52	0.52	2.23
Chhena	<i>Lagerstroemia parviflora</i>	30	30	0.30	3.57	1.56	0.56	5.69
Moyan	<i>Lannea coromandelica</i>	40	60	0.86	4.76	3.13	1.62	9.51
Bijasal	<i>Pterocarpus marsupium</i>	70	160	8.50	8.33	8.33	16.02	32.69
Girchi	<i>Salacia oblonga</i>	80	160	0.17	9.52	8.33	0.31	18.17
Sal	<i>Shorea robusta</i>	100	670	36.14	11.90	34.90	68.09	114.89
Jamun	<i>Syzygium cumini</i>	10	10	0.45	1.19	0.52	0.85	2.56
Harra	<i>Terminalia chebula</i>	40	60	0.83	4.76	3.13	1.56	9.45
Saja	<i>Terminalia tomentosa</i>	70	90	2.15	8.33	4.69	4.05	17.07
Total		840	1920	53.08	100	100	100	300

Table 4.24: Vegetation analysis of shrubs in Orchha, Orchha (Abujhmar) Block

Common Name	Botanical Name	Frequency (%)	Density (stem/ha)	Basal area (m ² /ha)	Relative Frequency (RF)	Relative Density (RD)	Relative Basal Area (RBA)	IVI
Gudsukari	<i>Grewia hirsuta</i>	60	130	1.27	7.41	3.74	25.71	36.85
Banchalita	<i>Leea asiatica</i>	50	280	0.63	6.17	8.05	12.76	26.98
Marorphali	<i>Helicteres isora</i>	80	180	0.08	9.88	5.17	1.55	16.60
Nilni	<i>Indigofera tinctoria</i>	30	50	0.29	3.70	1.44	5.86	11.00
Gotia	<i>Ziziphus xylopyrus</i>	40	50	0.08	4.94	1.44	1.61	7.99
Chind	<i>Phoenix acaulis</i>	100	760	0.57	12.35	21.84	11.60	45.78
Katakuli	<i>Ziziphus rugosa</i>	40	80	0.31	4.94	2.30	6.31	13.55
Dhawaiphul	<i>Woodfordia fruticosa</i>	70	50	0.21	8.64	1.44	4.19	14.27
Kanputa	<i>Flemingia strobilifera</i>	60	100	0.04	7.41	2.87	0.77	11.05
Sidha	<i>Albizia amara</i>	30	90	0.04	3.70	2.59	0.90	7.19
Salpami	<i>Desmodium gangeticum</i>	100	1250	0.27	12.35	35.92	5.54	53.81
Satawar	<i>Asparagus racemosus</i>	80	300	0.30	9.88	8.62	5.99	24.49
Makoy	<i>Ziziphus oenoplia</i>	70	160	0.85	8.64	4.60	17.20	30.44
Total		810	3480	4.94	100	100	100	300

Table 4.25: Vegetation analysis of herbs and climbers in Orchha, Orchha (Abujhmar) Block

Common Name	Botanical Name	Frequency (%)	Density (stem/ha)	Basal area (m ² /ha)	Relative Frequency (RF)	Relative Density (RD)	Relative Basal Area (RBA)	IVI
Mahul	<i>Bauhinia vahlii</i>	70	100	1.27	6.14	2.87	18.18	27.20
Ramdatun	<i>Smilax macrophylla</i>	100	170	0.66	8.77	4.89	9.43	23.09
Kosakanda	<i>Dioscorea esculenta</i>	100	210	0.73	8.77	6.03	10.44	25.24
karukanda	<i>Dioscorea bulbifera</i>	100	220	0.29	8.77	6.32	4.15	19.24
Kargaya kanda	<i>Dioscorea opposita</i>	80	330	0.08	7.02	9.48	1.14	17.64
Tikur	<i>Curcuma angustifolia</i>	100	760	0.58	8.77	21.84	8.25	38.86
Safed musli	<i>Chlorophytum tuberosum</i>	40	80	0.50	3.51	2.30	7.11	12.92
Kewkanda	<i>Costus speciosus</i>	10	10	0.003	0.88	0.29	0.05	1.21
Chikti	<i>Triumfetta rhomboidea</i>	60	60	0.46	5.26	1.72	6.65	13.64
Nagbel	<i>Cryptolepis buchamani</i>	30	280	0.51	2.63	8.05	7.30	17.98
Chirchita	<i>Achyranthes aspera</i>	70	250	0.29	6.14	7.18	4.15	17.48
Mahkuwa	<i>Ageratum conyzoides</i>	60	100	0.07	5.26	2.87	1.00	9.14
Jangali angur	<i>Vitis tiliifolia</i>	40	120	0.42	3.51	3.45	6.01	12.97
Kali dudhi	<i>Ichnocarpus frutescens</i>	30	350	0.27	2.63	10.06	3.87	16.55
Kalmegh	<i>Andrographis paniculata</i>	90	120	0.42	7.89	3.45	6.02	17.36
Kalihari	<i>Gloriosa superba</i>	60	170	0.23	5.26	4.89	3.29	13.44
Peng	<i>Celastrus paniculata</i>	100	150	0.21	8.77	4.31	2.96	16.04
Total		1140	3480	6.98	100	100	100	300

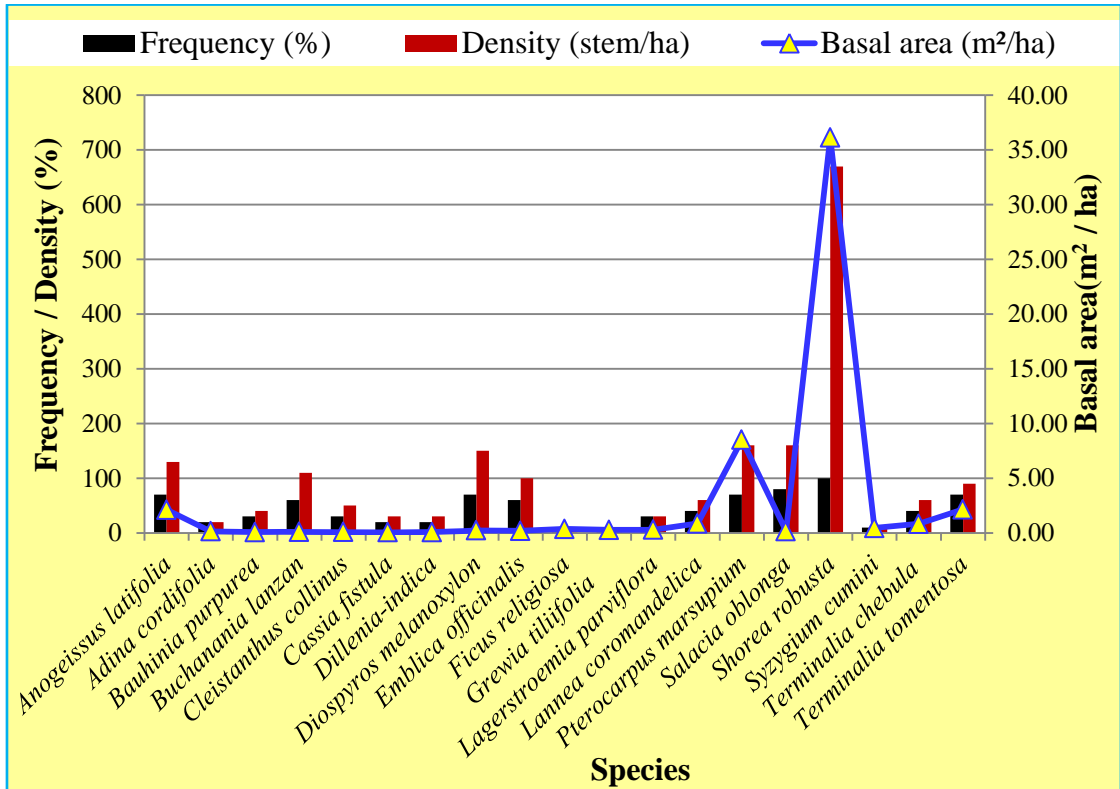


Fig. 4.27: Vegetation analysis of trees in Orchha site

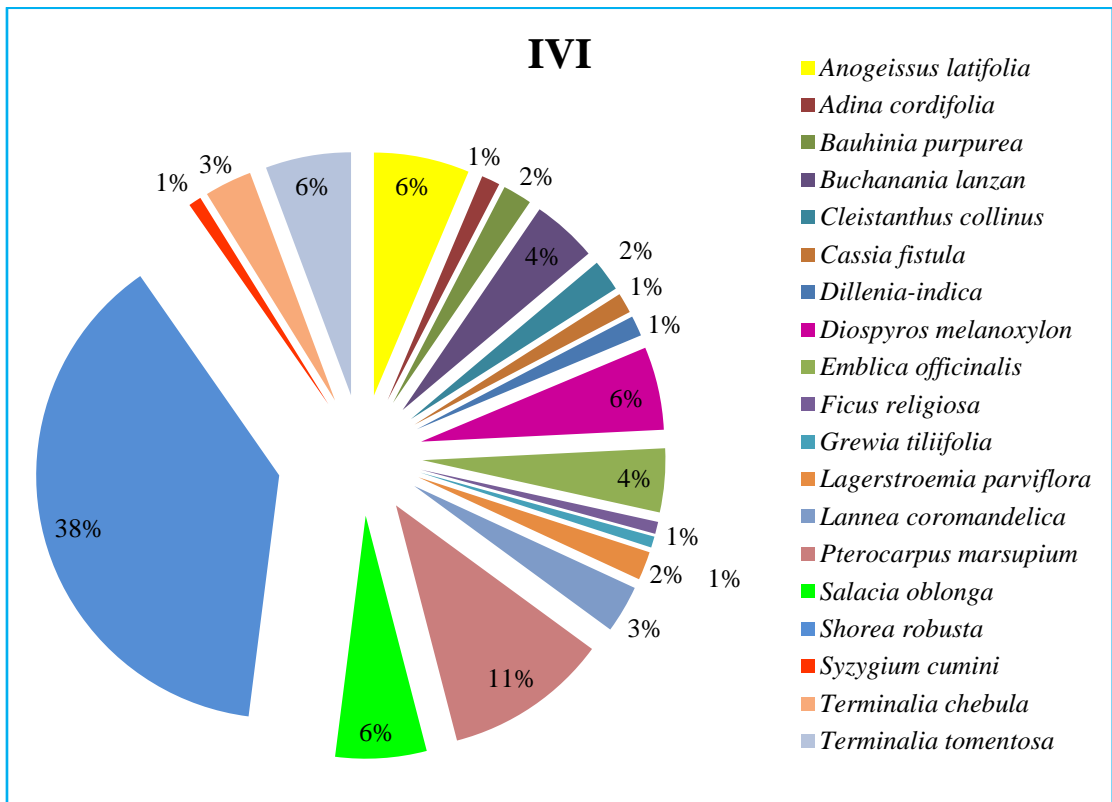


Fig. 4.28: Trees species based on IVI value in Orchha site

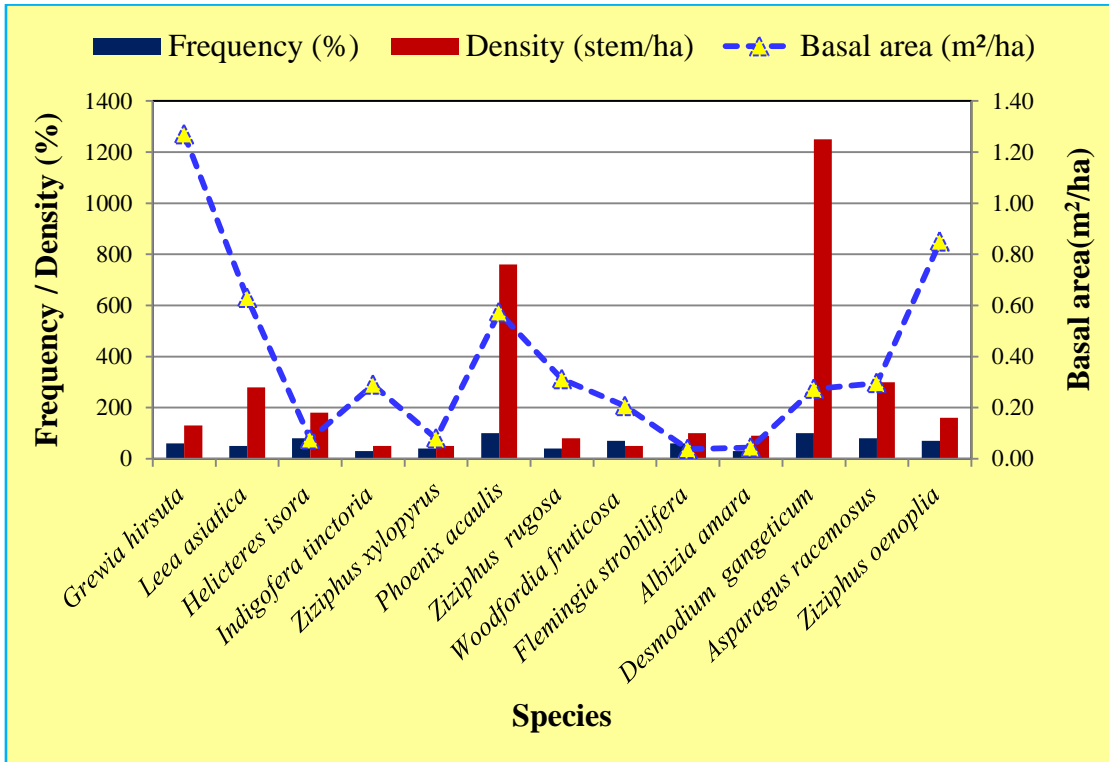


Fig. 4.29: Vegetation analysis of Shrubs in Orchha site

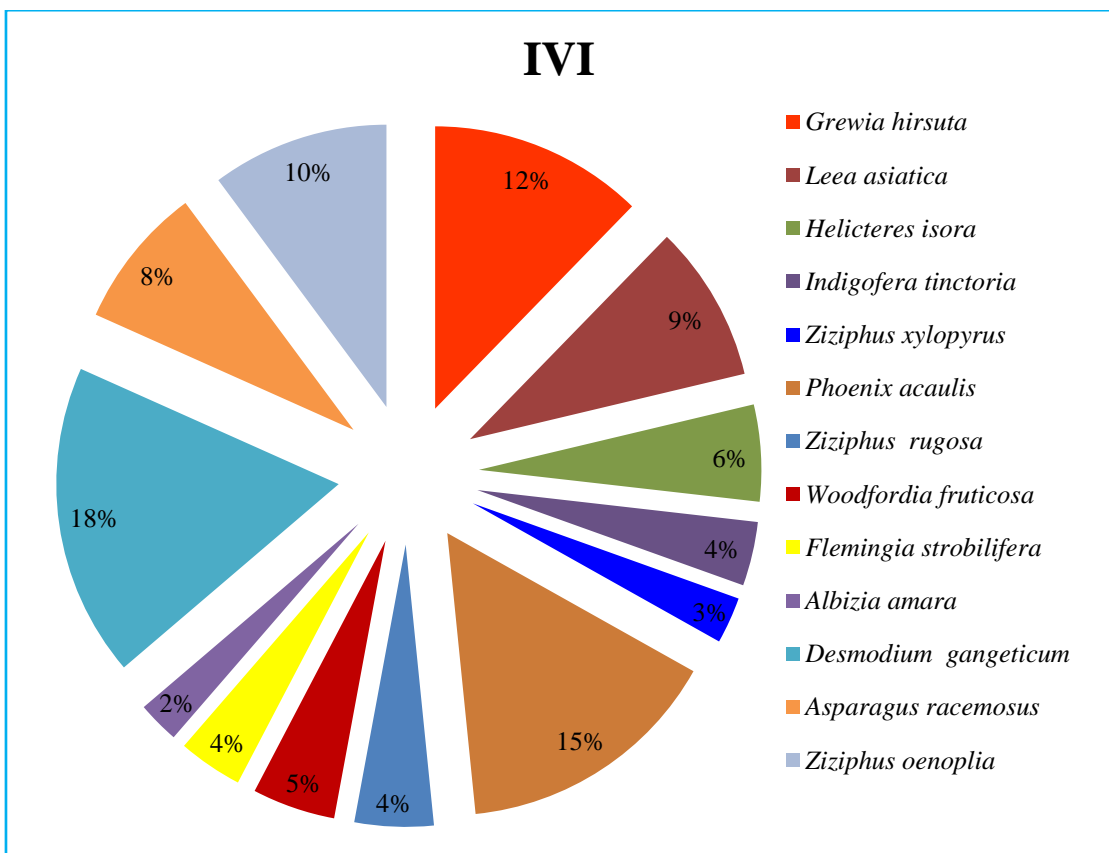


Fig. 4.30: Shrubs species based on IVI value in Orchha site

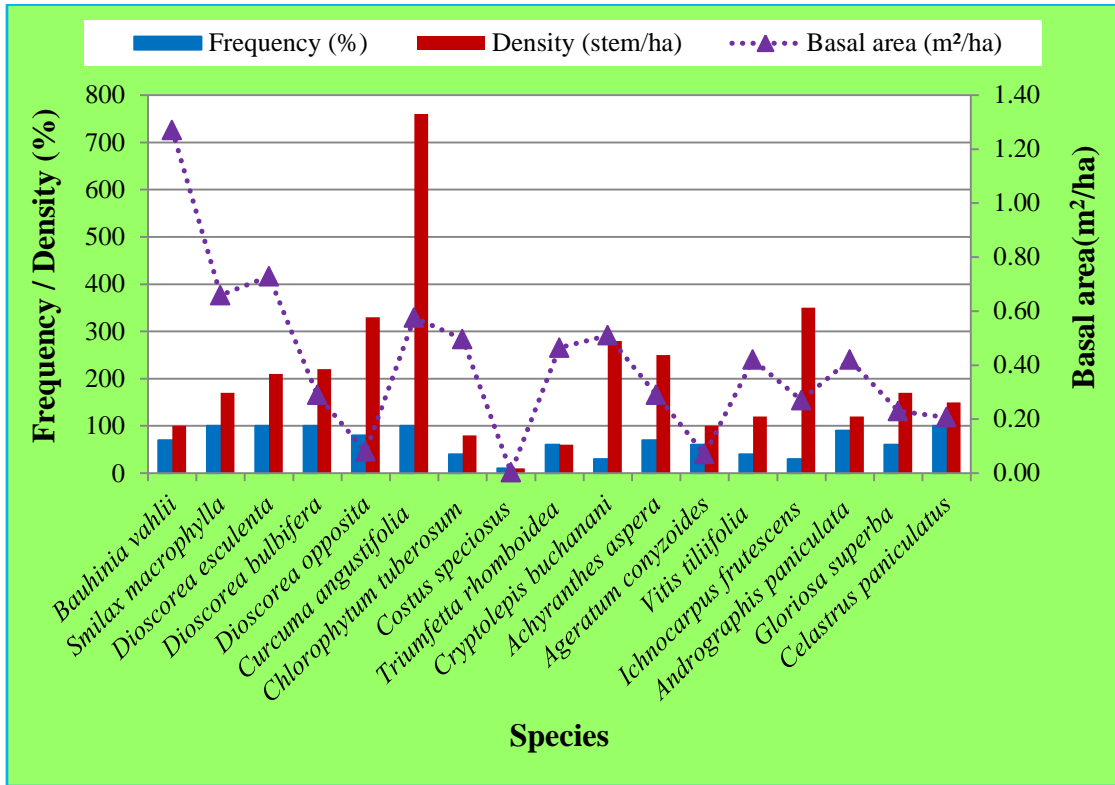


Fig. 4.31: Vegetation analysis of Herbs and Climbers in Orchha site

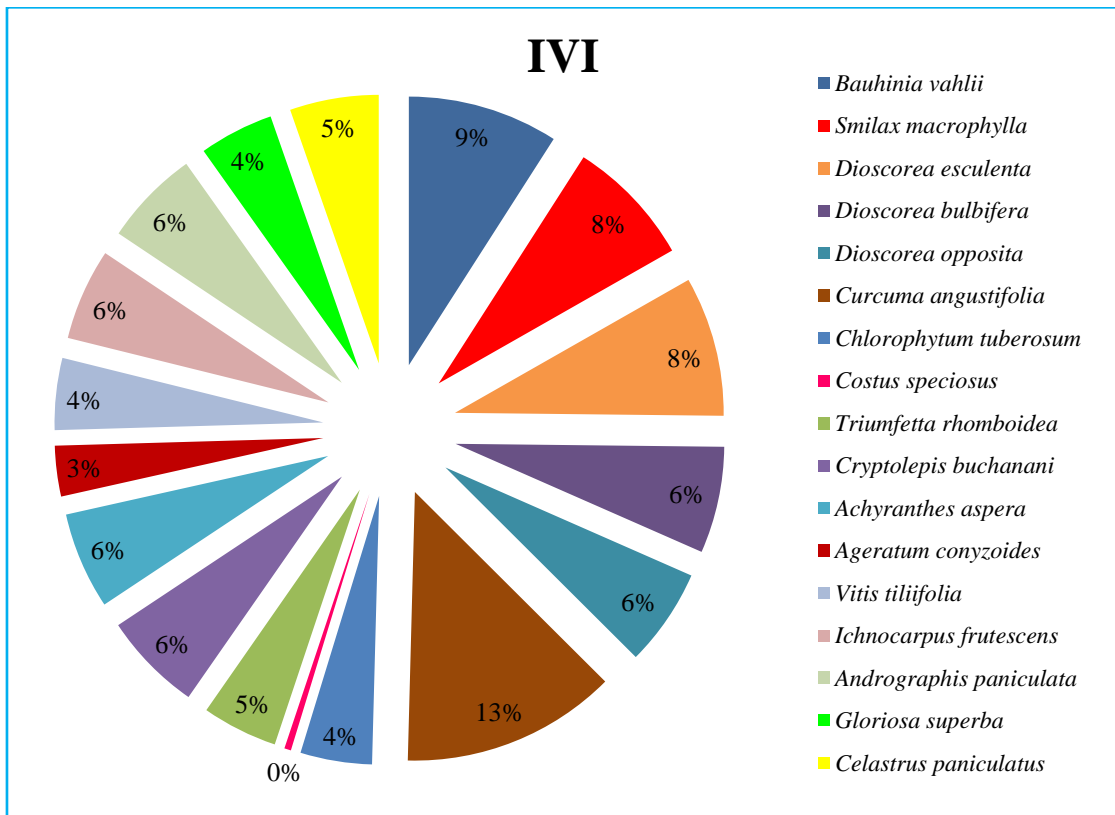


Fig. 4.32: Herbs and Climber species based on IVI value in Orchha site

Dominance Importance Value Index of trees at Gudadi site

Shorea robusta was the dominant species in the Orchha site, with the IVI value 136.96. The Co-dominant species are *Terminalia tomentosa* and *Lannea coromandelica* with IVI value 20.08 and 19.40 respectively. 100 % frequency was reported by the *Shorea robusta*. 10% frequency was observed by the four species *Bombax malabaricum*, *Maduca latifolia*, *Syzygium cumini* and *Ficus religiosa*. Highest Basal Area was recorded for the *Shorea robusta* 32.62 Lowest Basal Area was observed for the *Buchanania lanzan* 0.09. The minimum IVI value (2.56) was reported for the *Ficus religiosa*. *Shorea robusta* has the 45.33 % share in the forest of the Gudadi site. A density of 1711 tree stems ha⁻¹ was recorded in the Gudadi site. The density was recorded highest (840 stems ha⁻¹) for *Shorea robusta* followed by *Emblica officinalis* (160 stems ha⁻¹) and lowest was recorded for the five species *Bombax malabaricum*, *Ficus religiosa*, *Syzygium cumini*, *Terminalia tomentosa* and *Maduca latifolia* (10 stems ha⁻¹), (Table 4.26).

Importance Value Index of Shrubs at Gudadi site

The maximum IVI (92.30) was observed for the *Flemingia strobilifera*. *Desmodium gangeticum* and *Phoenix acaulis* has the IVI value of 56.48 and 41.18 respectively. 100% Frequency was recorded for the three species *Phoenix acaulis*, *Flemingia strobilifera* and *Desmodium gangeticum*. 10% Frequency was observed for the *Olax scandens*. Highest Basal Area was recorded for *Flemingia strobilifera* 2.56. Lowest Basal Area was observed for *Olax scandens* 0.01. A Density of (2120) Shrubs stems ha⁻¹ was recorded in the Gudadi site. The density was recorded highest (740 stems ha⁻¹) for *Desmodium gangeticum* followed by *Flemingia strobilifera* (640 stems ha⁻¹) and lowest was recorded (10 stems ha⁻¹) for one species *Olax scandens*. The minimum IVI Value (2.56) was recorded for the *Olax scandens* (Table 4.27).

Importance Value Index of herbs and Climbers at Gudadi site

The maximum IVI (235.54) was recorded for the *Curculigo orchoides*. The Co-dominant species *Abutilon indicum* with the IVI value 150.02. 100% Frequency was recorded for the four species *Dioscorea esculenta*, *Dioscorea bulbifera* and *Curcuma angustifolia* Lowest Frequency 30 % was observed for the *Cryptolepis*

Table 4.26: Vegetation analysis of Trees in Gudadi, Orchha (Abujhmar) Block

Common Name	Botanical Name	Frequency (%)	Density (stem/ha)	Basal area (m ² /ha)	Relative Frequency (RF)	Relative Density (RD)	Relative Basal Area (RBA)	IVI
Dhaura	<i>Anogeissus latifolia</i>	40	60	1.37	5.80	3.51	3.09	12.40
Chironji	<i>Buchanania lanzan</i>	30	30	0.09	4.35	1.75	0.19	6.29
Kasi	<i>Bridelia retusa</i>	30	40	0.23	4.35	2.34	0.52	7.20
Semal	<i>Bombax malabaricum</i>	10	10	0.47	1.45	0.58	1.06	3.09
Tendu	<i>Diospyros melanoxylon</i>	50	80	0.27	7.25	4.68	0.62	12.54
Amala	<i>Emblica officinalis</i>	60	160	0.43	8.70	9.35	0.97	19.02
Pipal	<i>Ficus religiosa</i>	10	10	0.24	1.45	0.58	0.53	2.56
Chena	<i>Lagerstroemia parviflora</i>	30	50	0.30	4.35	2.92	0.67	7.94
Moyan	<i>Lannea coromandelica</i>	60	120	1.64	8.70	7.01	3.69	19.40
Mahuwa	<i>Maduca indica</i>	10	10	0.44	1.45	0.58	1.00	3.03
Bijasal	<i>Pterocarpus marsupium</i>	70	120	0.39	10.14	7.01	0.87	18.03
Girchi	<i>Salacia oblonga</i>	60	90	0.20	8.70	5.26	0.45	14.41
Sal	<i>Shorea robusta</i>	100	840	32.62	14.49	49.09	73.37	136.96
Jamun	<i>Syzygium cumini</i>	10	10	0.34	1.45	0.58	0.76	2.79
Harra	<i>Terminalia chebula</i>	50	70	1.29	7.25	4.09	2.91	14.24
Saja	<i>Terminalia tomentosa</i>	70	11	4.13	10.14	0.64	9.29	20.08
Total		690	1711	44.45	100	100	100	300

Table 4.27: Vegetation analysis of shrubs in Gudadi, Orcha (Abujhmar) Block

Common Name	Botanical Name	Frequency (%)	Density (stem/ha)	Basal area (m ² /ha)	Relative Frequency (RF)	Relative Density (RD)	Relative Basal Area (RBA)	IVI
Katakuli	<i>Ziziphus rugosa</i>	50	60	0.12	9.62	2.83	2.01	14.46
Gotia	<i>Ziziphus xylopyrus</i>	30	80	0.88	5.77	3.77	14.74	24.28
Marorphali	<i>Helicteres isora</i>	50	70	0.49	9.62	3.30	8.21	21.12
Nilni	<i>Indigofera tinctoria</i>	30	60	0.91	5.77	2.83	15.24	23.84
Mokha	<i>Ziziphus oenoptia</i>	20	30	0.57	3.85	1.42	9.55	14.81
Chind	<i>Phoenix acaulis</i>	100	380	0.24	19.23	17.92	4.02	41.18
Lal kosum	<i>Olax scandens</i>	10	10	0.01	1.92	0.47	0.17	2.56
Dhawaiphul	<i>Woodfordia fruticosa</i>	30	50	0.05	5.77	2.36	0.84	8.97
Kanputa	<i>Flemingia strobilifera</i>	100	640	2.56	19.23	30.19	42.88	92.30
Salparni	<i>Desmodium gangeticum</i>	100	740	0.14	19.23	34.91	2.35	56.48
Total		520	2120	5.97	100	100	100	300

Table 4.28: Vegetation analysis of herbs and climbers in Gudadi, Orcha (Abujhmar) Block

Common Name	Botanical Name	Frequency (%)	Density (stem/ha)	Basal area (m ² /ha)	Relative Frequency (RF)	Relative Density (RD)	Relative Basal Area (RBA)	IVI
Mahul	<i>Bauhinia vahlii</i>	60	120	0.96	8.70	5.91	11.02	25.63
Ramdatun	<i>Smilax macrophylla</i>	80	150	1.95	11.59	7.39	22.39	41.37
Kosakanda	<i>Dioscorea exculenta</i>	100	380	0.19	14.49	18.72	2.18	35.39
Karukanda	<i>Dioscorea bulbifera</i>	100	220	0.91	14.49	10.84	10.45	35.78
Kargaya kanda	<i>Dioscorea opposita</i>	70	190	0.25	10.14	9.36	2.87	22.37
Tikur	<i>Curcuma angustifolia</i>	100	380	1.75	14.49	18.72	20.09	53.30
Safed musli	<i>Chlorophytum tuberosum</i>	40	250	1.67	5.80	12.32	19.17	37.29
Chikti	<i>Triumfetta rhomboidea</i>	60	80	0.32	8.70	3.94	3.67	16.31
Nagbel	<i>Cryptolepis buchanani</i>	30	160	0.64	4.35	7.88	7.35	19.58
Chirchita	<i>Achyranthes aspera</i>	50	100	0.07	7.25	4.93	0.80	12.98
Mahkuwa	<i>Ageratum conyzoides</i>	40	120	0.14	97.56	5.91	1.61	105.08
Phul ghangri	<i>Abutilon indicum</i>	60	160	0.16	146.34	7.88	1.84	150.02
Kali musli	<i>Curculigo orchitoides</i>	100	320	0.13	232.56	15.76	1.49	235.54
Total		690	2030	8.71	100	100	100	300

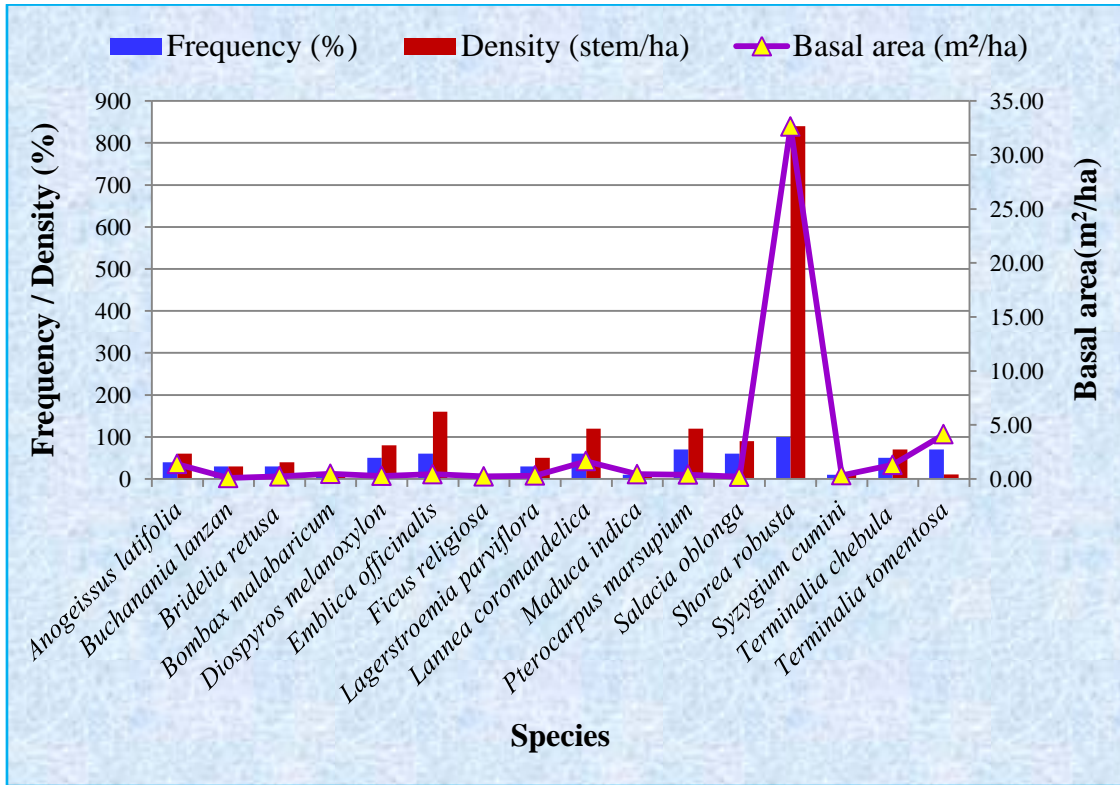


Fig.4.33: Vegetation analysis of trees in Gudadi site

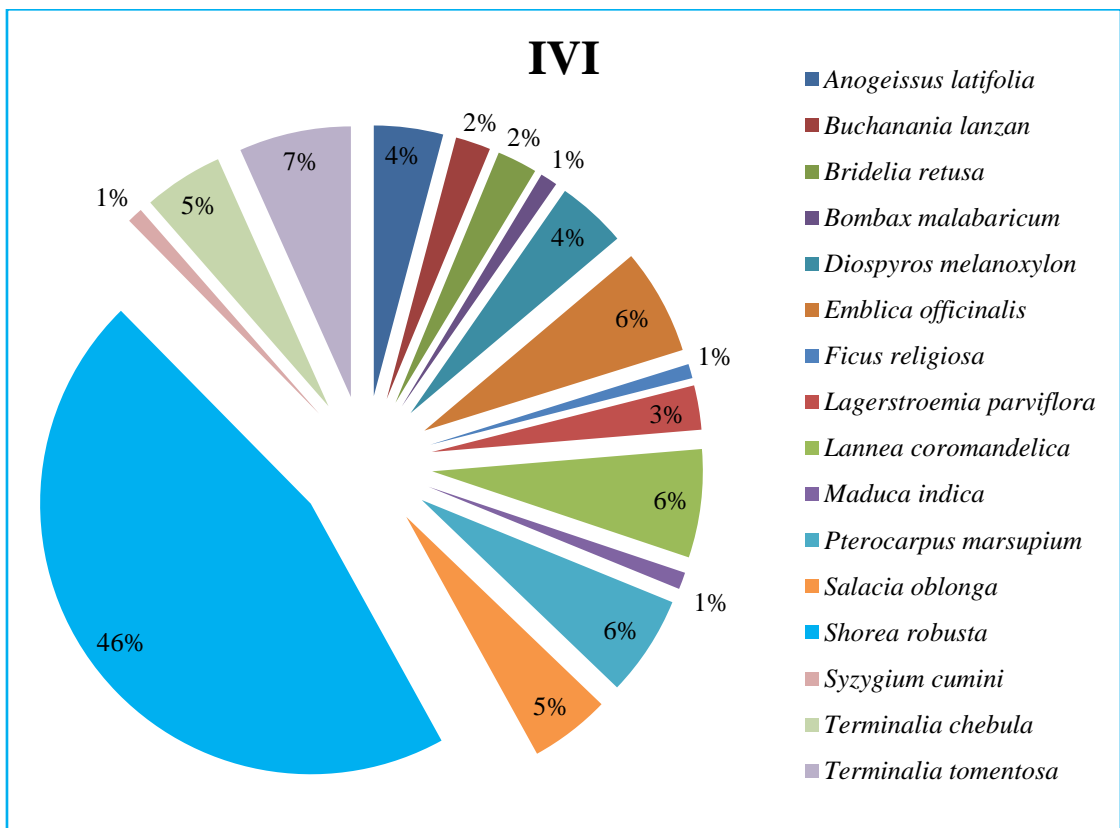


Fig. 4.34: Trees species based on IVI value in Gudadi site

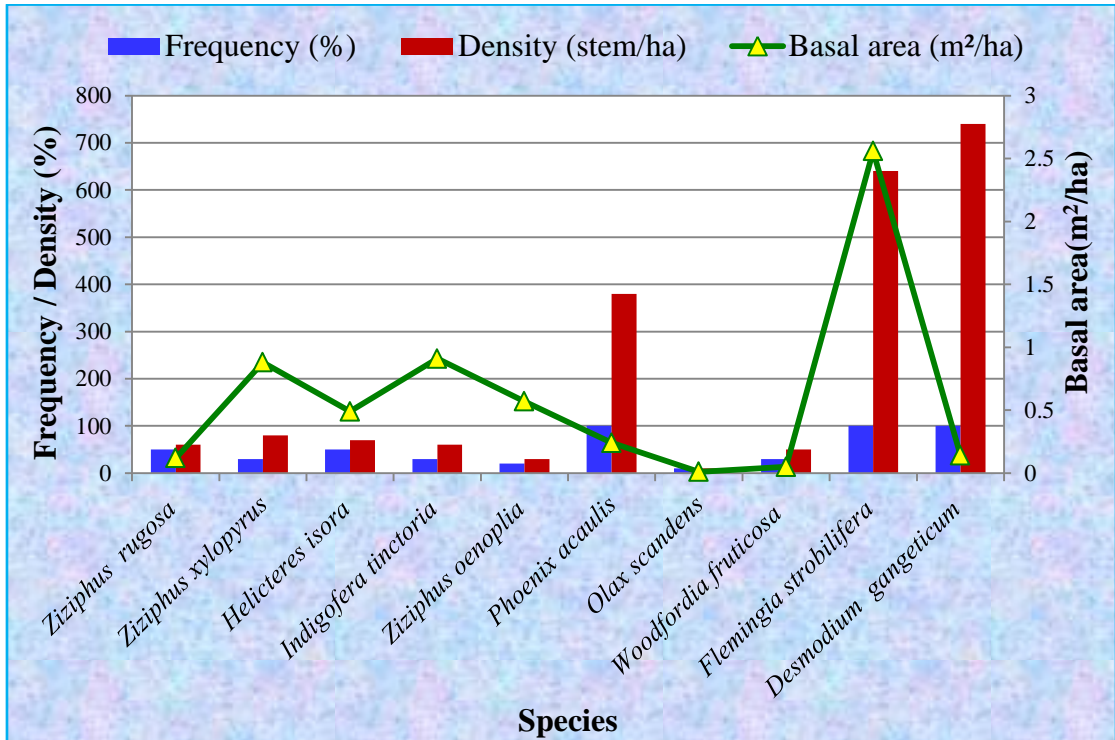


Fig. 4.35: Vegetation analysis of Shrubs in Gudadi site

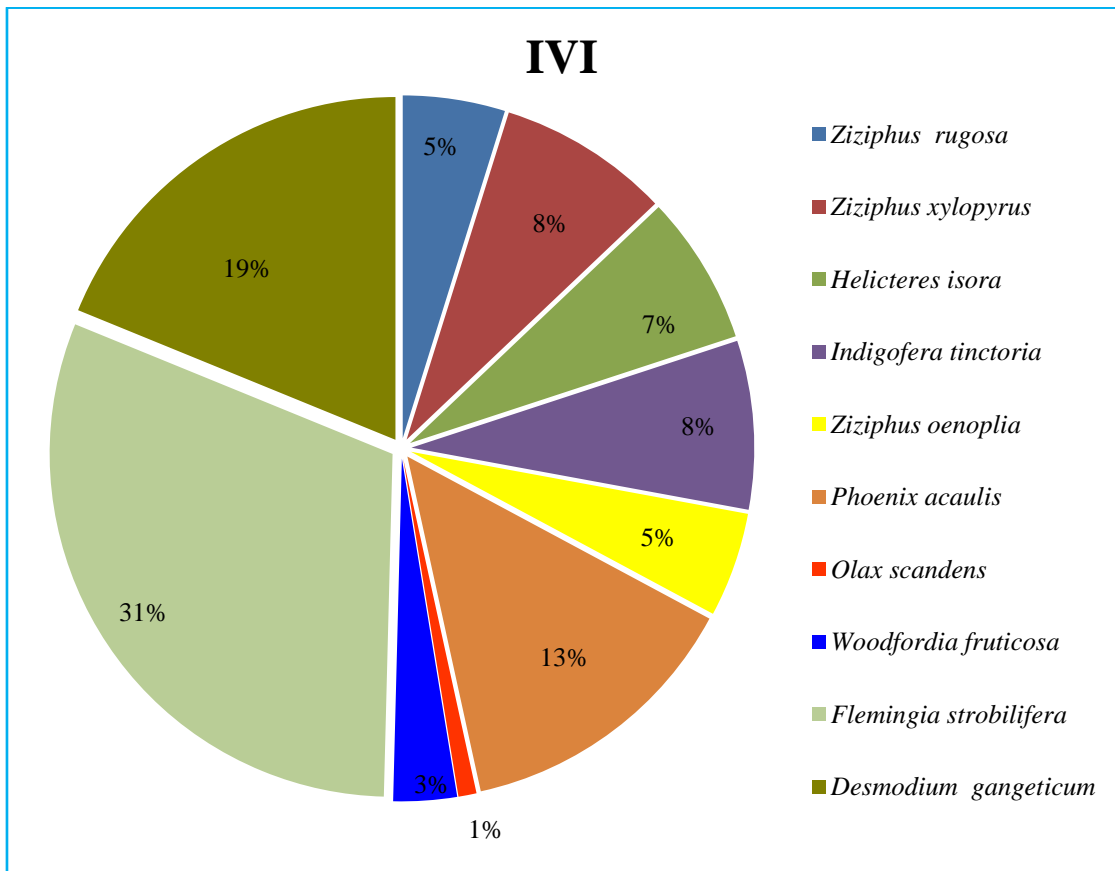


Fig. 4.36: Shrubs species based on IVI value in Gudadi site

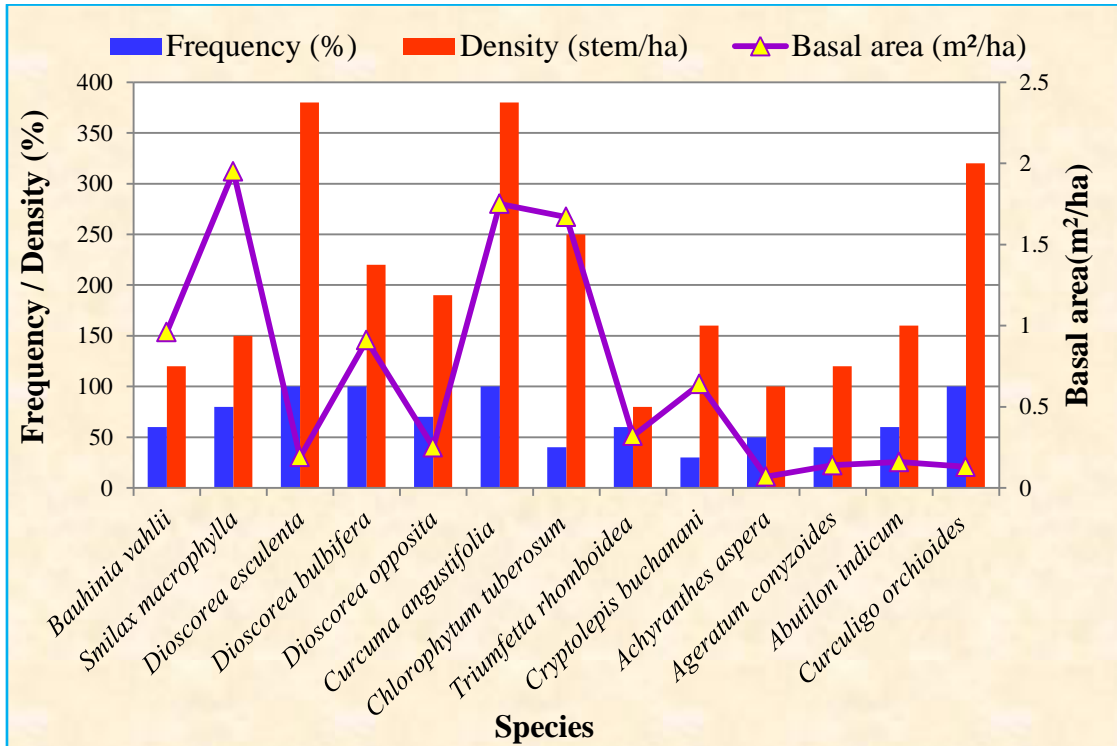


Fig. 4.37: Vegetation analysis of Herbs and Climbers in Gudadi site

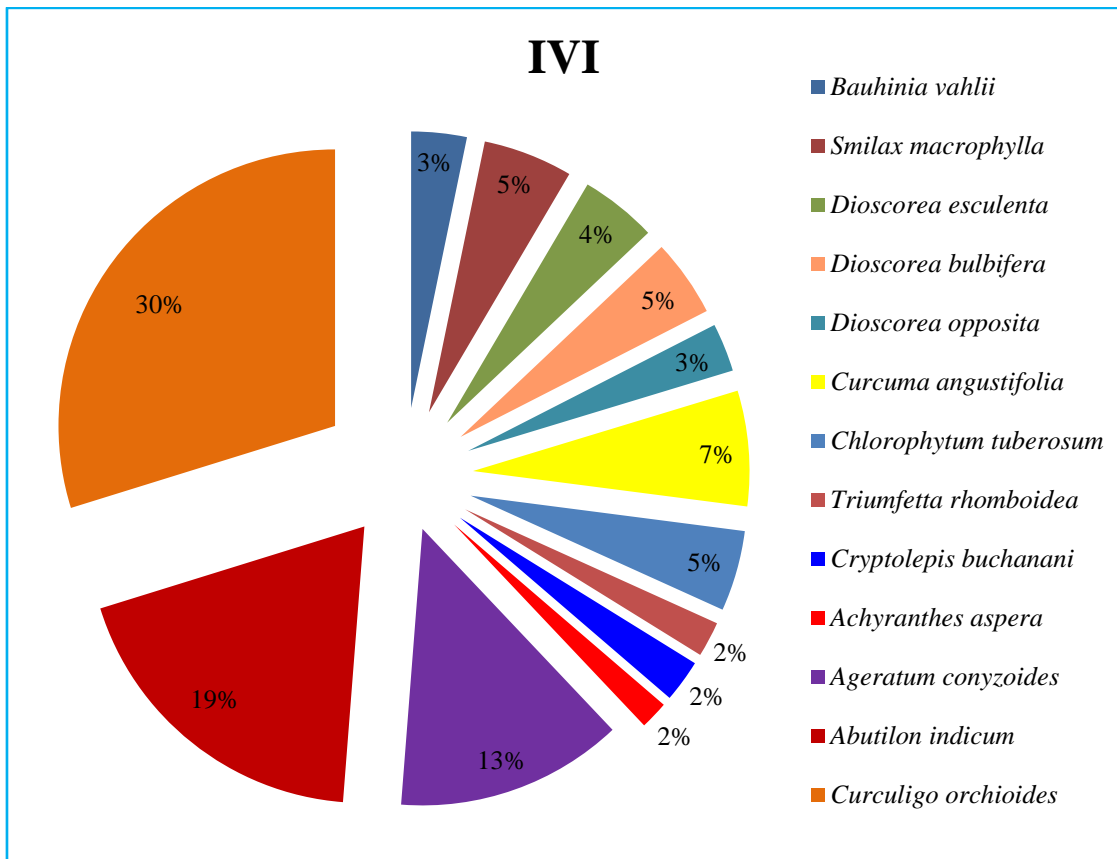


Fig. 4.38: Herbs and Climber species based on IVI value in Gudadi site

buchanani. Highest Basal Area was recorded for the *Curcuma angustifolia* 1.75. Lowest Basal Area was observed for the *Achyranthes aspera* 0.07. A Density of (2030) herbs and climber stems ha^{-1} was recorded in the Gudadi site. The density was recorded highest for (380 stems ha^{-1}) for the two species *Dioscorea esculenta* and *Curcuma angustifolia* followed by the *Curculigo orchioides* (320 stems ha^{-1}) and lowest was recorded for *Triumfetta rhomboidea* (80 stems ha^{-1}). The minimum IVI Value (12.98) was recorded for the *Achyranthes aspera* (Table 4.28).

Importance Value Index of trees at Basing site

Shorea robusta showed the dominant species in the Basing site, with the IVI value 123.60 *Pterocarpus marsupium* and *Terminalia chebula* The Co-dominant *Pterocarpus marsupium* and *Terminalia chebula* species are with IVI value 22.53 and 21.71 respectively. 100 % frequency was reported by the *Shorea robusta*. 10% frequency was observed by the three species *Tamilnadia uliginosa*, *Syzygium cumini* and *Gmelina arborea* Highest Basal Area was recorded for the *Shorea robusta* 14.75. Lowest Basal Area was observed for the *Tamilnadia uliginosa* 0.05. The minimum IVI value (3.38) was reported for the *Tamilnadia uliginosa*. *Shorea robusta* has the 41.2 % share in the forest of the Basing site. A density of 1290 tree stems ha^{-1} was recorded in the Basing site. The density was recorded highest (580 stems ha^{-1}) for *Shorea robusta* followed by the three species *Pterocarpus marsupium*, *Terminalia tomentosa* and *Terminalia chebula* (160 stems ha^{-1}) and lowest was recorded for the two species *Gmelina arborea* and *Syzygium cumini* (10 stems ha^{-1}), (Table 4.29).

Importance Value Index of Shrubs at Basing site

The maximum IVI (62.63) was observed for *Holarrhena pubescens*. *Phoenix acaulis* and *Desmodium gangeticum* has the IVI value of 53.35 and 52.49 respectively. 80% Frequency was recorded for the *Desmodium gangeticum*. 10% Frequency was observed for 4 species *Indigofera tinctoria*, *Ziziphus rugosa*, *Abutilon indicum* and *Abelmoschus moschatus*. Highest Basal Area was recorded for *Phoenix acaulis* 1.86. Lowest Basal Area was observed for *Ziziphus rugosa* 0.03. A Density of (740) Shrubs stems ha^{-1} was recorded in the Gudadi site. The density was recorded highest (190 stems ha^{-1}) for *Desmodium gangeticum*

followed by *Flemingia strobilifera* (150 stems ha⁻¹) and lowest was recorded (10 stems ha⁻¹) for tree species *Ziziphus rugosa*, *Abutilon indicum* and *Abelmoschus moschatus*. The minimum IVI Value (4.37) was recorded for the *Oxalis scandens* (Table 4.30).

Importance Value Index of herbs and Climbers at Basing site

The maximum IVI (43.50) was observed for *Curcuma angustifolia*. The Co-dominant species *Dioscorea esculenta* with the IVI value 41.25. 100% Frequency was recorded for the *Curcuma angustifolia*. Lowest Frequency 20 % was observed for *Cassia tora*. Highest Basal Area was recorded for *Dioscorea esculenta* and *Asparagus racemosus* 0.65. Lowest Basal Area was observed for *Cryptolepis buchmanii* 0.04. A Density of (940) herbs and climber stems ha⁻¹ was recorded in the Basing site. The density was recorded highest for (180 stems ha⁻¹) for *Curcuma angustifolia* followed by the *Cryptolepis buchmanii* (120 stems ha⁻¹) and lowest was recorded for four species *Dioscorea opposita*, *Andrographis paniculata*, *Gloriosa superba* and *Cassia tora* (80 stems ha⁻¹). The minimum IVI Value (18.37) was recorded for the *Andrographis paniculata* (Table 4.31).

Shahid and Joshi (2016) also reported that Dehra Dun forest division, Doon Valley, Uttarakhand, India. Phytosociological studies of the sites were conducted for tree species. Fifty quadrats of 10 × 10 m² size were laid on each site for studying the trees composition and structure. Diversity Indices were calculated for each site. Species richness ranged between six species in Thano to 15 species in Barkot. Two Way Indicator Species Analysis was performed and classified tree layer into eight groups depending on the eigen value. Bajpai *et al.* (2012) the mosaics of species distribution in any forest are governed by various environmental factors. The importance value indices varied in different site with different tree species this variation in dominant Co-dominant species because of the natural regeneration status soil type moisture content biotic interface may be the reason in the present investigation.

Table 4.29: Vegetation analysis of trees in Basing, Orchha (Abujhmar) Block

Common Name	Botanical Name	Frequency (%)	Density (stem/ha)	Basal area (m ² /ha)	Relative Frequency (RF)	Relative Density (RD)	Relative Basal Area (RBA)	IVI
Dhaura	<i>Anogeissus latifolia</i>	50	60	1.28	8.06	4.65	5.42	18.14
Chironji	<i>Buchanania lanzan</i>	30	40	0.18	4.84	3.10	0.78	8.72
Kasi	<i>Bridelia retusa</i>	20	20	0.14	3.23	1.55	0.61	5.38
Kuru	<i>Gardenia latifolia</i>	20	30	0.06	3.23	2.33	0.24	5.79
Tendu	<i>Diospyros melanoxylon</i>	30	40	0.47	4.84	3.10	2.00	9.94
Amala	<i>Embllica officinalis</i>	40	60	0.71	6.45	4.65	2.99	14.10
Kalikakri	<i>Tamilnadia uliginosa</i>	10	20	0.05	1.61	1.55	0.22	3.38
Paral	<i>Stereospermum colais</i>	30	50	0.28	4.84	3.88	1.20	9.91
Moyan	<i>Lannea coromandelica</i>	50	60	0.18	8.06	4.65	0.78	13.50
Gamhar	<i>Gmelina arborea</i>	10	10	0.44	1.61	0.78	1.87	4.26
Bijasal	<i>Pterocarpus marsupium</i>	60	80	1.57	9.68	6.20	6.65	22.53
Girchi	<i>Salacia oblonga</i>	50	70	0.13	8.06	5.43	0.57	14.06
Sal	<i>Shorea robusta</i>	100	580	14.75	16.13	44.96	62.51	123.60
Jamun	<i>Syzygium cumini</i>	10	10	0.34	1.61	0.78	1.43	3.82
Harra	<i>Terminalia chebula</i>	50	80	1.76	8.06	6.20	7.44	21.71
Saja	<i>Terminalia tomentosa</i>	60	80	1.25	9.68	6.20	5.29	21.16
Total		620	1290	23.60	100	100	100	300

Table 4.30: Vegetation analysis of shrubs in Basing, Orchha (Abujhmar) Block

Common Name	Botanical Name	Frequency (%)	Density (stem/ha)	Basal area (m ² /ha)	Relative Frequency (RF)	Relative Density (RD)	Relative Basal Area (RBA)	IVI
Nilni	<i>Indigofera tinctoria</i>	10	20	1.62	2.78	2.70	13.05	18.53
Chind	<i>Phoenix acaulis</i>	70	140	1.86	19.44	18.92	14.99	53.35
Katakuli	<i>Ziziphus rugosa</i>	10	10	0.03	2.78	1.35	0.24	4.37
Kangi	<i>Abutilon indicum</i>	10	10	0.61	2.78	1.35	4.92	9.04
Kamputa	<i>Flemingia strobilifera</i>	60	150	0.45	16.67	20.27	3.63	40.56
Salparni	<i>Desmodium gangeticum</i>	80	190	0.57	22.22	25.68	4.59	52.49
Lodara	<i>Desmodium pulchellm</i>	60	120	0.36	16.67	16.22	2.90	35.78
Duling/ Biabidang	<i>Embelia robusta</i>	20	40	0.88	5.56	5.41	7.09	18.05
Jungali bhindi	<i>Abelmoschus moschatus</i>	10	10	0.13	2.78	1.35	1.05	5.18
Duddi	<i>Holarrhena pubescens</i>	30	50	5.9	8.33	6.76	47.54	62.63
Total		360	740	12.41	100	100	100	300

Table 4.31: Vegetation analysis of herbs and climbers in Basing, Orchha (Abujhmar) Blocks

Common Name	Botanical Name	Frequency (%)	Density (stem/ha)	Basal area (m ² /ha)	Relative Frequency (RF)	Relative Density (RD)	Relative Basal Area (RBA)	IVI
Kosakanda	<i>Dioscorea esculenta</i>	60	70	0.65	11.76	7.45	22.03	41.25
Kargaya kanda	<i>Dioscorea opposita</i>	40	60	0.18	7.84	6.38	6.10	20.33
Tikhur	<i>Curcuma angustifolia</i>	100	180	0.14	19.61	19.15	4.75	43.50
Safed musli	<i>Chlorophytum tuberosum</i>	60	110	0.22	11.76	11.70	7.46	30.92
Satawar	<i>Asparagus racemosus</i>	30	50	0.65	5.88	5.32	22.03	33.24
Nagbel	<i>Cryptolepis buchanani</i>	30	120	0.04	5.88	12.77	1.36	20.00
Kali musli	<i>Curculigo orchitoides</i>	60	90	0.05	11.76	9.57	1.69	23.03
Ramdatun	<i>Smilax macrophylla</i>	40	80	0.24	7.84	8.51	8.14	24.49
Kalmegh	<i>Andrographis paniculata</i>	30	60	0.18	5.88	6.38	6.10	18.37
Kalihari	<i>Gloriosa superb</i>	40	60	0.18	7.84	6.38	6.10	20.33
Charota	<i>Cassia tora</i>	20	60	0.42	3.92	6.38	14.24	24.54
Total		510	940	2.95	100	100	100	300

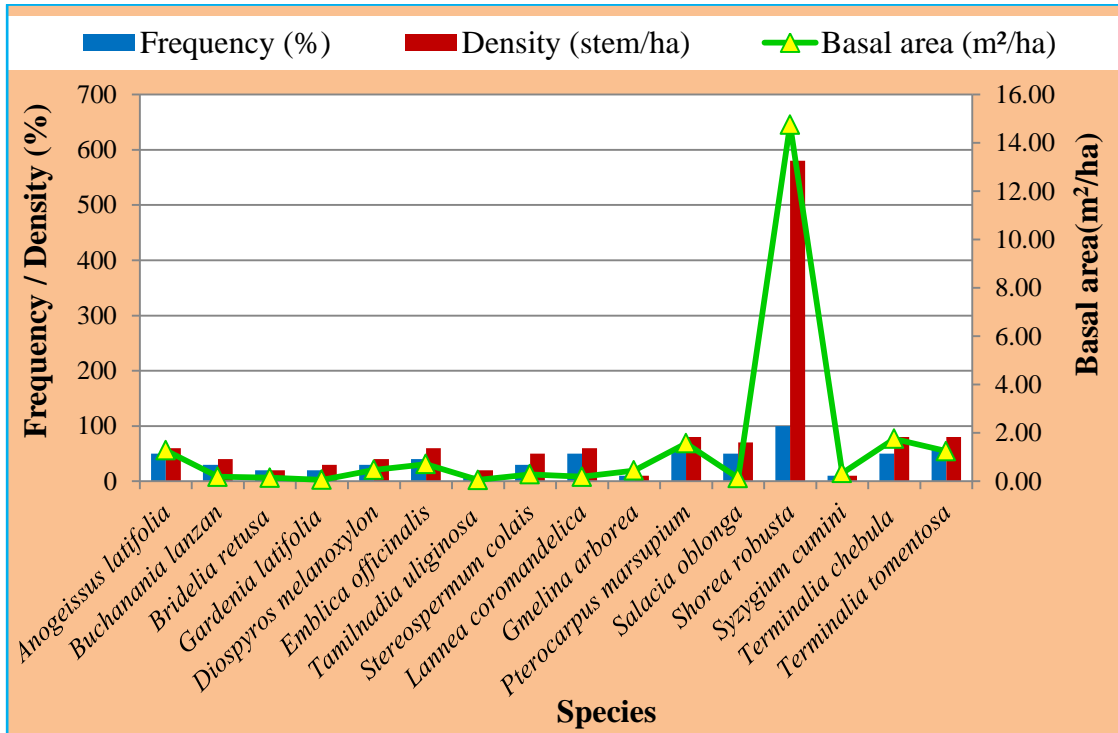


Fig. 4.39: Vegetation analysis of trees in Basing site

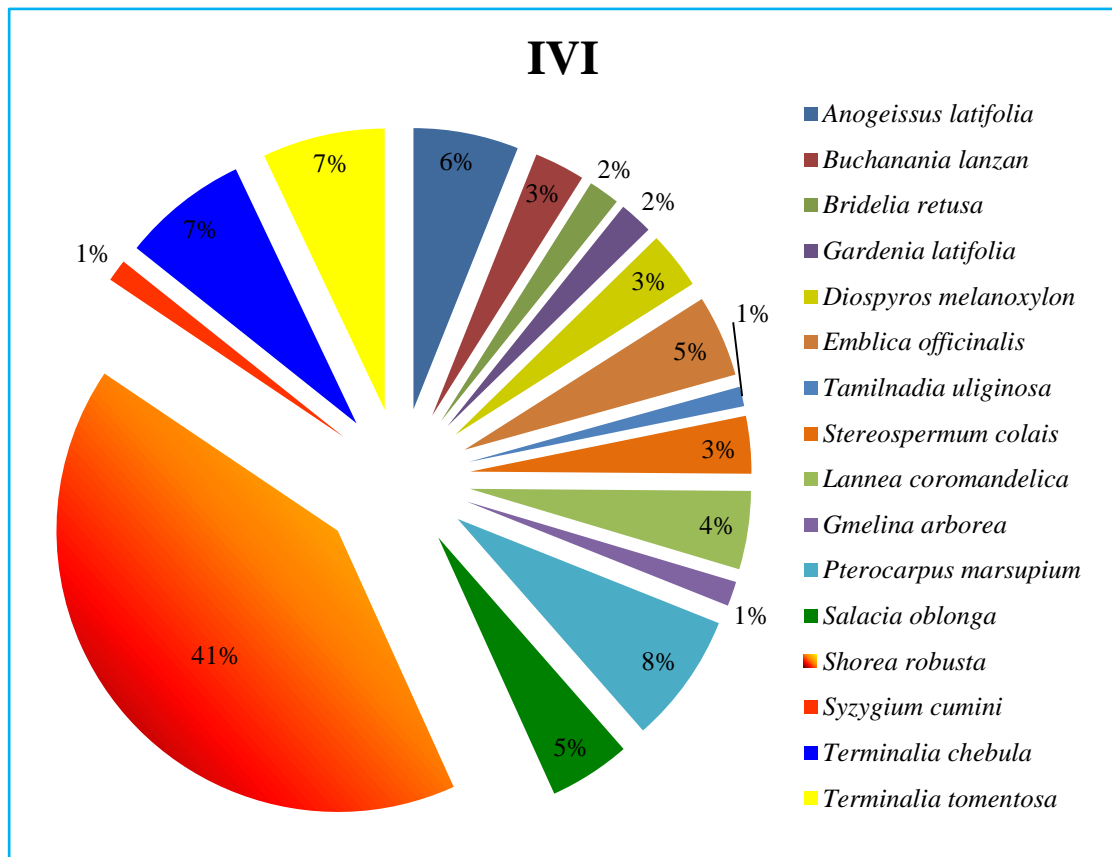


Fig. 4.40: Trees species based on IVI value in Basing site

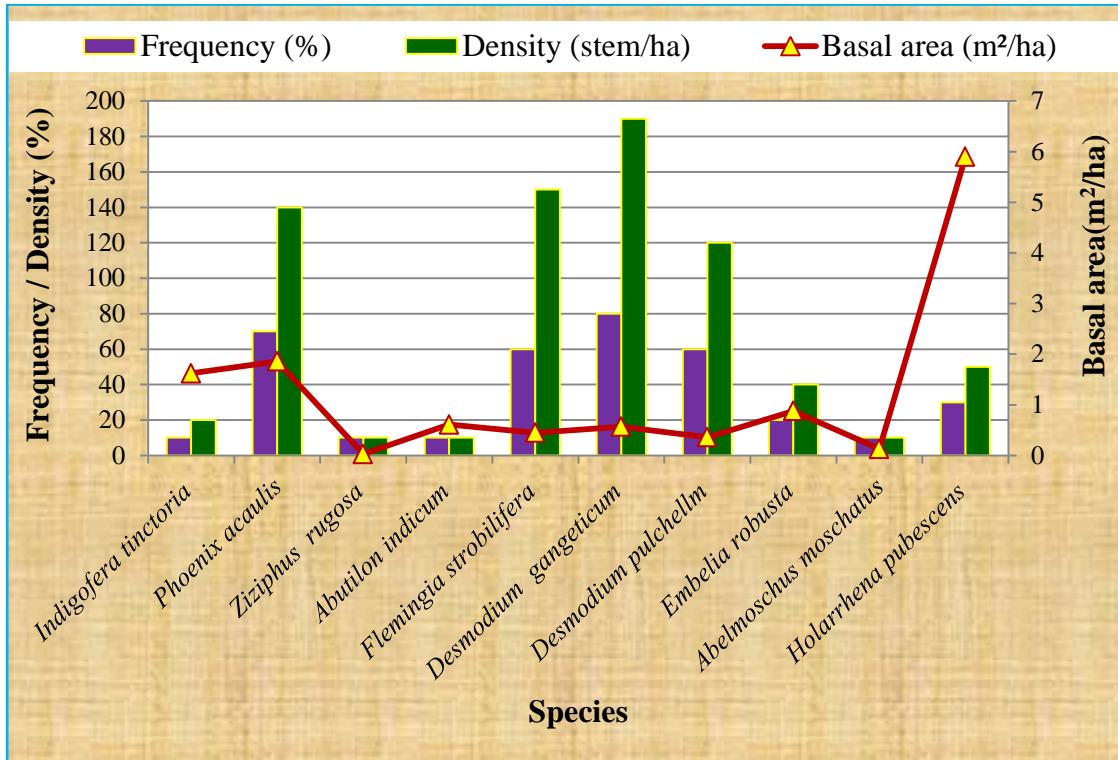


Fig. 4.41 Vegetation analysis of Shrubs in Basing site

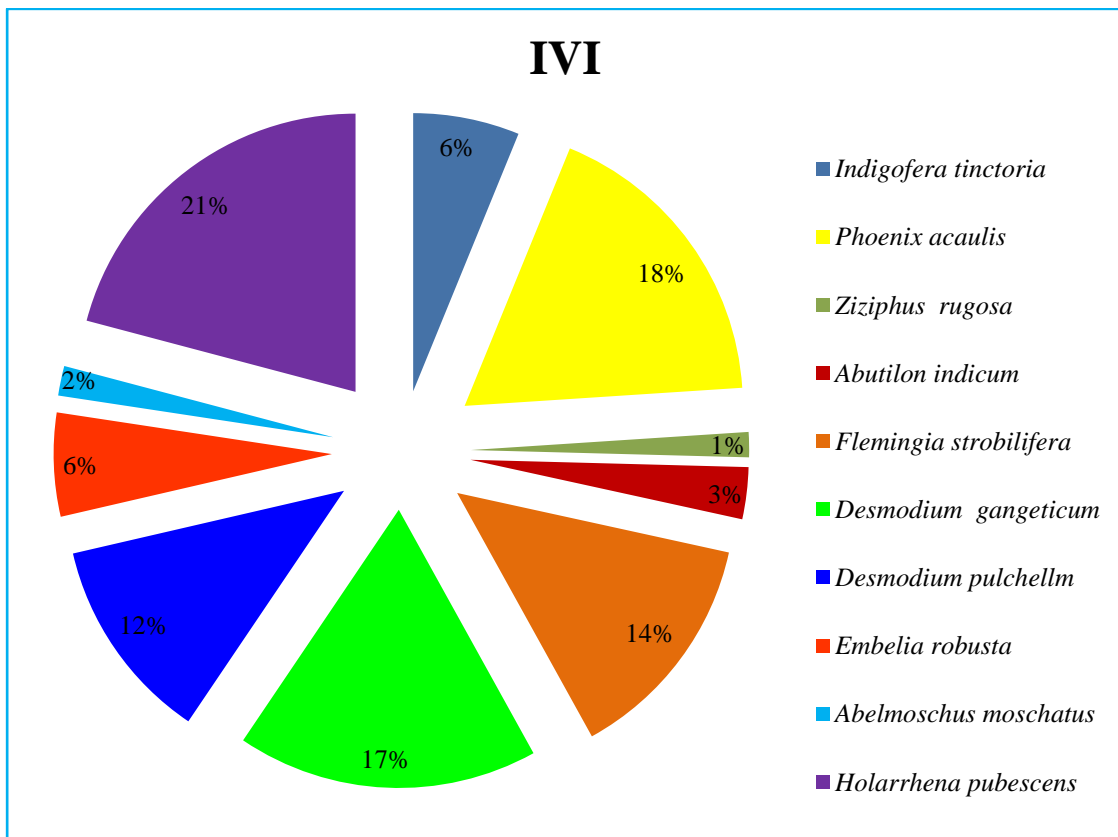


Fig. 4.42: Shrubs species based on IVI value in Basing site

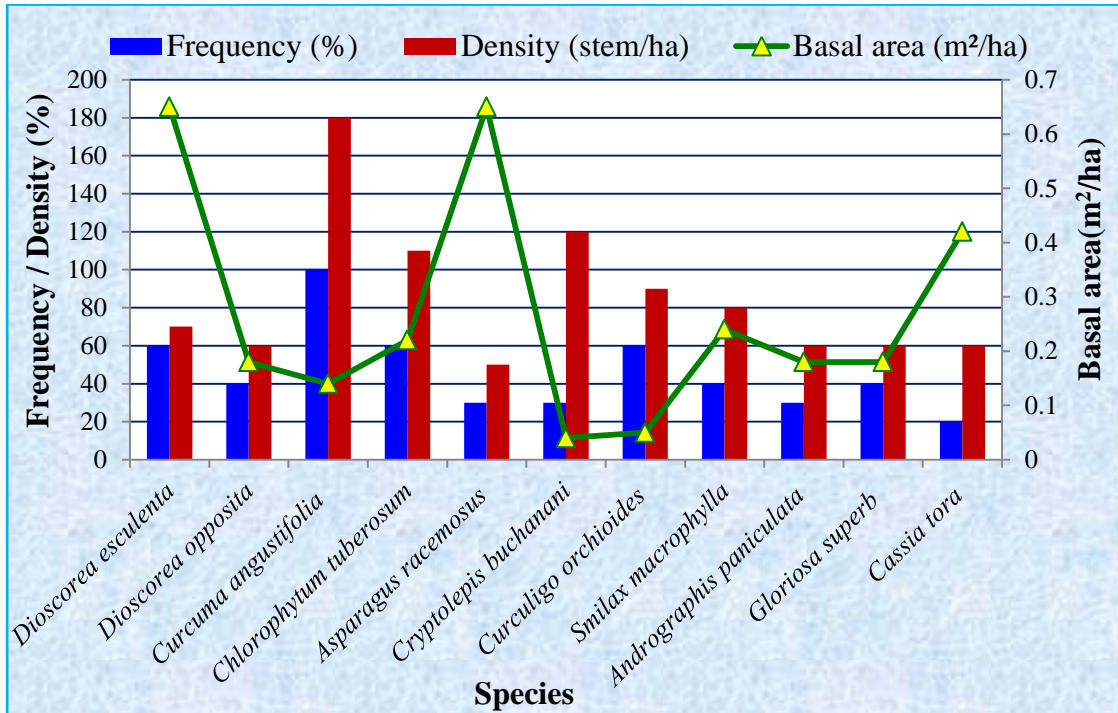


Fig. 4.43: Vegetation analysis of Herbs and Climbers in Basing site

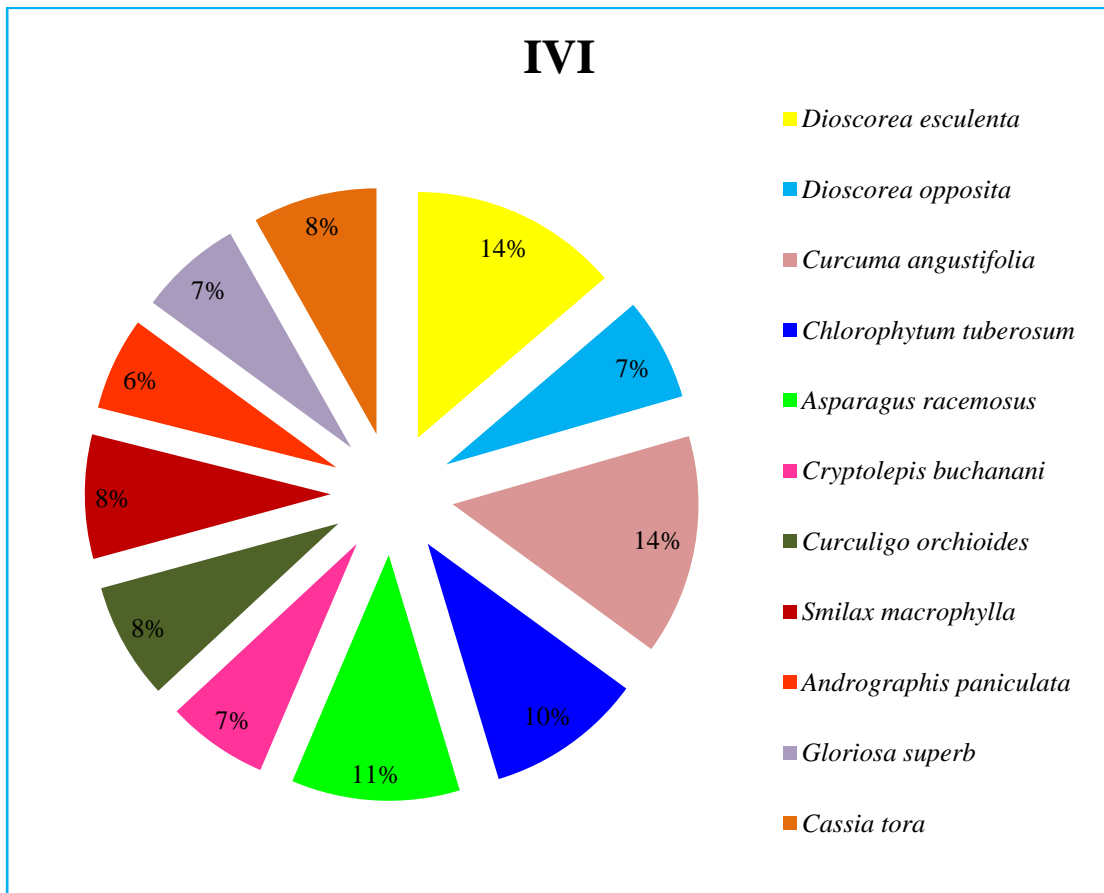


Fig. 4.44: Herbs and Climber species based on IVI value in Basing site

Similar study carried out by Khakhlyar & Sharma (2017) reported that the diversity of NTFPs of Garampani Wildlife Sanctuary in Karbi Anglong district, Assam, India. The data was collected by using random sampling method through laying quadrats along the transect of 5×5 m² (herbs & shrubs), 10×10 m² (tree) and calculated their diversity index and importance value index. 14 species of herbs/shrubs, 13 species of ferns/climber/epiphytes and 5 species of wild edible fruits were recorded. The average Shannon wiener index of diversity of different species were 1.96 (herbs/shrubs), 2.27 (ferns/climbers/epiphytic) and 1.50 (fruit edible) where ferns/climbers/ epiphytic species indicated higher importance value and diversity in comparison to herbs/shrubs and wild edible fruits species. *Delima sarmentosa* L. (climber) have high importance value index (115.81) and *Solanum indicum* L. (20.25) have lowest importance value index. The similar in case of NTFPs and medicinal plants dominance, frequency and density.

Criddle *et al.* (2003) have reported that vegetation of any place is the outcome interaction of many factors like meso-topographic gradients, the elevation, soil, species composition and biotic interferences. It is also reported that the regional patterns of species richness are consequences of many interacting factors, such as plant productivity, competition, geographical area, historical or evolutionary development, regional species dynamics, regional species pool, environmental variables and human activity. In present investigation also the all the three sites the tree, shrubs, climber and herbs dominance and diversity differ because of the so many biological factors like topography, soil type, moisture availability the species occurrence is not matched with the site. The Narayanpur Forest area the differ become of the so many factors are responsible in regeneration frequency and density in trees, shrubs, herbs and climber in two sites. The *Shorea robusta* was found the dominant species and co-dominated *Anageous latifolia* and *Clistanthus collinus*.

4.7 Entomophagy study

The Gond and Maria tribe residing in Narayanpur district of Chhattisgarh collected Chapora (Red ant), Chind kira (palm weevil), eggs and larvae of honey bees along with honey during summer season. Men and children were engaged in honey collection, while women involved in these activities. Children enjoy of this very much. Collection is done in the afternoon. To protect themselves from honey bees they spread a mixture prepared by chili and kerosene near the comb and keep the mixture below it. They felt it was nutritious for body as it was available at no cost for them hence it was also economical for them.

Similar phenomenon of Entomophagy has been reported by Fastoranti and Ajiboye (1993) in Kwara State of Nigeria in which four major tribes Yoruba, Ibara, Nupe and Baruba were present. Where seven species of insects are generally acceptable by these four groups namely Coleoptera, Hemiptera, Hymenoptera, Isoptera, Lepidoptera, Odonata and Orthoptera. Another study carried out by Ashru (1998) and reported that in Nigeria 69% larvae of venata are eaten by the people. In present investigation also it was observed that tribes having different food habits and they eat different insects, animal as per the availability of their population in that particular area. Some of the farmers of all the sites eat the larva of honey and red ant as chutney in their food. The larvae are prepared by roasting them in hot dry white sand for eating. The red ants are eaten to make chutney in the study area to fight with the make nutrition these eating habit came from their ancestors to full fill the requirement of protein and other minerals from these insects. The red ant also used as bite them to cure the fever as the ant having acid and that is effective to lowdown the temperature and body ach in the patient.

CHAPTER-V

SUMMARY AND CONCLUSIONS

The study entitled “**Documentation of Non Timber Forest Product Collection, Processing and Value Addition of Narayanpur Forest Area of Chhattisgarh**” was conducted at Narayanpur district of Chhattisgarh during 2016-2017.

SUMMARY

The maximum number of households was found in village Orchha (115) and maximum populations were recorded in village Chhotedongar (4302) in the study area.

- The population of scheduled tribe was higher in all the three sites of study area. The Schedule tribe population range varies from (51.60% - 98.005%). The highest population of Schedule tribe was recorded in Gudadi (98.05 %) and lowest population of Schedule tribe was in Benoor (51.60 %).
- The literacy percentage ranges from 30.41-51.16%. It was highest in Orchha (51.16%) and lowest in Bharanda (30.41%). Illiteracy percentage ranges recorded from 68.58-34.69%.
- All the villages had primary school and middle and high school where in Chhotedongar, Orchha and Benoor.
- All the three villages had Primary Health Center *viz.* Chhotedongar, Benoor and Orchha.
- All the five villages had independent Panchayat and the Panchayat of Basing was Kundala
- The landless labour was recorded 5.83 % and marginal farmer percentage was 20.00% only.
- During documentation and identification of NTFPs 21 trees, 9 shrubs, 7 herbs, 6 grasses and 17 climber NTFPs species were identified in the study

area. Which are utilized and collected for trade.

- Traditional collection methods and post harvest techniques which are used for NTFPs collection and processing in the study area resulted the check in natural regeneration as well as low quality produce.
- The market rate was found highest for *Curcuma aungustifolia* (250 Rs/kg) Tikhur, among other NTFPs. Honey (180-250Rs/kg) *Celastrus paniculata* (180-200Rs/kg), *Bauhinia vahlii* (100 bundal 120 Rs) *Termitomyces spp* (50-120Rs/kg) *Buchanania lanzan* (85-90 Rs /kg), *Andrographis paniculata* and *Astraeus hygromericus* (80-100Rs/Kg)and *Tamarindus indica* (25-40 Rs/kg.) also had good price, but available in low quantity.
- The maximum income was recorded from NTFPs then other sources of income. The maximum annual income was (Rs.9931.75) earned from NTFPs collection in Orchha village.
- Average yearly collection of NTFPs among all the villages were basically comprises of Tendu leaves (94750.00 bundles), Mahul leaves (1616.66 bundles) and Mahua (2800 kg.)
- Commercially important species like Mahua, Anola, Imli and Char etc. are over exploited. These species enlisted in the verge of extinction very soon if no control measure taken.
- The household annual income varied from Rs. 14063.75-29514.75. It was highest in village Benoor (Rs. 29514.75) and lowest in Gudadi (Rs. 14063.75).
- Marginal, Small farmer and landless labour on the study area had the average land holding of 3.46 acre. The population of marginal farmer was higher than the landless labour.
- The Agriculture production also very low in study area due to lack of irrigation facilities and knowledge of advanced technique of cultivation.

- The overall role in collection of NTFPs the trend observed was Women>Men>Children
- The women had the highest average involvement in the collection of NTFPs which was recorded 47.69 % in the study area.
- Tendu leaves and mahul leaves were collected in a good quantity. Hence income generated from these products was also high.
- IVI value for trees was recorded highest (136.96) for *Shorea robusta* in the site of Gudadi and recorded lowest (2.23) for *Grewia tiliifolia* in Orchha site.
- IVI value for shrubs was recorded highest (92.30) for *Flemingia strobilifera* in the site of Gudadi and lowest (1.79) for *olax scandens* in the site of Chhotedongar.
- IVI value for herbs and climber was recorded highest (235.54) for *Curculigo orchioides* in the site of Gudadi and lowest (1.21) for *Costus speciosus* in the site of Orchha study area.
- Total frequency for tree was recorded highest (840%), the density was recorded highest (1920 Stem/ha) and the basal area was recorded highest (36.23 m²/ha) in Orchha site.
- Total frequency for shrubs was recorded highest (820%) for Chhotedongar, the density was recorded highest (3210 Stem/ha) for Orchha and the basal area was recorded highest (12.41 m²/ha) for Bharanda.
- Total frequency for herbs and climber was recorded highest (1140%) for Orchha site, the density was recorded highest (3480 Stem/ha) for Orchha site and the basal area was recorded highest (8.79 m²/ha) for Benoor.

CONCLUSIONS

- Among all these Medicinal and NTFPs species enlisted and identified some are the source of their income such as *Madhuca latifolia* (Mhaua) flower, *Bauhinia vahlii* (Mahul) leaves, *Diospyros melanoxylon* (Tendu) leaves. There are 52 NTFPs were identified and documented during present investigation. The identified 52 NTFPs species belongs to 26 trees, 10 shrubs, 7 herbs and 9 climbers' species. A variety of NTFPs viz. seeds, leaves used for plate making, Tans and Dyes, Gum and Resin, edible products, Oil yielding, Bamboo, Fiber, Thatching, Broom making, Medicinal plants and Biocides (fungicidal, insecticidal and nematicidal). The forest of the study area has abundant different NTFPs plants species, which are used by villagers for various purpose viz. food, medicine, tans & dyes, oil, fuel, fodder, construction etc.
- The collected 65 plants as NTFPs in which 21 Tree, 9 Shrubs, 7 herbs, 6 Grasses, 17 Climbers and 5 Bio - products were collected and sold in the market as well as their own use. The fruit collection was carried out of *Syzygium cumuni*, *Diospyros melanoxylon*, *Aegle marmelos*, *Tamarindus indica*, *Semecarpus anacardium*, *Schleichera oleosa*, *Emblica officinalis*, *Buchanania lanzan*, *Mangifera indica*, *Terminalia chebula*, *Terminalia bellirica*, *Madhuca longifolia*, *Strychnos potatorum* and *Azadirachta indica* etc. The juice was collected from *Caryota urens* and *Phoenix aculis* .The medicinal plant Kalmegh was uprooted before maturity of seed thus next year production declines. The most of the trees, shrubs, herbs and grasses were used for medicinal purposes. Tribal people use the roots of many trees, shrubs, herbs and grasses as medicine. Lac and Cocoons were also collected by the tribals from the forest two major source tree species *Shorea robusta* and *Terminalia tomentosa* was found in study area for rearing Cocoon (Kosa) and one major source tree species *Schleichera oleosa* was found in study area for Lac production people called Kusumi Lac. The tribals are also collected meat of forest (Boda) and Mashroom and Bio-product honey, *Rhynchophorus ferrugineus* (chind kira), *Soplenopisis invicta* (Chapora) used for food purpose.

- The collected 65 plants as NTFPs in which 21 Tree, 9 Shrubs, 7 herbs, 6 Grasses, 17 Climbers and 5 Bio – products were collected processing technique used and sold in the market as well as their own use.
- The tree density was highest in Orchha site (1920 stem ha¹) followed by Gudadi site (1711 stem ha¹) and lowest on Basing site (1290 stem ha¹). The shrubs density was highest on Chhotedongar site (3230 stem ha¹) followed by Orchha site (3210 stem ha¹) and lowest on Basing site (740 stem ha¹). The herbs and climber density was highest on Orchha site (3480 stem ha¹) followed by Gudadi site (2030 stem ha¹) and lowest on Bharanda (720 stem ha¹).
- The tree frequency was highest on Orchha site (840%) followed by Benoor site (720%) and lowest on Chhotedongar site (560%). The shrubs frequency was highest on Chhotedongar (820 %) followed by Orchha site (810 %) and lowest on Basing site (360%). The herbs and climber frequency was highest on Orchha site (1140 %) followed by Gudadi site (690 %) and lowest on Bharanda site (430%).
- The tree basal area was highest on Orchha site (53.08 m²/ha) followed by Gudadi site (44.45m²/ha) and lowest on Basing site (560 m²/ha). The shrubs basal area was highest on Basing site (12.41 m²/ha) followed by Bharanda site (6.74 m²/ha) and lowest on Chhotedongar site (4.25 m²/ha). The herbs and climber basal area was highest on Benoor site (8.79 m²/ha) followed by Gudadi site (8.71 m²/ha) and lowest on Basing site (2.95m²/ha).
- The destructive harvesting practices, proper processing, value addition in NTFPs and medicinal plants is the major problem due to this the natural regeneration of these species very poor. The sustainable harvesting practices, post harvest technology and value addition of these produces will be need of the day and we may enhance the income of rural poor who are the stake holder of these forest produces.

Suggestion for future work

Documentation of Non Timber Forest Product collection, processing and value addition of Narayanpur was studied in tropical dry deciduous forest of Chhattisgarh. The study has limited scope since it is conducted only in a small area and covering few sample villages. There is need to replicate such studies in different area of Chhattisgarh for arriving a sound conclusion on pattern of NTFPs collection methods, processing, value addition and Socio-economic status of tribes forest dwellers. Continuing research is needed to determine the sustainable and scientific method for collection of NTFPs and post harvest techniques to enhance the quality of raw material and obtain better price through smart packaging.

- The extraction methods were crude, scientific training should be imparted on proper harvesting and utilization of the voluble NTFPs. The vulnerable and commercially important NTFPs such as Char, Mushroom, Aonla, Kalmegh, Honey, Tikhur etc. could be domesticated in the kitchen gardens and also in protected forest as in situ cultivation and conservation.
- There is a tremendous scope for developing NTFPs based cottage industries like Plate making, Lac and Sericulture, Honey extraction, Rope making, Craft center, Tamarind product center, Mushroom center, Tikhur processing center in the study area.
- Traditional knowledge concerning the collection and utilization of different NTFPs needs to be documented and utilized for the benefit of local communities.
- Institutional arrangement and marketing facilities need to be improved for denationalized forest products. The minimum support price for each NTFPs must be declared by the state Govt. and Central Govt. so, that the livelihood of the tribes who are the stake holder will be improved.

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APPENDICES

APPENDIX-I

परिशिष्ट

आर्थिक सर्वेक्षण के लिए प्रपत्र

(अ) व्यक्तिगत जानकारी

1.	गांव का नाम	
2.	व्यक्ति का नाम	
3.	पिता का नाम	
4.	जनजाति का नाम	
5.	बच्चों की संख्या	
6.	परिवार में सदस्यों की कुल संख्या	
7.	परिवार में NTFPs संग्रहण करने वालों की संख्या	
8.	शिक्षा की स्थिति	
9.	कुल रकबा	
10.	आय के अन्य स्रोत	
11.	विभिन्न NTFPs संग्रह की राशि	

(ब) NTFPs के संदर्भ में महत्वपूर्ण संसाधनों की पहचान व मूल्य

अकाष्ठकीय उत्पाद का नाम	वानस्पतिक नाम	एक वर्षीय व बहु वर्षीय झाड़ी	उपयोगी भाग	उपयोग	मूल्य प्रति किलो	वानिकी प्रकार
तेन्दू पत्ती						
माहूल पत्ती, रस्सी व बीज						
आँवला						
चिरोंजी						
आम						
मैदा						
बांस						
इमली						
साल पत्ती व बीज						
महूआ						

(स) अन्य अकाष्ठकीय उत्पाद

क्र.	वर्ग	प्रजातियाँ	उपयोग	उपयोग घरेलू व वाणिज्यिक उद्देश्य
1.	रंजक			
2.	तेल			
3.	गोंद			
4.	रेशा / जंगली कपास			
5.	पेय पदार्थ			
6.	चारा			
7.	जैव-उत्पाद			

(द) गांव स्तर की जानकारी

1.	गांव का नाम	
2.	गांव में घरों की संख्या	
3.	गांव की आबादी	
4.	गांव के हावी जनजाति	
5.	गांव से बाजार की दूरी	
6.	NTFPs संग्रहण कर्ताओं की संख्या	

(य) इन्फ्रास्ट्रक्चर

1.	गांव का नाम		
2.	पंचायत की स्थिति		
3.	बिजली		
4.	पानी के स्रोत		
5.	सड़क		
6.	फसलों की जानकारी		
7.	शिक्षित जनसंख्या		
	महिला		
	पुरुष		
8.	वनों की जानकारी		
	कुल भौगोलिक क्षेत्रफल		
	वन क्षेत्रफल		
	कृषि क्षेत्रफल		
9.	मजदूरी दर / दिन	महिला	पुरुष
10.	सिंचाई की स्थिति	सिंचित	असिंचित

(र) मौसम के अनुसार संग्रहण

मौसम	NTFPs का नाम	संग्रहण मात्रा		विक्रय मूल्य/मात्रा		उपभोग मात्रा	
		किंट/किलो	मूल्य	किंट/किलो	मूल्य	किंट/किलो	मूल्य
खरीफ							
रबी							
जायद							

(ल) बाजार चक्र

आढ़तिया		थोक विक्रेता		उपभोक्ता	
मात्रा	मूल्य	मात्रा	मूल्य	मात्रा	मूल्य

(व) NTFPs की कम उपलब्धता के कारण

- 1.
- 2.
- 3.
- 4.
- 5.

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