The study was conducted in two states viz. MP and Odisha. 10 villages from each state were selected for detailed study of domestication potential of six selected NTFPs viz. *Annona squamosa*, *Buchanania lanzan*, *Chlorophytum borivilianum*, *Commiphora wightii*, *Emblica officinalis* and *Litsea glutinosa* under agroforestry systems. From the study it was found that out of six species studied, *E. officinalis* showed the highest IVI (94.46) followed by *B. lanzan* (52.10) and *A. squamosa* (24.5). The IVI of *L. glutinosa* was 17.4. The IVI of *C. borivilianum* was very less (6.1) as it was rare in distribution.

*E. officinalis* has emerged as the most preferred species by the farmers for commercial cultivation. This was due to the fact that the gestation period of this species is low (4 years only). Also the farmers did not face any difficulty in selling the fruits. The cultivation of this species has been widely promoted under various schemes like NMPB and NHM programmes. Though, the prices of the fruits were less remunerative, there was consistency in market demand and pricing and the farmers and collectors were capable of capturing maximum value.

*A. squamosa* is second in the preference list of the farmers. This species also has low gestation period (4 years only). But inspite of it being a high value fruit crop there was very little exposure amongst the farmers regarding commercial cultivation of this species. Other species like *C. wightii* and *L. glutinosa* did not find any takers at all since both these species are slow growing and no efforts have been taken on their varietal improvement and domestication. The preference for *C. borivilianum* was low because the investment cost for the species was very high and the cost benefit ratio was also low which is why the farmers were reluctant to cultivate the species in their farmlands.

*A. squamosa* is in the second stage of domestication in Sehore (MP), Rairangpur and Koraput (Od). The species is grown under indigenous agroforestry system (homegardens) in these areas. In Hoshangabad, the fruits were unsustainably harvested and therefore, the species is in Stage 0 of domestication. However improved varieties have been developed and cultivated in other parts of India and thus, is in Stage 3 of domestication. *B. lanzan* is in the first stage of domestication in Baripada and Koraput.
Whereas, in other places the seeds were unsustainably harvested. Therefore, it is also in Stage 0 of domestication.

The tuberous root of *C. borivilianum* were unsustainably harvested in Baripada and Rairangpur districts of Odisha and thus, is in Stage 0 of domestication whereas in Hoshangabad and Sehore (MP) wild variety of the species was commercially cultivated. However no improved variety of the species has been developed till date. Therefore, the species in Stage 2 of domestication.

*C. wightii* occurs in wild state in MP and is domesticated in Hoshangabad district (MP). The species is not found in Odisha. While improved variety (Marusudha) has been developed by CIMAP, Lucknow, but its cultivation technique has not reached the farmers and is therefore, in Stage 2 of domestication process.

*E. officinalis* is already domesticated and has come into the regular cropping system in MP and therefore, it is in the Stage 3 of domestication. *L. glutinosa* is propagated through root suckers in nursery at Matkuli in Pipperiya range of Hoshangabad MP. In Baripada, Rairangpur and Koraput Forest Divisions the bark of *Litsea* is unsustainably harvested and therefore, is in Stage 0 of domestication.

Among the different sources of income the contribution of NTFPs was the highest in both the states. In MP second highest contribution in household income was from agroforestry whereas in Odisha it was from agriculture. The average contribution in annual household income of *A. squamosa* was the highest (41.2%) followed by *B. lanzan* (8.1%). The contribution of *E. officinalis* and *L. glutinosa* was 3.2% and 4.7% respectively. The contribution of *C. borivilianum* was insignificant due to its unavailability in the study areas whereas the species *C. wightii* was not found in the study site.

The collection of *A. squamosa* fruits was worth of Rs. 2,478,232 which was highest followed by *B. lanzan* kernels which was worth of Rs. 484,985. The lowest amount of annual collection was of *C. borivilianum* roots which were 20 kg worth of
Rs. 2,970. The total amount of collection of *E. officinalis* fruits and *L. glutinosa* bark was 13,065 kg and 8,938 kg worth of Rs. 193,268 and Rs. 138,756 respectively.

*A. squamosa* shows the highest volume traded from the study area in both the states (125464 kg). The fruits of *E. officinalis* are second in the list of volume traded with 13065 kg. This is followed by *B. lanzan* and *L. glutinosa* whereas, *C. borivilianum* and *C. wightii* did not show any volumes at all. This indicates that the demand of *A. squamosa* was the highest among the six selected NTFPs.

The roots of *C. borivilianum*, kernels of *B. lanzan* and gum of *C. wightii* were high priced NTFPs whereas, the bark of *L. glutinosa*, fruits of *E. officinalis* and *A. squamosa* were low priced NTFPs. The collectors of *B. lanzan*, *C. wightii* and *C. borivilianum* get higher price as compared to other selected NTFP plant products in MP. In Odisha also a similar kind of situation was observed where the collectors of fruits of *B. lanzan* get high price as compared to the collectors of fruits of *E. officinalis*, *A. squamosa* and bark of *L. glutinosa*.

The price trends of different NTFPs in last five years show that fruits of *A. squamosa* and *E. officinalis*, kernels of *B. lanzan* and tuberous roots of *C. borivilianum* has consistent growth as its price has increased steadily in last five years. Such products at farmer’s gate have much acceptability since there is less price fluctuation thereby evading farmers against any losses. Moreover, the volumes in which these are traded are also much higher as the consumers of these products are more. Thereby the demand is consistent and high. The price of gum from *C. wightii* shows slow growth while the price of bark of *L. glutinosa* (Maida Chhal) shows stagnation. The Cost Benefit Ratio of *B. lanzan* (1:7.4) was the highest followed by *E. officinalis* (1:33) among the selected species studied while that of *L. glutinosa* (1:1.10) was the lowest. Therefore, from the present study the following could be concluded:

1. Serious conservation measures are required for *C. borivilianum*, *C. wightii* and *L. glutinosa* to maintain its natural population in wild. Ex- situ conservation and sustainable harvesting protocols need to be developed.
2. Preference of farmers for a particular NTFP tree species is based on consistency in price trend, volume traded and social acceptance.

3. Among the six species studied only *E. officinalis* is in the third stage of domestication. Efforts for domesticating the rest of the selected species are required.

*E. officinalis* (27) and *A. squamosa* (26) scored high on domestication potential parameters. This was followed by *B. lanzan* (25) and *C. borivilianum* (17) which exhibited moderate domestication potential. The species *C. wightii* (11) and *L. glutinosa* (11) had low domestication potential. Therefore, the following could be concluded:

1. The demand of *A. squamosa* was the highest among the six selected NTFPs.

2. *E. officinalis* and *A. squamosa* has the highest potential for domestication and has been widely accepted amongst the farmers as compared to rest of the species.

3. Trade restrictions also restrain the farmers from domesticating NTFPs species

4. Specific schemes are required for domestication of *C. wightii* and *L. glutinosa*

The farmers in the study area expressed high potential for further developing the plantations of *A. squamosa* if provided with better knowledge regarding the improved varieties and its package of practice for cultivation. The species *C. wightii* and *L. glutinosa*, on the other hand, has the lowest potential for domestication. These species are also vulnerable to extinction from wild due to their unsustainable harvesting and therefore, efforts must be taken to ramp up the *in-situ* conservation and *ex-situ* cultivation measures to protect these species while maintaining the commercial demand for the same. *L. glutinosa* is a species which is not been taken as a priority species for conservation in any schemes except for some mixed plantation by state forest department in MP and ban on its harvesting in Odisha. However, the trade of its product is not banned. Therefore, there is illicit harvesting taking place.
The main hurdles in domestication of *C. wightii* and *L. glutinosa* are as follows:

1. **Slow growth of species**

2. The product harvested eg. gum and bark involved wounding the tree thereby risking the plant to death and therefore, the same plant cannot be harvested year after year.

3. For domestication of tree species under Agroforestry, the farmers require big land holdings which may not be available in many cases

As far as agroforestry feasibility is concerned, it was found that both the states have conducive environment for agroforestry and the overall feasibility of agroforestry in MP was 62% (36 out of 58) whereas, in Odisha it was 58% (34 out of 58). The main reason for variance between the two was the difference in the Policy and legal framework support and compliances in these two states.

NMPB has formulated two types of schemes for funding the projects related medicinal plants having assured market. Out of six selected species, three species viz. *C. wightii*, *C. borivilianum* and *E. officinalis* have been in the prioritised list of species and are therefore, covered under NMMP of NMPB. *A. squamosa* is taken by Horticulture and Food Processing Department under National Horticulture Mission. The remaining species viz. *B. lanzan* and *L. glutinosa* are not covered under any scheme. It was observed that MP had the highest takers of NMPB and NHM schemes due to conducive environment but at the same time Odisha had very few farmers opting for such schemes as they found it very cumbersome and faced a lot of bureaucratic hurdles in availing these schemes.

In Madhya Pradesh there are specific policies related to private forestry known as “Lok Vaniki”. Moreover, the government also declares minimum support price for the NTFPs so as to protect the interest of the agroforestry growers. The state has formed the M.P. State Minor Forest Produce Trading & Development Co-operative Federation
and initiated a People’s Protected Area approach to involve local people in protection and conservation of valuable forest resources in resource rich areas.

In MP the MFP Federation procures Achar- guthli (*B. lanzan*) and Aonla (*E. officinalis*) from the Primary Cooperative Societies and therefore, MSP is available for these two species only. The fruits of *A. squamosa* and *E. officinalis*, kernels of *B. lanzan* and tubers of *C. borivilianum* from cultivated source does not need Transit Permits as per the Indian Forest Act, 1927. The gum from *C. wightii* and bark from *L. glutinosa* requires Transit Permit whether collected from forest or collected from cultivated source.

In Odisha, the Government does not have any separate policy for agroforestry but the state has lot of community forestry initiatives promoted by the local communities or facilities by NGOs. Therefore, it is clear that though Odisha has policies and regulatory bodies regarding trade and harvesting of NTFPs, but it fails to provide adequate policy support for *in-situ* and *ex-situ* cultivation. It can be concluded that as compared to MP, Odisha’s Policy support are not favourable enough for supporting agroforestry.

In MP the models practised are Agri-horticulture, Agri-horti-silviculture, Agri-horti-Pasture and Traditional agroforestry model in the form of Homestead. In Odisha the different types of models practiced are Traditional Agroforestry, Agri-horticulture, Agri-horti-silviculture and Agro-horti-floriculture.

The more the number of components, the more is the income. Farmers select the species depending upon their subsistence or monetary requirement. Usually they cultivate seasonal vegetables for meeting their own subsistence requirement. Horticulture species were selected to obtain monetary gains which could meet the expense of cultivating agriculture crops. The species were selected depending upon the ease of marketing. In MP the farmers had large land holdings than the farmers of Odisha where the land was small and too much fragmented. Therefore, the farmers in MP were able to grow and cultivate more species than the farmers in Odisha.
Based on the prevailing agroforestry practices and the feasibility of
domestication of six selected species in the study 5 types of agroforestry models are

*E. officinalis* could be planted in alley cropping system, with a spacing of 4m x 4m spacing between rows. East – West direction of alleys should be followed is so that there is minimum shade effect of the agriculture crops. Boundary plantation, adopted from traditional agroforestry system, is proposed for *A. squamosa* and *B. lanzan* as the respondents were already practicing such model but without any proper layouts and spacing.

The species *C. borivilianum*, *C. wightii* and *L. glutinosa* continues to be under threat and have a high commercial demand. But these species have scaled low on farmer’s preference. This is because the species *C. wightii* and *L. glutinosa* have high gestation period and *C. borivilianum* involves high cost of investment and low Cost Benefit Ratio. Therefore, *C. wightii* and *L. glutinosa* could be planted in boundaries of village common land at a spacing of 1.5 m x 1.5 m with an undergrowth of fodder species and medicinal plants like *C. borivilianum*.

It is clear from the study that domestication of NTFP provides sustainable income to farmers on one hand and on the other meet the commercial demand for the species thereby reducing pressure from the wild. It is a way of responsible business wherein social equity and environmental concern are interwoven with economic prosperity. Domestication is therefore, a win–win scenario wherein both conservation and economic development go hand-in-hand.

There are many pharmaceutical, nutritional and Fast Moving Consumer Goods (FMCG) companies that source their raw materials from wild are hugely affected by declining resources resulting not only in paying up higher prices for the raw materials but are also getting increasingly inferior quality of such raw material leading to higher
percentage of wastages and thereby escalating the cost of production. This also impacts the consumers who are affected by the price rise of such products.

The current research would help the companies in understanding the insights of the various facets of domestication and therefore, built a robust domestication programme as strengthening its backward linkage of supply chain. Such linkages have both economic sense and inclusive growth of the catchments of the manufacturing units as part of companies Corporate Social Responsibility (CSR). One of such example is of ITC limited which have strengthened in raw material sourcing through domestication of their pulpwood supply. The research is applicable to any of such forestry species as it provides a basis framework of feasibility study and many more species could be adopted on this platform as per the suitability of the companies.

Apart from the selected NTFP species studied, other species which are fast depleting from forest and needs immediate domestication efforts are *Aegle marmelos* (Bael) from Central India; *Terminalia arjuna* (Arjun) from Central India; *Garcinia indica* (Kokum) from South India; *Saraca asoka* (Ashoka) from Tripura; *Aquilaria malaccensis* (Agarwood) from Tripura; *Acacia catechu* (Katha) from Central India and Himalaya foothills; *Cinnamomum tamala* (Tejpatta) from South India and Northern Himalaya; *Sapindus* sp. (Ritha) from Andhra Pradesh and *Taxus baccata* (Thuner) from Uttarakhand and Northern Himalaya.