



Preliminary Assessment of Regeneration, Afforestation and Nurseries at Selected Sites of TBTTT



**The Consortium for the Monitoring & Evaluation of TBTTT
(IUCN/FAO/WWF)
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Acknowledgements

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The field testing team comprised of Dr Aurangzeb Khan, Team leader (IUCN), Syed Kamran Hussain (WWF), Asim Jamal (IUCN), and Muhammad Afzal (FAO). The consortium is grateful to these members of the team who took the risk and dared to travel amid the on-going COVID-19 situation and gathered the field data.

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Mahmood Akhtar Cheema

Country Representative,
IUCN Pakistan

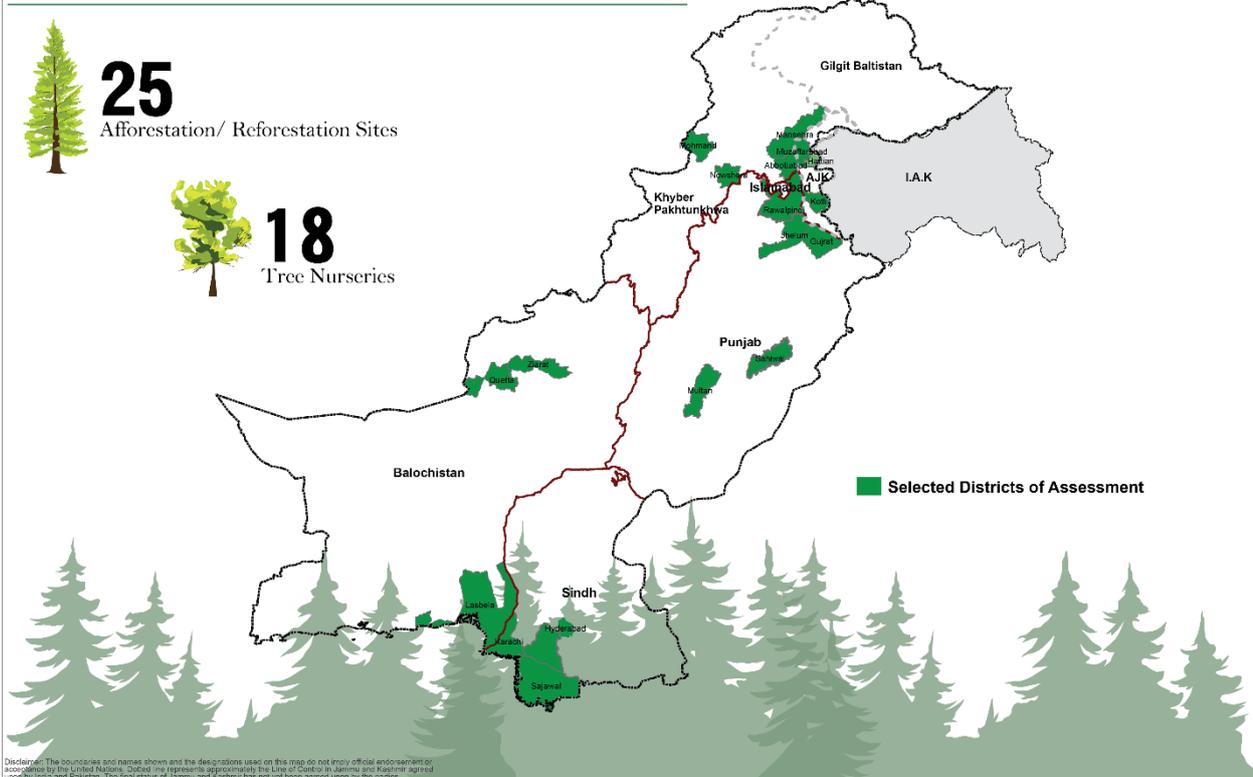
Rebekah Bell

FAO Representative a.i. in
Pakistan

Hammad Naqi Khan

Director General, WWF
Pakistan

ASSESSMENT OF SELECTED AFFORESTATION & REFORESTATION SITES AND TREE NURSERIES



List of Acronyms and Abbreviations

| | |
|--------------|---|
| AJK | Azad Jammu and Kashmir |
| ANR | Assisted Natural Regeneration |
| Av Km | Avenue Kilometer |
| AvM | Avenue Miles |
| BLEF | Broad Leaved Evergreen Forest |
| BR | Bare Rooted |
| FAO | Food and Agriculture Organization of the United Nations |
| FD | Forest Division |
| GB | Gilgit Baltistan |
| Ha | Hectare |
| IUCN | International Union for Conservation of Nature |
| KP | Khyber Pakhtunkhwa |
| M&E | Monitoring and Evaluation |
| MoCC | Ministry of Climate Change |
| PM&E | Pilot Monitoring and Evaluation |
| TBTP | Ten Billion Tree Tsunami Programme |
| TPM&E | Third Party Monitoring and Evaluation |
| TP | Tube Plant |
| WWF-Pakistan | World-Wide Fund for Nature Pakistan |

List of Common and Scientific Names of Trees

| Common Name | Scientific Names |
|-----------------|-----------------------------------|
| Ailanthus | <u><i>Ailanthus excelsa</i></u> |
| American Sau | <i>Cuperessus arizonica</i> |
| Arjun | <i>Terminalia arjuna</i> |
| Babul | <u><i>Acacia nilotica</i></u> |
| Bakaine | <i>Melia azedarach</i> |
| Chir | <u><i>Pinus roxburghii</i></u> |
| Dodonea/Sanatha | <i>Dodonaea viscosa</i> |
| Eucalyptus | <i>Eucalyptus camaldulensis</i> |
| Frash | <i>Tamarix aphylla</i> |
| Guava | <i>Psidium guajava</i> |
| Gulmor | <i>Delonix regia</i> |
| Huisache | <i>Acacia farnesiana</i> |
| Imli | <i>Tamarindus indica</i>) |
| Iple iple | <i>Leucaena leucocephala</i> |
| Juniper | <u><i>Juniperus recurva</i></u> |
| Kachnar | <i>Bauhinia variegata</i> |
| Kaner | <i>Cascabela thevetia</i> |
| Kikar | <i>Acacia nilotica</i> |
| Lagistonia | <u><i>Lythraceae speciosa</i></u> |
| Mulberry | <u><i>Morus alba</i></u> |
| Neem | <u><i>Azadirachta indica</i></u> |
| Olive | <u><i>Olea europaea</i></u> |
| Phulai | <u><i>Acacia modesta</i></u> |
| Poplar | <u><i>Populus euphratica</i></u> |

| | |
|----------------|---------------------------------------|
| Quetta ash | <u><i>Fraxinus xanthoxyloides</i></u> |
| Rhizophora | <u><i>Rhizophora mucronata</i></u> |
| Robinia | <u><i>Robinia pseudoacacia</i></u> |
| Saru | <u><i>Cupressus sempervirens</i></u> |
| Shisham | <u><i>Dalbergia sissoo</i></u> |
| Simal | <u><i>Bombax ceiba</i></u> |
| Siris | <u><i>Albizia lebbeck</i></u> |
| Sukhchain | <u><i>Pongamia pinnata</i></u> |
| White mangrove | <u><i>Avicennia marina</i></u> |
| Willow | <u><i>Salix alba</i></u> |
| Ziziphus | <u><i>Ziziphus jujuba</i></u> |

Table of Contents

| | |
|--|-----------|
| Acknowledgements..... | 2 |
| List of Acronyms and Abbreviations | 4 |
| List of Common and scientific Names of Trees..... | 5 |
| 1. Introduction | 9 |
| 2. Purpose | 9 |
| 3. Methodology..... | 9 |
| 3.1. Selection of Size and Shape of the Sample Plots | 9 |
| 3.2. KoBo Toolbox | 11 |
| 3.3. Site Selection..... | 12 |
| 4. Evaluation of Regeneration and Afforestation Sites..... | 13 |
| 4.1. Natural Regeneration..... | 14 |
| 4.2. Sowing and Dibbling..... | 16 |
| 4.3. Block Plantations..... | 17 |
| 4.4. Rehabilitation of Riverine Forests..... | 22 |
| 4.5. Rehabilitation of Irrigated Plantation | 24 |
| 4.6. Linear Plantations | 25 |
| 4.7. Mangrove Forests | 28 |
| 4.8. Urban Forestry | 30 |
| 4.9. Analysis of the Results of Evaluation of Regeneration and Afforestation | 31 |
| 5. Assessment of Selected Tree Nurseries..... | 35 |
| 5.1. Private Women Nursery, Makrhia Bala, Shinkhari, Siran Forest Division, Khyber Pakhtunkhwa..... | 36 |
| 5.2. Basti Sher Khan, Departmental Nursery, Gallies Forest Division, Khyber Pakhtunkhwa..... | 36 |
| 5.3. Aqrab Daag Bala, Departmental Nursery, Mahmand Forest Division, Khyber Pakhtunkhwa..... | 37 |
| 5.4. Aqrab Daag Bala, Women Private Nursery, Mahmand Forest Division, Khyber Pakhtunkhwa..... | 37 |
| 5.5. Palotar, Jhelum Valley Departmental Nursery, JV Forest Division, AJK..... | 38 |
| 5.6. Rawani Private Nursery, Jhelum Valley Forest Division, AJK | 38 |
| 5.7. Kathai Departmental Nursery, Jhelum Valley Forest Division, AJK..... | 39 |
| 5.8. Rata Kas Lehrar Departmental Nursery, North Rawalpindi Forest Division, Punjab | 40 |
| 5.10. Chichawatni Departmental Nursery, Chichawatni Forest Division, Punjab..... | 41 |
| 5.11. Kirpal Pur Road Departmental Nursery, Multan Forest Division, Punjab..... | 41 |
| 5.12. Shah Bandar Departmental Nursery, Left Bank Forest Division, Sindh | 42 |

| | |
|--|----|
| 5.13. M-9 Sub-Division 2 Departmental Nursery, Karachi 1 Forest Division, Sindh | 42 |
| 5.14. Lasbela Departmental Nursery, Lasbela Forest Division, Baluchistan | 43 |
| 5.15. Damb Coast Winder Departmental Nursery, Lasbela Forest Division, Baluchistan..... | 43 |
| 5.16. Spiny Road Quetta Departmental Nursery, Quetta Forest Division, Balochistan..... | 43 |
| 5.17. Forest Colony Ziarat Departmental Nursery, Ziarat Forest Division, Balochistan | 45 |
| 5.18. Airport Road Zarghun Departmental Nursery, Quetta Forest Division, Balochistan..... | 45 |
| 5.19. Analysis of the Results of Evaluation of Forest Tree Nurseries | 46 |
| | |
| 6. Conclusions and Recommendations | 47 |
| 6.1. Regeneration and Afforestation | 47 |
| 6.2. Forest Tree Nurseries..... | 49 |
| | |
| Annexes | |
| Annexes 1: Natural Regeneration and Afforestation Evaluation KoBo Toolbox Form | 51 |
| Annex 2: Forest Tree Nursery Evaluation KoBo Toolbox Form..... | 60 |
| Annex 3: List of Regeneration and Afforestation sites Selected for Evaluation | 66 |
| Annex 4: List of Forest Tree Nurseries Selected for Evaluation..... | 67 |
| Annex 5: List of all regeneration and Afforestation Sites with Official Count of Plants, The Optimum Number that should be planted and actual count | 69 |

Preliminary Assessment of Regeneration, Afforestation and Nurseries at Selected Sites of TBTP

1. Introduction

The Ten Billion Tree Tsunami Programme (TBTP) is a major initiative of the Government of Pakistan, which has wide national and international recognition. In view of its importance, and to ensure transparency in its implementation and results, the Ministry of Climate Change (MoCC) decided to create a mechanism for independent third-party monitoring and evaluation of the TBTP. For this purpose, the MoCC, requested the International Union for Conservation of Nature Pakistan (IUCN), the Food and Agriculture Organization of the United Nations (FAO), and World-Wide Fund for Nature Pakistan (WWF) to form a consortium for independent third party monitoring. The preliminary assessment of regeneration, afforestation and the forest tree nurseries has been carried out within the limitations of limited travel and face to face meetings with the concerned officials due to the COVID19 pandemic.

2. Purpose

The purpose of this assessment was to undertake a preliminary appraisal of regeneration and afforestation success, and the forest tree nurseries in determining the effectiveness of planting and nursery operations, identifying problems, and verifying whether the standard procedures were adopted.

3. Methodology

A combination of sampling techniques involving field sampling, and where permissible, Unmanned Aerial System (UAS) technology (drone photography) was employed to monitor and evaluate the rehabilitation and restoration of degraded forests, ecosystems, plantation sites and the tree nurseries. The challenge in evaluating regeneration and afforestation success is in choosing an inventory method that will give reliable information not only on germination success, seedling survival, seedling condition, spatial distribution of surviving seedlings, but also, the species composition, plant community structure, and biodiversity and ecosystem services restoration and rehabilitation. Information on survival is useful in determining the effectiveness of planting and nursery operations.

3.1. Selection of Size and Shape of the Sample Plots

The sampling methods have three challenges: (a) how to take a sample; (b) how many samples to take; (c) and how to locate sample points and implement unbiased sampling. The most used method is quadrat sampling. There are several statistical methods for designing a sampling methodology; however, keeping in view the scope of the work, the

sampling method selected for the TBTP is based on similar work undertaken in other countries.



Figure 1: Sampling in Mangroves – Sajawal, Sindh

A quadrat size of 1/10th (10%) or 1/100th (1%) ha is commonly used in the field both for regeneration and afforestation surveys. The quadrat is usually a circular, or a rectangular plot depending on the type of afforestation or terrain. The Consortium Monitoring Team tested both 1/10th and 1/100th ha circular and rectangular plots before starting the evaluation. In Jugian Daur Community Plantation, data were collected through circular plots with radius of 17.84 m having an area of 1/10th ha and circular plot with radius 5.64 m having area 1/100th ha. A total of 10 samples were taken with both sizes - 5 samples each size. In 1/10th ha quadrats, a total of 538 plants were counted with an average of 107.6 per plot or 1076 plants per ha while in 1/100th ha quadrat 54 plants were counted with an average of 10.8 plants per sample or 1060 per ha. Thus, the result of sampling was similar with both 1/100th and 1/10th ha size quadrats. Then, 1/100th ha quadrat was tested in different shapes (circular plot radius 5.64 and square plot having 10 X 10 m in Maser Reserve Forest, Shinkhari, Siran Forest Division. The average number of seedlings per quadrat were 148 in square and 147 in circular quadrat.

It was observed that with 1/10th ha quadrat, three extra persons were required compared to the 1/100th ha quadrat. Furthermore, the circular quadrats are much more convenient and efficient to demarcate on the ground. However, since the linear plantations usually have a narrow with, therefore the use of rectangular quadrat is the only option. A survey pole and chain were used to establish a circular plot with a radius of 5.64 m for 1/100 ha plots. The circle was visually divided into four equal parts for sapling count. For linear plantations, 10 x

20 m rectangular quadrat was established using a survey pole and chain. The rectangular quadrats were divided into four equal parts for sapling count. In addition to field sampling, drones were used where feasible to take videos.

The survey procedures assume that seedling distributions are relatively homogenous within planted and seeded areas, and that areas where differences do exist will be grouped into strata before beginning a survey. Although the number of desired samples is usually calculated using statistical techniques, in practice, one sample for every 2 ha is the commonly employed standard when using 1/100th ha quadrats. However, due to the limitations of time and resources, one sample plot was taken for every four ha.

In order to eliminate personal bias, the quadrat location was selected at random. Before starting sampling, the team took a walk through the planted stand to verify its size and shape, record blank areas, and make general observations on the health and condition of saplings. If necessary, the planted stand was stratified into separate sampling units where variations exist in species and soil moisture conditions, because of topography, soil type, etc. Moderate to steep slopes were also used as a strata layer.

3. 2. KoBo Toolbox

The Consortium used KoBo Toolbox for the purpose of collection of data in the field. It is a free open-source tool for mobile data collection. It allows collection of data in the field using mobile devices such as a mobile phone or a tablet. The development of KoBo Toolbox for humanitarian use is a joint initiative between OCHA, Harvard Humanitarian Initiative (HHI) and the International Rescue Committee (IRC). Following are some of the advantages of using KoBo Toolbox:

- Data does not need to be transcribed from paper to computers, and thus transcription errors are eliminated.
- Enumeration errors are minimized because of the data validation that can occur in real time as data is collected.
- It works offline, which is the major key advantage of this software as number of places/forests are far off from populated areas where internet availability is a problem.
- It is easy to use (requires no technical knowledge to manage and enumerators can be trained in a short time).
- It is fully supported by the developers who can provide support for the platform for its use and to fix any bugs, if any.
- It also supports multimedia activities like directly taking picture and making small size videos.
- It contains centralized database which can be accessed by counterpart from any location.
- This software can also collect GPS coordinates in the field, and it can be used for mapping and graphic facilities.

Sample of the proformas developed for assessment of the assisted natural regeneration and other afforestation sites is shown in annex 1 and the proforma developed for the assessment of forest tree nurseries is shown in annex 2.

3.3. Site Selection

3.3.1 Regeneration and Afforestation: A complete list of the sites selected for evaluation of the natural regeneration and afforestation is annex 3. Following is a summary of the number of sites selected in for the evaluation of regeneration and afforestation.

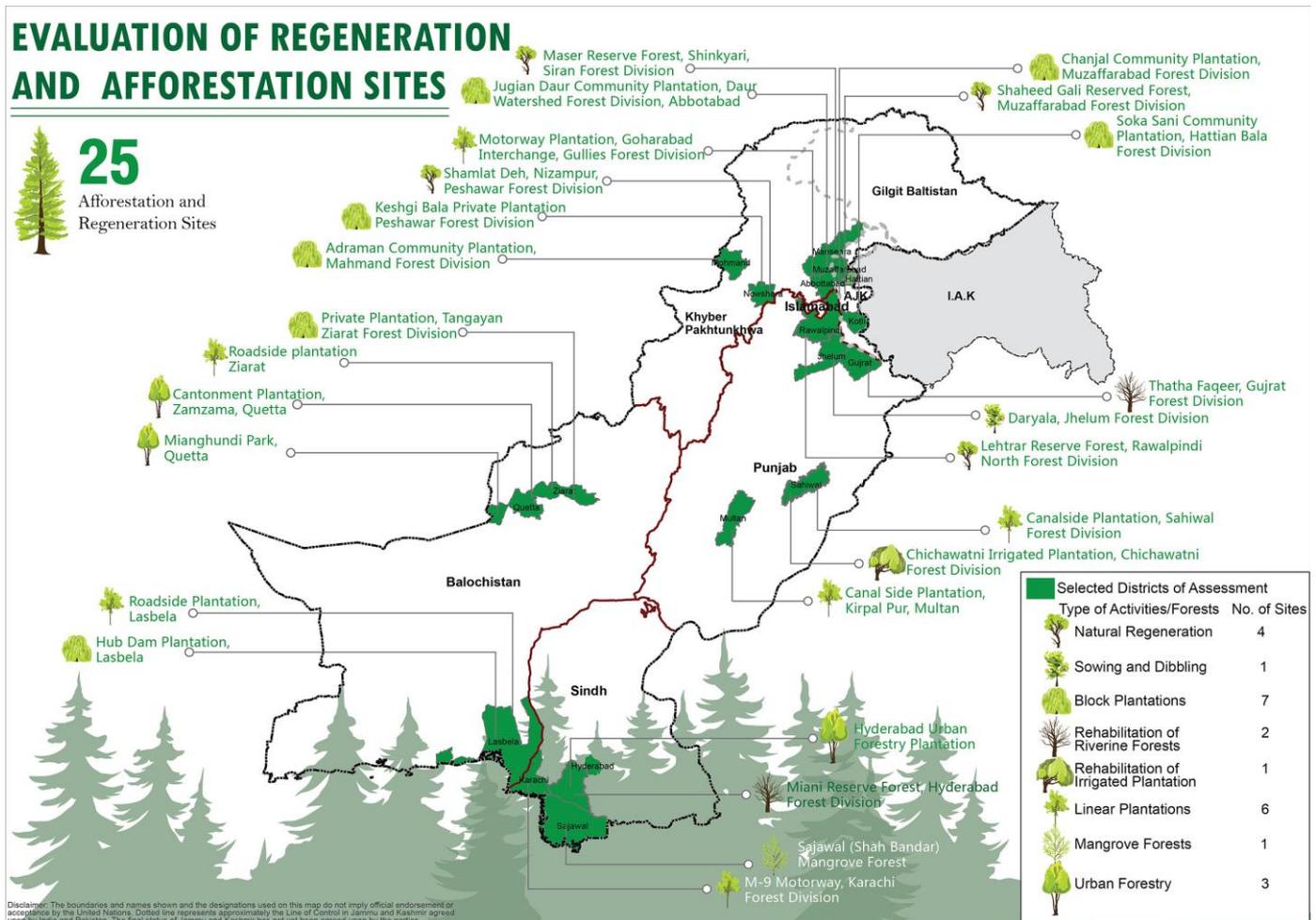
| Activity | Forest Type | Sites |
|----------------|---|-------|
| Regeneration | Sub-tropical Chir-pine Forests/ Sub-tropical Broadleaved Evergreen Forest | 4 |
| Sowing of Seed | Scrub Forests | 1 |
| Afforestation | Riverine Forests | 2 |
| | Irrigated Plantations | 1 |
| | Mangroves | 1 |
| | Block plantation on community and private lands | 7 |
| | Urban forestry | 3 |
| | Roadside Plantations | 4 |
| | Canalside Plantations | 2 |

3.3.2. Forest Tree Nurseries: A complete list of the nurseries selected for evaluation is in annex 4 and a summary of the list of the nurseries by ownership type evaluated by the monitoring team.

| Ownership | Type of Nursery | Number of Nurseries |
|--------------------|-----------------|---------------------|
| Forest Department | Tube | 12 |
| | BR | 2 |
| | Tube & BR Mixed | 1 |
| Private Nursery | Tube | 1 |
| Women Tree Nursery | Tube | 2 |

4. Evaluation of Regeneration and Afforestation Sites

A complete list of all sites together with official count of plants, the optimum number of plants that should be planted, and actual count together with success percentage is given in annex 5 and shown in the map given below.



4.1. Natural Regeneration

The degraded natural forests have potential to regenerate naturally provided the underlying factors of degradation like grazing by livestock and cutting of trees for fuel by the local people are mitigated. To assist the nature, brushwood or barbed wire fences are erected to keep the livestock out. Furthermore, in theory, local communities are motivated to provide social fencing and keep out of the enclosures to allow nature to work. These enclosures are generally 40 ha in size and a local person identified by the community is hired to perform the watch and ward duties. The assisted natural regeneration (ANR) is a major component of the TBTP. If the site conditions are favorable, many seeds germinate but not all survive to become saplings. Over time, as growing saplings compete for space and light, the number of young plants keep decreasing and only a few survive to mature into pole crop. It is estimated that in the pine forests in Pakistan, there should be a minimum of 2,000 well distributed saplings per ha to grow into a full density forest.

The enclosures usually have a varying degree of tree cover, and therefore the net addition to the number of tree per enclosure cannot be simply calculated by multiplying 2,000 with the area of the enclosure to come up with a tree count towards the TBTP targets. For example, in a 40-ha enclosure with 50% tree cover, the maximum saplings that can be counted towards TBTP target will be 40,000. An assessment of the few sample locations that the 3rd Party monitoring team visited is as follows.

4.1.1. Maser Reserve Forest, Shinkiari, Siran Forest Division, Khyber Pakhtunkhwa

The site selected for assisted natural regeneration already has more than 50% area under tree cover. The site lies in the Sub-tropical Chir Pine Forest Ecosystem and the area of the enclosure is 40 ha. A total of 10 circular sample plots of 0.01 ha each were located randomly throughout the enclosure. All the sample plots had more than 20 saplings of Chir Pine, therefore the regeneration on the blank areas can be assessed as 100% success. The official count of plants is 500 per ha in year 1, 1000 per ha in year 2 and 2000 per ha in year 3. The number of plants reported is assuming that all 40 ha were blank. However, in reality, the enclosure has more than 50% tree cover. The numbers per enclosure should be calculated by multiplying saplings per ha with the net blank area. In addition to the Chir Pine, some species of broad-leaved trees are also found in this ecosystem, but no saplings of any other species were found regenerating.

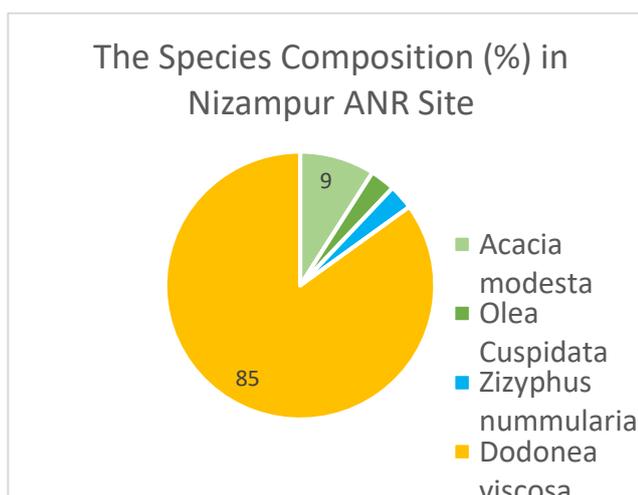


Figure 2: Photo showing more than 50% trees cover on site selected for assisted natural regeneration in Shinkiari Forest.

The site seemed to be well protected, and seedlings looked healthy. The enclosure had a canopy cover of over 50%, and therefore area of forest regenerated would only be 20 ha and not 40 ha. Thus, against the claim of 80,000 plants, the monitoring team would estimate around 40,000 plants, 50% less than the officially reported for TBTP target of 10 billion trees. The consortium team observed that there were other forests in the same area which were more degraded and thus should have been given priority during the site selection process.

4.1.2. Shamlat Deh, Nizampur, Peshawar Forest Division, Khyber Pakhtunkhwa

The ANR site of 40 ha lies in the Sub-tropical Broadleaved Evergreen Forest. This site was not a fit site for ANR, as there were very few scattered trees of Phulai and Kao. This site was a good candidate for afforestation through sowing of seed. A total of 10 sample plots were located at random in the enclosure and the average number of seedlings per plot was 23 which are more than a minimum of 20 saplings



required for a full canopy forest. The official count of plants is 2000 per ha. There was more than 50% vegetation cover in the site. However, more than 90% of the saplings are of *Dodonaea viscosa*, which is a shrub, not a tree and furthermore it is not a desirable species in this ecosystem. It only colonizes degraded forests. therefore, although the area is well stocked with vegetation, it cannot be considered a successful regeneration of the natural forest.

4. 1. 3. Shaheed Gali Reserved Forest, Muzaffarabad Forest Division, Azad Jammu & Kashmir

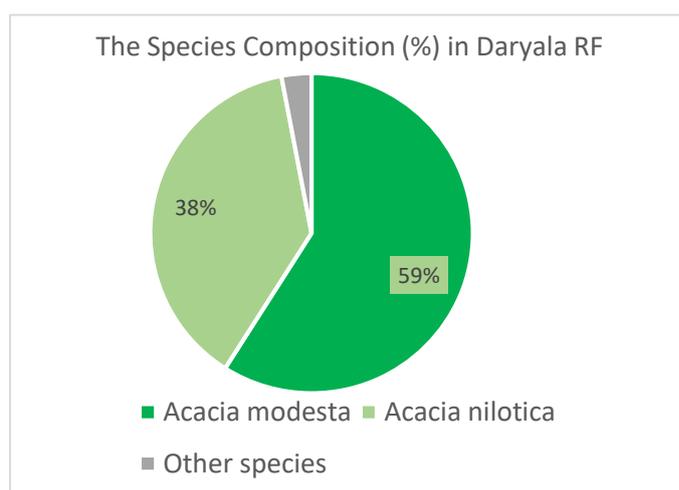
The site is situated in the Sub-tropical Chir Pine Forest Ecosystem and the existing tree cover is over 50%. The total area of enclosure was 40 ha. A total of 10 sample plots were randomly located in the enclosure. The average number of seedlings per plot was more than 39 whereas a minimum of 20 saplings are sufficient for full stocking. The official count of plants is 80,000 for the enclosure (2000 per ha x 40 ha), whereas the 50% of the area was covered with trees, therefore the monitoring team estimate is only 40,000 for the whole enclosure. The Chir pine was the only species which is a climax species of this ecosystem. In addition to the Chir Pine, some species of broadleaved trees are also found in this ecosystem, but no saplings of any other species were found regenerating. The site is not well protected and there was evidence of grazing by the livestock. However, the saplings seemed to be in good health.

4.1. 4. Lehtrar Reserve Forest, Rawalpindi North Forest Division, Punjab

The site selected for assisted natural regeneration already had more than 50% tree cover (photo on the title page). The area lies in the Sub-tropical Chir-Pine Forest ecosystem and the total area of enclosure is 40 ha. A total of 10 sample plots were laid randomly across the enclosure of which 9 plots had more than 20 seedlings, while 1 plot had only 3 seedlings. The average number of saplings per plot were 18.3 which comes to over 90% stocking. The official count of plants is 80,000 for the enclosure, whereas 50% of the area already had good tree cover, therefore, the monitoring team estimated a maximum of 40,000 plants for the enclosure. All the saplings were of the Chir-Pine. In addition to the Chir-Pine, some species of broadleaved trees are also found in this ecosystem, but no saplings of any other species were found regenerating. The enclosure was not well protected as there was evidence of grazing. The saplings seemed healthy.

4.2. Sowing and Dibbling

The areas that have been completely deforested can be reforested through sowing of seed of tree species that are naturally found in the area. In order to harvest the rainwater for pits or trenches are dug across the contour in such a way as to minimize soil erosion and capture moisture for germination of seed and growth of the seedlings. Dribbling on the other hand is a



practice of supplanting natural regeneration in areas that are not completely deforested.

4.2.1. Daryala, Jhelum Forest Division, Punjab

The site is army land given on 99 years lease to a private farmer. The Forest Department has signed an agreement with the owner. The site is situated in the Tropical Dry Deciduous Forest. The enclosure is 40 ha with scattered mature trees of *Acacia modesta*. The enclosure was reforested through sowing of 400 kg seed in total (10 kg per ha) of *Acacia modesta* (30%) and *Acacia nilotica* (60%) and remaining 10% *Dodonaea viscosa* in 10ft long and 2 ft wide troughs dug 10 feet apart in a staggered manner to capture rainwater and prevent soil erosion. *Acacia nilotica* is not a suitable species for site as it is not part of the ecosystem. It likes deep soil, is normally a farm tree or planted along roads, and grows along riverbanks in Sindh province. While a large number of seeds have germinated, the number of plant count if there is a plant at every 10 feet (one young trees per trough), will be 1,076 per ha (10' x 10'), whereas the official estimate is 2000 plants per ha. The department claim 2000 trees/ha at maturity. The quality of work was satisfactory, however the protection of site against grazing seemed to be lax. The saplings did not appear to be in good health and condition.



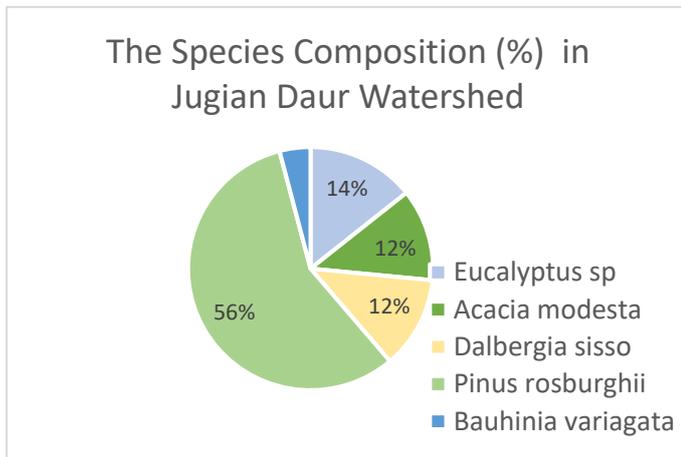
Figure 3: Photo showing afforestation through seeding on military land leased to a private person at Daryala, Jhelum.

4.3. Block Plantations

The plantations over compact blocks of lands are usually special purpose plantations established by planting tree saplings produce in the nurseries. Except for plantations of farmlands, the plantations in natural landscapes must be planned on sound ecological principles. Following is an assessment of the block plantations visited by the 3rd Party Monitoring Team.

4.3.1. Jugian Daur Community Plantation, Daur Watershed Forest Division, Abbotabad, Khyber Pakhtunkhwa

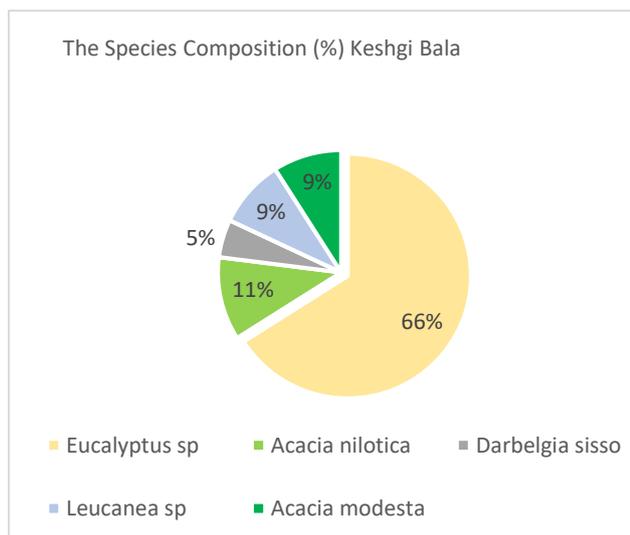
The plantation area of 20 ha is a community land and lies in the transition zone between the Sub-tropical Chir-Pine Ecosystem and Broadleaved Evergreen Forest Ecosystem. Five different tree species in various proportions have been planted at a spacing of 10X10 feet. The official count of saplings is 21,500, whereas at this spacing there should be a total of 21,520 plants over the entire 20 ha area. Quality of work was satisfactory, and the plants appeared to be in good health and condition.



Based on the results of sampling, the team estimated 18,868 plants; therefore the survival rate is 88%. However, the choice of species is not ecologically sound. Eucalyptus is an exotic and a very controversial tree, and not suitable for planting in a watershed. Shisham although an indigenous tree, does not grow naturally in this ecosystem, and therefore should not have been planted.

4.3.2. Keshgi Bala Private Plantation Peshawar Forest Division

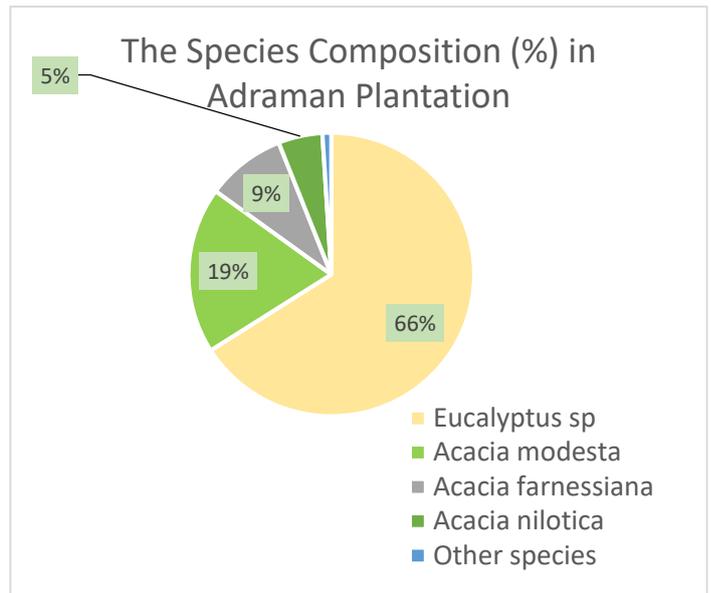
Keshgi Bala plantation is over 31 ha of private land. This plantation has been carried out on barren land owned by a single farmer. FD has signed an agreement with the farmer. A total of 5 different species were planted in various proportions at a spacing of 10X10 feet. The official count of saplings is 33,325, whereas based on calculations, there should be 33,356 plants in 31 ha. Based on sampling, the team calculated



34,163 and therefore the plantation was 102% successful. The quality of work was satisfactory, and the plants appeared in good health and condition. Except for *Acacia modesta*, no other species is found naturally in this ecosystem. The *Eucalyptus*, an exotic and highly controversial tree accounted for 66% of all the plants. The *Leucaenea* is also an exotic plant.

4.3.3. Adraman Community Plantation, Mahmand Forest Division, Khyber Pakhtunkhawa

The plantation site lies in the Sub-Tropical Broadleaved Forest on an area of 55 ha on a communal land. Several different species were planted at spacing was 10X10 feet. The total number of plants should be 54,876 whereas as per record, 60,000 plants were planted. The sampling estimated by the monitoring team calculated 57,475 plants. Therefore, the plantation can be considered a 96% success. The quality of work was good, and health and condition of the plants was satisfactory. Beating up of failure was regularly done for which plants were available on site. Here also, Eucalyptus, an exotic and a controversial tree makes up 66% of the plants. Except for *Acacia modesta*, the other species are not native of this ecosystem,



4.3.4. Chanjal Community Plantation, Muzaffarabad Forest Division, Azad Jammu & Kashmir

The Chanjal plantation over an area of 40 ha comprising of community and private lands lies in the transition zone of the Sub-Tropical Chir-Pine and Sub-tropical Broad Leaved Evergreen Forest. Several different species were planted at a spacing was 8X5 feet. The quality of work was satisfactory and plants in good health and condition. At this spacing there should be a total of 107,593 plants whereas the official count was 111,000.

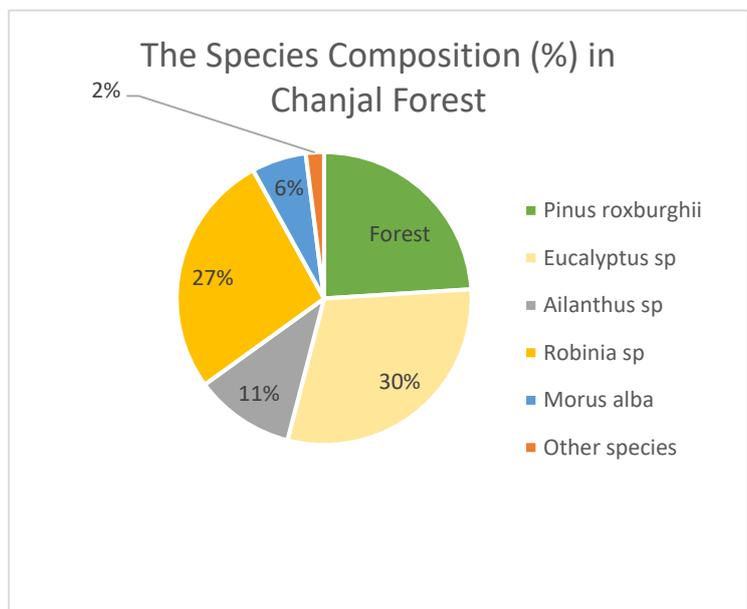


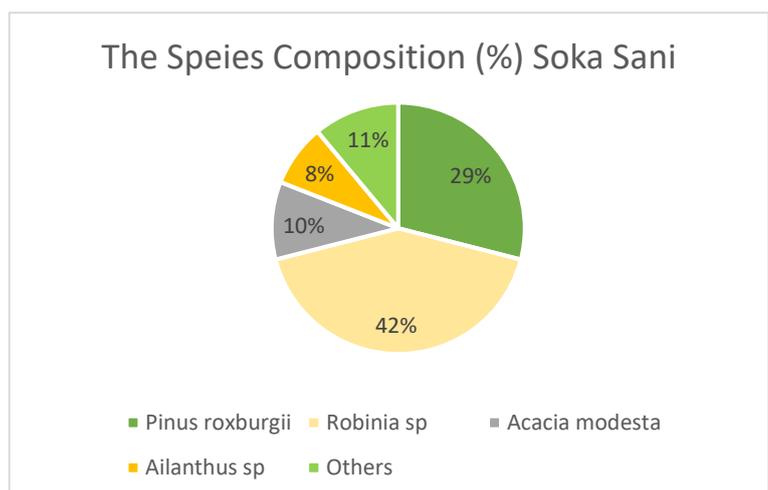


Figure 4: Photo of Chanjal community plantation at Muzaffarabad showing planting of Ailanthus in a Chir-Pine Zone.

Based on sampling, the monitoring team estimated 95,526 plants which come to an overall success rate of 86%. The Chir-Pine saplings planted initially were damaged by the porcupine and were replaced by Eucalyptus and Ailanthus. The Eucalyptus, an exotic and highly controversial species comprised 30% of the plants. Ailanthus and Robinia are also exotic, and except for Chir-Pine, all other species are do not naturally grow in this ecosystem,

4.3.5. Soka Sani Community Plantation, Hattian Bala Forest Division, Azad Jammu & Kashmir

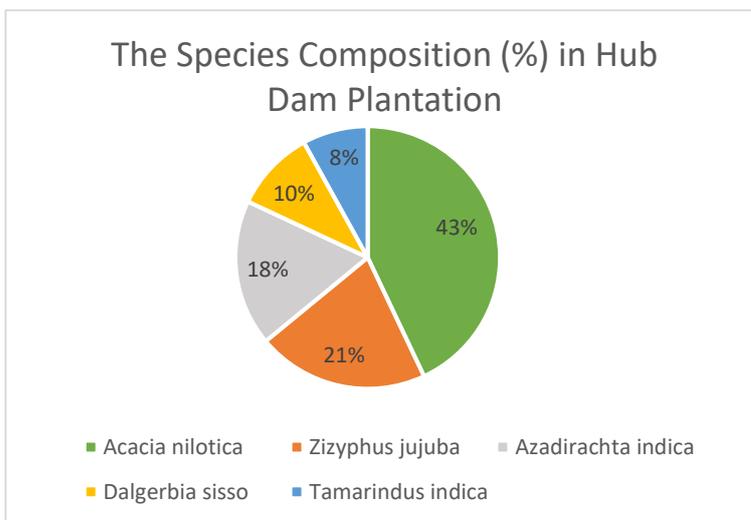
The plantation over 40 ha of private and community lands lies in the Sub-Tropical Chir-Pine Ecosystem. More than 5 species were planted at a spacing of 8X5 feet. The quality of work was good, and health and condition of the plants was satisfactory. At this spacing there should be 107,593 plants in the



plantation whereas the official count is 108,900. On the basis of sampling, the monitoring team estimated 91,504 plants which come to a success rate of 84%. A total of seven different species were planted in various proportions, of which only Chir-Pine and Phullai are part of the ecosystem. Robinia and Ailanthus are exotics.

4.3.6. Hub Dam Plantation, Lasbela, Baluchistan

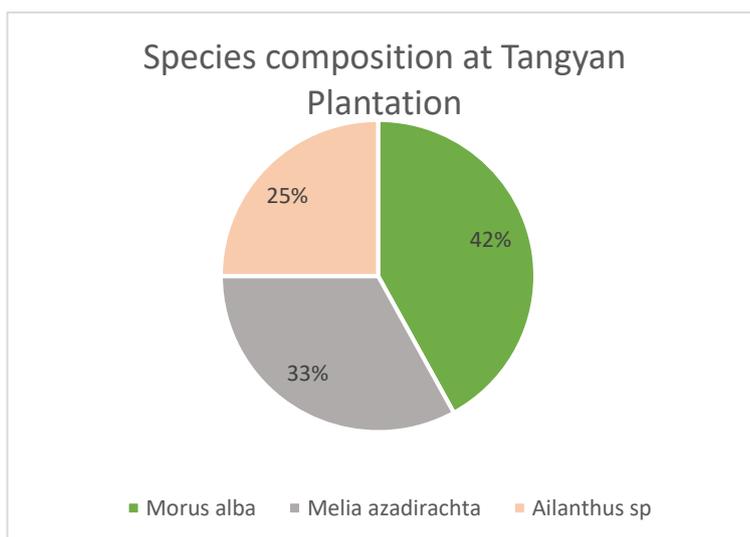
The 28.3 ha plantation on government land of Hub Dam lies in the Tropical Thorn Forest. A total of five species have been planted in various proportions at a spacing of 10x10 ft. There should be a total of 30,450 plants. The monitoring team estimated 26,998 plants based on sampling which makes it 89% success rate. The quality of work was good, and plants looked in good health and condition.



All the species planted are native, but not part of the ecosystem. Shisham is way outside or its normal planting range and is not likely to do well over time. All these species need some supplemental irrigation, and long-term success will depend on some irrigation.

4.3.7. Private Plantation, Tangyan Ziarat Forest Division, Baluchistan

The plantation is on an area of 10 ha private land wherein three species have been planted at a spacing of 10x10 ft. The total plants should be 10,760 whereas the official count is 10,800. The monitoring team estimated 8,149 plants, which makes it 75% success rate. The quality of work was satisfactory, and the health condition of plants was also satisfactory. It appeared that plants need more frequent watering.



4.4. Rehabilitation of Riverine Forests

The riverine forests generally occur along the banks of the rivers and mainly rely on shallow water table and flooding of the banks in summer. Like many other forests, the riverine forests have degraded over time both due to anthropogenic factors and scarcity of water due to diversion and damming of river waters. In Punjab, the riverine forests are initially raised by pumping water from shallow wells and when plants grow up they tap the subsoil moisture. In Sindh, the forests regenerate from flood waters. Following is an assessment of the sites visited by the monitoring team.

4.4.1. Thatha Faqeer, Gujrat Forest Division, Punjab

An area of 12 ha was planted after clearing the site of local vegetation. While traditionally, in Punjab, Shisham and mulberry were planted in the riverine forests, several different species including landscape and fruit trees have been planted. The planting was carried out at a spacing of 10 x 6 ft with official plant count is 36,300. The monitoring team estimated 33,239 plants based on sampling with 92% success rate. The quality of work and health and condition of plants was good.

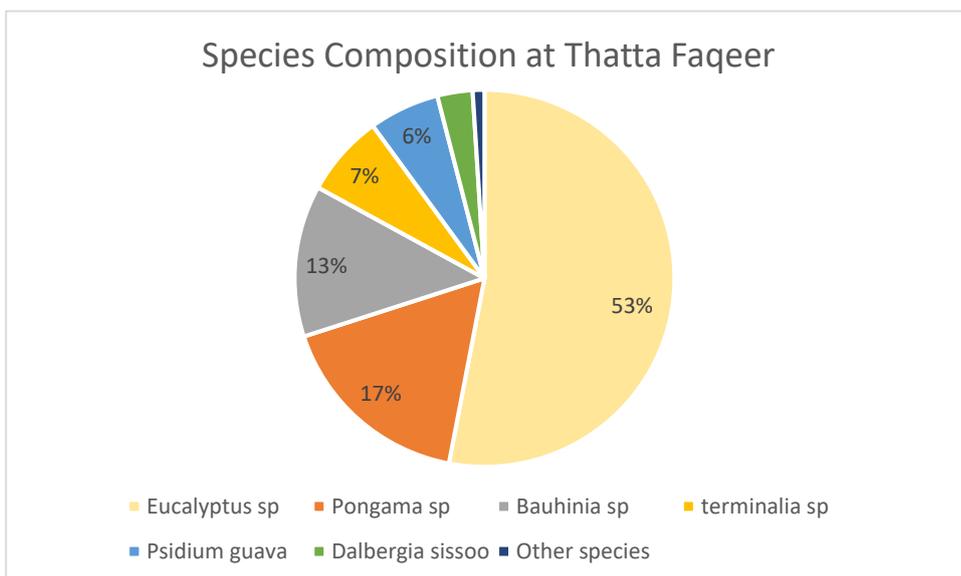




Figure 5: Photo of Riverine forest in Thatha Faqeer showing Guava fruit plants and other ornamental species planted

Eucalyptus, an exotic and a very controversial tree comprises 53% of all species planted followed by two ornamental species Suk Chain 17%, Kachnar 13%, and Arjan 7%. Guava, a fruit plant was 6%, and Shisham, the only tree suitable for this habitat was only 3%.

4.4.2. Miani Reserve Forest, Hyderabad Forest Division, Sindh

The forest has been developed on an area of 81 ha (200 acre) of riverine land recovered from land grab mafia. Seeds of Kikar and Jand were sown at the rate of about 5 kg per acre. The official claim for seedlings is 3,630 per ha. The monitoring team field survey counted more than 20 saplings per sample plot of 100th ha which are more than necessary for successful establishment of the full canopy forest (at least 1076 tree per ha). The quality of the work was excellent and health and condition of plants was satisfactory. The species used are native and suitable for the habitat.



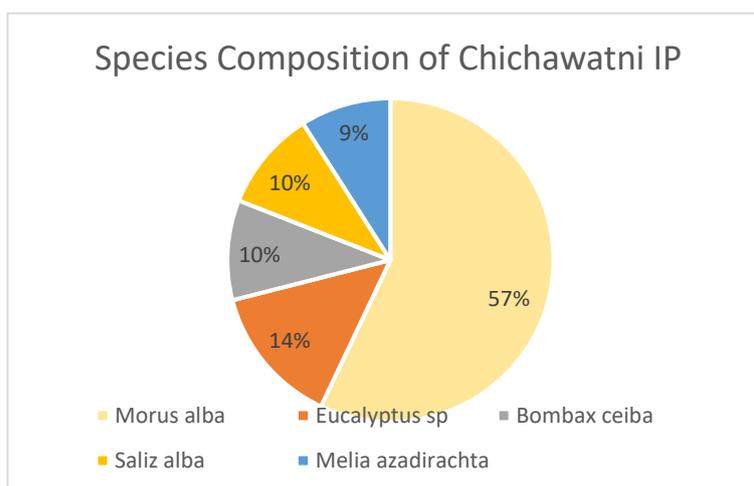
Figure 6: Photo showing profuse germination of Kikar seed sown on land recovered from encroachers near Hyderabad, Sindh

4.5. Rehabilitation of Irrigated Plantation

These are manmade forests established on large parcels of canal irrigated lands mainly in the Punjab and Sindh. The trees are planted in trenches for irrigation that are 10 ft apart and plant to plant distance along one trench is 6ft. Thus, a total of 726 saplings are planted in one ha. After 5 years alternate young plants are removed along the trenches reducing the number of plants to about 363 tree per acre. In Punjab, it is mainly the Shisham that is planted mixed with some Mulberry plants. The following is the assessment of one plantation site visited by the team in Punjab.

4.5.1. Chichawatni Irrigated Plantation, Chichawatni Forest Division

The total area of the plantation is 4,668 ha (11,531 acre), but only an area of 7 ha which is already fully stocked with trees has been selected for rehabilitation under the TBTP. Five different species were planted at a spacing of 10x6 ft



which comes to a total of 12,552 plants whereas the official claim is 13,068 plants. The monitoring team estimated 11,484 plants based on sample plots which are 88% success rate. The area selected already had a thick forest trees cover, hence trees planted under trees. The quality of the work with respect to spacing and pits size was good, whereas health and condition of the plants did not appear good due to scarcity of water for irrigation.



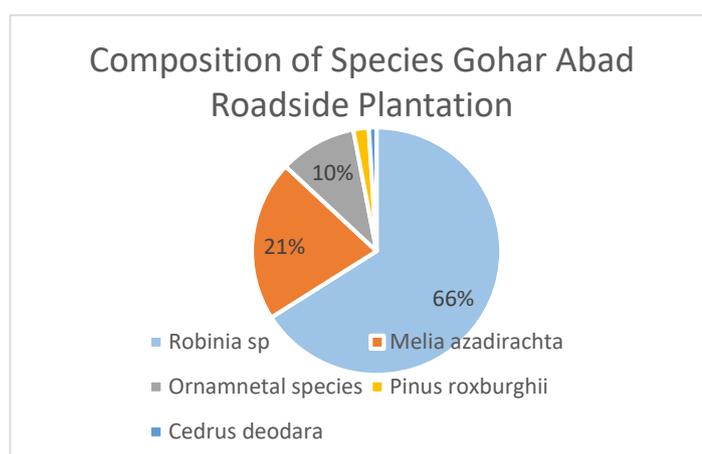
Figure 7: Planting trees under trees – Chichawatni irrigated plantation

4.6. Linear Plantations

The avenue plantations along highways are generally to improve the aesthetics. The planting design has to keep the road safety issues in mind and species selected for planting should be suitable for the climate. On the contrary, the land along canals offers an opportunity to grow valuable timber trees because the trees hardly need any irrigation after a year of two because the trees are able to tap into shallow after table. Following is an assessment of the roadside and canal side plantations visited by the monitoring team

4.6.1. Motorway Plantation, Goharabad Interchange, Gullies Forest Division, Khyber Pakhtunkhwa

A total of 45.4 Av km have been



planted along the Goharabad Interchange of Hazara Motorway. The trees have been planted at 5 ft apart in lines and 10 ft apart in rows. The official record is 48, 840 plants, whereas, the monitoring team estimated 43,772 plants based on sampling, which gives a success rate of 90%. The quality of the work was not satisfactory, and the health and condition of plants was not good due to lack of adequate watering.

The planting design was not appropriate to harvest and retain the rain water in the pits. The choice for species selected were not ecologically suitable for the site.

4.6.2. Canalside Plantation, Sahiwal Forest Division, Punjab

The plantation covers 43.5 av km equivalents to 20 ha plantation along the canal side. The plantation was done 6 ft apart in 10 ft apart trenches which comes to 23,780 plants. The official record is 36,300 plants, while the monitoring team estimated 34,592 plants as per sample plots, which gives a success rate of 95%.

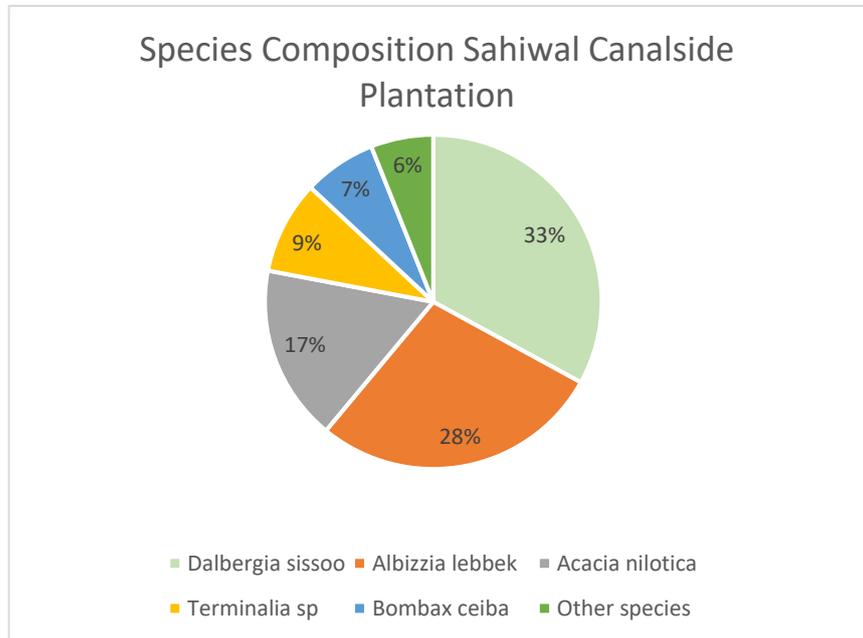
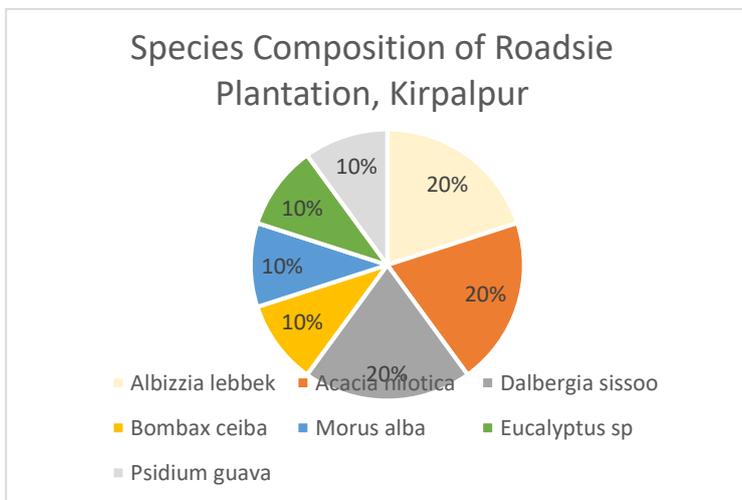


Figure 8: View of Canal side plantation in Sahiwal

The quality of work was satisfactory, and the health and condition of the plants was excellent. The choice of species was appropriate for the habitat.

4.6.3. Canal Side Plantation, Kirpalpur, Multan

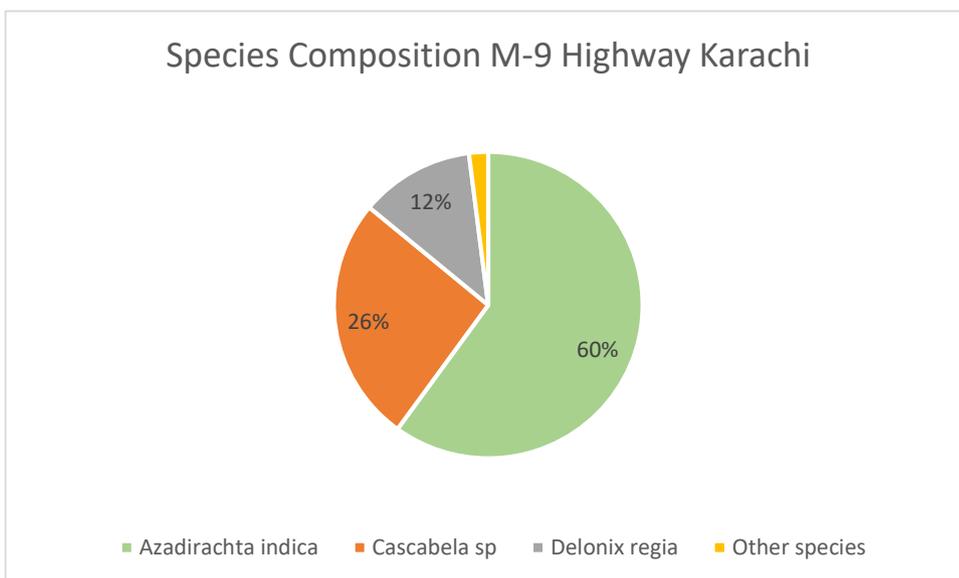
The plantation comprises of 10 Av km with trees planted at 6 ft distance along 10 ft apart trenches. The total plants at this spacing come to 5466 whereas the official count is 8,330 plants, while the monitoring team estimated 8,002 plants, which gives a success rate of 96%. The quality of work was good, and health and condition of the plants was excellent. The species choice was generally appropriate except for Eucalyptus 10%, and Guava 10%.



Plantation was carried out in single row scheme. The growth was vigorous and sufficient water was available for irrigating the plants.

4.6.4. M-9 Motorway, Karachi Forest Division

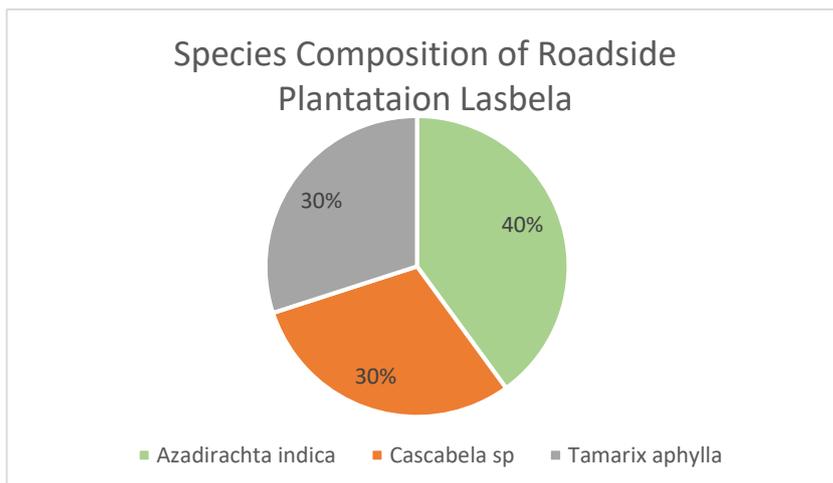
The plantation along M-9 Karachi – Hyderabad Motorway is in multiple rows with a total length of 30 Av km. The plants were planted 10 ft apart in 10 apart rows which works out to a total of 9,840 plants. The official count is 12,000 plants and the monitoring team estimated 11,415 plants, which gives a success rate of 95%. The quality of work was satisfactory, and health and condition of the plants was good.



The planting design was not appropriate; the plants of different heights were mixed in a haphazard manner. The species selected are not suitable for the site. All these species will need watering throughout their lives which is neither economical nor a sustainable arrangement.

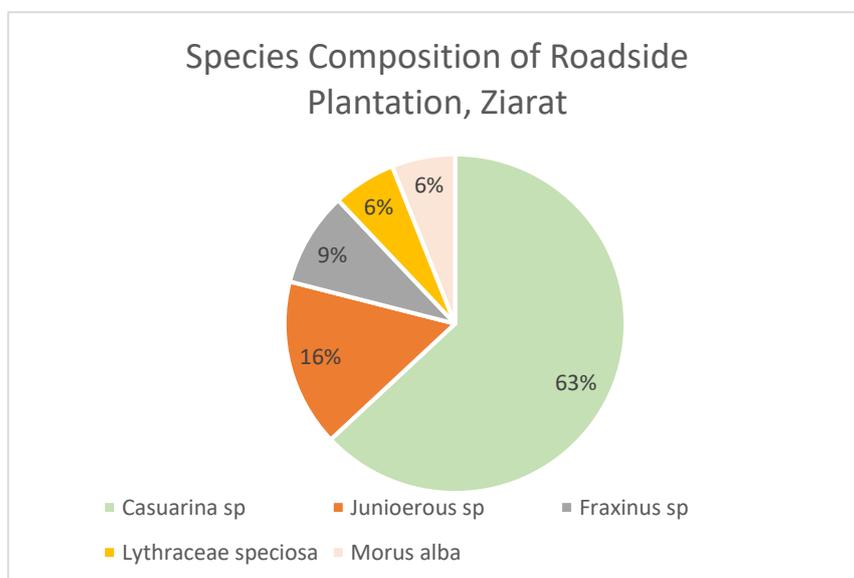
4.6.5. Roadside Plantation, Lasbela, Baluchistan

The plantation is over a total of 10 Av Km and trees planted 10 ft apart in 10 ft apart rows. The total number of trees works out to be 3,280. The official count is 4,100, while the monitoring team estimated 3858 plants, which gives it a success rate of 94%. The quality of work was satisfactory, and the health and condition of the plants was good. Neem and Casacabela require watering and are thus not suitable for planting in arid climate without irrigation.



4.6.6. Roadside plantation Ziarat, Baluchistan

The plantation is less than one av km just at the start of the Ziarat town. The official plant count is 3200. The plants were planted at a distance of 10 ft in lines that were 10 ft apart. The monitoring team estimate was also 3200 plants, a 100% success rate. The quality of the work was satisfactory, and the health and condition of the plants was also satisfactory. The choice of species appears to be appropriate for the local climate.



4.7. Mangrove Forests

The Mangroves of Indus delta cover an area of about 0.6 million hectares, and depend entirely on freshwater discharges from the River Indus. The ecosystem is dominated by *Avicennia marina* (90%), followed by *Rhizophora mucronate* (08%). The historical records indicate that there were eight species of mangroves in the Indus delta, but at present only four species survive. The other two species - *Aegiceras corniculatum* (1.5%) and *Ceriops tagal* (0.5%), are rare and therefore efforts must be made to increase their population where ever suitable there is suitable habitat. The assessment of one field afforestation site visited by the monitoring team is as follows.

4.7.1. Sajawal (Shah Bandar) Mangrove Forest

The monitoring team visited a 40 ha mangrove afforestation site in Sajawal. The mangrove seedlings were planted at spacing of 10x10 ft which works out to be the same number of plants as per of official record is 43,200. The monitoring team estimated 41,664 plants based on field sampling, which gives a 96% success rate.. There is a very limited choice of species for the mangrove forests in Pakistan. The choice of species Rhizophora 79% and Aviceneae 21% percent was appropriate.

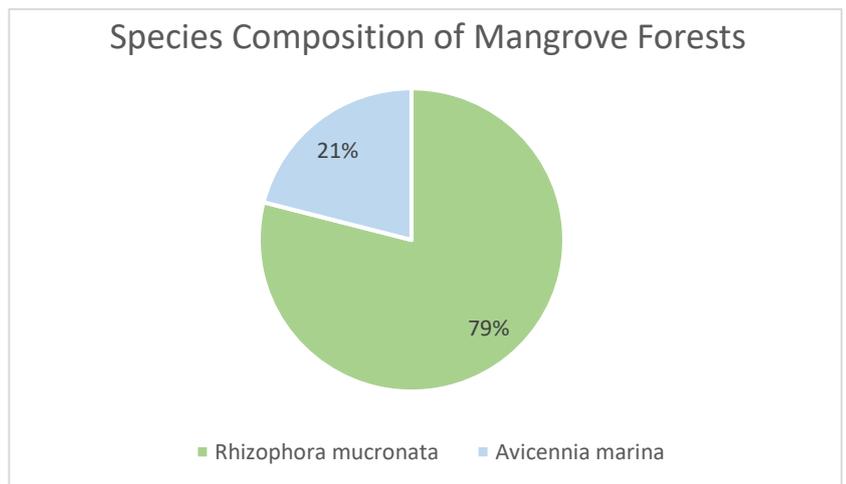


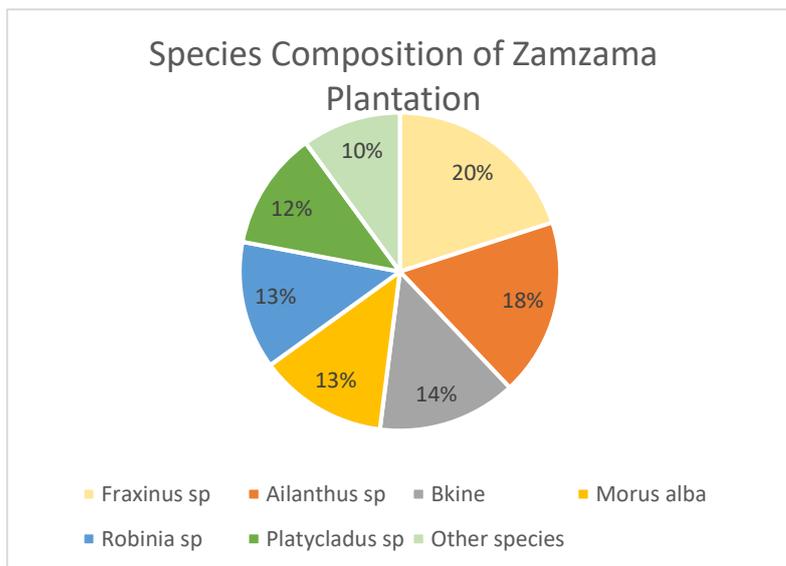
Figure 9: View of Mangroves plantation in Sajawal, Sindh

However, the percentage mix of the two species does not match with the percentage of these two species in the ecosystem where Aviceneae is the dominant species. The quality of work and health of plants was good.

4.8. Urban Forestry

4.8.1. Hyderabad Urban Forestry Plantation

An area of 3 ha inside the Psychiatry and Mental Hospital compound has been planted with over a dozen different species in various proportions. The planting has been done at close spacing of 6 x 6 ft which comes to 3630 trees, the same as the official record. The monitoring team estimated 3267 plants based on sampling, which gives a survival rate of 90%. The quality of work and health of plants was good and appreciable as growth of plants was vigorous. The species selected for the urban



forest was appropriate. All species are native, except Jungle Jalebi, which has become naturalized in Pakistan. Some species are shade trees, while others are ornamental and fruit trees. The plants were well protected with reasonable watering facility. The size and design of pits were appropriate; and the growth of plants was vigorous.

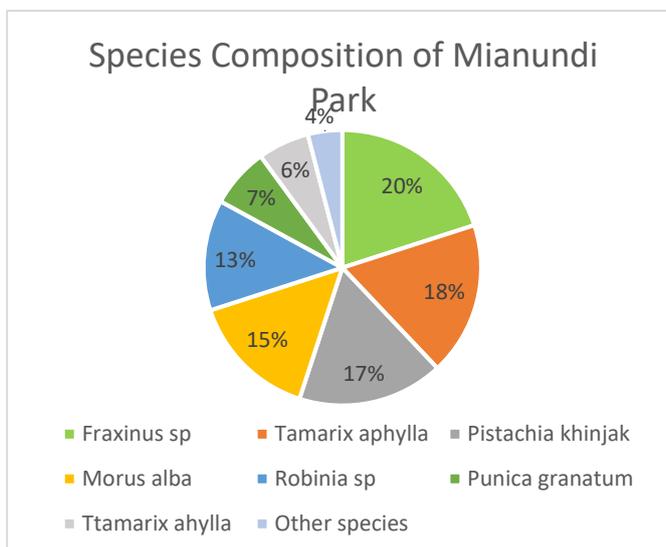
4.8.2. Cantonment Plantation, Zamzama, Quetta, Baluchistan

The plantation is on an area of 36 ha which lies in the cantonment area. Several different species have been planted at a spacing of 10-17 ft. The official count of plants is 21,400 whereas the monitoring team estimated 17,496 plants based on sampling that makes it 81% success rate. The quality of work was good, however, the plants were not in good health due to lack of adequate watering.

The Ailanthus and Robinia are both exotic species. Instead of being treated as a plantation, the site should best be planted as an Urban Forest like an arboretum – a place where trees, shrubs, and sometimes herbaceous plants are cultivated for conservation of biodiversity, and scientific and educational purposes.

4.8.3. Mianghundi Park, Quetta, Baluchistan

Mianghundi Park with an area of 36 ha is situated outside of Quetta town on Quetta-Karachi Highway. Several different species have been planted in the Park with a total of 10,750 plants. The monitoring team estimated 9072 plants; therefore the success rate is 84%. The quality of work was good and health and condition of the plants was satisfactory. Except Robinia, all other species are



native Mianghundi Recreational Park. It is better to have a proper landscape plan for the Park and trees should not be planted in an ad-hoc fashion. Reliance must be made on local species and the inclusion of an urban forest based on Miyawaki method to create fascinating complex ecosystems, in balance with local soil and climate conditions.

4.9. Analysis of the Results of Evaluation of Regeneration and Afforestation

1. Prioritization for the Selection of Sites for Assisted Natural Regeneration:

All sites selected for ANR in AJK, KP and Punjab had over 50% tree cover. The 3rd party field monitoring team drove past some forest areas that were more degraded than the site selected for ANR, and therefore it appears that no prioritization has been carried out for the selection of sites based on the extent of degradation of the sites.

2. Assisted Natural Regeneration: The assisted natural regeneration implies assisting trees species naturally found in an ecosystem to come back for restoring the forests to their near normal condition. The degraded forests usually have a soil compacted due to grazing by livestock and covered by rough grasses. Therefore, ANR sometimes requires some soil working to create suitable ground for seeds to grow and seedlings to establish. Also assisting natural regeneration includes supplemental planting sowing of seed of species of which no seed trees are left in the area to regenerate naturally.

3. Choice of appropriate methodology for rehabilitation of forests: The Nizampur Shamlat Deh, had only scattered trees of the natural vegetation – Phulai (*Acacia modesta*) and Kao (*Olea cuspidata*) tree. The site had been invaded by Sanatha, which is a bushy plant and invades forests in this ecosystem after the tree vegetation starts disappearing. Therefore, this site would have been best rehabilitated through sowing of seed of Phulai and Kao. The protection of site has helped more aggressive Sanatha to cover 85% of the area. The two dominant tree species of the ecosystem – Phulai and Kao or Wild Olive are only 15% of the saplings. The Zamzama and Mianghondi Park plantations in Quetta are included in the category of Block Plantations whereas these should have been a part of Urban Forestry component because the objectives of these two components are entirely different

4. Planting Distance: The planting distance between the plants varies a lot from province to province. Some of the more widely used spacings observed during the field survey are:

10 x 10 ft – most common

10 x 6 – mainly Punjab

8 x 5 – only in AJK

- a) In some special situations 10 x 17 and 6 x 6 or 5 x 5 ft distance between the plants has also been used. While the choice of initial planting distance depends on many factors such as the terrain, growth rates of the plants, species, and purpose of planting. Most trees need growing space within 2-3 years and 10 feet spacing between the plants on all sides is generally the most desirable standard. In many afforestation sites, the numbers of trees

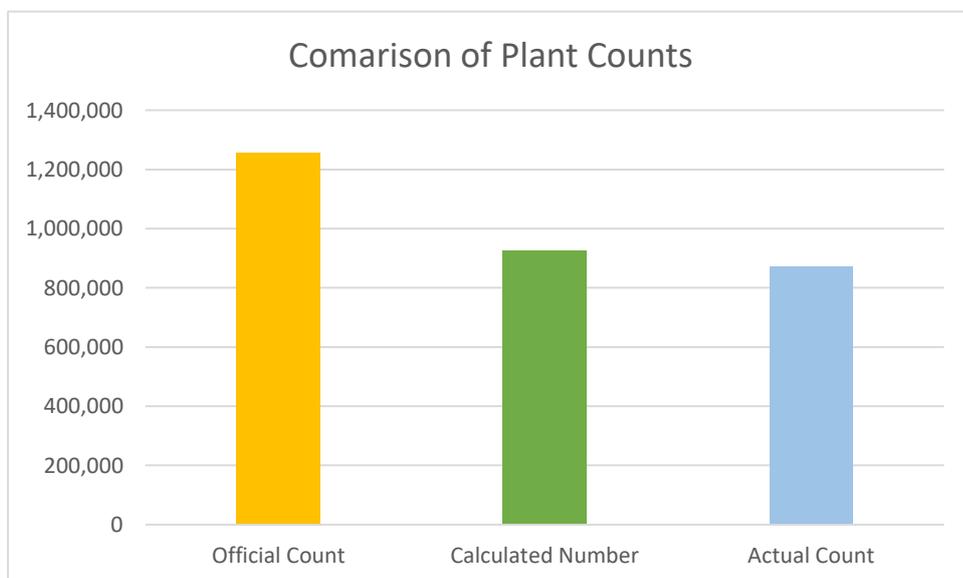
reported planted is much higher than the total number that can be planted based on the planting distance adopted for the site, for example:

- b) Thatta Faqeer Bela Forest, Gujerat: 12 ha planted at 10 x 6 ft should have a maximum of 21,520 plants, whereas the official record is 36,300 plants.
- c) Canalside Plantation, Sahiwal: 43.5 av km planted at 10 x 6 ft can have a maximum of 23,780 plants, whereas the official record is 36,300 plants.
- d) Canalside Plantation, Kirpalpur: 10 av km planted at 10 x 6 ft should have a maximum of 5,466 plants, while the official record is 8,330 plants.

The variations in the planting distance, planting more trees than required all distort the relationship between the numbers of trees planted and the area of forests or landscapes reafforested. The chances are that planting more trees per unit area may be to achieve the allocated target of the number of trees for TBTP. Whereas it is not prudent for the TBTP to prescribe a planting distance, the possibility of number of trees planted for reporting towards TBTP targets should be standardized per unit area – ha and av kms.

5. Over-estimation of the plant count: In case of ANR, it is estimated that on successful establishment of saplings, there will be an addition of 1800-2000 trees per ha (in the relatively humid ecosystems in the north). The site selected for ANR are supposed to have enough mother trees to act as source of seed, therefore all areas selected for ANR have varying degrees of tree cover. However, the numbers of trees regenerated for the purpose of TBTP targets does not consider the existing tree cover, and 80,000 plants (2000 plants /ha x 40 ha) are reported per enclosure. All ANR sites visited by the monitoring team had almost 50% forest cover, and no more than 40,000 plants should be reported per enclosure.

A comparison of official count across all 25 sites with the number of plants calculated based on planting distance and the actual count is shown in annex 5 and totals shown in the following figure.



6. Choice of Species: One of the major objectives of the TBTP is to restore the forests and ecosystems, therefore reliance must be made on native species of the ecosystem. There are enough native species sowing and planting in different ecosystems and on different site conditions, however, not only in some cases wrong choice of species has been made but also there is a widespread use of exotics – especially Eucalyptus species, use of which is very controversial not only in Pakistan, but globally as well. The trees that are susceptible to high mortality rate should be avoided especially when other suitable alternatives are available. For example, Shisham is susceptible to ‘die-back’ throughout its range in the sub-continent, but still it has been used for planting all the way from KP to Baluchistan.

It is argued by the foresters that the choice of species planted on the community and private lands are decided by the communities or the landlords. If the Forest Department is going not only to bear all costs, but also plant trees on the private and community lands, then it should do only if the plantations contribute to restoration of landscapes to their near natural condition, protect the watershed values, and enhance the biodiversity value of the ecosystem. If farmers are going to do farm forestry at their own expense, then definitely they should make the choices.

Some specific examples are discussed quoted here:

- a) Jugian Duar Community Planation (KP): This planation has been established by a Watershed Division, who should be extra careful in choosing species that contribute to improvement of watershed goods and services. Eucalyptus is not a tree for the watershed, and shisham does not belong to this ecosystem.
- b) Keshgi Bala Private Plantation (KP): 60% Eucalyptus:
- c) Adraman Cummunity Plantation (KP) 66% Eucalyptus.
- d) Chanjal Community Plantation (AJK). Eucalyptus 30%
- e) Hub Dam Plantation (Baluchistan): Area not suitable climatically for Shisham.
- f) Thatta Faqeer Bela Forest (Punjab). Except for Shisham, none of the other 5 species belong to riverine ecosystem. Suk Chain (*Pongamia sp*), Kachnar (*Bauhinia sp*) and Arjan (*Terminalia sp*) are urban landscape trees, guava is a fruit tree.
- g) Chichawatni Irrigated Plantation (Punjab): Eucalyptus is 17% of the species. Shisham the main tree of the Irrigate Plantation not planted in Chicahawatni due to ‘shisam die-back’ but planted in Canalside plantations in Sahiwal and Kirpal Pur.
- h) Roadside Plantation, Motorway Interchange Gohar Abad (KP): One of the fundamental principles of planting along roads is that if the trees fall, they should not be tall enough to block the roads or cause any accidents. Chir Pine and Deodar are both tall trees and thus not suitable for planting along roads. Furthermore, Deodar is a tree of dry temperate climate and not suitable for sub-tropical climate.
- i) Canalside Plantations Sahiwal and Kirpal Pur (Punjab): Shisham plants have been suffering from ‘die-back’ all across its range in the sub-

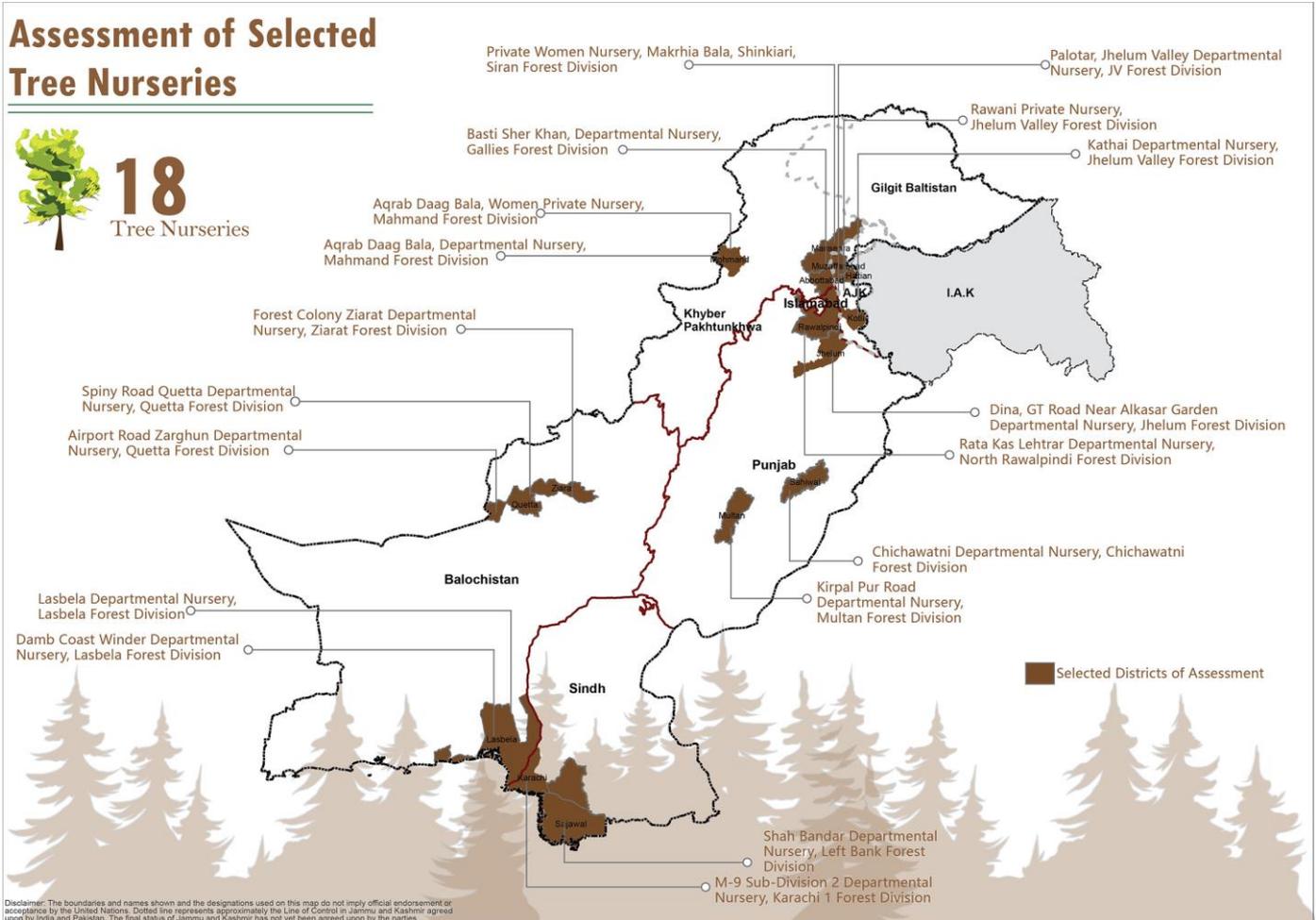
continent. In Sahiwal shisham is 33% and in Kirpalpur it is 20% of the species.

7. Area and Location of the Sites for TBTP: The TBTP is a high-profile project and sites selected for rehabilitation of forests or for afforestation should be large enough to create a visible impact. Scattered small sites are not only having higher overhead costs but are difficult to manage and create no impact. Some of the sites selected are too small. Following are some examples from the few sites visited by the 3rd Party Monitoring team:

- a) Thatta Faqeer Bela Forest (Punjab): A 12 ha site disconnected from any bela forest in the area.
- b) Chichawatni Irrigated Plantation (Punjab): Chichawatni is a large plantation of over 5,000 ha, but only a small patch of 7 ha has been selected for rehabilitation.
- c) Ziarat Roadside Plantation (Baluchistan): The area is less than 1 km.

5. Assessment of Selected Tree Nurseries

A complete list of the forest tree nurseries with their production capacity is shown in annex 4 and shown in map given below.

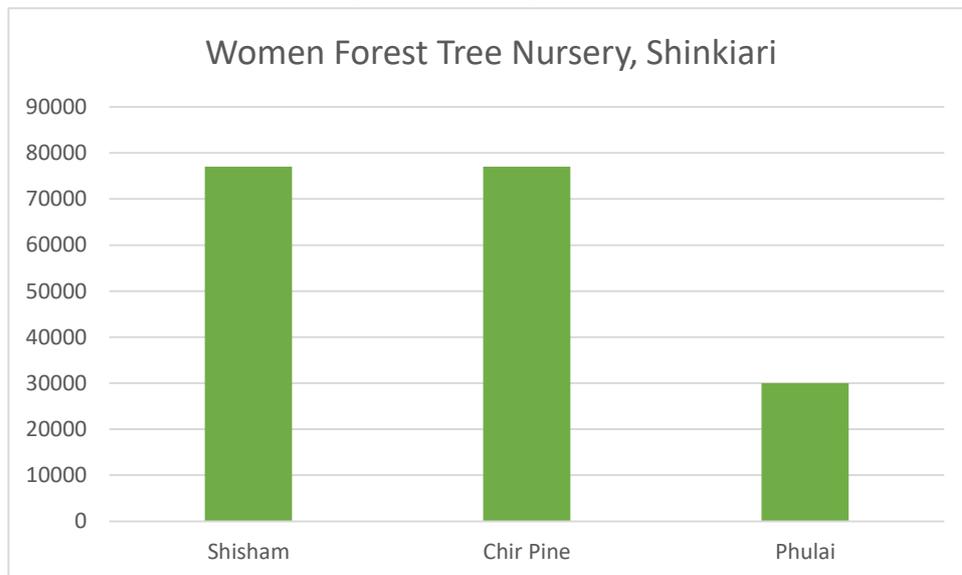


5.1. Private Women Nursery, Makrhia Bala, Shinkiari, Siran Forest Division, Khyber Pakhtunkhwa

This tube nursery has a capacity to raise 170,000 plants. The tube plants are watered through flood irrigation, which is neither a recommended nor a desirable practice. Shisham plants are not produced in tubes but seed is grown in the ground and bare rooted plants or root-shoot

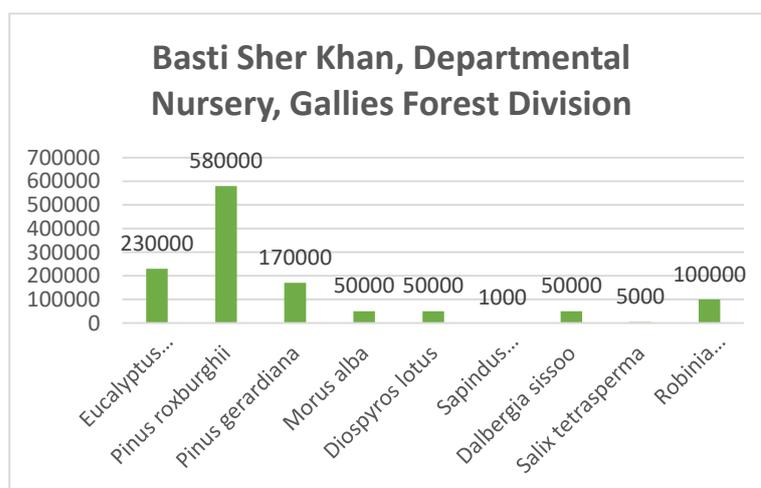
cuttings are used for planting. The Shisham plants account for 58% of the seedlings. This is not a suitable climatic zone for Shisham nor there is demand for it. The nursery was not well maintained. It appears that the owner had little

training and guidance from the Forest Department in nursery raising. The woman nursery was mainly managed by male of the family sparing some time from his other responsibilities. The health and condition of the saplings was not good.



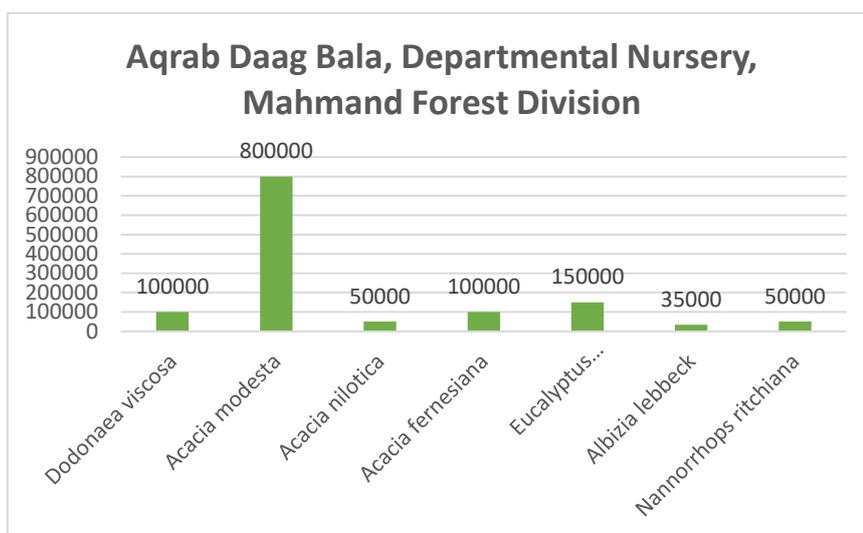
5.2. Basti Sher Khan, Departmental Nursery, Gallies Forest Division, Khyber Pakhtunkhwa

Tube nursey has a capacity to raise 1250,000 tube plants. The nursery has a good access. Overall drainage of the nursery site was favorable; however, natural drainage of rainwater from some nursery beds was not appropriate. The seedlings were healthy and in good condition but could have been more improved by timely shifting.



5.3. Aqrab Daag Bala, Departmental Nursery, Mahmand Forest Division, Khyber Pakhtunkhwa

The tube and bare rooted plant nursery has a production capacity of 1285,000 plants. Overall, a well-drained site having good fertility and protection in place. The seedlings are mostly healthy and in good condition. The ratio of Eucalyptus was comparatively high. Dodonaea is a shrub, a

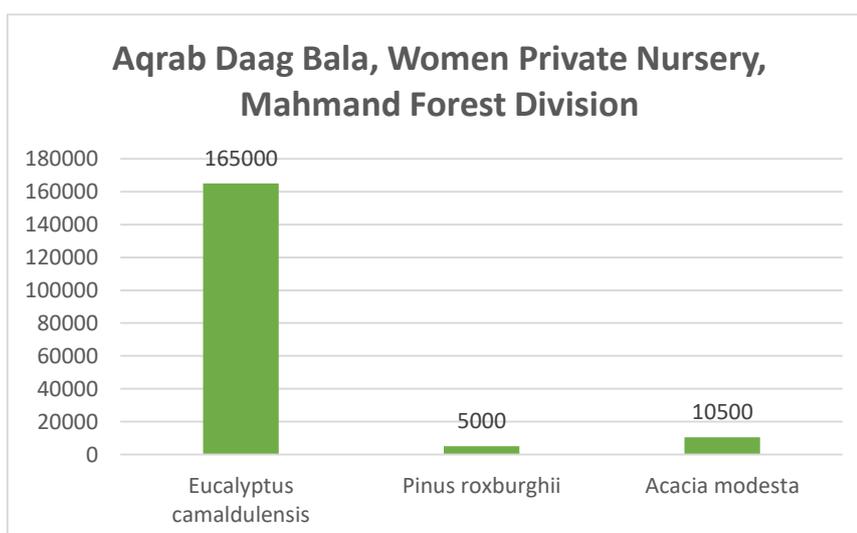


colonizer on degraded sites and there is no justification for using it for afforestation when better species are available. The nursery also has some seedlings of fruit plants produced from seed. The number of fruit plants of various species is as follows:

| Jaman | Orange | Lookat | Guava | Pomegranate | Grapes | Total |
|-------|--------|--------|-------|-------------|--------|---------|
| 2000 | 80000 | 6000 | 40000 | 20000 | 7000 | 155,000 |

5.4. Aqrab Daag Bala, Women Private Nursery, Mahmand Forest Division, Khyber Pakhtunkhwa

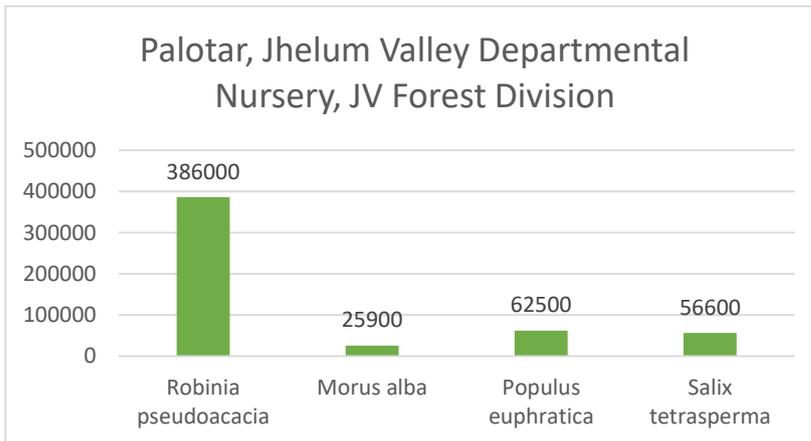
Tube nursery of 200,000 tube plants production capacity. A women nursery in the former tribal areas is a commendable job. There is a very high number of Eucalyptus seedlings (85%) compared to the two native species. Proper nursery up keep is lacking, and while it is labelled a women



nursery, the work is being done by men when they have some extra time. The general condition of the nursery was not impressive. Timely shifting was not done; therefore health of the saplings was not too good.

5.5. Palotar, Jhelum Valley Departmental Nursery, JV Forest Division, AJK

Bare rooted nursery with capacity of 550,000 seedlings. The site has good soil, water is available, however it does not have an easy access for transportation. Except for Robinia all other species are native. Robinia, although an exotic has been well naturalized in Pakistan. Health and condition of the plants was good.



5.6. Rawani Private Nursery, Jhelum Valley Forest Division, AJK

The tube nursery has a capacity to raise 150,000 seedlings. There is a sprinkler irrigation system for watering the plants which is good thing. The nursery was operating below its capacity and normal nursery practices seemed delayed. The nursery operator needs training and proper guidance. Plant health, condition of the nursery and saplings was not good.

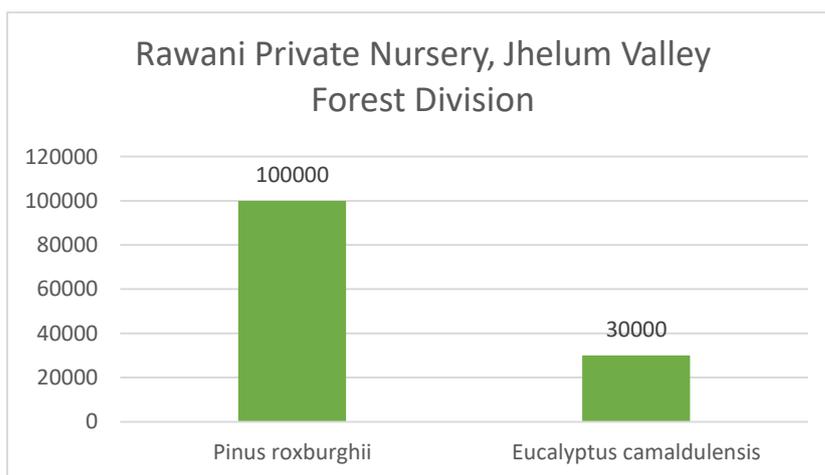
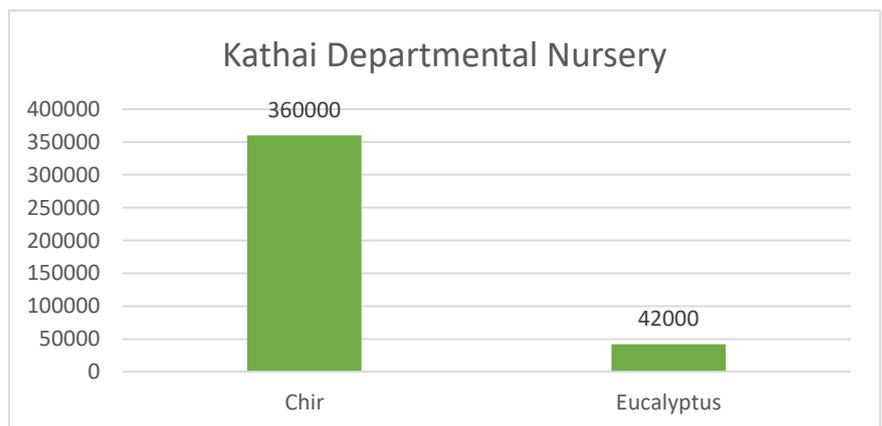




Figure 10: Departmental Tube Nursery, Muzaffarabad

5.7. Kathai Departmental Nursery, Jhelum Valley Forest Division, AJK

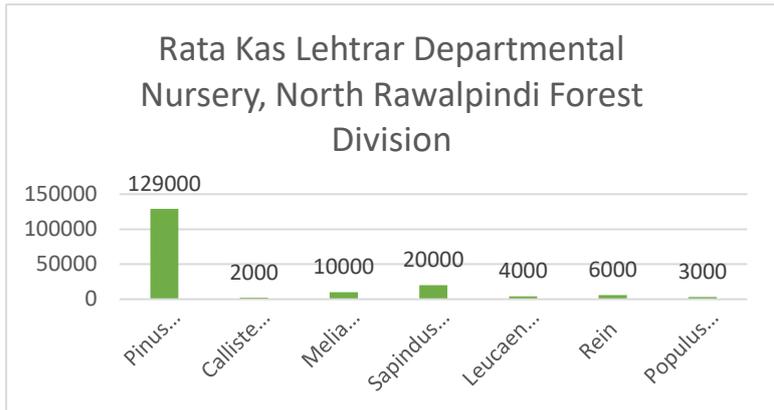
The nursery has a capacity of 505,000 tube plants but was not stocked at full capacity. Mostly native species (Chir) with good planting stock was available. However, 30% beds needed timely shifting.



Although the nursery was not fully stocked however, the health and condition of the existing and timely shifted seedlings was good.

5.8. Rata Kas Lehtrar Departmental Nursery, North Rawalpindi Forest Division, Punjab

The nursery has a capacity of 360,000 tube plants but was quite understocked (around 60%). The nursery was not in good condition. Dominant specie in nursery was Chir pine and was according to the ecological zone. However, the size of tubes was not uniform, some having more length and some less. Similarly tube beds depth was also not appropriate



allowing water stagnation in case of heavy rains. Therefore, the health of the saplings was not good. The nursery also had the fruit plants as follows:

| Guava | Lokat | Amlook | Total |
|-------|-------|--------|-------|
| 11000 | 10000 | 3000 | 24000 |

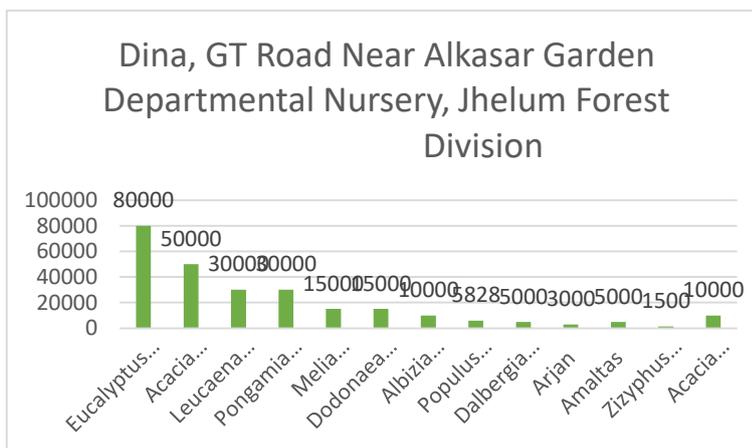


Figure 11: Photo of forest tree nursery in Dina, Jehlum in complete ruin due to lack of attention.

5.9. Dina, GT Road Near Alkasar Garden Departmental Nursery, Jhelum Forest Division, Punjab

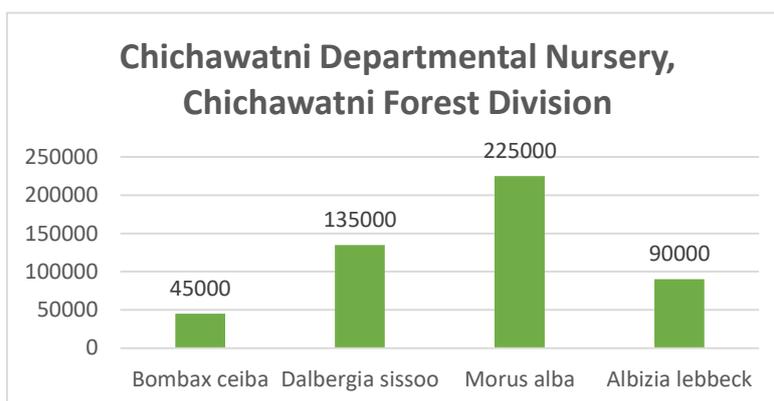
Tube nursery of 355,000 tube plants production capacity. The nursery was not in a good condition. The plants had grown big.

Proper nursery operations like shifting of tubes, hoeing, root pruning etc. had not been done. Irrigation was carried out through flooding which is not a desirable practice. There was a high failure of seeds in tubes.



5.10. Chichawatni Departmental Nursery, Chichawatni Forest Division, Punjab

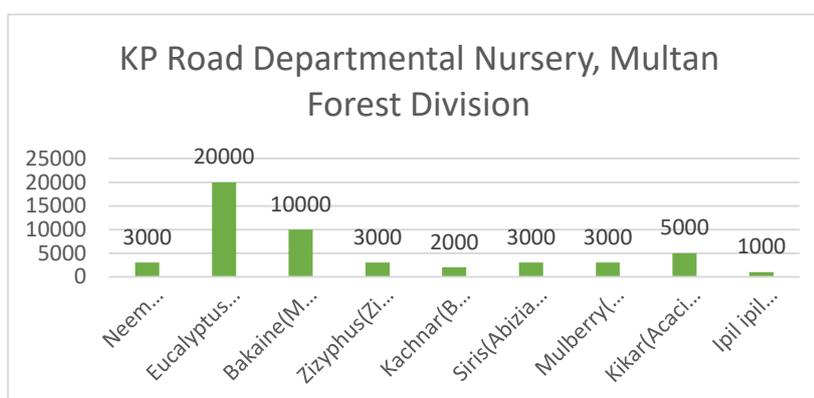
It is a bed nursery with a capacity of 550,000 plants. Overall good nursery with healthy and vigorous plants.



5.11. Kirpal Pur Road Departmental Nursery, Multan Forest Division, Punjab

The nursery has a capacity of 50,000 tube plants. The watering of plants is carried out through flooding. The plants need shifting and root pruning to prevent roots going into the soil. The size of tubes was not uniform, some having more length and some less.

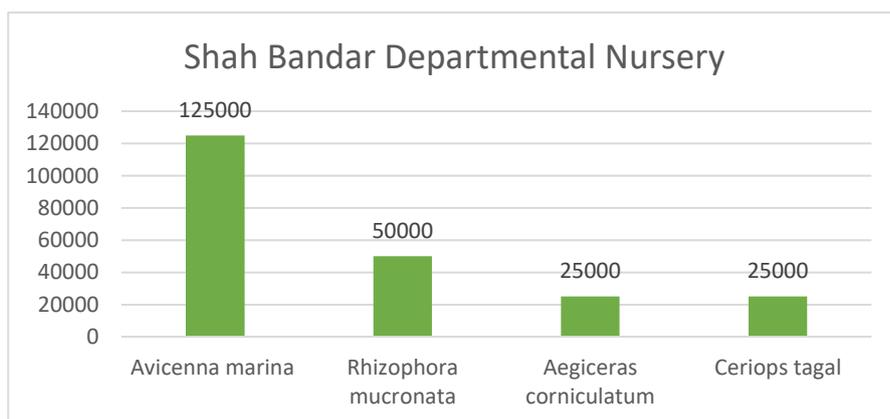
The depth of sunken beds for tube was not appropriate allowing water stagnation in case of heavy rains or over flooded irrigation. The health and condition of the saplings was not good. The ratio of Eucalyptus plants was very high as compared to native species.



5.12. Shah Bandar Departmental Nursery, Left Bank Forest Division, Sindh

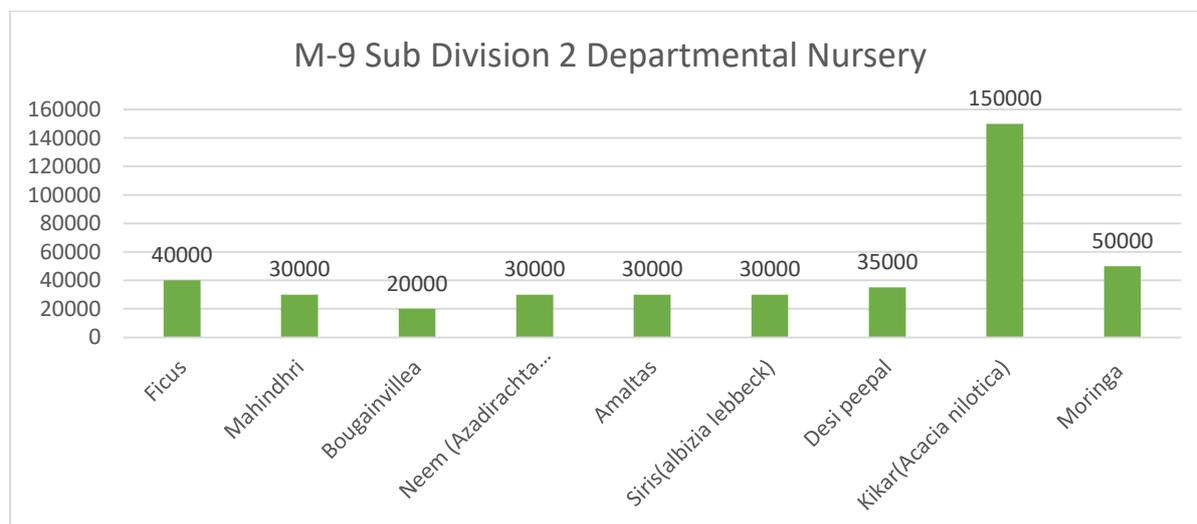
The nursery has a capacity 400,000 tube plants. Almost all four species of Mangroves are present in the nursery.

Health and condition of the plants was good.



5.13. M-9 Sub-Division 2 Departmental Nursery, Karachi 1 Forest Division, Sindh

The nursery has a capacity 1000,000 tube plants. The nursery was well maintained with a rich variety of ornamental and landscape plants. The health and condition of the saplings was good as nursery is located on main Karachi-Hyderabad Highway and frequent inspections are carried out due to easy accessibility.

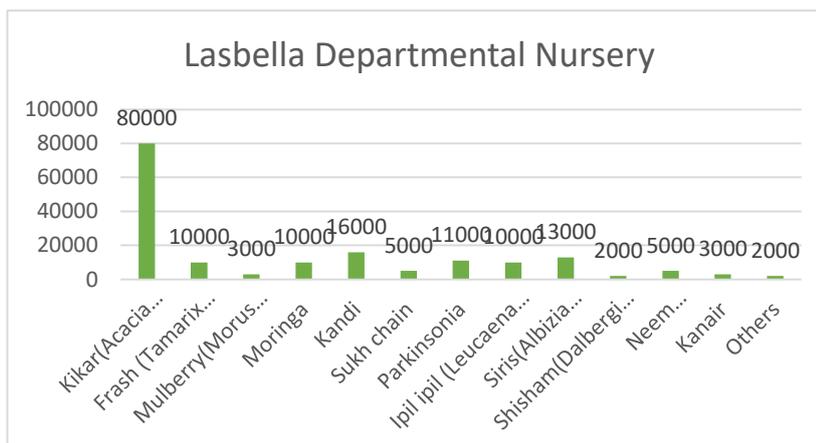


The nursery also has seedlings of the following fruit plants:

| Jaman | Dates | Imli | Total |
|-------|-------|-------|--------|
| 5000 | 5000 | 30000 | 40,000 |

5.14. Lasbela Departmental Nursery, Lasbela Forest Division, Baluchistan

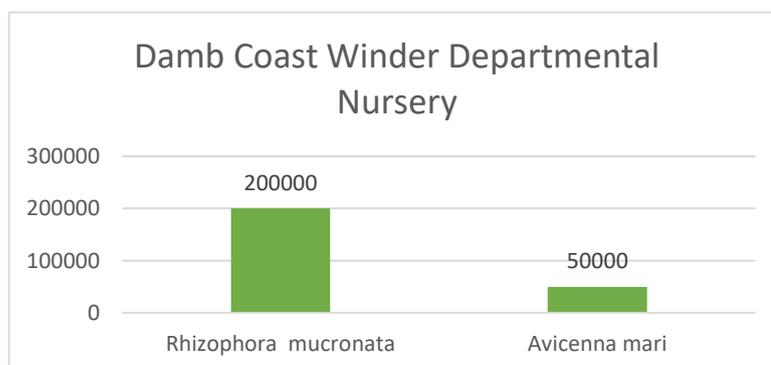
The nursery has a capacity of 205,000 tube plants. Overall the nursery was in good condition with diverse species. The health and condition of seedlings was good. About a third of the tube plants need shifting. The nursery also had the following fruit plants.



| Species | Jaman | Imli | Zizyphus(Ziziphus jujuba) | Lahsoda | Total |
|---------|-------|-------|---------------------------|---------|--------|
| Number | 2000 | 17000 | 10000 | 2000 | 31,000 |

5.15. Damb Coast Winder Departmental Nursery, Lasbela Forest Division, Baluchistan

The nursery has a capacity of 250,000 plants. The nursery was in good condition, and the health and condition of saplings was also good. Species diversity is missing; Avicenna and Rhizophora species were emphasized.



5.16. Spiny Road Quetta Departmental Nursery, Quetta Forest Division, Balochistan

The bed nursery has a capacity to produce 1200,000 bare root plants. Flood irrigation is done through sewage water and large quantity of plastic bags/shoppers was spread around in the nursery beds. Use of waste water without treatment is not a healthy practice, which can be a big health hazard for employees and all personnel handling the plants and the nursery operations.

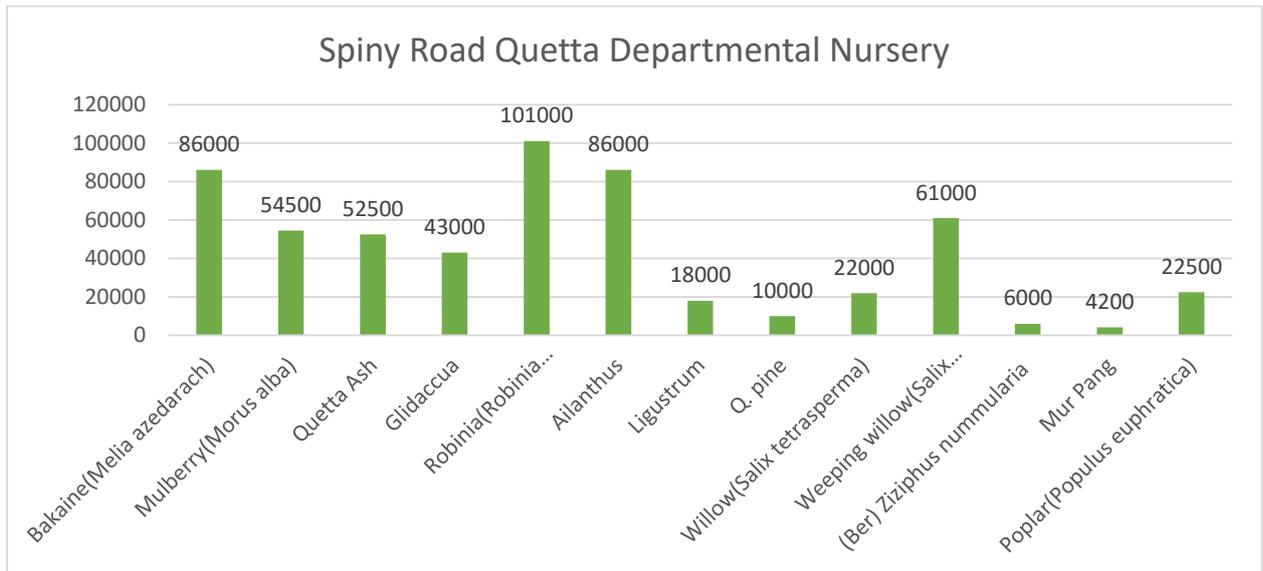
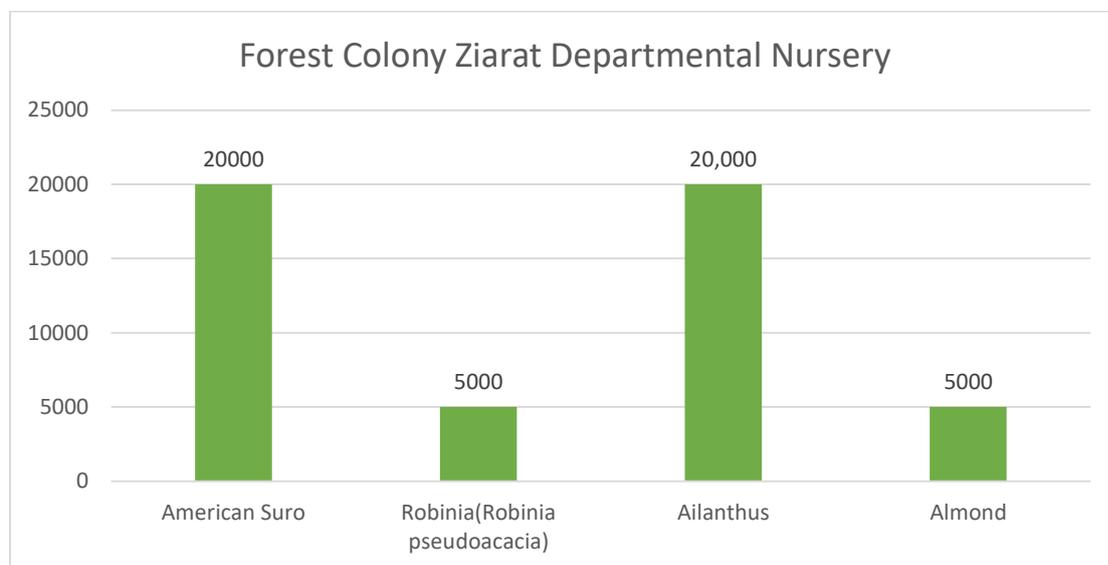


Figure 12: A forest tree nursery in Quetta littered with plastic bags that came with the sewage water used for irrigation.

5.17. Forest Colony Ziarat Departmental Nursery, Ziarat Forest Division, Balochistan

The nursery has a capacity to produce 50,000 tube plants. Nursery was raised in plastic tunnels. Well growing seedlings were observed. Nursery located in DFO Ziarat office compound. The nursery was in good condition; health and condition of plants was also good.



5.18. Airport Road Zarghun Departmental Nursery, Quetta Forest Division, Balochistan

The nursery has a capacity to produce 350,000 tube plants. The seedlings were generally not in good health and condition.

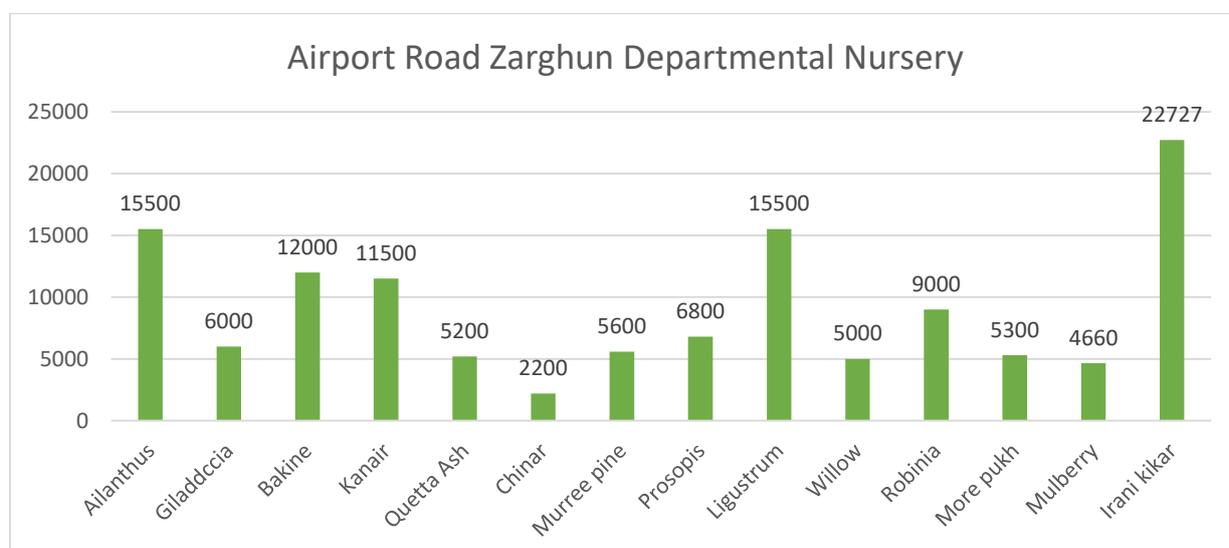




Figure 13: Photo of the forest tree nursery in Quetta showing polythene tubes below the ground level instead of half above and half below ground.

The depth of tube beds was more than the height of the tubes, so some beds were inundated. Therefore, over all condition of planting stock was poor due to lack of proper cultural practices in the nursery despite of easy access and vigilance.

5.19. Analysis of the Results of Evaluation of Forest Tree Nurseries

1. Training for Private Nursery Owners: The monitoring team visited three private nurseries out of which two were supposed to be women operated nurseries. In all three cases, the nursery operator lacked proper training in nursery raising techniques, and there was lack of on-going guidance to the nursery operators. The so-called women nurseries were in reality being operated by the men for all practical purposes.

2. Nursery Techniques: There are two types of nurseries – polythene tube plant nursery and bed nursery. The deciduous plants are generally planted bare root in late winter or early spring season. Most of these plants need more space to grow in the season and are thus produced by sowing seed on raised beds or ridges in the soil and called bed nurseries. One year old plants are pulled out of the ground and either the entire plants are transplanted or converted into root-shoot cuttings (9 inches root with three inch of stem). The cost of production, transportation and planting is a fraction of the tube plants. Furthermore, when grown in tubes, these plants are much smaller and weaker compared those produced in the ground. The evergreens are generally produced in the tubes or pots. Many deciduous plants like

shisham, mulberry, robinia, ailanthus, Salix were found being produced in the polyethylene tubes, which is a wrong practice.

3. Choice of Species: Many species being propagated in the nurseries are either exotic or plants not suitable for that climatic zone. Some specific examples are as follows:

- a) Eucalyptus: There is a very heavy focus on Eucalyptus particularly in KP and to some extent in Punjab. It is an exotic and highly controversial plant not suitable for forest and landscape restoration.
- b) Shisham: The mountainous regions of KP are not suitable for Shisham, but still being produced in some nurseries.
- c) Chilghoza: This is a species of dry temperate climate, but its seedlings are being produced in Gullies moist temperate zone (Gullies Forest Division).
- d) Dodonaea: It is a shrub, and a colonizer that occupies degraded forest lands. It is not a very desirable plant when other suitable species are available for planting.
- e) Other exotic Species: The nurseries have other exotic plants; some are ornamental plants while others are naturalized in Pakistan.

4. Quality of Nurseries: The nurseries are primarily a means of producing high quality plants. The seeds and other plant propagating stock are obtained from certified seed sources, seed orchards or designated mother trees. Most of the nurseries were using uncertified seed mainly obtained through contractors. Most nurseries were not in good condition and needed serious attention. There was not a single nursery among the nurseries monitored that can be termed as well maintained and impressive. Therefore, due importance must be given to adopt proper nursery raising techniques and provision of adequate funds as to ensure the TBTP may not miss its targets.

6. Conclusions and Recommendations

The following conclusions and recommendations are based on the analyses of the results of evaluation of regeneration and afforestation (section 4.9) and nurseries (section 5.19) in this report.

6.1. Regeneration and Afforestation

6.1.1. Survival percentage of regeneration and afforestation

Of the 25 sites evaluated by the monitoring team, 18 sites had over 90% survival rate, six sites had between 80 and 90% survival and at only one site survival rate was 75%.

Recommendations:

1. The quality of the planting stock grown in nurseries needs to come from good quality seeds, and production of healthy plants properly hardened to survival in the field.
2. The species selected for afforestation should be native and best suited for the climatic zone of the ecosystem,

6.1.2. Number of Trees Planted

The number of trees planted as per official records, in many cases appears to be on the higher side. In case of natural regeneration, the reporting assumes that all 40 ha enclosure is blank, whereas the monitoring team found more than 50% of the area already covered with tree crop. In many plantations, only a certain number of trees can be planted at the adopted planting distance, but in many cases, the number of trees reported was much higher.

Recommendations:

1. For regeneration, the count of trees should only be for the blank area of the enclosure, and not for the total area.
2. For afforestation, the number of plants for TBTP targets should be based on area planted and not the number of trees planted. For block plantations the calculations should be made based on 10 x 10 ft planting (1076 per ha) and for 10 ft apart in lines in case of one km (328 plants).

6.1.3. Lack of focus on restoration of landscapes, ecology, and biodiversity

In case of regeneration of forests, no effort has been made to assist the nature by supplemental planting of broad leaved species that are part of the ecosystem, but have generally disappeared from the forests. In block plantations, there is heavy emphasis on exotics, especially Eucalyptus which is very controversial tree. In case of roadside, many species planted are not suitable for the climatic zone and consequently, their long-term survival is doubtful. There appear to be no policy guidelines for regeneration and afforestation on different types of forests or landscapes. If these exist, there is no evidence that those are being followed.

Recommendations:

1. In case of natural forests, the assisted natural regeneration, in addition to fencing, appointment of a *neghaban* should also include

- supplemental sowing of planting of trees species that have either disappeared or are rare, to restore the forests to their natural condition.
2. For block plantations in ecologically sensitive landscapes and watershed, only native trees of the ecosystem should be used for planting.
 3. The ecological value of the irrigated plantations and Canalside plantations should be enhanced through planting a small percentage of fruit and nectar trees.
 4. The linear plantations along roads should follow proper guidelines for planting along highways to minimize traffic hazards.
 5. Forest department should not plant trees on the private lands but provide technical support to the landowners and provide only necessary incentives.

6.1.4. Prioritization for Selection of Sites

It was observed that while selecting sites for ANR many forest areas that were more degraded than those selected for the ANR had been ignored. Similarly, many sites are too small to create any impact. It appears that targets for number of trees are distributed to the field offices who then struggle to find areas for planting.

Recommendations:

The planning for regeneration and afforestation must be carried out based on areas needing rehabilitation or afforestation rather than finding areas to meet the numbers target for TBTP.

6.2. Forest Tree Nurseries

6.2.1. Private Nurseries

The private nursery owners appeared to lack training in forest tree nurseries. Many essential nursery operations had been ignored the plants did not look healthy and vigorous.

Recommendation

All private nursery operators must be given training before they start the nursery and there should be follow-up visits by the field staff to provide continuous guidance and supervision.

6.2.2. Women Nurseries

Two of the women forest nurseries evaluated by the monitoring team were being looked after by the men in their spare time. The women nurseries are meant to provide income for poor and marginalized women, but it appears women are being recruited to meet the targets of women nurseries, rather than for the needy women.

Recommendations:

The women who are either heads of the households or need work to earn money for supplementing family income, should be supported under the TBTP for nursery development.

6.2.3. Production of Deciduous Plants in Polyethylene Tubes

The deciduous plants are best produced by sowing seed in the ground rather than sowing in the tubes. These plants grow vigorously in the growing season and need more space for the development of root. Many deciduous species were found growing in the tubes which is wrong.

Recommendations:

All deciduous plants must be grown in the ground and not in the tubes.

6.2.4. Nursery Design and Maintenance Operations

Many tube nurseries lacked proper drainage for the sunken trough dug in the soil to hold the tubes. Consequently, after rain or flow irrigation, the stagnant water is harmful for the plants, The dugouts are supposed to be lined by plastic sheet, and only 4.5 inch deep so that half the tube is inside the ground level and half the tubes is above the ground. However, in many cases, the dugouts were so that the tubes were completely below ground level. The tube plants require shifting and root pruning, and operation that was lacking or delayed in many nurseries. In most nurseries health and condition of saplings was in average condition.

Recommendations:

The standard nursery techniques for layout, must be followed strictly for the design, and proper tending and grooming of the plants to produce healthy and vigorously.

Annex 1:

TBTP DATA FORM FOR REGENERATION & AFFORESTATION SURVEY

| | | |
|--|---|---|
| Province | | |
| <input type="radio"/> AJK | <input type="radio"/> Balochistan | <input type="radio"/> Gilgit Baltistan |
| <input checked="" type="radio"/> Khyber Pakhtunkhwa | <input type="radio"/> Punjab | <input type="radio"/> Sindh |
| District | | |
| Abbottabad | | |
| Forest Division Name | | |
| Abbottabad Forest Division | | |
| Forest Name/Location | | |
| Dour Sherwan Jogian Abbottabad | | |
| Forest Ecosystem | | |
| <input type="checkbox"/> Marine and Island | <input type="checkbox"/> Littoral and Mangrove | <input type="checkbox"/> Salt Marshes |
| <input type="checkbox"/> Riverine | <input type="checkbox"/> Wetlands & swamps | <input type="checkbox"/> Tropical Thorn Forest |
| <input type="checkbox"/> Sand Dune Desert | <input type="checkbox"/> Dry Sub Tropical Semi-evergreen Scrub Forest | |
| <input type="checkbox"/> Dry Temperate Semi-evergreen Scrub Forest | <input type="checkbox"/> Sub-Tropical Chir Pine Forest | |
| Forest Category | | |
| <input type="checkbox"/> Natural Forests | <input type="checkbox"/> Mangroves | <input type="checkbox"/> Rangelands |
| <input type="checkbox"/> Riverine Forests | <input type="checkbox"/> Irrigated Plantations | <input type="checkbox"/> Roadside Plantations |
| <input type="checkbox"/> Canalside Plantations | <input type="checkbox"/> Community Plantations | <input type="checkbox"/> Woodlots (private lands) |
| <input checked="" type="checkbox"/> Other If Other, then please specify | | |

| | | |
|--|--|---|
| Legal Land Ownership | | |
| <input type="checkbox"/> Chos Act land | <input type="checkbox"/> Community Land | <input type="checkbox"/> Guzara Forest |
| <input type="checkbox"/> Miscellaneous Forest | <input type="checkbox"/> Private Land | <input type="checkbox"/> Protected Forest |
| <input type="checkbox"/> Resumed | <input type="checkbox"/> Reserved Forests | <input type="checkbox"/> Section 38 |
| <input type="checkbox"/> State Forests | <input type="checkbox"/> Unclassed Forest | <input type="checkbox"/> Other |
| Activity Name | | |
| <input type="checkbox"/> Natural Regeneration | <input checked="" type="checkbox"/> Block Plantation | <input type="checkbox"/> Sowing & Dibbling |
| <input type="checkbox"/> Roadside Plantation | <input type="checkbox"/> Canalside Plantation | <input type="checkbox"/> Railwayside Plantation |
| <input type="checkbox"/> Saline & waterlogged Plantation | <input type="checkbox"/> Urban Forestry | <input type="checkbox"/> Other |
| Protection Mechanism | | |
| <i>check one</i> | | |
| <input type="checkbox"/> Government | <input type="checkbox"/> Community | <input checked="" type="checkbox"/> Individual |
| <input type="checkbox"/> Women Warden Organization | <input type="checkbox"/> Other | |
| Recovery Plan for rare species | | |
| <input type="radio"/> Yes | <input type="radio"/> No | |
| Tree Plantation Guide | | |
| <input type="radio"/> Yes | <input checked="" type="radio"/> No | |
| Village land use Plan | | |
| <input type="radio"/> Present | <input checked="" type="radio"/> Absent | |
| Women Participation | | |
| <input checked="" type="radio"/> None | <input type="radio"/> Active | <input type="radio"/> Passive |
| Nighaban Role | | |
| <input type="radio"/> None | <input checked="" type="radio"/> Active | <input type="radio"/> Average |
| <input type="radio"/> Poor | | |

GPS Coordinates of Location Site1

34.1121632 73.1060093 0 0

latitude (x,y °)

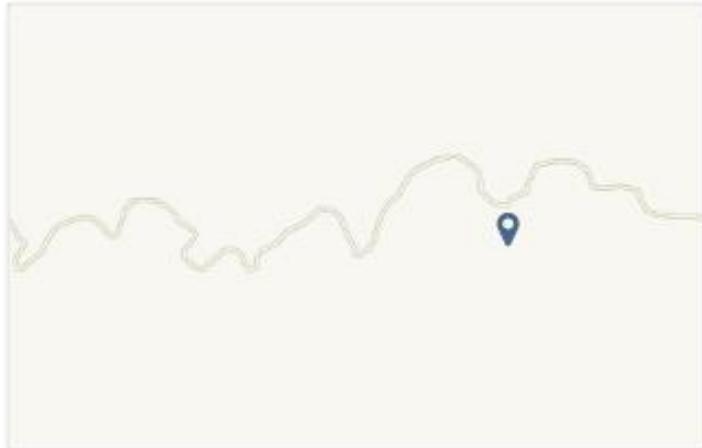
34.1121632

longitude (x,y °)

73.1060093

altitude (m)

accuracy (m)



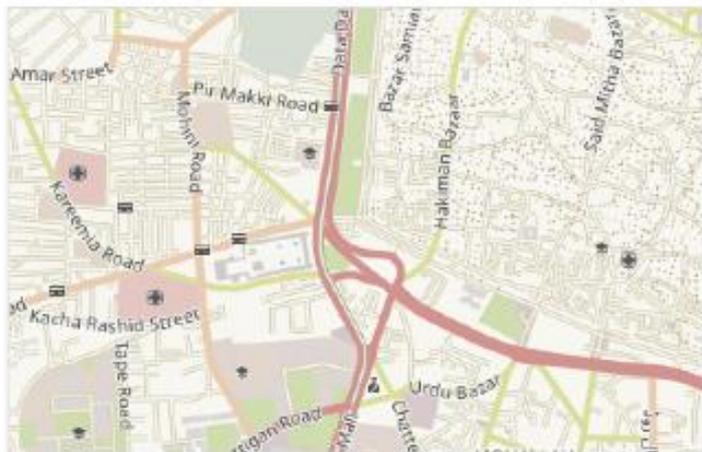
GPS Coordinates of Location Site2

latitude (x,y °)

longitude (x,y °)

altitude (m)

accuracy (m)



GPS Coordinates of Location Site3

latitude (x.y °)

longitude (x.y °)

altitude (m)

accuracy (m)



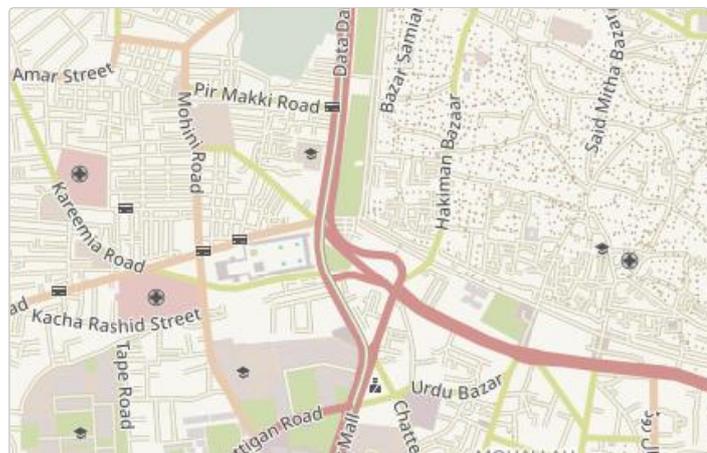
GPS Coordinates of Location Site4

latitude (x.y °)

longitude (x.y °)

altitude (m)

accuracy (m)



Site Reconnaissance Survey Results

| | | |
|---|--|------------------------------------|
| Canopy Cover (%) | | |
| <input type="radio"/> >75% | <input type="radio"/> 50% - 75% | <input type="radio"/> 25% - 50% |
| <input type="radio"/> < 25% | <input checked="" type="radio"/> Blank | |
| Seedling distribution | | |
| <input type="checkbox"/> Uniform | | |
| <input checked="" type="checkbox"/> Scattered | | |
| <input type="checkbox"/> Patchy | | |
| Age of Seedlings | | |
| <input type="radio"/> Upto 1 year | <input checked="" type="radio"/> 1-3 years | <input type="radio"/> > 3 years |
| Health of Seedlings | | |
| <input checked="" type="radio"/> Vigorous | <input type="radio"/> Weak | <input type="radio"/> Stunted |
| Protection status | | |
| <input type="radio"/> Good | <input checked="" type="radio"/> Average | <input type="radio"/> Poor |
| Competition from Weeds | | |
| <input type="radio"/> Heavy | <input checked="" type="radio"/> Normal | <input type="radio"/> Low |
| Native Species | | |
| <input type="checkbox"/> >75% | <input type="checkbox"/> 50% - 75% | <input type="checkbox"/> 25% - 50% |
| <input type="checkbox"/> < 25% | | |
| Nectar & wildfruit Species | | |
| <input type="radio"/> >10% | <input type="radio"/> <10% | <input type="radio"/> None |

Design of sowing pits

NA

Good

Average

Poor

Irrigation Arrangements

Adequate

Average

Insufficient

Seedling Species Frequency

| SR# | Name of Species (Four Letter Abbreviation) | Dominant (>70%) | Frequent (<50%) | Rare (<5%) |
|-----|--|--|--|--|
| 1 | | <input type="radio"/> Yes <input type="radio"/> No | <input type="radio"/> Yes <input type="radio"/> No | <input type="radio"/> No <input type="radio"/> Yes |
| 2 | | <input type="radio"/> Yes <input type="radio"/> No | <input type="radio"/> Yes <input type="radio"/> No | <input type="radio"/> No <input type="radio"/> Yes |
| 3 | | <input type="radio"/> Yes <input type="radio"/> No | <input type="radio"/> Yes <input type="radio"/> No | <input type="radio"/> No <input type="radio"/> Yes |
| 4 | | <input type="radio"/> Yes <input type="radio"/> No | <input type="radio"/> Yes <input type="radio"/> No | <input type="radio"/> No <input type="radio"/> Yes |
| 5 | | <input type="radio"/> Yes <input type="radio"/> No | <input type="radio"/> Yes <input type="radio"/> No | <input type="radio"/> No <input type="radio"/> Yes |

| | | | | |
|--------------|--|--|--|--|
| 6 | | <input type="radio"/> Yes <input type="radio"/> No | <input type="radio"/> Yes <input type="radio"/> No | <input type="radio"/> No <input type="radio"/> Yes |
| 7 | | <input type="radio"/> Yes <input type="radio"/> No | <input type="radio"/> Yes <input type="radio"/> No | <input type="radio"/> No <input type="radio"/> Yes |
| 8 | | <input type="radio"/> Yes <input type="radio"/> No | <input type="radio"/> Yes <input type="radio"/> No | <input type="radio"/> No <input type="radio"/> Yes |
| 9 | | <input type="radio"/> Yes <input type="radio"/> No | <input type="radio"/> Yes <input type="radio"/> No | <input type="radio"/> No <input type="radio"/> Yes |
| Other | | <input type="radio"/> Yes <input type="radio"/> No | <input type="radio"/> Yes <input type="radio"/> No | <input type="radio"/> No <input type="radio"/> Yes |

Sampling Design

Random Stratified Random

Sample Plot size

1/200 ha 1/100 ha 1/50 ha

Shape of sample Plot

Circular Rectangular Other

Survival or Stocking Percent of Species (four letter abbreviation)

| (To be calculated from Data Sheets) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|--|----------|----------|----------|----------|----------|----------|----------|
| Species | | | | | | | |
| Survival % | | | | | | | |
| <p>Scan datasheet with mobile app and upload</p> <p>Click here to upload file. (< 10MB)</p> | | | | | | | |
| <p>Point and shoot! Use the camera to take a photo</p> <p>Click here to upload file. (< 10MB)</p> | | | | | | | |
| <p>Point and shoot! Use the camera to take a photo</p> <p>Click here to upload file. (< 10MB)</p> | | | | | | | |
| <p>Point and shoot! Use the camera to take a photo</p> <p>Click here to upload file. (< 10MB)</p> | | | | | | | |
| <p>Point and shoot! Use the camera to take a photo</p> <p>Click here to upload file. (< 10MB)</p> | | | | | | | |

Drone Video Available

Yes

No

Use the camera to record a video

[Click here to upload file. \(< 10MB\)](#)

Comments/Observations/Notes

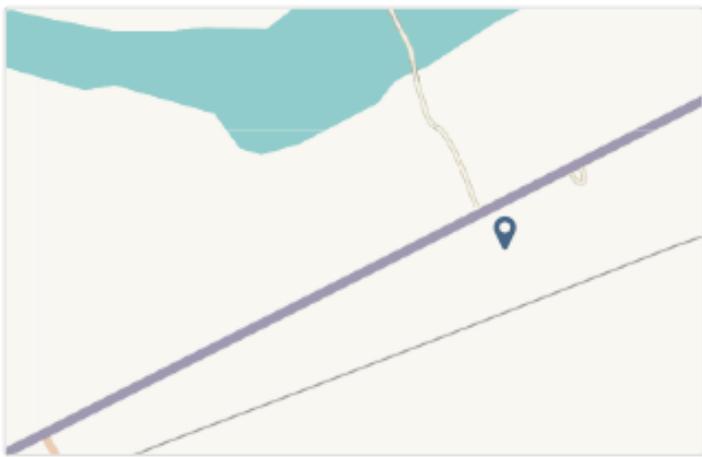
Name of Enumerator

Enter a date

yyyy-mm-dd

Annex 2: Forest Tree Nursery Evaluation KoBo Toolbox Form

TBTTP Tree Nursery Assessment Questionnaire

| | | |
|--|--------------------------------------|---|
| Province | | |
| <input type="checkbox"/> AJK | <input type="checkbox"/> Balochistan | <input type="checkbox"/> Gilgit Baltistan |
| <input checked="" type="checkbox"/> Khyber Pakhtunkhwa | <input type="checkbox"/> Punjab | <input type="checkbox"/> Sindh |
| District | | |
| Abbottabad | | |
| Name and Location of Nursery | | |
| Tube Nursery Basti Sher Khan Abbottabad | | |
| Nursery Type | | |
| <input checked="" type="checkbox"/> Tube | <input type="checkbox"/> Bare Rooted | <input type="checkbox"/> Combine |
| Record your current location | | |
| 33.995843 73.0602592 0 0 | | |
| latitude (x.y °) | 33.995843 | |
| longitude (x.y °) | 73.0602592 | |
| altitude (m) | | |
| accuracy (m) | | |
|  | | |

Nursery Ownership Status

Government
 Private Male Operator
 Private Female operator

CBO Male
 CBO Female
 Other

Total Production/year

Maximum Capacity

| Rare Species | Name of Species | Number of Plants |
|--------------|-----------------|------------------|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |

| Forest Tree Plants | Name of Species | Number of Seedlings | Certified Seed |
|--------------------|-----------------|---------------------|----------------|
| | | | |

| | | | | |
|--------------------------|------------------------|---|-------------------------|--|
| 1 | | | | <input type="radio"/> No <input type="radio"/> Yes |
| 2 | | | | <input type="radio"/> No <input type="radio"/> Yes |
| 3 | | | | <input type="radio"/> No <input type="radio"/> Yes |
| 4 | | | | <input type="radio"/> No <input type="radio"/> Yes |
| 5 | | | | <input type="radio"/> No <input type="radio"/> Yes |
| 6 | | | | <input type="radio"/> No <input type="radio"/> Yes |
| Other | | | | <input type="radio"/> No <input type="radio"/> Yes |
| Fruit Tree Plants | Name of Species | Drafting/Budding | Number of Plants | Certified Seed |
| 1 | | <input type="radio"/> Drafting <input type="radio"/> Budding | | <input type="radio"/> No <input type="radio"/> Yes |
| 2 | | <input type="radio"/> Drafting <input type="radio"/> Budding | | <input type="radio"/> No <input type="radio"/> Yes |
| 3 | | <input type="radio"/> Drafting <input type="radio"/> Budding | | <input type="radio"/> No <input type="radio"/> Yes |

| | | | | |
|--------------------------|------------------------|---|--|--|
| 4 | | <input type="radio"/> Drafting <input type="radio"/> Budding | | <input type="radio"/> No <input type="radio"/> Yes |
| 5 | | <input type="radio"/> Drafting <input type="radio"/> Budding | | <input type="radio"/> No <input type="radio"/> Yes |
| 6 | | <input type="radio"/> Drafting <input type="radio"/> Budding | | <input type="radio"/> No <input type="radio"/> Yes |
| Other | | <input type="radio"/> Drafting <input type="radio"/> Budding | | <input type="radio"/> No <input type="radio"/> Yes |
| Ornamental Plants | Name of Species | Number of Plants | Certified Seed | |
| 1 | | | <input type="radio"/> Yes <input type="radio"/> No | |
| 2 | | | <input type="radio"/> Yes <input type="radio"/> No | |
| 3 | | | <input type="radio"/> Yes <input type="radio"/> No | |
| 4 | | | <input type="radio"/> Yes <input type="radio"/> No | |
| 5 | | | <input type="radio"/> Yes <input type="radio"/> No | |
| 6 | | | <input type="radio"/> Yes <input type="radio"/> No | |

| | | | |
|---|--|--|--|
| Other | | | <input type="radio"/> Yes <input type="radio"/> No |
| Bed Nursery Soil <input type="radio"/> Fertile <input checked="" type="radio"/> Marginal <input type="radio"/> Poor | | | |
| Drainage <input type="checkbox"/> Good <input checked="" type="checkbox"/> Average <input type="checkbox"/> Poor | | | |
| Potting Soil Mix <input type="radio"/> Organic Manure <input type="radio"/> Inorganic N-P-K | | | |
| Drone Video Available <input type="radio"/> Yes <input type="radio"/> No | | | |
| Comments/Observations <hr/> | | | |
| Point and shoot! Use the camera to take a photo Click here to upload file. (< 10MB) <hr/> | | | |
| Use the camera to record a video Click here to upload file. (< 10MB) <hr/> | | | |

Enumerator Name

Enter a date

yyyy-mm-dd

Annex 3: List of Regeneration and Afforestation sites Selected for Evaluation

| INTERVENTIONS | ECOSYSTEM | PROVINCE | SITE | DISTRICT |
|-------------------------------|--------------------|-------------|-----------------------|--------------|
| Assisted Natural Regeneration | Chir | KP | Masar RF | Shinkiari |
| | Thorn Forest | KP | Nizampur | Nowshera |
| | Chir Pine | AJK | Shaheed Gali | Muzaffrabad |
| | Chir Pine | Punjab | Kotli Sattian | Rawalpindi |
| Sowing & Dibbling | Thorn Forest | Punjab | Daryala | Jehlum |
| Block Plantations | Chir/Blue Pine | KP | Jugian Daur | Abbotabad |
| | Thorn Forest | KP | keshgi Bala | Charsadda |
| | Sub-tropical | KP | Adraman | Mahmmand |
| | Chir Pine | AJK | Chanjal | Muzaffarabad |
| | Chir Pine | AJK | Soka Sani | Hattian Bala |
| | Tropical Thorn | Balochistan | Hub Dam | Lasbela |
| | Dry Temperate | Balochistan | Zamzama | Quetta |
| | Dry Temperate | Balochistan | Mian Ghundi Park | Quetta |
| Riverine plantations | Riverine | Punjab | Thatha Faqeer | Gujrat |
| | Riverine | Sindh | Miani | Hyderabad |
| | | | | |
| Irrigated Plantations | Irrigated | Punjab | Chichawatni | Chichawatni |
| | | | | |
| Linear Plantations | Roadside | KP | Goharabad interchange | Abbotabad |
| | Roadside/Canalside | Punjab | LBDC RD # 346-353 | Sahiwal |
| | Roadside/Canalside | Punjab | Kirpal pur | Multan |
| | Roadside | Sindh | M-9, Karachi-1 | Karachi |
| | Roadside | Balochistan | Near Coast Guard | Lasbela |
| | Roadside | Balochistan | Ziarat | Ziarat |
| Mangroves | Littoral & swamp | Sindh | Creek Mirgh | Sajjawal |
| Urban Forestry | Thorn Forest | Sindh | Hyderabad | Hyderabad |

Annex 4: List of Forest Tree Nurseries Selected for Evaluation

| Province | Name & Location | Ownership | Type of Nursery | Production Capacity |
|---------------------------|---|--------------|-----------------|---------------------|
| Khyber Pakhtunkhwa | Women Nursery, Makrhia Bala, Shinkiari, Siran Forest Division | Private | Tube | 170,000 |
| | Basti Sher Khan Nursery, Gallies Forest Division | Departmental | Tube | 1250,000 |
| | Aqrab Daag Bala Nursery, Mahmand Forest Division | Departmental | Tube & BR mixed | 1285,000 |
| | Women Nursery, Aqrab Daag Bala, Mahmand Forest Division | Private | Tube | 200,000 |
| AJK | Palotar, Jhelum Valley Nursery, JV Forest Division, AJK | Departmental | BR | 550,000 |
| | Rawani Nursery, Jhelum Valley Forest Division, AJ | Private | Tube | 150,000 |
| | Kathai Departmental Nursery, Jhelum Valley Forest Division, AJK | Departmental | Tube | 505,000 |
| Punjab | Rata Kas Lehtrar Nursery, North Rawalpindi Forest Division | Departmental | Tube | 360,000 |
| | Dina, GT Road Nursery, Jhelum Forest Division | Departmental | Tube | 355,000 |
| | Chichawatni Nursery, Chichawatni Forest Division | Departmental | Tube | 550,000 |
| | Kirpal Pur Road Departmental Nursery, Multan Forest Division | Departmental | Tube | 50,000 |
| Sindh | Shah Bandar Nursery, Left Bank Forest Division, Sindh | Departmental | Tube | 400,000 |
| | M-9 Sub-Division 2 Nursery, Karachi 1 Forest Division | Departmental | Tube | 1000,000 |
| Balochistan | Lasbela Nursery, Lasbela Forest Division | Departmental | Tube | 205,000 |
| | Damb Coast Winder Nursery, Lasbela Forest Division | Departmental | Tube | 250,000 |
| | Spiny Road Quetta Nursery, Quetta Forest Division | Departmental | BR | 1200,000 |
| | Forest Colony Ziarat Nursery, Ziarat | Departmental | Tube | 50,000 |

| | | | | |
|--|---|--------------|------|---------|
| | Forest Division | | | |
| | Airport Road Zarghun Nursery, Quetta Forest Division | Departmental | Tube | 350,000 |

Annex 5: List of all regeneration and Afforestation Sites with Official Count of Plants, The Optimum Number that should be planted and actual count

| Site Name | Official Count | Calculated Number | Actual Count | Success % |
|--|----------------|-------------------|--------------|-----------|
| Maser Reserve Forest, Shinkiari, Siran Forest Division | 80,000 | 40,000 | 40,000 | 100 |
| Shamlat Deh, Nizampur Peshawar Forest Division | 80,000 | 40,000 | 40,000 | 100 |
| Shaheed Gali Reserved Forest Muzaffarabad Forest Division | 80,000 | 40,000 | 40,000 | 100 |
| Lehtrar Reserve Forest Rawalpindi North Forest Division | 80,000 | 40,000 | 40,000 | 100 |
| Daryala Jhelum Forest Division | 200,000 | 72,600 | 72,600 | 100 |
| Jugian Daur Community Plantation, Daur Watershed Forest Division | 21,500 | 21,527 | 18,868 | 88 |
| Keshgi Bala Private Plantation Peshawar Forest Division | 33,325 | 33,354 | 34,163 | 102 |
| Adraman Community Plantation, Mahmand Forest Division | 60,000 | 54,876 | 57,475 | 96 |
| Chanjal Community Plantation Muzaffarabad Forest Division | 111,000 | 107,593 | 95,526 | 86 |

| | | | | |
|---|---------|---------|---------|-----|
| Soka Sani Community Plantation Hattian Bala Forest Division, AJK | 108,900 | 107,593 | 91,504 | 84 |
| Hub Dam Plantation Lasbela, Baluchistan | 30,450 | 30,422 | 26,998 | 89 |
| Cantonment Plantation, Zamzama, Quetta, Baluchistan | 21,400 | 22,794 | 17,496 | 81 |
| Mianghundi Park Plantation Quetta, Baluchistan | 10,750 | 10,750 | 9,072 | 84 |
| Private Plantation, Tangayan Ziarat Forest Division | 10,800 | 10,760 | 8,149 | 75 |
| Thatha Faqeer Gujrat Forest Division, Punjab | 36,300 | 21,520 | 33,239 | 92 |
| Miani Reserve Forest Hyderabad Forest Division | 117,523 | 117,523 | 117,523 | 100 |
| Chichawatni Irrigated Plantation, Chichawatni Forest Division | 13,068 | 12,552 | 11,484 | 88 |
| Motorway Plantation, Goharabad Interchange, Gullies Forest Division | 48,840 | 48,200 | 43,772 | 90 |
| Canalside Plantation Sahiwal Forest Division | 36,300 | 23,780 | 43,592 | 95 |
| Canal Side Plantation Kirpal Pur, Multan | 8,330 | 5,466 | 8,002 | 96 |
| M-9 Motorway, Karachi Forest Division | 12,000 | 9,840 | 11,415 | 95 |

| | | | | |
|--|-----------|---------|---------|-----|
| Roadside Plantation Lasbela, Balochistan | 4,100 | 3,280 | 3,858 | 94 |
| Roadside plantation Ziarat, Balochistan | 3,200 | 3,200 | 3,200 | 100 |
| Sajawal (Shah Bandar) Mangrove Forest, Sindh | 43,200 | 43,200 | 41,664 | 96 |
| Hyderabad Urban Forestry Plantation, Sindh | 3,630 | 3,630 | 3,267 | 90 |
| Total | 1,254,616 | 924,460 | 872,867 | |



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Tsunami**
Pakistan's **LARGEST** ever tree plantation drive!

