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ASSESSMENT OF NATURAL REGENERATION IN ENCLOSURES ESTABLISHED UNDER 10-BTTP OF MARDAN FOREST DIVISION BY RESEARCH & DEVELOPMENT DIRECTORATE, PESHAWAR KHYBER PAKHTUNKHWA FOREST DEPARTMENT

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Abstract

The purposes of the current study were systematically carried out the precise assessment of the regeneration condition of mother tree species in all of the enclosures and achieve a 100 % target. The study was carried out under 10-BTTP thirty numbers enclosures were established as per DFO office records in various sites of the Mardan forest division. Major and associated species of the Mardan forest division were Acacia modesta, Olea ferruginea, Mallotus phillippenensis, Dalbergia sissoo, Albizia lebbek and Dodonaea viscose. A total of 30 enclosures were assessed to get an accurate natural regeneration ratio. All the field data were recorded on the prescribed Questionnaire in which all the relevant parameters were given. The data was collected on-spot GPS calibrated points using tally sheets and questionnaires. A prominent point within each enclosure was selected as the first sampling point. Each of the sampling plots was based on the point centre method where each of the points/plots was a circle having a radius of 17.8m. The data were analyzed by using the Excel programme. After the data analysis, enclosures were categorized into Poor, Average and Good based on the number of regenerations per Acre. Average numbers of regeneration in all enclosures 417 per acre was reported. In the Mardan forest division, 5 numbers of enclosures of 16.67% were recorded in the Poor category, 6 numbers of enclosures of 20% were in the Average category, and 19 numbers of enclosures 63.33% were reported in the Good category.

Keywords: Natural Regeneration**,** Enclosures, 10 BTTAP, Assessment, Research and Development Directorate Peshawar.

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INTRODUCTION

More than half of the world's tropical forests have been converted to other land uses, limiting available habitats and resources for forest-dependent species and humans and jeopardising the ecosystem functions that sustain all life on Earth.(Chazdon & Guariguata, 2016) The public's attention is generally drawn to the loss and deterioration of virgin tropical forests, which are frequently referred to in media reports as "the lungs of the Earth" because they exchange massive amounts of gases with the atmosphere.(Grace et al., 2014). Conservation and effective management of surviving old-growth forests are critical to preventing future biodiversity loss and preserving carbon stocks.(Grace et al., 2014) Natural regeneration incorporates the silvicultural practise of "close-to-nature" forestry, which supports the sustainability of natural forest ecosystem. (Hammond et al., 2021) It so improves the variety, stability, and resilience of forest ecosystems (Liira et al., 2011)

From the oxygen we breathe to the wood we consume, we rely on forests for our life. In addition to providing habitat for animals and human livelihood, forests preserve watersheds, prevent soil erosion, and moderate climate change. Despite our reliance on trees, we are nonetheless letting them perish. (Importance of Forests | WWF, n.d.). Natural regeneration is critical for biodiversity preservation and maintenance. It is critical to sustain the process of forest renewal by suitable natural and artificial regeneration, depending on management objectives. Clear felling hastens the loss of seedlings and saplings while also disrupting the natural condition of natural forests and hence the ecology. (Rahman et al., 2011)

Unfortunately, many human disturbances are constantly posing a danger to many tropical ecosystems (Fischer et al., 2016). These forms of forest disturbance are mostly caused by encroaching agriculture, logging (both legal and illegal), and collecting non-timber forest products (NTFPs) for fuelwood, food, and medicine (Lawer et al., 2013). The species that regenerate, their survival, and the particular land and tree management techniques that farmers use—even if they have been scantly recorded in the literature—determine the final composition of regenerated vegetation (Lohbeck et al., 2020).

Despite the significance of natural regeneration for the preservation of genetic resources, its growth and development are sometimes sluggish because of the very complex relationship between seedling establishment and the local environmental circumstances (Pardos et al., 2005) .

Mardan Forest Division falls in a sub-tropical broad-leaved evergreen scrub forest having a semi-arid climate i.e. hot summers and cold winters, under 10-BTTP 30 numbers of enclosures were established in different sites i.e. 30 numbers of enclosures were established in the year 2020-21 under 10-BTTP. Major species of Mardan forest division are Acacia modesta, Olea ferrugenia, Mallothus phillipensis, Dalbergia sisso, Albizia lebbeck and Dodonia viscosa. Mostly these enclosures were established in the Year

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2020. The topography of the area is moderate to steep hills. Soil condition ranges from gravel to silty loam which supports natural regeneration. The purpose of the establishment of these enclosures is to enhance natural regeneration in these areas. A total of **3460.25** Acres area were monitored and assessed.

Study Area

District Mardan is a district in Pakistan's Khyber Pakhtunkhwa province's Mardan Division. The district is named after Mardan, which also serves as the district's headquarters. The area is well-known for its agricultural sector and archaeological monuments such as Takht Bhai, Jamal Garhi, and Sawal Dher.

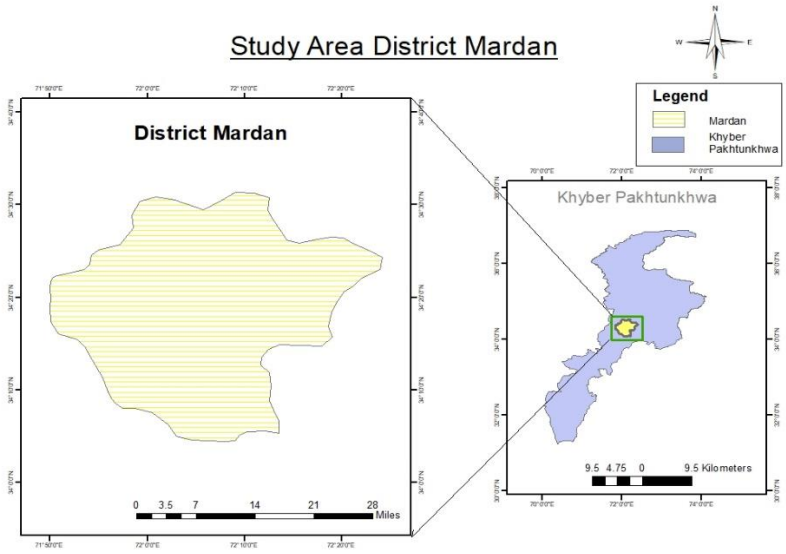

Figure 1: Map of the Study Area

METHODOLOGY

Before starting the field assessment all the relevant records of the forest department i.e. Enclosures technical feasibility reports, social VDC profiles file, Reference coordinates, list of Negahbans and GIS resource Maps were checked and some of the Maps were found to be incorrect while some of the enclosures lack Boundary demarcation or having loose boundary demarcation.

The fieldwork included the questionnaire plus study design field testing and their amendments before the actual fieldwork. The data was collected on-spot GPS calibrated points using tally sheets and questionnaires. A grid of 200m was designed for the sampling plots to study the area thoroughly by systematic random sampling. Each of the sampling plots was based on the point centre method where each of the points/plots was a circle having a radius of 17.8m to ensure 10% coverage of the area per hectare for

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ensuring maximum precision of the data recorded. In the total 30 assessed enclosures, a total of 295 sample plots were observed, recorded and analyzed afterwards.

RESULTS

Status of Enclosures of Mardan Forest Division

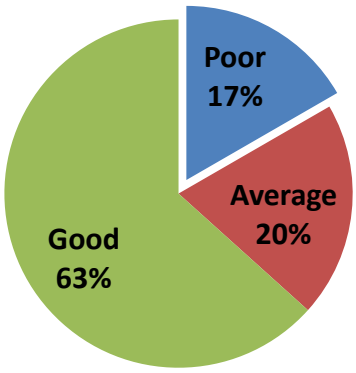
MARDAN FOREST DIVISION				
S.No	**Status**	**Criteria Per Acre**	**Number of Enclosures**	**Percentage**
1.	Poor	0-150	5	16.67 %
2.	Average	151-300	6	20.0 %
3.	Good	300 and above	19	63.33 %
4.	Total		30	100 %

Poor: 1 - 150 Plants/Regeneration per Acre

Average: 151 - 300

Good: 301 & Above

STATUS OF ENCLOSURES



Data Reported by Research and Development Directorate, KP

In Mardan Forest Division six number of VDCs have been established which comprising of thirty number of enclosures of various sites. Katlang, Saba VDC has ten enclosures: Gumbat, Kasai, Shah Baig, Planwa Khwa, Shamshad Tangai, ShahKhel Tangai, Zelo Kamar, Musa Kandow, Bara Obah, and Kajoor Garhi, with Zelo Kamar having the highest regeneration rate per acre (390 plants per acre) and Gumbat having the lowest regeneration rate per acre (129 plants per acre). The overall findings of Katlang, VDC Saba reveal that the enclosure status was 40% Good, 40% Poor, and 20% Average.

Ismaila Swabi was the second VDC, with a single enclosure Sor Kamar covering an area of 92.63 acres with a regeneration rate per acre of 313. And the enclosure was rated as Good.

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Rustam Garyale was the third VDC, with two enclosures, Iteran-1 and Iteran-2, all of which were in Good Condition. However, Iteran-2 had a high regeneration rate per acre (500 Plants per acre).

Rustam, Kass Malandary, was the fourth VDC, with four enclosures: Kohidana, Kohidana 1, Birbal Dara, and Bridge Dara. The maximum regeneration rate is 500 plants per acre in the Kohidana enclosure, while the lowest regeneration rate is 175 plants per acre in the Bridge Dara area. The overall state of the enclosures of the VDC Rustam, Kass Malandary shows that three of them are in Good condition, while one is in Average condition.

VDC Rustam, TN, DKK was the fifth, with three enclosures: Krapa, Gujaro Tangay, and Prekary. Gujaro Tangay had the greatest regeneration rate of 288 plants per acre. While the Krapa enclosure has a poor regeneration rate of 139 plants per acre.

VDC Katlang, Saba, with ten enclosures, was followed by Ghato Tangy, Tawas Khwar, Salmata, Jalala Kasai, Qajeer Band, Hagha Khwa, Sheikh Patay, Tortum, Warbaze, and Badam Kasai. The maximum regeneration rate was reported in Qajeer Band (946 plants per acre), while the lowest regeneration rate was observed in Ghato Tangy (264 plants per acre). Except for the Ghato Tangy enclosure, all of the enclosures exhibit a good state of regeneration.

Mardan Forest Division had an average regeneration rate of 417 plants per acre.

Table 1: Enclosures of Mardan Division

S.No	VDC Name	Enclosure Name	Area Calculated (GIS) in Acre	Reg/Acre	Total Reg in Enclosure	Status
1	USC Katlang, SABA VDC Office order No. 76 Dated. **11/02/2020**	Gumbat	100.78	129	13097	Poor
2		Kasai	106.95	144	15458	Poor
3		Shah baig	109.67	146	16117	Poor
4		Planwa khwa	105.22	139	14697	Poor
5		shamshad tangai	97.57	274	26742	Average
6		ShahKhel Tangai	101.76	304	30982	Good
7		Zelo kamar	98.8	390	38600	Good
8		Musa Kandow	99.05	318	31559	Good
9		Bara Obah	108.68	383	41712	Good
10		Kajoor Garhi	115.1	257	29638	Average
11	Ismaila Swabi Office order No. 74	Sor Kamar	92.63	313	29025	

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	Dated. **12/03/2020**					Good
12	Rustam Garyale, Office order No. 135	Iteran-1	92.38	448	41402	Good
13	Dated. **22/06/2020**	Iteran-2	149.19	500	74594	Good
14	Rustam, Kass Malandary, Office order No. 87 Dated. **20/02/2020**	Kohidana	92.38	496	45852	Good
15		Kohidana 1	98.8	457	45200	Good
16		Birbal Dara	103	455	46871	Good
17		Bridge Dara	103.25	175	18099	Average
18	Rustam, TN,DKK VDC Office order No.77 Dated. **11/02/2020**	Krapa	98.8	139	13760	Poor
19		Gujaro Tangay	98.8	288	28480	Average
20		Prekary	111.15	184	20520	Average
21	USC Katlang, SABA Office order No. 76 Dated**. 11/02/2020**	Ghato Tangy	102.26	264	27076	Average
22		Tawas Khwar	118.56	517	61392	Good
23		Salmata	125.48	574	72085	Good
24		Jalala Kasai	195.87	612	120060.2	Good
25		Qajeer Band	111.15	946	105210	Good
26		Hagha Khwa	159.56	768	122546.2	Good
27		Sheikh Patay	128.44	565	72644	Good
28		Tortum	122.27	673	82319	Good
29		Warbaze	147.21	322	47442	Good
30		Badam Kasai	165.49	665	110148	Good
Total			3460.25	11859	1443327	
Average Regeneration Per Acre			417			

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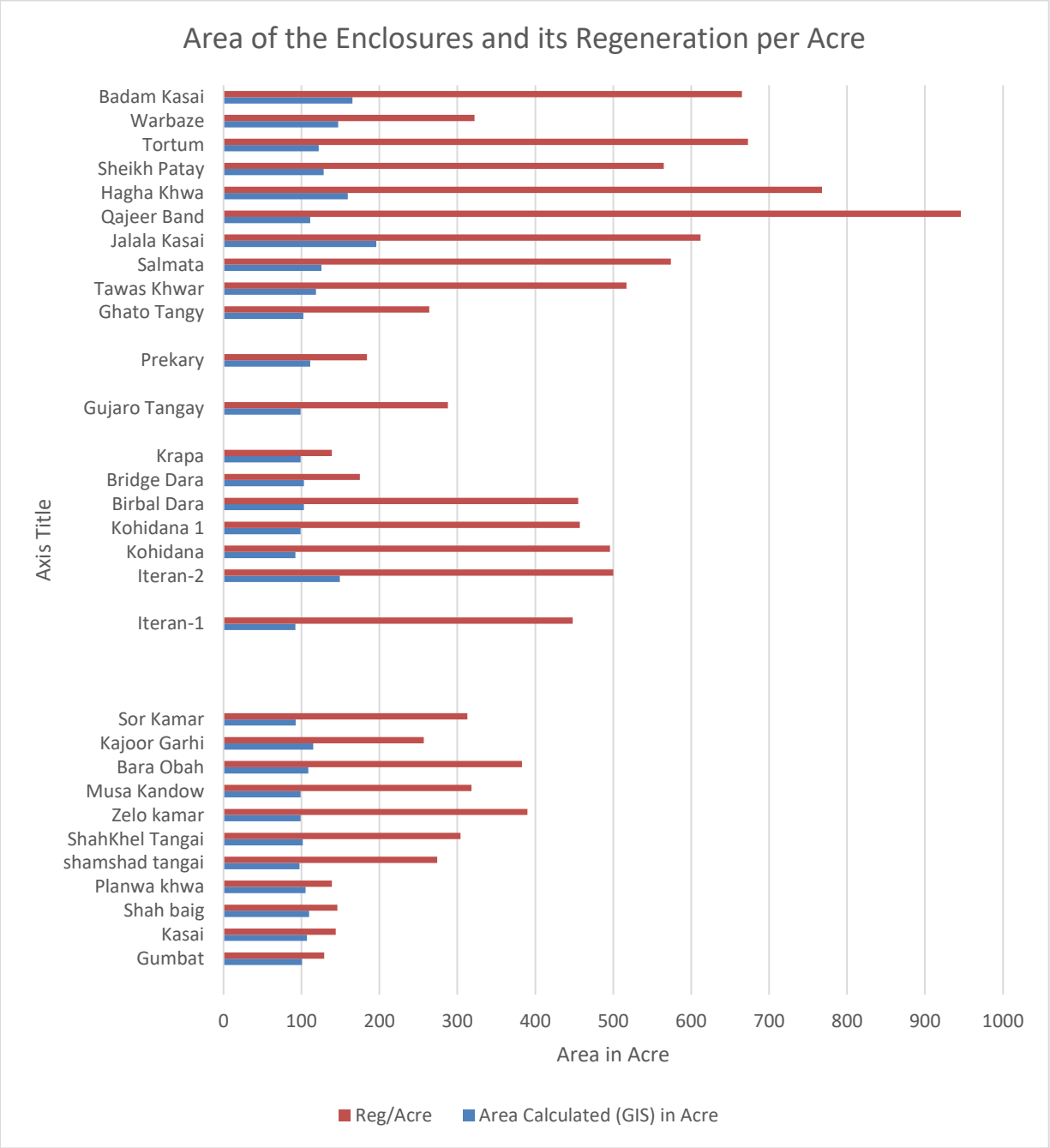
Figure 2: Area of the Enclosures and its Regeneration per Acre



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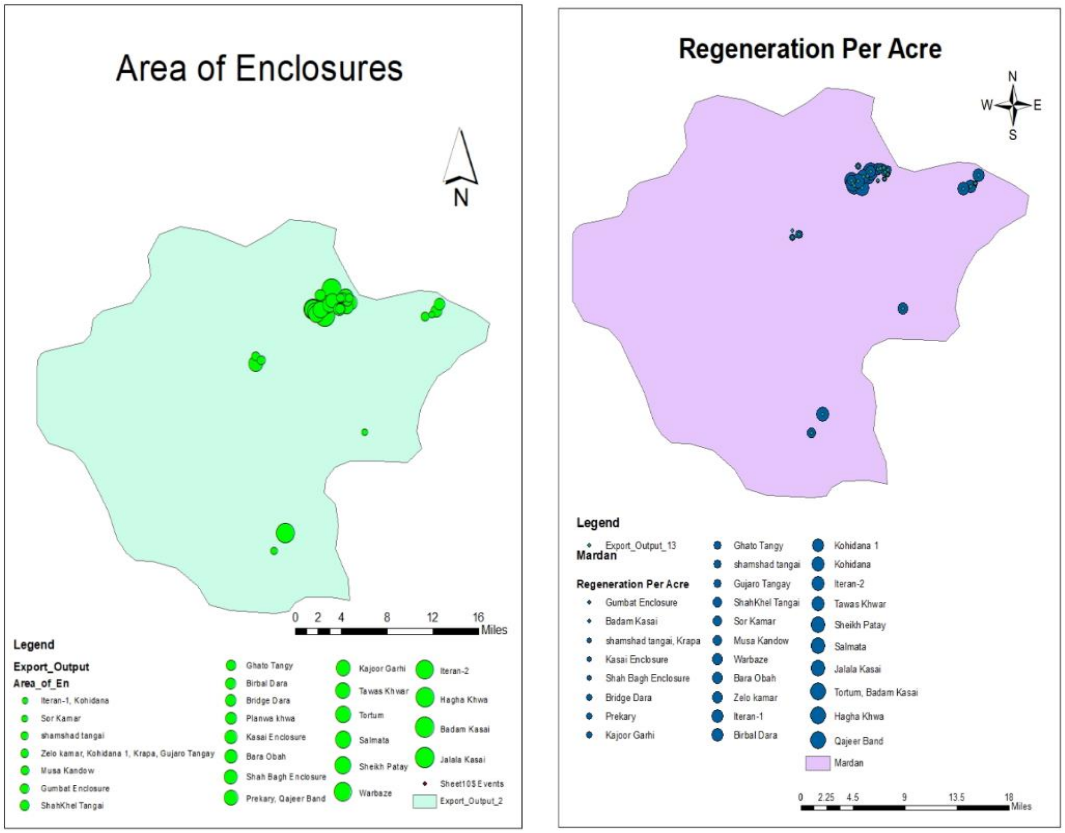

Figure 3: Areas of the Enclosures and Regeneration per Acre Status

CONCLUSIONS AND RECOMMENDATIONS

- As per PC-I target a total of 30 number of enclosures were established. All of the enclosure 100% target was achieved by the Mardan Forest Division.
- A total of **3460.5** Acres area were monitored and assessed.
- Average Regeneration 417 per acre of Mardan Forest Division enclosures was reported.
- No formal area was demarcated i.e., the boundary was not clearly defined, and the details as mentioned in respective tables.
- Neghabans have limited knowledge about their duties, area on the ground, grazing management and the importance of regeneration etc.
- Grazing was observed in some of the enclosures as mentioned.

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- List of Neghabans, Reference coordinates of enclosures, GIS recourse maps, Technical feasibility files and social profiling of VDCs were checked and found correct.

RECOMMENDATIONS

- Before the establishment of any enclosure, the area should be properly demarcated on the ground.
- The boundary of the enclosure should be highlighted on the ground with permanent and visible objects like lime stones or painted rock ridges.
- Keeping in view the good sprouting results and low cost, sowing and dibbling should further be increased. Seeds of native species should be distributed in the growing season amongst Neghabans in order to be sown during the growing season in blank patches.
- Delays in the release of funds have created uncertainty and doubts on the part of Neghabans. In most forest enclosures Neghabans were not paid from six to nine months, timely releases of funds are highly recommended.
- ANR (Assisted Natural Regeneration) is the main activity of natural regeneration, Negahbans selection and avoiding anthropogenic factors for the success of natural regeneration are the main tool of assisted natural regeneration, similarly sowing/ dibbling of the seed of indigenous species is also an essential tool of ANR, therefore the practice should be strictly observed to achieve the requisite success of enclosures.
- Field tours to each should be arranged monthly by the concerned Forest Officials to ensure check and balance and attendance of Negahbans.
- Regarding community mobilization especially for the establishment of enclosures the process has improved but needs improvement. Proper training should be given to Neghaban about seed sowing practices, management of grazing animals and prevention against pests, fire and diseases.
- To ensure the continuity of the activity awareness and education should be imparted to the adjacent communities to elaborate the concept and credibility of enclosures and to strengthen the local community so that after the completion of the project they may able to continue same activities for his joint economy.
- We recommend the cash awards for good performing Neghabans/VDCs community members for their encouragement and motivation.

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