Participatory Forest Management Plan, (PFMP)

Sadhuja, Wahidpur and Bahab Forests of Sukkur Forest Division

2022 – 2031

Conservation Committee &
Forest & Wildlife Department
Government of Sindh, Pakistan

2022

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Endorsement

1. **Chairman, Conservation Committee**

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This Participatory Forest Management Plan is not a funding commitment from Sindh Forest and Wildlife Department. It is a proposal to be considered for future implementation of REDD+ Programme if funds are committed by the Sindh government and/or any other donor(s). The success of this plan is contingent to the commitment of all stakeholders involved in the implementation of this plan. Benefit Sharing Mechanism and institutional setup for implementation of REDD+ approved by the Government of Sindh will form the basis for implementing this Plan. Information on these aspects are suggestive and not binding on the Sindh Forest and Wildlife Department and any other stakeholders mentioned in this document.

وضاحت

سندھ کا محکمہ جنگلات، جنگلی حیات و ماہی گیری اس منصوبے کے لیے مالی وسائل فراہم کرنے کا پابند نہیں ہوگا۔ اس منصوبہ پر عمل درآمد کرنے کے لیے مالی اور انتظامی سفارشات دی گئی ہیں۔ تاہم ان پر عمل سندھ کے محکمہ جنگلات، جنگلی حیات و ماہی گیری کے بنائے گئے انتظامی و مالی رہنما اصولوں کے تحت ہوگا۔

Table of Contents

List of Figures

List of Tables

List of Photos

Abbreviation

AGB	Above Ground Carbon
BGB	Below Ground Carbon
ANR	Assisted Natural Regeneration
CKNP	Central Karakoram National Park
F&W Department	Forest and Wildlife Department
FCPF	Forest Carbon Partnership Facility
GIS	Global Information System
GOP	Government of Pakistan
LPG	Liquid Petroleum Gas
MoCC	Ministry of Climate Change
NCCP	National Climate Change Policy
NTFP	Non-Timber Forest Product
PFMP	Participatory Forest Management Plan
PFRA	Participatory Forest Resource Assessment
PSDP	Public Sector Development Programme
REDD+	Reducing Emission form Deforestation and Forest Degradation
TFCC	Planning Commission Task Force on Climate Change
Ton/ha	Ton per hectare
10 BTTP	10 Billion Tree Tsunami Project

Executive Summary

Forest located in Sadhuja, Wahidpur and Bahab of Sukkur Forest Division selected by the Forest, and Wildlife Department (FD) in consultation with key stakeholders as pilot sites to demonstrate implementation of REDD+. This is part of a larger project being implemented by the Ministry of Climate Change, Government of Pakistan, and the Provincial Forest departments in which a total of 15 Participatory Forest Management Plans are being developed for REDD+ implementation in all six entities of Pakistan.

The Government of Pakistan has joined global efforts to address deforestation and forest degradation to mitigate climate change and its impact by initiating REDD+ activities. REDD+ has three phases; i. readiness, ii. demonstration through implementation, and iii. result-based payments. The first two phases when combined are known as the REDD+ Readiness Phase. Pakistan has made substantial progress in meeting REDD+ readiness requirements. Pakistan has developed a National REDD+ Strategy in 2021. Whereas the Sindh Forests and Wildlife department has developed a Subnational / Provincial REDD+ Action Plan. This action plan is a decentralised framework for Sindh to proceed with REDD+ implementation. Preparation of Participatory Forest Management Plans is an important step to implement this action plan by integrating and implementing REDD+ activities in forest management in various socio-ecological systems.

The local stakeholders were engaged in preparation of this Participatory Forest Management Plan. The plan will guide the implementation of REDD+ by projecting business as usual and reduced emission scenarios derived from detailed participatory assessment of socio-economic circumstances, ecological condition, and challenges (drivers), and assessment of the forest resource which have been described in this plan. The plan also presents stakeholders' analysis with their roles and obligations, use rights of forest dependent communities, conflict resolution and benefit-sharing mechanisms. This information is crucial for determining an inclusive set of activities and successful implementation of REDD+.

The analysis of the site indicates decreasing forest cover at a rate of 102.08 ha per annum, emitting 6510 tonnes CO_2 eq annually. The activities included in this PFMP if properly implemented, will reverse the trend through collaborative forest management efforts of the stakeholders. This plan has proposed distribution of carbon and non-carbon benefits accrued by the implementation of plan according to which 80% benefits will go to the Government, and 20% will go to the customary right holders and forest users. These benefits will only be distributed if the targets are achieved. The plan therefore provides scenarios to reduce or increase benefits so that the stakeholders can enjoy results-based payment and benefits. The success of this plan, therefore, is contingent on the commitment of all the stakeholders involved. A specific and definitive distribution of benefits in case of REDD+ programme is yet to be developed by the government, which will form basis for sharing of benefits in the case of private forests. This proposed ratio will be finalized or confirmed only after finalizing Sindh's benefit sharing mechanism.

The initial period of this plan will be 10 years; however, the plan will be a living document and open for annual reviews. A budget forecast to implement activities mentioned is also provided in this plan. The implementation of activities described in the plan will be guided by annual operational plans to be developed by the provincial FD in consultation with the relevant stakeholders. The plan will be implemented by village and district committees to be notified by the provincial FD in consultation with the relevant stakeholders.

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خلاصہ

سندھ کے سکھر فارسٹ ڈویژن میں واقع سدھوجا، واحد پور اور بہاب کے جنگل محکمۂ جنگلات، جنگلی حیات اور ماحولیات کی جانب سے منتخب کردہ مقامات میں سے ہیں جہاں پائلٹ سائٹ کے طور پر اہم شراکت داروں سے مشاورت کے ساتھ ریڈ پلس کے نفاذ کا عملی مظاہرہ کیا جائے گا۔ یہ ایک بڑے منصوبے کا حصہ ہے جو وزارتِ موسمیاتی تبدیلی، حکومتِ پاکستان اور صوبائی محکمۂ جنگلات کے ذریعے لاگو کیا جا رہا ہے جس میں پاکستان کے تمام چھ علاقوں میں ریڈ پلس پر عمل درآمد کی غرض سے مجموعی طور پر جنگلات کے شراکتی انتظام کے لیے پندرہ منصوبے بنائے جا رہے ہیں۔

حکومتِ پاکستان نے جنگلات کی کٹائی اور تنزلی سے نمٹنے اور موسمیاتی تبدیلی کے اثرات کم کرنے کے لیے ریڈ پلس سرگرمیوں کا آغاز کر کے عالمی کوششوں میں شمولیت اختیار کی ہے ۔ریڈ پلس کے تین مراحل ہیں۔(i) تیاری (ii)عمل درآمد کے ذریعے مظاہرہ، اور(iii) نتائج پر مبنی ادائیگیاں۔ پہلے دو مراحل کو مشترکہ طور پر ریڈ پلس کی تیاری کا مرحلہ کہا جاتا ہے۔ پاکستان نے ریڈ پلس کی تیاری کی ضروریات کو پورا کرنے کے لیے خاطر خواہ پیش رفت کی ہے۔ پاکستان نے 2021 ء میں ایک قومی ریڈ پلس حکمتِ عملی تیار کی ہے ۔جب کہ سندھ کے جنگلات، جنگلی حیات کے محکمے نے صوبائی سطح پر ایک جامع ریڈ پلس ایکشن پلان تیار کیا ہے۔ سندھ میں ریڈ پلس پر عمل درآمد کو آگے بڑھانے کے لیے یہ ایکشن پلان ایک صوبائی فریم ورک ہے۔ مختلف سماجی ماحولیاتی نظاموں میں جنگل کے انتظام کے لیے ریڈ پلس سرگرمیوں کو مربوط اور لاگو کر کے جنگلات کے شراکتی انتظام کے منصوبوں کی تیاری اس ایکشن پلان پر عمل درآمد کے لیے ایک اہم قدم ہے۔

مقامی فریقین نے جنگلات کے شراکتی انتظام کے منصوبے کی تیاری میں حصہ لیا۔ ریڈ پلس پر عمل درآمد میں رہ نمائی کے لیے اس منصوبے کے تحت دو مختلف منظر ناموں یعنی موجودہ حالات اور اخراج میں کمی کا اندازہ لگایا جائے گا۔ اس مقصد کے لیے سماجی اقتصادی حالات کے تفصیلی شراکتی تجزیے، ماحولیاتی صورتِ حال اور چیلنجز اور منصوبے میں واضح کردہ جنگلاتی وسائل کا جائزہ لیا جائے گا۔ یہ منصوبہ فریقین کے کردار اور ذمّے داریوں کے ساتھ اُن کے تجزیے، جنگلات پر انحصار کرنے والی لوگوں کے حقوق کے استعمال، تنازعات کے حل اور مشترک فوائد کے حصول کا طریقۂ کار بھی پیش کرتا ہے۔ ریڈ پلس پر کامیاب عمل درآمد اور شراکتی سرگرمیوں کی تفصیلات کا تعیّن کرنے کے لیے یہ معلومات ضروری ہیں۔

جنگل کے رقبے کے تجزیے سے پتا چلتا ہے کہ 2011ء سے 2021ء تک ان جنگلوں میں 102.08 ہیکٹر سالانہ کی شرح سے کمی ہوئی ہے جس سے سالانہ 6,510 ٹن کاربن ڈائی آکسائڈ کا اخراج عمل میں آ رہا ہے۔ جنگلات کے شراکتی انتظام کا اس منصوبے میں شامل اقدامات کے عملی اطلاق سے نہ صرف ان نقصانات میں کمی آئیگی بلکہ فریقین کے مشترکہ جنگلات کے انتظامی اقدامات سے جنگلات کے وسائل میں مزید اضافہ ہوگا۔

مجوزہ منصوبے کے مطابق اس منصوبے پر عمل درآمد سے حاصل ہونے والے کاربن اور نان کاربن محصولات میں سے 80 فی صد حکومت کو حاصل ہوں گے، جبکہ 20 فی صد جنگل کے استعمال کے حقوق رکھنے والے صارفین کو ملیں گے۔ یہ فوائد صرف اہداف حاصل ہونے کی صورت میں تقسیم کیے جائیں گے اس لیے یہ منصوبہ فوائد میں کمی یا اضافے کا منظر نامہ پیش کرتا ہے تاکہ فریقین نتائج پر مبنی ادائیگی اور فوائد سے مستفید ہو سکیں۔ لہٰذا اِس منصوبے کی کامیابی اس میں شامل تمام فریقین کے عزم پر منحصر ہے۔

حکومت کی طرف سے ریڈ پلس پروگرام کے معاملے میں فوائد کی ایک مخصوص اور قطعی تقسیم فی الحال تیار نہیں ہوئی ہے جو جنگلات کے سلسلے میں فوائد کے اشتراک کی بنیاد بنائے گی ۔مشترک فوائد پر مبنی سندھ کے طریقۂ کار کے طے ہونے کے بعد ہی اس مجوزہ تناسب کو حتمی شکل دی جائے گی یا اس کی تصدیق کی جائے گی۔

اس منصوبے کی ابتدائی مدّت دس سال ہوگی تاہم یہ منصوبہ ایک زندہ دستاویز ہوگا اور سالانہ جائزے کے لیے پیش ہوگا۔ اس منصوبے میں مذکورہ سرگرمیوں پر عمل درآمد کے لیے رہ نمائی متعلقہ فریقین کی مشاورت سے صوبائی محکمۂ جنگلات کی طرف سے تیار کیے جانے والے سالانہ آپریشنل منصوبوں کی مدد سے کی جائے گی۔ اس منصوبے کو گاؤں اور ضلعی کمیٹیوں کے ذریعے لاگو کیا جائے گا اور اس کے بارے میں متعلقہ فریقین کی مشاورت سے صوبائی محکمۂ جنگلات کے ذریعے مطلع کیا جائے گا۔

1. Introduction

1.1 The Context of PFMP

Pakistan has been implementing REDD+ activities since 2010 to mitigate climate change through reduced carbon emissions from the forestry sector. The Government of Pakistan (GoP), Ministry of Climate Change (MOCC) is implementing a REED+ readiness programme funded by the Forest Carbon Partnership Facility (FCPF) of the World Bank. This Participatory Forest Management Plan (PFMP) is to demonstrate integration and implementation of REDD+ activities in forest management in various socio-ecological systems

The Participatory Forest Management Plans (PFMPs) translate REDD+ concepts and processes at practical level considering complex socio-economic conditions, burden of rights and concessions, as well as obligations in the forest. This is the reason that in addition to forest stock assessment, the preparation of PFMPs for REDD+ sites require a detailed assessment of the roles and rights of stakeholders in forest management and revenues so that trade-offs become clearer for redressal and communities are not deprived of their legitimate access to forest for their livelihoods. The core thrust of PFMPs in REDD+ perspective is to find contextually relevant options to address drivers of deforestation and forest degradation to mitigate global climate change. REDD+ also provides mechanisms for the enhancement, measurement, and trade of carbon.

This PFMP provides information including description of the site, GIS supported forest stock assessment, socio-economic situation, analysis of stakeholders with their interests and influences, emissions reduction scenarios, future interventions with estimated budget and implementation mechanism and key challenges for implementation. The activities that will maintain forest as carbon pool have been exclusively explained in this plan giving a lead and support role to stakeholders, as well as the expected outputs. It is expected that the implementation of the PFMP will enable the stakeholders of Sadhuja, Wahidpur and Bahab Forests of Sukkur Forest Division to trade carbon credits in the national and international market in foreseeable future like any other product, by increasing and maintaining the carbon stock sequestered in the forest. The PFMP will thus act as a road map for implementation, monitoring, reporting and verification of resources improvement, and distribution of benefits among stakeholders.

The proposed activities include strengthening of social organization for communities to play a role in decision making such as designation of grazing and firewood collection areas, community watch and ward system, addressing land encroachment for agriculture, etc.

1.2 Objectives of PFMP

In line with the global and national objectives and priorities (see section 1.4), the following specific objectives for conducting the PFMP in Sadhuja, Wahidpur and Bahab Forests are elaborated:

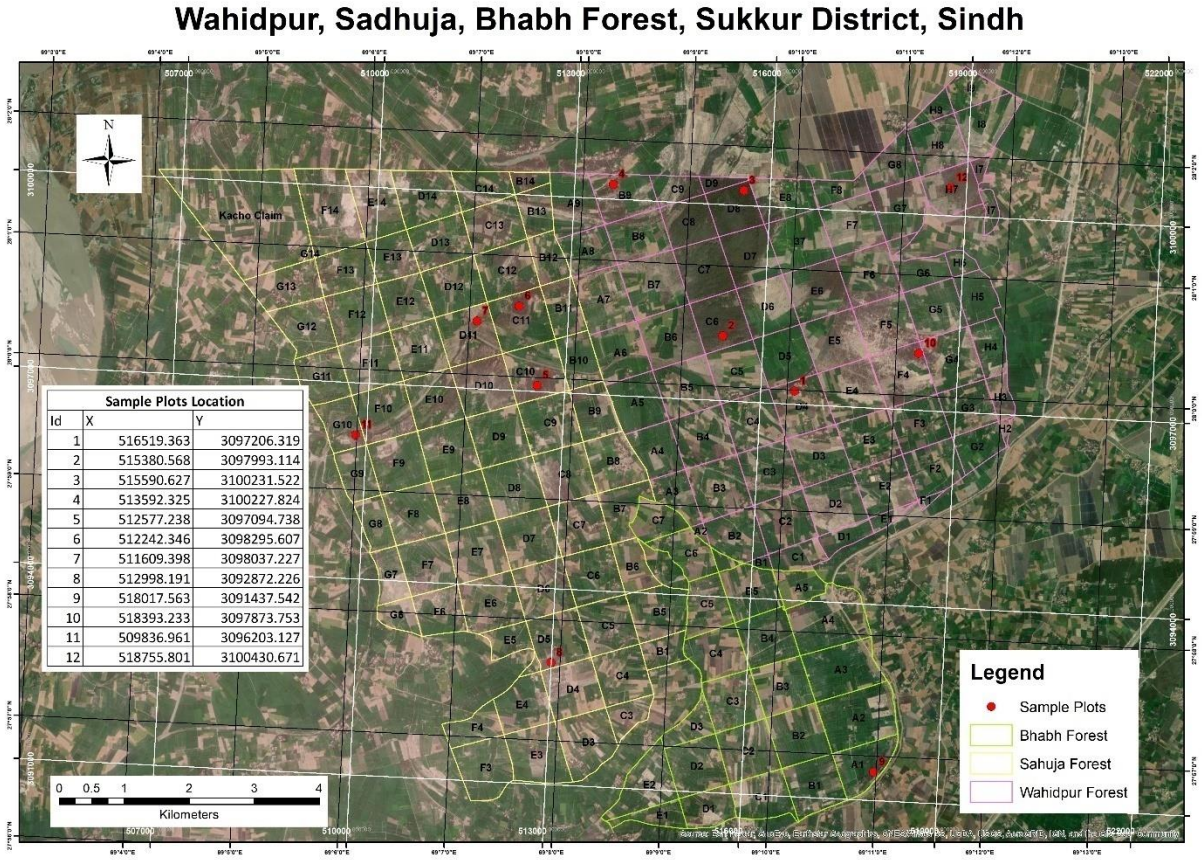
1 To promote sustainable Forest management in Sadhuja, Wahidpur and Bahab Forests.
2 To protect, improve forest health and enhance Carbon stocks in Sadhuja, Wahidpur and Bahab Forests while addressing drivers of deforestation and forest degradation
3 To enable the local community and Forest Department staff to manage forests jointly and efficiently for multiple uses.

1.3 Methodology

The overall methodology for preparation of the plan has been guided by PFMP Manual (version 1.0, 2021) for practitioners prepared under Forest Carbon Partnership Facility (FPCF) of the Ministry of Climate Change (MOCC), Islamabad. A multi-disciplinary team consisting of two Participatory Forest Management experts, a sociologist, a GIS specialist, two Range Forest Officers, two Forest Guards and three community representatives (nominated by the community) collected data for preparation of the management plan. A multi-layered methodology was adapted for the preparation of PFMP, which includes the following steps:

i. Selection of site in light of the REDD+ guidelines and procedure. Sadhuja, Wahidpur and Bahab forest was one of the two potential sites selected for preparation of PFMP in Sindh.
ii. Participatory Planning session were held with local stakeholders during the course of data taking and assessment. Local community of Sadhuja, Wahidpur and Bahab participated in providing socio-economic data and sharing details on forest-community interaction. They also participated in collecting forest resource assessment data and in identifying forest management activities and implementation mechanism. Under the Free Prior Informed Consent (FPIC), the community was briefed on relevant concepts, causes and effects of activities. They participated in identifying drivers of deforestation and forest degradation and demand of timber and firewood. The solutions to problems and demands of community were translated into interventions in prioritised order and listed. The exercise was conducted through PRA using spot observations, Focused Group discussion, mapping, semi structure interviews, transect walk and ranking.
iii. Participatory forest inventory was conducted in July 2021 to collect data from 11 sample plots selected in Sadhuja, Wahidpur and Bahab Forests. The location of sample plots is provided in following map **(Figure 1)**. The sample plots were chosen through stratified random sampling among each forest stratum. The soil, topography, water availability, and status of vegetation vary spatially within a land-use category and the overall area proposed for the site. Trees, biomass stock, and growth rate are not distributed uniformly in a site. Therefore, a sampling design is followed for locating the sample plots in each of the selected forest strata. The location of sampling plots could determine the biomass stock or growth rate estimates. Based on forest type and forest density, three forest stratum (>70%, 40%-70%, 10%-40% tree canopy cover) were formed to carry out the systematic stratified sampling on the map.
iv. Sample plots were nested circular plots of 17.64 m, 5.64 m, and 0.56 m radius. All living trees and standing dead woods with DBH above 5cm and stumps were measured from the full plot of 17.84 meters (~1000 m^2). Fallen trees and stumps, dead wood with diameter above 5cm were also recorded from 17.84-meter plot. The plot included two subplots; 5.64 meters (~100 m^2) for collecting data of seedlings and shrubs and 0.56-meter plots (~1 m2) for data on litter, leaves, grasses, etc. From a plot of 5.64 m, all seedlings were counted, and shrubs were cut down and fresh weight of the sample was recorded, collected the sample in bags to find the oven dried biomass in the lab. The above-ground non-tree biomass including leaves, litter, grasses, etc. was collected from 0.56 m radius sub-plot and weighed and soil organic carbon values are taken from the national forest inventory, which was carried out in 2018 as the time required to detect a significant change in soil organic carbon is generally more than 10 years. The data from these samples was analysed for estimation of carbon stock. The coordinates of each sample plot were noted, and fixed-point photos taken during the inventory.
v. The data were analysed, GIS map prepared and put together in the form of PFMP with a 10-year perspective including an annual forestry operational plan.
vi. The plan was sent for peer review and endorsement by the REDD+ focal person of the Sindh.

Figure 1. Location of sample plots



1.4 Policy Alignment

The objectives of this local PFMP are aligned with the following provincial, national, and global policies/strategies/commitments related to REDD+.

1.4.1 Global Commitment

Reducing Emissions from Deforestation and forest Degradation plus, the Sustainable Management of Forests, and the conservation and enhancement of forest carbon stocks (REDD+), is an essential part of the global efforts to mitigate climate change (FAO, 2021). The REDD+ is a framework created by Conference of Parties (CoP) of UNFCC to incentivise developing countries either to reduce emissions of Green House Gases (GHGs) or to increase sink of CO2 in forest lands (UNFCC, 2021).

1.4.2 National Policies/commitments

Pakistan is an active member of the international negotiation forum on climate change and making efforts to reduce emission reduction suiting to the priorities of its citizens (GCISC, 2018). Pakistan's report on intended Nationally Determined Contributions seeks 20% reduction of the current national GHG emissions (GOP, 2017). From 2016 onwards, continued investments in nature-based solutions (Nbs) through the largest ever afforestation programs in the history of the country Ten Billion Tree Tsunami Program (TBTTP) will sequester 148.76 MtCO2e emission over the next ten years.

The National Climate Change Policy (NCCP) 2012 under Section 4.4 on Forestry Sector states that the climate change is likely to have multi-faceted adverse effects on the ecosystem as a whole, particularly on the already vulnerable forestry sector in Pakistan. Mitigation in the forestry sector entails restoration of Pakistan's forests through sustainable forest management, with particular focus on how these are affected by climate change. This will not only benefit state forests but forests dependent communities and the whole society in general. The most likely impacts of climate change will be decreased productivity, changes in species composition, reduced forest area, unfavourable conditions for biodiversity, higher flood risks and the like, as portrayed in the Planning Commission Task Force on Climate Change (TFCC) Report (GoP, 2010).

Pakistan has also approved its National Forest Policy 2015 with a goal of expansion, protection, and sustainable use of national forests, protected areas, natural habitats, and watersheds for restoring ecological functions, improving livelihoods and human health in line with the national priorities and international agreements.

1.4.3 Provincial policies and commitments

The climate change policy of Sindh acknowledges the role of forests in mitigation and adaption and most particularly to improve resilience of communities and their livelihoods in future scenarios of changes in local climate. The activities mentioned in this PFMP to manage Sadhuja, Wahidpur and Bahab Forests align well with the actions suggested in the climate change policy of Sindh for managing forests.

2. Participatory Forest Management Planning Survey Results

A technical team comprising of concerned territorial Divisional Forest Officers, Range Forest Officers, PFMP Expert and Provincial Coordinator REDD+ Sindh conducted the socio-economic and forest stock assessment along with the local community stakeholders in Sadhuja, Wahidpur and Bahab Forests. Participatory Planning sessions were also held with local stakeholders during the course of data collection and assessment.

2.1 Ecological data

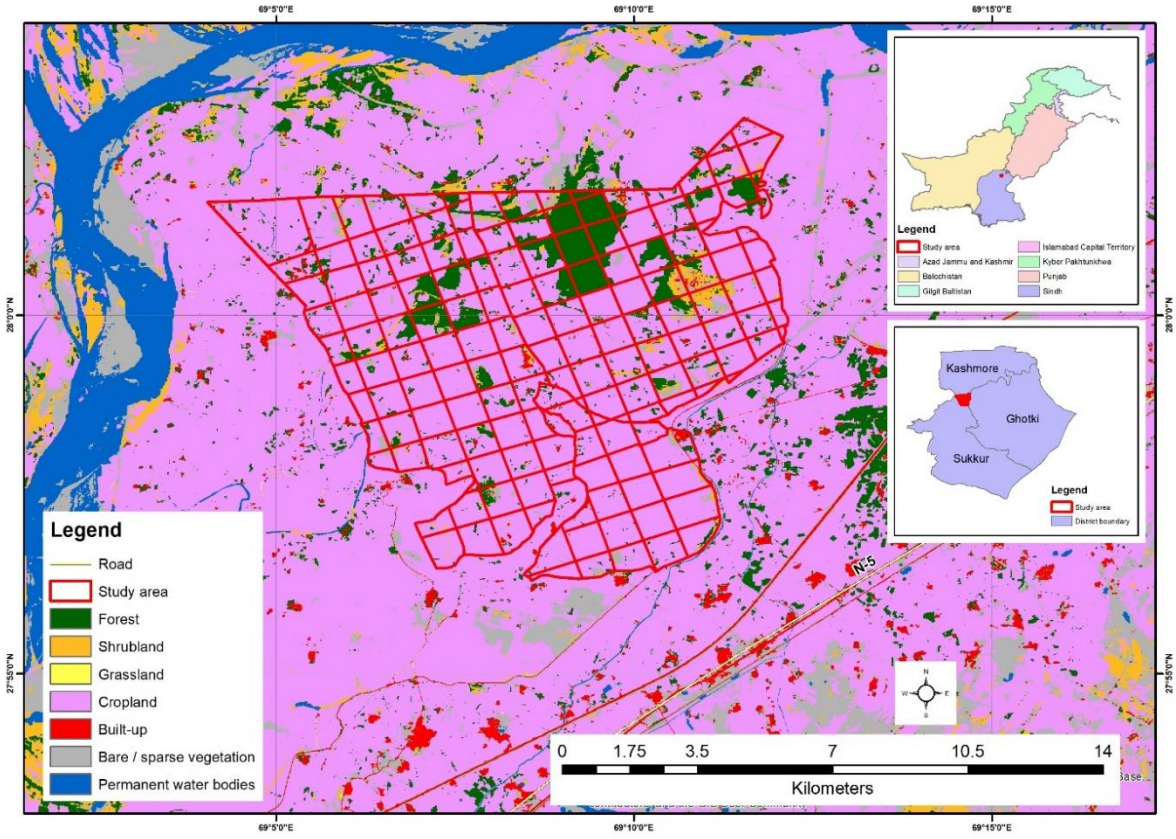
2.1.1 Location

These forests are notified reserve forests. Meandering behaviour of River Indus especially in Sindh creates a unique ecosystem- Riverine Forests Ecosystem and are ecologically classified as tropical thorn forests. Of these forests, area of Sadhuja forests comprises 3,562.45 ha of Wahidpur forests 3,419.2 ha and Bahab forest 1,220.5 ha. Administratively Sadhuja (27°58’47''N & 69°08’11''E) and Bahab (27°57’26''N & 69°10’23''E) are located in Taluka Pano Aqil of District Sukkur. Wahidpur is located in Taluka & District Ghotki (28°oo’16''N & 69°10’57''E).

2.1.2 Vegetation type

The climax tree vegetation area is Kandi (*Prosopis cineraria*) whereas Babul (*Acacia nilotica*) has been encouraged and introduced as sub climax specie of the region being desirable from economic and marketing point of view. *Acacia nilotica* is planted during Abkalani / flood season.

Figure 2. Land Use Map of Sadhuja, Wahidpur and Bahab Forest



2.2 Socio-economic data

Socio-economic data of this site, which comprises three forests namely Sadhuja, Wahidpur and Bahab, was collected during Focus Group Discussion and key informant interviews. Summary of the data is given in a table in **Annex 1** which is explained below under major headings.

2.2.1 Demography

The distance of PFMP site i.e., Sadhuja, Wahidpur and Bahab Forests of Sukkur District is 36 kms away from major town of Sukkur. Sukkur District falls on the right Bank of River Indus downstream Guddu Barrage. Sukkur district is the part of Sukkur Civil division. As per the census report 2017, the total District has population is 767788. Population of Sadhuja is 3016, Wahidpur 1980 and Bahab 290. The community is quite similar in the three forests. In Sadhuja Chachar, Arbani, Kalwar and Mangi tribesmen are residing since decades. In Wahidpur Chachar, Arbani, Lolai, and Ghoto tribesmen are residing since decades. In Bahab, Chachar, Arbani, shaikh, and Ghoto tribesmen are residing since decades.

2.2.2 Health and education

The literacy rate of these areas is below 30%. Education facilities up to secondary and high school level are available in the government sector at Samoo Chachar of Sukkur District being adjacent to the PFMP sites. A Rural Health Centre is located in Samoo Chachar Town adjacent to Sadhuja, Wahidpur and Bahab Forests.

2.2.3 Sources of livelihoods

Agriculture is the major source of livelihood of the local peoples of Sukkur District. This includes the cultivation of the vegetables since it has a potential market of Sukkur and Khairpur being the major cities nearby. Besides this the land less peoples work as daily labour in the local fertilizer, cement and sugar factories and a section of the people are also involved in hotel industry at the local town level. Small number of inhabitants is working abroad as an overseas employee.

Wheat, Cotton, and Rice are the major Rabi and Kharif crops of Sukkur district. Peoples big and small land holders mostly raise these agriculture crops over their lands in addition to this vegetable production is also a major source of income for them and is being largely practiced specially in Sukkur district since the major market of Sukkur and Khairpur cities are near to them.

Mostly small land holders are the feature of the areas having their holdings in between 10 to 20 acres whereas big land holders of having more than 100 acres of land are also there in very small number. The local people who mostly resides inside the forests are land less and residing in Katcha constructed huts in the forests.

Sadhuja: The neighbouring communities or the inside residents are mostly dependent on agriculture crop cultivation, grazing, honey collection, fishing, and sometimes illegal cutting of trees. Livelihood of the local inhabitants of Sadhuja Forest is mainly agriculture but their engagement with the agriculture activities is conditional with the harvesting seasons which are mainly Rabi & Kharif. After the harvesting seasons are over they mostly work as daily wages labour in the nearby town or in the transport field/road construction/stone queries. The local people here do involve themselves in the activities of date palm harvesting during the months of May & June. Date Palm cultivation in Sukkur and Khairpur Districts is the major agriculture/fruit crop of the region. Even the labour from Punjab migrate to the areas of Sukkur and

Khairpur Districts and work as labour during the said seasons of harvesting and further processing of dates.

Whidpur: The neighbouring communities or the inside residents are mostly dependent on agriculture crop cultivation, grazing, honey collection, fishing, and sometimes illegal cutting of trees. Here also the livelihood of the local inhabitants of Wahidpur Forest is mainly agriculture but their engagement with the agriculture activities is conditional with the harvesting seasons which are mainly Rabi & Kharif. After the harvesting seasons are over they mostly work as daily wages labour in the nearby town or in the transport field/road construction/stone queries. The local people here do involve themselves in the activities of date palm harvesting during the months of May & June. Date Palm cultivation in Sukkur and Khairpur Districts is the major agriculture/fruit crop of the region. Even the labour from Punjab migrate to the areas of Sukkur and Khairpur Districts and work as labour during the said seasons of harvesting and further processing of dates.

Bahab: In this forest the neighbouring communities or the inside residents are mostly dependent on agriculture crop cultivation, grazing, honey collection, fishing, and sometimes illegal cutting of trees. Here also the livelihood of the local inhabitants of Bahab Forest is mainly agriculture but their engagement with the agriculture activities is conditional with the harvesting seasons which are mainly Rabi & Kharif. After the harvesting seasons are over they mostly work as daily wages labour in the nearby town or in the transport field/road construction/stone queries. The local people here do involve themselves in the activities of date palm harvesting during the months of May & June. Date Palm cultivation in Sukkur and Khairpur Districts is the major agriculture/fruit crop of the region. Even the labour from Punjab migrate to the areas of Sukkur and Khairpur Districts and work as labour during the said seasons of harvesting and further processing of dates.

2.2.4 Dependence on forests

Part of the local villagers exclusively depends on rearing of livestock in the forest and collection of firewood/timber from the forests and their further transportation up to the market. During the era of agroforestry leases which have just been stopped in the wake or court orders, the local inhabitants use to work as local farmers in the lease areas allotted to the lease holders of the forest for five years term. Wood/coal is the major source of energy for the local inhabitants of in and around forests. Whereas electric facilities are also available in the major towns around the forests for example Samoo Chachar Village of Sukkur district. Whereas Natural gas facilities in the district headquarters like Sukkur, Ghotki and Khairpur Districts is also available.

The women of the area do not play a major role in the management of forest. However, grazing/ domesticated cattle i.e., goat/sheep are being supervised by the older ladies in the forest. In addition to this the exercise of collection of fuelwood is also undertaken by them to meet either their homely requirement or to sale them in the towns near the forests.

2.2.5 Forest rights

Community has access / permission to use timber for their domestic use like house construction, etc. they also collect firewood for their domestic use. But the main use of the forest is for grazing livestock, grass cutting followed by energy. Fuel substitutes are very costly and available too far from where people live. The forest area is Reserved, and forest department decides what to do here. The user group community of this site has scattered kacha and pakka houses in and around the forests. Forest Guards and Foresters appointed by Forest and wildlife department, are protecting forest and illegal hunting.

2.2.6 Changes in forests over time

Over the last 30 years, the availability of fuel wood and timber has decreased due to heavy illegal harvesting and biotic pressure in the past. However, the production of agriculture crop has increased in areas cleared of forests with date palm plantation. The population of wildlife and other forest produce has also decreased. The locals also believe that the rare species of Hog Deer has gone extinct due to over exploitation and illegal hunting. The core reasons for these changes are Illegal harvesting of timber and firewood for commercial purposes and clearance of forest land for agriculture crop as well as illegal hunting. There are poor legal controls in this area and while illegal use is on a rise, legal demands are also high due to population pressure. Encroachment of land for agricultural is beyond control due to elite involvement. Inundation from the Indus have reduced as well, which is creating dryer conditions for afforestation.

2.3 Stakeholders

Stakeholder analysis is given in Table 2 and description of the main stakeholders is given below

A. Forest department:

These are government reserved forests as such huge and decisive responsibility lies on the shoulders of the forest department in its conservation, further propagation, and overall management. Although the role of local communities cannot be denied. They can equally plan a huge role in protection of forest growth/carbon pools in context of REDD+ but nevertheless department's role in manifold bigger in identifying the potential sites for raising and maintaining the Forest plantation which have either been raised through traditional regeneration operations carried out during flood season or raising of forestry plantations through lift irrigation inside the riverine forests. The cooperation and contribution made by the local communities and their coordination with the managers of the Forest Department carries immense importance and value in fulfilling these objects and goals. Forest department can play handsome role in providing and helping the local communities with the alternate sources of energies and fuel wood so that their dependence of forest in reduced and carbon pools are well conserved and maintained throughout.

B. Community Forest institutions

The socioeconomic data of Sadhuja, Wahidpur and Bahab Forests indicates institutional dimensions which may be relevant in management of drivers of deforestation and maintaining future trend in favour of REDD+. The following institutions are relevant for management of above Forests.

Traditional Jirga: Although there is no registered panchayat/village committee in the area, but the local people have formed their owned Panchayat committee based on their cast and creeds. The conflicts arising if any are taken up and discussed in these tribal based Panchayat under the arbitration through the notables of the areas. Any untoward incident of serious nature is either settled down during the internal negotiations between the local villagers through their cast-based panchayat/arbitrations and in another case if such issues are not settled down everybody is allowed to knock the door of law i.e., Police/Courts. There is no traditional Jirga system prevalent in the forests of Sadhuja, Wahidpur and Bahab Forests. However, the local issues and problems are taken up before the local elites/ elected representatives to redress them. Any untoward incident is either settled down during the internal negotiations between the local villagers through arbitrations. In case such issues are not settled down everybody is allowed to knock the door of law i.e., Police/Courts.

Village Conservation Committee: There are not any formal/notified Village Conservation Committees in vogue. Since the nature of the forests is purely government owned as such no role is played by the local

committees in the management of forests. However, under the REDD+ programme / approach the local communities have been mobilized to play their desired role in the process of Conservation and further propagation of the natural resource on sustained basis for which, the Non-Governmental Organization have now become active in the private sector and have constituted the forests protection committee at the district level. These committees are functional and contributing their role in controlling the forest wood theft incidents and attempts of unauthorized encroachment by the local people. Furthermore, informal meetings have been conducted with such Forest Protection Committees and they have been apprised about the importance of REDD+ programme and their benefits which are going to accrue in future. Handsome progress has already taken place through the establishment of coastal community organizations which are already engaged in the protection activities of the mangroves forests and contributing their due role in the Conservation process in context of REDD+ approach.

2.4 Stakeholder Analysis

The stakeholder analysis (**Annex 2**) was an exercise of highly immense value. This was conducted with the purpose to obtain information about major actors of Forests, their influence, their interest, their contribution on forest resources utilization, Management of Forest, and their role in restoring the Forest. The stakeholder analysis was conducted in context of REDD+ approach at two levels. (A) The influence and interests of stakeholders in the management of forest and (B) the influence and interest the stakeholder in carbon pools. The analysis was conducted to determine as to what the stakeholders are contributing and what their role in the management of forest since the forests of Sadhuja, Wahidpur and Bahab forests are government reserved forests as such the rights of local communities are very much limited. However, their role in the conservation and protection of forests cannot be denied, which will ultimately set the goals and achievements under REDD+ Programme in maintaining the carbon pools. During the course of analysis, it was observed that the local communities have now become more interested in protection of forestry growth realising the importance of REDD+ in the overall uplift of socio-economic conditions of the local communities.

As mentioned above, Sadhuja, Wahidpur and Bahab forests are government reserved forests as such huge and decisive responsibility lies on the shoulders of the forest department in its conservation, further propagation, and overall management. Although the role of local communities cannot be denied. They can equally plan a huge role in protection of forest growth/carbon pools in context of REDD+ but nevertheless department's role in manifold bigger in identifying the potential sites for raising and maintaining the Forest plantation which have either been raised through traditional regeneration operations carried out during flood season or raising of forestry plantations through lift irrigation inside the riverine forests. The cooperation and contribution made by the local communities and their coordination with the managers of the Forest Department carries immense importance and value in fulfilling these objects and goals. Forest department can play handsome role in providing and helping the local communities with the alternate sources of energies and fuel wood so that their dependence of forest in reduced and carbon pools are well conserved and maintained throughout.

Although as mentioned earlier the main sources of earnings/local communities have often been noticed to have been involved in the removal and illegal theft of forest trees from the forest to earn their livelihood. However, realising about success the future prospects and importance of REDD+ the interdependence of Forest Department and local communities seems to be inevitable. The inferences drawn from the stakeholder analysis are annexed as Table.

Photo 1. Meeting with communities during socio economic Survey

2.5 Analysis of drivers of deforestation, forest degradation and barriers to enhancment

As described earlier, Sadhuja, Wahidpur and Bahan Forests are Reserved forests and the land and Forest belong to the government. Only grazing rights are admitted in the forest. In the area, the demand for fuelwood is more than the annual increment of forest. Also, the conversion of forest land for Agriculture is a major issue. The illegal extraction of timber and firewood from forests by local offenders is common to supplement their livelihoods.

The analysis of major drivers of deforestation and forest degradation is provided in **Table 1**:

Table 1. Major drivers of deforestation, forest degradation and barriers to enhancement

Serial Number	Major drivers of degradation	Underlying causes	Degree of severity*
Deforestation			
1	Conversion of land for Agriculture	1. Lack of Alternatives 2. Poverty 3. Weak enforcement of rules	3
Forest Degradation			
1	Firewood extraction	1. No Alternative source of energy 2. Poverty, lack of affordability	3
2	Timber theft for selling in the market	1. To gain financial benefits 2. Weak enforcement of rules	3
3	Grazing	1. No demarcation of designated grazing areas 2. Small landholding to support fodder	2
Barriers to Enhancement			

1	Availability of Planting stock	1. Resource allocation for raising nurseries	1
2	Availability of Water	2. Reduction in irrigation water availability	3
Degree of severity: 1: low 2: medium 3: high			

2.6 Carbon stock assessment of Sadhuja, Wahidpur and Bahab Forests

This part of field survey was conducted in July 2021 to collect data from 11 sample plots were selected in Sadhuja, Wahidpur and Bahab Forests. The location of sample plots is provided in Figure 1. At the observation points, sample plots were nested circular plots of 17.64 m, 5.64 m, and 0.56 m radius. All living trees and standing dead woods with DBH above 5cm and stumps were measured from the full plot of 17.84 meters (~1000 m^2). Fallen trees and stumps, dead wood with diameter above 5cm were also recorded from 17.84-meter plot. The plot included two subplots; 5.64 meters (~100 m^2) for collecting data of seedlings and shrubs and 0.56-meter plots (~1 m2) for data on litter, leaves, grasses, etc.

From a plot of 5.64 m, all seedlings were counted, and shrubs were cut down and fresh weight of the sample was recorded, collected the sample in bags to find the oven dried biomass in the lab. The above-ground non-tree biomass including leaves, litter, grasses, etc. was collected from 0.56 m radius sub-plot and weighed and soil organic carbon values are taken from the national forest inventory, which was carried out in 2018 as the time required to detect a significant change in soil organic carbon is generally more than 10 years. The data from these samples was analysed for estimation of carbon stock (table 5). The coordinates of each sample plot were noted, and fixed-point photos taken during the inventory.

Photo 2. Data collection in Sadhuja, Wahidpur & Bahab Forests

2.6.1 Plot level Carbon Stock Estimation

Based on the field data carbon stock (tonnes per hectares) for Above Ground Carbon (AGB) and Below Ground Carbon (BGB) was worked out using the standard sets for tree species, tree DBH and hight, and dry biomass of shrubs and litter (**Table 2**). The tree species level carbon stock is given in Annex 1. Based on this data individual plots level carbon stock values are given in table 5. The estimated stock of carbon per hectares (ha) was then used to estimate the total carbon stock in the selected site of Wahidpur Forest.

Table 2. Plot level above and below ground carbon stock

Plot No.	Average AGC (tonnes/ha)2	Average of BGC (tonnes/ha)3
1	1.079997038	0.269999259
2	0.139724127	0.034931032
3	0.127550892	0.031887723
4	0.101973344	0.025493336
5	0.135510922	0.033877731
7	0.29028645	0.072571612
8	0.052728998	0.01318225
9	0.287793096	0.071948274
10	0.196942696	0.049235674
11	0.750108886	0.187527221
12	0.084706414	0.021176603
Average	**0.228154446**	**0.057038612**

2.6.2 Forest Cover Assessment

The change in forest cover was assessed by using Landsat multispectral 30m spatial resolution satellite images on the path (151) and row (041) and google Earth Engine Cloud Computing platform for the classification of forest cover by applying Random Forest Machine Learning Algorithm. The analysis indicates decline of 1764.44 ha in forest cover in the past 10 years at an average decline rate of 102.08 hectare (ha) per year (**Table 3**). The amount of carbon trapped in 5 carbon pools (above ground biomass, below ground biomass, soil organic carbon, deadwood and litter on forest floor is grouped here into three carbon pools (above ground, below ground and soil).

Table 3. Forest cover assessment (2010 -2021)

No	Landsat Satellite Sensor	Landsat data acquisition	Forest Cover (ha)
1	Landsat-8	2021-04-11	2027.97
2	Landsat-5	2011-04-25	1007.19
Change in Forest Cover in last 10 years			-1020.78
Per year change in forest cover			-102.08

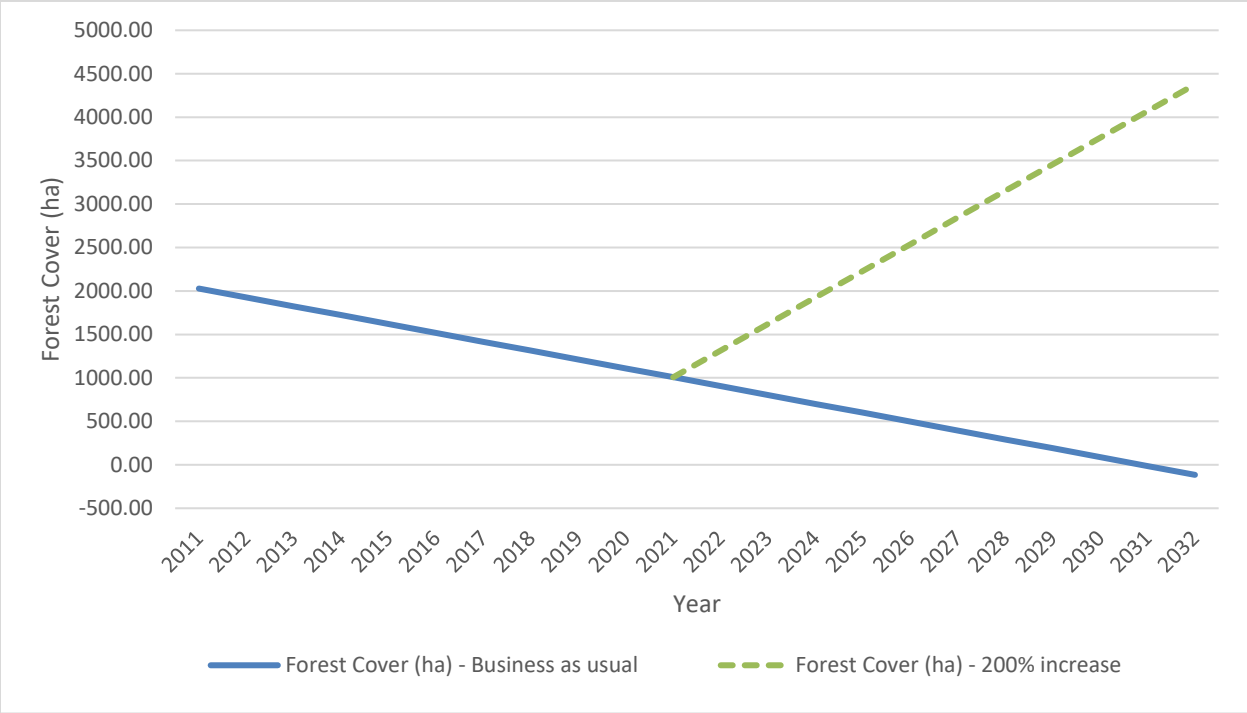
Table 4 provides forest cover change in business as usual and 200% increase in current trending the coming ten years. In Business as usual, scenario that is moving in negative direction eroding forest cover at a rate of 102.08 ha per annum meaning all the remaining forest cover will be gone in next 10 years. If this trend can be stopped then 1007.19 ha will become the starting point for REDD+ implementation. The total area under PFMP is 8707 ha, based on the area available for increasing forest cover, in discussion with Forest department it is proposed to reverse the current forest cover loss by 200% per annum for the next 10 years that will increase the forest cover to 4376 ha by the year 2032.

Table 4. Forest Cover Scenarios based on trend in the past 10 years

Rate of change per year	-102.08	-204.16
Year	**Forest Cover (ha) - Business as usual**	**Forest Cover (ha) - 200% increase**
2011	2027.97	
2012	1925.89	
2013	1823.81	
2014	1721.74	
2015	1619.66	
2016	1517.58	
2017	1415.50	
2018	1313.42	
2019	1211.35	
2020	1109.27	
2021	1007.19	1007.19
2022	905.11	1313.42
2023	803.03	1619.66
2024	700.96	1925.89
2025	598.88	2232.13
2026	496.80	2538.36
2027	394.72	2844.59
2028	292.64	3150.83
2029	190.57	3457.06
2030	88.49	3763.30
2031	-13.59	4069.53
2032	-115.67	4375.76

These scenarios are presented visually in **Figure 3** below.

Figure 3 Forest Cover Area



2.6.3 Total Carbon stock estimation

The field data and biomass collected from 11 samples was used to calculate Above Ground Biomass (AGB) using locally developed allometric equations (Chave et al., 2014) for 2011-2021 (**Table 5**). In Sadhuja, Wahidpur and Bahab forests, the cumulative carbon stock in five carbon pools (above, below, deadwood, litter, and soil) was estimated to as 35,273.96 tonnes of Organic Carbon (Corg) back in 2011 which decreased to 17,518.79tonnes in 2021. This change corresponds to the decrease in forest cover from 2027.97 ha in 2011 to 1007.19 ha in year 2021(see figure 4 and table 5). The year-wise change in carbon stock is provided in Table 8.

Figure 4: Forest Cover Maps used for Change Analysis

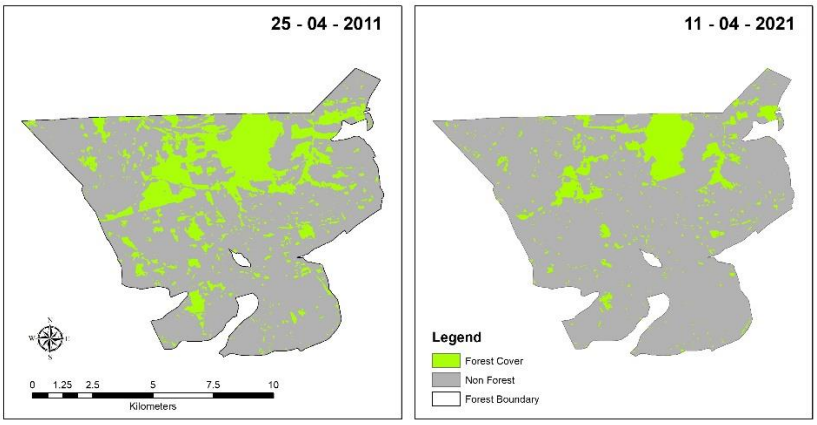


Table 5. Carbon stock estimation (2011-2021)

Carbon pool	Mean carbon stock (tones C stock per hectare)	Forest Cover (ha)	Total stock (tones C stock)	CO_2 Emissions (tones CO_2 eq)
2011 (2011-04-25)				
Above	0.23	2027.97	462.69	
Below	0.06		115.67	
Litter	0.11		220.10	
Soil*	17		34,475.49	
Cumulative			35,273.96	129,338
2021 (2021-04-11)				
Above	0.23	1007.19	229.79	
Below	0.06		57.45	
Litter	0.11		109.31	
Soil	17		17,122.23	
Cumulative			17,518.79	64,236
Rate of change per year				
2021-2011		**- 102.08**	**- 1,775.52**	**6,510**

* Soil Carbon Value taken from NRO Inventory

2.6.4 CO_2 emissions reduction Scenarios for deforestation

This section presents the future CO_2 emissions reduction scenarios applying 50% reduction to current emissions rate over the past 10 years due to deforestation (As per definition of forest adopted by Pakistan for REDD+).

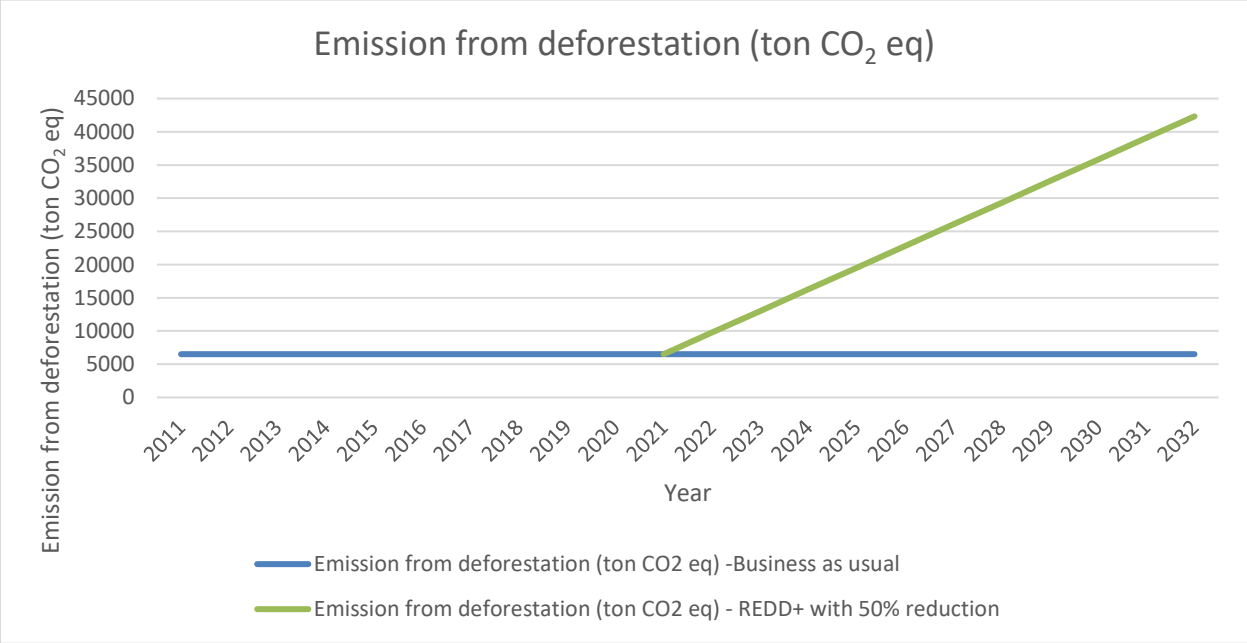
Table 6. Deforestation Emissions trend and Different Emissions reduction scenarios

Rate of change per year	6510	-3255
Year	Emission from deforestation (ton CO_2eq) -Business as usual	Emission from deforestation (ton CO_2eq) - REDD+ with 50% reduction
2011	6510	
2012	6510	
2013	6510	
2014	6510	
2015	6510	
2016	6510	
2017	6510	
2018	6510	
2019	6510	
2020	6510	
2021	6510	6510
2022	6510	9765
2023	6510	13020
2024	6510	16276
2025	6510	19531

Rate of change per year	6510	-3255
Year	Emission from deforestation (ton CO_2eq) -Business as usual	Emission from deforestation (ton CO_2eq) - REDD+ with 50% reduction
2026	6510	22786
2027	6510	26041
2028	6510	29296
2029	6510	32551
2030	6510	35806
2031	6510	39061
2032	6510	42316

The above table shows that under REDD+ implementation with reversal of current deforestation trend and 50% reduction in emissions annually the forest will start sequestering CO_2 in the coming and can sequester 42,316 tonnes CO_2eq by the year 2032 as shown in the figure 5 below.

Figure 5. Emissions reduction scenarios - Deforestation



2.6.5 CO_2 Emissions Trend – forest degradation

Fuelwood and Timber consumption for the pilot site was estimated based on population of the area, population growth rate and per capita fuelwood and timber consumption statistics collected during the field survey. The total population of the pilot site in 2017 was 5,286with a growth rate of 2.53 per annum. The fuelwood and timber consumption per capita per annum was calculated as 0.591 m^3 and 0.166 m^3, respectively. Based on this data emissions from forest degradation are calculated and presented in the Table 9.

Table 7. Forest Degradation Emissions trend

Year	Population	Fuel wood Consumption (FC) (m^3/year)	Timber Consumption (TC) (m3/year)	Fuel wood Emissions[1] (FC*D*BEF2*CF*44/12) (tones CO_2 eq)	Timber Emission (TC*D*BEF2*CF*44/12) (tones CO_2 eq)	Emission from Forest Degradation (tones CO_2 eq) -Business as usual
2011	4533	2679	752	4505	1265	5770
2012	4650	2748	772	4621	1298	5920
2013	4771	2820	792	4741	1332	6073
2014	4895	2893	813	4865	1366	6231
2015	5022	2968	834	4991	1402	6393
2016	5152	3045	855	5120	1438	6559
2017	5,286	3124	877	5253	1476	6729
2018	5420	3203	900	5386	1513	6899
2019	5557	3284	922	5522	1551	7074
2020	5697	3367	946	5662	1590	7253
2021	5842	3452	970	5805	1631	7436
2022	5989	3540	994	5952	1672	7624
2023	6141	3629	1019	6103	1714	7817
2024	6296	3721	1045	6257	1758	8015
2025	6456	3815	1072	6416	1802	8218
2026	6619	3912	1099	6578	1848	8425
2027	6786	4011	1127	6744	1894	8639
2028	6958	4112	1155	6915	1942	8857
2029	7134	4216	1184	7090	1991	9081
2030	7315	4323	1214	7269	2042	9311
2031	7500	4432	1245	7453	2093	9547
2032	7689	4544	1276	7642	2146	9788

[1] Wood Density (D)

Acacia nilotica	*0.7691*
Prosopis cineraria	*0.6877*
Tamarix dioica	*0.6206*
Average	*0.692*
Biomass Expansion Factor: BEF2	1.35 (IPCC Table 3A.1.10)
CF = carbon fraction of dry matter	0.5

2.6.6 Net Emissions from Deforestation and Forest Degradation

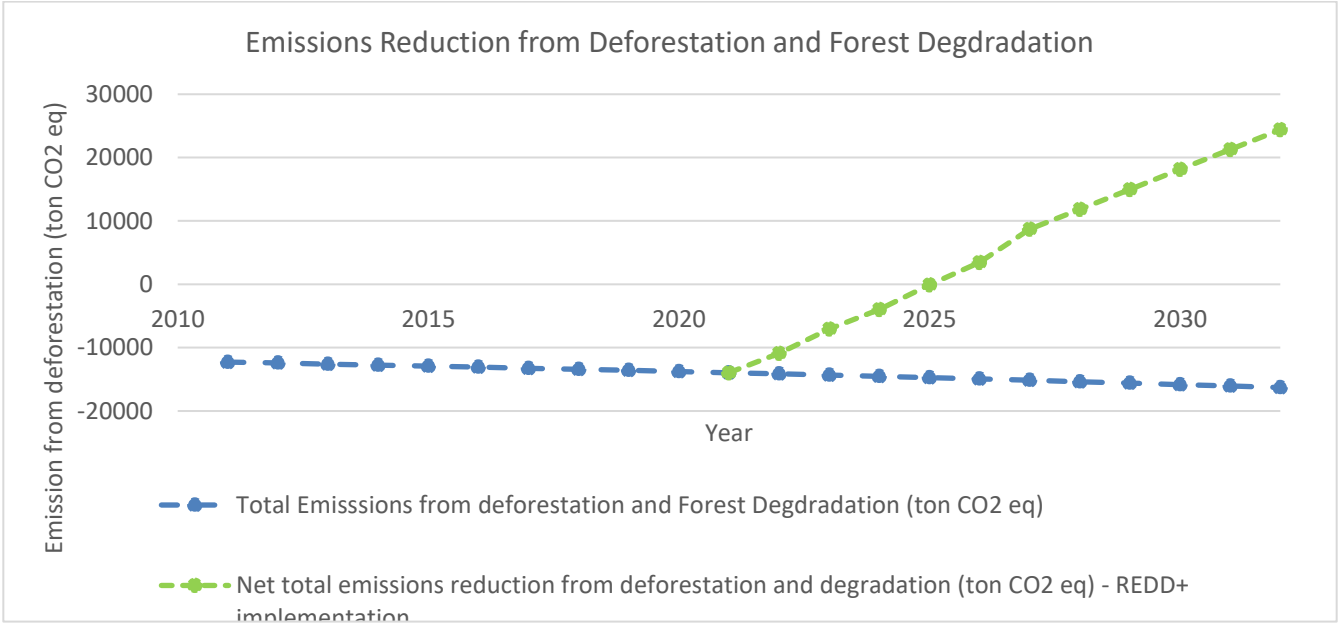
The table 8 below provides a net CO_2 sequestration scenario based on 50% reduction in emissions due to deforestation by enhancing forest cover in addition to addressing existing negative trend and reducing emissions from forest degradation starting with 10% reduction in the initial years then gradually reaching 50% reduction by the 10th year in an incremental manner. In this scenario, the net emissions from the forest will continue declining due to cumulative effect of increasing forest cover and reduction in forest degradation due to REDD+ implementation.

Table 8. Sequestration Scenario from Forest Enhancement and Reducing degradation

Rate of change per year	6510					-1302	
Year	**Emission from deforestation (ton CO_2 eq) - Business as usual**	**Emission from Forest Degradation (ton CO_2 eq) -Business as usual**	**Total Emissions from deforestation and Forest Degradation (ton CO_2 eq)**	**10-50% Reduction in Degradation emissions**	**Net emissions from degradation after 10-50% fuel demand reduction**	**Sequestration from avoided deforestation (ton CO_2 eq) - REDD+ with 50% reduction**	**Net total emissions reduction from deforestation and degradation (ton CO_2 eq) - REDD+ implementation**
2011	6510	5770	-12280				
2012	6510	5920	-12430				
2013	6510	6073	-12583				
2014	6510	6231	-12741				
2015	6510	6393	-12903				
2016	6510	6559	-13069				
2017	6510	6729	-13239				
2018	6510	6899	-13409				
2019	6510	7074	-13584				
2020	6510	7253	-13763				
2021	6510	7436	-13946		7436	-6510	-13946
2022	6510	7624	-14134		7624	-3255	-10879
2023	6510	7817	-14327	782	7035	0	-7035
2024	6510	8015	-14525	801	7213	3255	-3958
2025	6510	8218	-14728	1644	6574	6510	-64
2026	6510	8425	-14936	2106	6319	9765	3446
2027	6510	8639	-15149	4319	4319	13020	8701

Rate of change per year	6510					-1302	
Year	Emission from deforestation (ton CO_2 eq) - Business as usual	Emission from Forest Degradation (ton CO_2 eq) -Business as usual	Total Emissions from deforestation and Forest Degradation (ton CO_2 eq)	10-50% Reduction in Degradation emissions	Net emissions from degradation after 10-50% fuel demand reduction	Sequestration from avoided deforestation (ton CO_2 eq) - REDD+ with 50% reduction	Net total emissions reduction from deforestation and degradation (ton CO_2 eq) - REDD+ implementation
2028	6510	8857	-15367	4429	4429	16276	11847
2029	6510	9081	-15592	4541	4541	19531	14990
2030	6510	9311	-15821	4656	4656	22786	18130
2031	6510	9547	-16057	4773	4773	26041	21268
2032	6510	9788	-16298	4894	4894	29296	24402

Figure 6. Sequestration scenarios – Forest Enhancement and Reduced degradation.



3. Proposed Intervention

Several interventions have been proposed here based on the participatory forest inventory, socio-economic data, drivers of deforestation and stakeholders' analysis. The analysis ascertained that in order to achieve effective results for sustainable forest management and incremental Carbon sequestration, the activities required under this PFMP need to cater to the Sadhuja, Wahidpur & Bahab Forest issues. The following interventions are, therefore, suggested for managing the Sadhuja, Wahidpur & Bahab Forests as a REDD+ pilot site:

In order to address the driver of Deforestation, **Conversion of land for Agriculture**, the following interventions are proposed:

1. Appointment of community forest guards (50 Nos in 10 Years)
2. Training /exposure of forest officials and community in accordance with their roles in REDD+
3. Repair & maintenance Jeep-able compartment Roads (50Km in 10 Years) for inspection & supervision of Planting Activities.
4. Construction of Huts. (03 Nos. in 2nd Year only)

For addressing drivers of Degradation, **Firewood extraction, grazing and Timber theft for selling in the market**, following interventions are proposed:

Firewood extraction

1. Identify designated areas for firewood collection and planting fast growing fuelwood species
2. Support people with fuel efficient techniques / cooking stoves and solar energy
    a. Promotion of alternate energy sources
    b. Promotion of energy efficiency
3. Promotion of alternative sources of livelihoods (e.g., entrepreneurship in energy efficiency, solar tech., etc)

Grazing Pressure

1. Identify and designate areas for grazing

Timber theft for selling

1. Community / youth motivational events (20Nos in 10 Years)
2. Promotion of alternative sources of livelihoods (e.g., entrepreneurship in energy efficiency, solar tech., etc)
3. Appointment of community forest guards (50 Nos in 10 Years)
4. Trainings to promote alternative sources of livelihoods (e.g., NTFP)
5. Develop funding proposals to generate funding for PFMP activities

For addressing barriers to enhancement, **planting stock and water availability**, following interventions are proposed:

Planting Stock Availability:

1. Enhancement site with dry afforestation technique including species like *Acacia nilotica* (no need to plan nurseries), Planting in Blank areas (2041.60 Hectares in 10 Years)

Water Availability:

1. Installations of Solar energy operated lift Pump & Bores (30 Nos. in 10 Years)
2. Pay of lift Pump Operator-cum-chowkidar (30 Persons for 10 Years)

The total indicative budget of the PFMP implementation is **PKR 492,940,000.00**

Table 9. Visualization of Budget in Percentage

S.N.	Activity	Percentage
1	Preparation for implementation of PFMP	0.2%
2	Notification of forums	0.0%
3	Appointment of community forest guards	1.0%
4	Training activities REDD+	0.2%
5	Planting in Blank Areas	75.1%
6	Installation of Lift Pumps & Bores	9.1%
7	Pay of Lift Pump Operators	10.0%
8	Repair & Maintenance of Jeepable Compartment Roads	1.2%
9	Construction of Huts	0.6%
10	Community / youth motivational events	0.4%
11	Trainings to promote alternative sources of livelihoods	0.1%
12	Develop funding proposals	2.0%

Figure 7. Visualization of Budget in Percentage

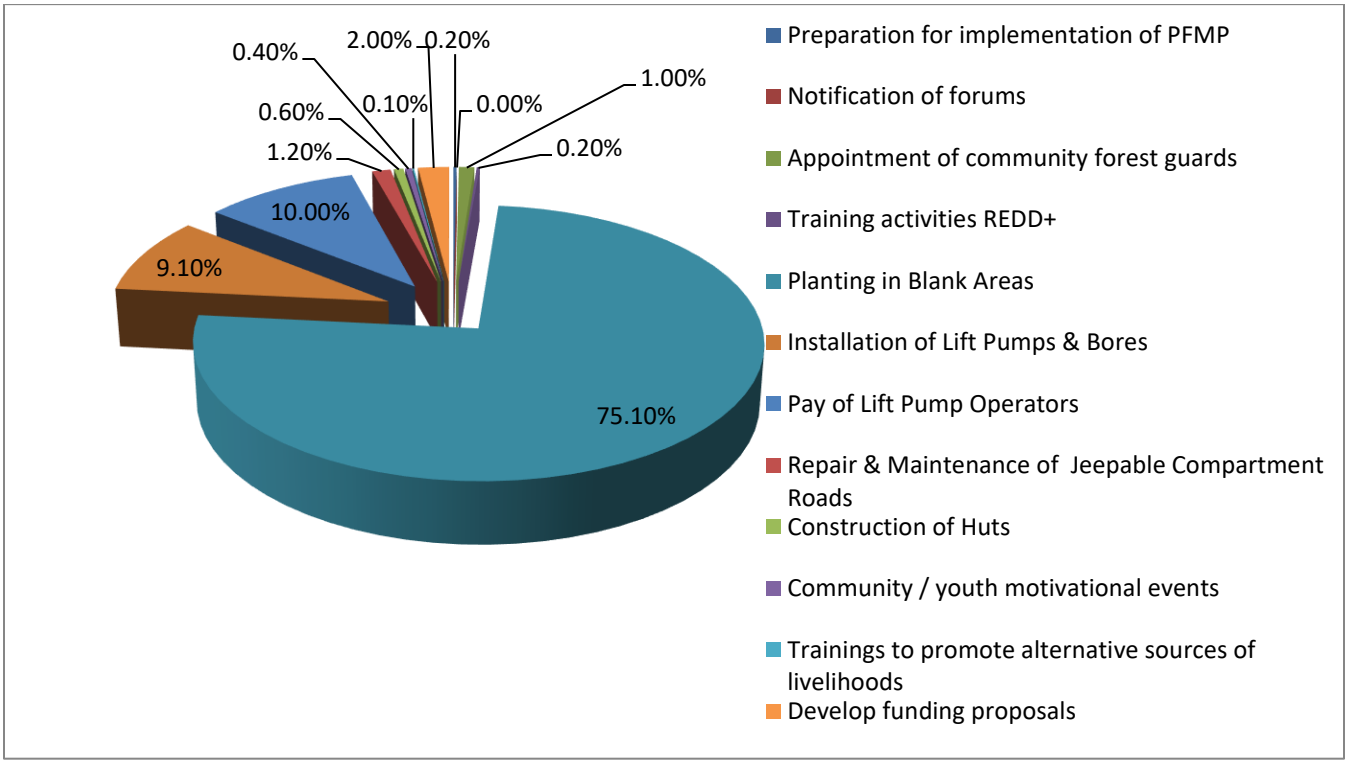


Table 10. Indicative operational plan and budget of PFMP for 10 years

				Operational Plan											
S.N.	**Activity**	**Unit**	**Unit cost**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total units**	**Total cost**
1.	Preparation for implementation of PFMP and periodical follow up meetings (community and other stakeholders.	Meetings	50,000	3	1	1	1	3	1	1	1	1	3	16	800,000
2.	Notification of forums	Notification	0	1	-	-	-	-	-	-	-	-	-	1	0
3.	Appointment of community forest guards	Guard	100,000	5	5	5	5	5	5	5	5	5	5	50	5,000,000
4.	Training /exposure of forest officials and community in accordance with their role in REDD+	Training exposure	200,000	1	2	2	-	-	-	-	-	-	-	5	1,000,000
5.	Planting in blank areas	Hectare	125,000 With 10% annual escalation	204.16	204.16	204.16	204.16	204.16	204.16	204.16	204.16	204.16	204.16	2041.60	370,040,000
6.	Installation of Solar energy operated lift pumps & Bores		1,500,000	3	3	3	3	3	3	3	3	3	3	30	45,000,000
7.	Pay of Lift Pump Operator-Cum-Chowkidar		25000 per month (300,000 per Year)	3	3	3	3	3	3	3	3	3	3	30	49,500,000
8.	Repair & maintenance Jeepable Compartment Roads	Kilometre	120,000	5	5	5	5	5	5	5	5	5	5	50	6,000,000
9.	Construction of Huts	No.	1,000,000	-	3	-	-	-	-	-	-	-	-	3	3,000,000

S.N.	Activity	Unit	Unit cost	Operational Plan										Total units	Total cost
				1	2	3	4	5	6	7	8	9	10		
10.	Community / youth motivational events	Events	100,000	2	2	2	2	2	2	2	2	2	2	20	2,000,000
11.	Trainings to promote alternative sources of livelihoods (e.g., NTFP)	Training	200,000	-	-	1	-	1	-	1	-	-	-	3	600,000
12.	Develop funding proposals to generate funding for PFMP activities	Proposals	1,000,000	-	1	-	-	-	-	-	-		-	1	1,000,0000
Total															**492,940,000**

4. Implementation Mechanism for the PFMP

4.1. Resources for activities

The Sindh Forest & Wildlife Department as custodian of the forest and having linkages with national and international funding sources will take a lead this activity. The key stakeholders identifying in this plan, especially the Sindh Forest & Wildlife Department will look for resources for implementation of activities identified in this plan. The Sindh Forest & Wildlife Department will submit proposals for potential funding sources including the Ministry of Climate Change, Public Sector Development Programme (PSDP), international donors and private sector investors.

4.2. Suggested institutional mechanism for implementation of activities

The Sindh Forest & Wildlife Department in consultation with the community will decide on formation/notification of suitable institutional mechanism for implementation of this plan. It is suggested that village and district level REDD+ implementation committees notified by the Sindh Forest & Wildlife Department will oversee implementation of activities. The notifications will include description of responsibilities of Sindh Forest & Wildlife Department, the respective communities, and any other relevant stakeholders.

VRIC: In consultation with the community the Sindh Forest & Wildlife Department may notify two committees. A Village REDD+ Implementation Committee (VRIC) and the District REDD+ Implementation Committee (DRIC). The VRIC may consist of representative from the community and the Sindh Forest & Wildlife Department. The community will nominate representatives for the VRIC to represent them. The representatives of the community will be responsible to ensure and harness community support for the implementation of activities. Representatives of the households having land and settlements inside the forest will be crucial for success of REDD+ activities. The Sindh Forest & Wildlife Department will assign duties of a Rang Forest Officer to represent the department in the VRIC. The VRIC may be Co-chaired by a community member nominated by the community and the RFO.

DRIC: The VRIC will be supported by a District level REDD+ Implementation Committee (DRIC) chaired by the Deputy Commissioner and consisting of Divisional Forest Officer, REDD+ Focal Person and two members nominated by the community including the Chair of the VRIC. The responsibility of the DRIC will be to monitor progress on implementation of activities and harnessing support from the relevant actors including the government departments.

4.3 Benefit Distribution Mechanism

The implementation of the REDD+ interventions package and other support activities will increase the volume of carbon stock in the forest. The increase in carbon stock in the forest pool measured by variable means and the trade of carbon will generate substantial income for the stakeholders of Sadhuja, Wahidpur & Bahab Forest in due course of time. The income earned by trading carbon stock will be distributed in proportions as per use rights held by stakeholders. Due to the financial and non-financial benefit, the stakeholders may be expected to value standing trees than to cut for other uses.

Since the community will be reducing harvest of fuel wood, restrict grazing for encouraging regeneration and voluntarily participate in restocking of forest, they will expect a major share from results base payments from reduced carbon emissions. An example is the 80:20 benefit sharing mechanism between the community and the F&W Department from trophy hunting programme in

Gilgit-Baltistan. A specific distribution of benefits in case of REDD+ programme is yet to be developed by the Sindh Forest & Wildlife Department which will form basis for sharing of benefits.

This plan has proposed distribution of carbon and non-carbon benefits accrued by the implementation of plan according to which 80% benefits will go to the Government, and 20% will go to the customary right holders and forest users. These benefits will only be distributed if the targets are achieved. The plan therefore provides scenarios to reduce or increase benefits so that the stakeholders can enjoy results-based payment and benefits. The success of this plan, therefore, is contingent on the commitment of all the stakeholders involved.

A specific and definitive distribution of benefits in case of REDD+ programme is yet to be developed by the government, which will form basis for sharing of benefits in the case of private forests. This proposed ratio will be finalized or confirmed only after finalizing KP's based benefit sharing mechanism.

5. Conflict and grievance redressal mechanism

5.1 Conflict within the community

Traditionally, a *jirga* system resolves conflicts within the community and the decisions taken are acceptable for the parties. Under REDD+ redressal, it is suggested that the same *jirga* may take lead role to resolve conflicts arising among the community regarding implementation of REDD+ activities. The structure and function of *jirga* system will be formulated by Sindh Forest & Wildlife.

5.2 Community's grievance towards the Forest Department

The REDD+ is a new mechanism for communities as well as for the Sindh Forest & Wildlife Department, therefore both partners (Community and the Sindh Forest & Wildlife Department might be facing some conflict of interest in due course of time. In case of any such grievances arises, these will be dealt through the grievance redressal mechanism developed under the REDD+ obligation. This mechanism is also reflected well in Provincial REDD+ Action Plan.

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5. IPCC. (2021). Climate Change 2021: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri, and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland.

Annex 1. Socio-economic Data of Sadhuja, Wahidpur & Bahab Forests

I. Stakeholder group (name)	Forest Department, community
II. General information	**Sadhuja, Wahidpur & Bahab Forests, Sukkur (Sindh)**
Location of stakeholder groups (e.g. different villages/hamlets in and outside forest area) and names and indicate on map if possible	The user group community of this site has scattered kacha and pakka houses in and around the forests.
III. Social organization in the forest area	
2. Traditional organizations (e.g. jirga)	-
2.1. Organization (name; purpose; membership)	-
2.2. Organization (name; purpose; membership	-
2.3. Organization (name; purpose; membership	-
3. Formal organization (e.g. social; welfare organization or village development committee	-
3.1. Organization (name; purpose; membership)	-
3.2 Organization (name; purpose; membership)	-
3.3 Organization (name; purpose; membership)	-
IV. Use of forest and forest area	
For what are you using the forest a r e a ?	
Timber for personal use like house construction, etc. (where; locate on the map)	Yes
Timber for commercial selling (where; locate on the map)	Yes
Firewood (where; locate on the map)	Yes
Grazing (where; locate on the map)	Yes
Grass cutting (where; locate on the map	Yes
Other products, e.g. mushroom, pine nuts, pine needles, vegetables, stones, minerals, medicinal plants (where; locate on the map)	Yes
Forest areas related daily labor/employment (employed by whom; for what?)	No
Tourism (what; where; locate on the map)	No
Hunting/Fishing	Fishing and illegal hunting
What would it mean if you had no access to these forest products? (Any alternatives? Threat to livelihood?)	Costly substitute of food, energy, timber and minor Forest products.
V. Rights and concessions in forest area	
Do you have formal, legal or traditional, customary rights on forest products (use)? Which ones? If Documented rights, where?	No
Timber (shares)	No
Fodder: grass cutting/grazing	No
Firewood	No
Other products:	No
VI. Control of forest area	
Who is controlling access to the forest area?	Forest Department
What are forest control mechanisms? E.g. watch and ward; herdsmen; fencing; providing permits.	Watch and ward by Forest Department
Explain control mechanisms: Are there any traditional mechanisms like nagha; herdsman; watchman? How is it organized? Who pays for it? Are there formal mechanisms like permits by FD; watch and ward by watchman or forest guard? How	Forest Guards and Foresters appointed by Forest and wildlife department, are protecting forest and illegal hunting.

does it work?	
VII. Changes over time in forest area	
What changes took place regarding the availability of forest products (timber; firewood; grasses; NTFP) during the last 30 years?	The availability of fuel wood and timber has been decreased due to illegal harvesting in the past. However, the production of agriculture crop has increased in areas cleared of forests. The population of wildlife and other forest produce has also decreased. The locals also believe that the rare species of Hog Deer has gone extinct due to over exploitation and illegal hunting.
What are (according to you) the reasons for change?	Illegal harvesting of timber and firewood for commercial purposes and clearance of forest land for agriculture crop.
Were there any efforts in the past for forest restoration and by whom?	No
VIII. Main problems	
What are the main problems in forest management? with respect to:	
a. rights	None
b. different uses	Illegal cutting, encroachment
c. control	Conflict between community and FD over encroachment on forest land.
d. managing drivers (of deforestation, degradation and forest enhancement)	i) Poor law & order situation of the area ii) Illegal harvesting of forest by local offenders. The demand for fuel wood is more than the annual increment of forest. iii) Land hunger & encroachment on forest land iv) Mechanization of the agriculture implements. v) Population pressure. vi) Decreased annual inundation
IX. Conflicts / disputes	
On different land uses: Describe nature of conflict, between which groups and put location on map if possible	Encroachment over forestland by land grabbers
Do they have effect on forest management? And how?	Yes. They destroy the newly sprouted saplings and raise agriculture crop.
On social issues: Describe nature of conflict, between which groups and put location on map if possible	None
Do they have effect on forest management? And How?	None
Existing Conflict resolution mechanisms: - traditional (e.g., jirga) - formal (court)	Court of law.
X. Other Forest Management Projects	
Are there any other Forest Management Projects in the area? If so, which projects? What are their activities?	No
XI. Recommendations	
What are your recommendations for forest? management activities?	Afforestation on denuded forestlands through regeneration during abkalani (flood) and lift irrigation by planting, enclosing and protection. This can be augmented by raising awareness among rural masses and specific trainings for harvesting Non-Timber Forest Produce (NTFP) benefits.

Annex 2. Analysis of Stakeholders

STAKEHOLDER	**INTEREST in Forest**		**INFLUENCE on Forest**	
	Type of interest	**Level of interest***	**Type of influence**	**Level of influence***
Forest Department	Better Management	3	Controller	3
Adjoining village community of Basar Palijo	Grazing, Timber Fuel wood, NTFP, Water	3	Local control on forest benefits	1
Law & Enforcement Agencies	Law Enforcement	1	None	1
Forest Encroachers	Nil	2	Political in Nature	2
Illegal harvesters	Illegal Business/damage	1	Nominal	1
Revenue Department	General Interest	1	Little	1
Irrigation Department	Nil	0	Nil	0

***Scale**	**Level of interest**	**level of influence**
0	None	Negligible or ignored
1	Little	Little
2	Significant	Significant
3	High/vital for existence	Controller

Annex 3. Plot Level Carbon Stock

Plot No.	Latitude	Longitude	Species Name	DBH (cm)	Tree height (m)	Wood Density (g/cm^3)	AGB (kg)	AGB (ton/ha)	AGC (ton/ha)	BGC (ton/ha)
1	69.17	28	Tamarix dioica	12	8.2	0.6206	42.0963	0.42	0.20	0.05
1	69.17	28	Tamarix dioica	51	4.1	0.6206	360.623	3.61	1.69	0.42
1	69.17	28	Tamarix dioica	23	3.1	0.6206	58.0044	0.58	0.27	0.07
1	69.17	28	Tamarix dioica	18	4.8	0.6206	55.0786	0.55	0.26	0.06
1	69.17	28	Tamarix dioica	21	6.1	0.6206	94.0272	0.94	0.44	0.11
1	69.17	28	Tamarix dioica	18	6.1	0.6206	69.5942	0.70	0.33	0.08
1	69.17	28	Tamarix dioica	13	5.2	0.6206	31.5527	0.32	0.15	0.04
1	69.17	28	Tamarix dioica	11	4.8	0.6206	21.0615	0.21	0.10	0.02
1	69.17	28	Tamarix dioica	13	4.7	0.6206	28.588	0.29	0.13	0.03
1	69.17	28	Tamarix dioica	15	6.9	0.6206	54.9852	0.55	0.26	0.06
1	69.17	28	Tamarix dioica	14	5.2	0.6206	36.4637	0.36	0.17	0.04
1	69.17	28	Tamarix dioica	41	7.6	0.6206	430.158	4.30	2.02	0.51
1	69.17	28	Tamarix dioica	36	6.9	0.6206	303.682	3.04	1.43	0.36
1	69.17	28	Tamarix dioica	38	7.1	0.6206	347.028	3.47	1.63	0.41
1	69.17	28	Tamarix dioica	36	9.2	0.6206	402.123	4.02	1.89	0.47
1	69.17	28	Tamarix dioica	42	11.2	0.6206	658.292	6.58	3.09	0.77
1	69.17	28	Tamarix dioica	35	12.9	0.6206	529.366	5.29	2.49	0.62
1	69.17	28	Tamarix dioica	36	15.9	0.6206	685.907	6.86	3.22	0.81
1	69.17	28	Tamarix dioica	41	6.3	0.6206	358.187	3.58	1.68	0.42
1	69.17	28	Tamarix dioica	14	4.1	0.6206	28.9147	0.29	0.14	0.03
2	69.16	28.01	Prosopis cineraria	13	6.0	0.6877	39.8295	0.40	0.19	0.05
2	69.16	28.01	Prosopis cineraria	15	6.1	0.6877	53.7944	0.54	0.25	0.06
2	69.16	28.01	Prosopis cineraria	14	6.2	0.6877	51.0968	0.51	0.24	0.06
2	69.16	28.01	Prosopis cineraria	14	6.8	0.6877	54.0186	0.54	0.25	0.06
2	69.16	28.01	Prosopis cineraria	13	6.1	0.6877	42.0409	0.42	0.20	0.05
2	69.16	28.01	Prosopis cineraria	13	4.0	0.6877	26.8126	0.27	0.13	0.03
2	69.16	28.01	Prosopis cineraria	10	3.1	0.6877	13.0119	0.13	0.06	0.02

Plot No.	Latitude	Longitude	Species Name	DBH (cm)	Tree height (m)	Wood Density (g/cm^3)	AGB (kg)	AGB (ton/ha)	AGC (ton/ha)	BGC (ton/ha)
2	69.16	28.01	Prosopis cineraria	11	4.0	0.6877	18.3546	0.18	0.09	0.02
2	69.16	28.01	Prosopis cineraria	10	5.1	0.6877	22.197	0.22	0.10	0.03
2	69.16	28.01	Prosopis cineraria	10	6.0	0.6877	24.7884	0.25	0.12	0.03
2	69.16	28.01	Prosopis cineraria	11	4.1	0.6877	18.8023	0.19	0.09	0.02
2	69.16	28.01	Prosopis cineraria	11	5.3	0.6877	25.2916	0.25	0.12	0.03
2	69.16	28.01	Prosopis cineraria	11	5.0	0.6877	22.8207	0.23	0.11	0.03
2	69.16	28.01	Prosopis cineraria	10	5.1	0.6877	21.1525	0.21	0.10	0.02
2	69.16	28.01	Prosopis cineraria	11	5.2	0.6877	23.7112	0.24	0.11	0.03
2	69.16	28.01	Prosopis cineraria	11	6.2	0.6877	28.152	0.28	0.13	0.03
2	69.16	28.01	Prosopis cineraria	11	6.1	0.6877	29.0111	0.29	0.14	0.03
2	69.16	28.01	Prosopis cineraria	10	6.0	0.6877	26.0125	0.26	0.12	0.03
2	69.16	28.01	Prosopis cineraria	10	5.2	0.6877	21.5572	0.22	0.10	0.03
2	69.16	28.01	Prosopis cineraria	13	5.1	0.6877	33.9874	0.34	0.16	0.04
2	69.16	28.01	Prosopis cineraria	8	4.0	0.6877	10.1461	0.10	0.05	0.01
2	69.16	28.01	Prosopis cineraria	10	4.5	0.6877	18.7201	0.19	0.09	0.02
2	69.16	28.01	Prosopis cineraria	15	4.1	0.6877	38.9577	0.39	0.18	0.05
2	69.16	28.01	Prosopis cineraria	13	4.2	0.6877	27.0541	0.27	0.13	0.03
2	69.16	28.01	Prosopis cineraria	15	4.3	0.6877	36.9853	0.37	0.17	0.04
2	69.16	28.01	Prosopis cineraria	15	4.0	0.6877	36.8225	0.37	0.17	0.04
2	69.16	28.01	Prosopis cineraria	13	5.0	0.6877	33.3368	0.33	0.16	0.04
2	69.16	28.01	Prosopis cineraria	13	5.2	0.6877	37.3386	0.37	0.18	0.04
2	69.16	28.01	Prosopis cineraria	10	6.1	0.6877	26.4355	0.26	0.12	0.03
2	69.16	28.01	Prosopis cineraria	15	3.2	0.6877	29.6162	0.30	0.14	0.03
3	69.16	28.03	Prosopis cineraria	10	5.0	0.6877	20.7476	0.21	0.10	0.02
3	69.16	28.03	Prosopis cineraria	8	2.0	0.6877	4.83836	0.05	0.02	0.01
3	69.16	28.03	Prosopis cineraria	13	4.0	0.6877	25.796	0.26	0.12	0.03
3	69.16	28.03	Prosopis cineraria	10	3.0	0.6877	12.6021	0.13	0.06	0.01
3	69.16	28.03	Prosopis cineraria	15	7.0	0.6877	63.5798	0.64	0.30	0.07
3	69.16	28.03	Prosopis cineraria	18	6.0	0.6877	73.9025	0.74	0.35	0.09

Plot No.	Latitude	Longitude	Species Name	DBH (cm)	Tree height (m)	Wood Density (g/cm^3)	AGB (kg)	AGB (ton/ha)	AGC (ton/ha)	BGC (ton/ha)
3	69.16	28.03	Prosopis cineraria	13	4.0	0.6877	25.796	0.26	0.12	0.03
3	69.16	28.03	Prosopis cineraria	10	3.0	0.6877	12.6021	0.13	0.06	0.01
3	69.16	28.03	Prosopis cineraria	8	2.0	0.6877	4.83836	0.05	0.02	0.01
3	69.16	28.03	Prosopis cineraria	10	5.0	0.6877	20.7476	0.21	0.10	0.02
3	69.16	28.03	Prosopis cineraria	8	3.0	0.6877	7.18725	0.07	0.03	0.01
3	69.16	28.03	Prosopis cineraria	13	4.0	0.6877	25.796	0.26	0.12	0.03
3	69.16	28.03	Prosopis cineraria	18	6.0	0.6877	73.9025	0.74	0.35	0.09
3	69.16	28.03	Prosopis cineraria	15	5.0	0.6877	45.7823	0.46	0.22	0.05
3	69.16	28.03	Prosopis cineraria	10	3.0	0.6877	12.6021	0.13	0.06	0.01
3	69.16	28.03	Prosopis cineraria	8	2.0	0.6877	4.83836	0.05	0.02	0.01
3	69.16	28.03	Prosopis cineraria	10	5.0	0.6877	20.7476	0.21	0.10	0.02
3	69.16	28.03	Prosopis cineraria	13	4.0	0.6877	25.796	0.26	0.12	0.03
3	69.16	28.03	Prosopis cineraria	15	5.0	0.6877	45.7823	0.46	0.22	0.05
3	69.16	28.03	Prosopis cineraria	18	6.0	0.6877	73.9025	0.74	0.35	0.09
3	69.16	28.03	Prosopis cineraria	10	3.0	0.6877	12.6021	0.13	0.06	0.01
3	69.16	28.03	Prosopis cineraria	8	2.0	0.6877	4.83836	0.05	0.02	0.01
3	69.16	28.03	Prosopis cineraria	5	2.0	0.6877	2.19264	0.02	0.01	0.00
3	69.16	28.03	Prosopis cineraria	15	5.0	0.6877	45.7823	0.46	0.22	0.05
3	69.16	28.03	Prosopis cineraria	13	4.0	0.6877	25.796	0.26	0.12	0.03
3	69.16	28.03	Prosopis cineraria	10	3.0	0.6877	12.6021	0.13	0.06	0.01
4	69.14	28.03	Prosopis cineraria	13	4.0	0.6877	25.796	0.26	0.12	0.03
4	69.14	28.03	Prosopis cineraria	8	2.0	0.6877	4.83836	0.05	0.02	0.01
4	69.14	28.03	Prosopis cineraria	13	3.0	0.6877	19.481	0.19	0.09	0.02
4	69.14	28.03	Prosopis cineraria	15	5.0	0.6877	45.7823	0.46	0.22	0.05
4	69.14	28.03	Prosopis cineraria	10	3.0	0.6877	12.6021	0.13	0.06	0.01
4	69.14	28.03	Prosopis cineraria	5	2.0	0.6877	2.19264	0.02	0.01	0.00
4	69.14	28.03	Prosopis cineraria	8	2.0	0.6877	4.83836	0.05	0.02	0.01
4	69.14	28.03	Prosopis cineraria	13	4.0	0.6877	25.796	0.26	0.12	0.03
4	69.14	28.03	Prosopis cineraria	10	3.0	0.6877	12.6021	0.13	0.06	0.01

Plot No.	Latitude	Longitude	Species Name	DBH (cm)	Tree height (m)	Wood Density (g/cm^3)	AGB (kg)	AGB (ton/ha)	AGC (ton/ha)	BGC (ton/ha)
4	69.14	28.03	Prosopis cineraria	15	4.0	0.6877	36.8225	0.37	0.17	0.04
4	69.14	28.03	Prosopis cineraria	13	4.0	0.6877	25.796	0.26	0.12	0.03
4	69.14	28.03	Prosopis cineraria	8	2.0	0.6877	4.83836	0.05	0.02	0.01
4	69.14	28.03	Prosopis cineraria	10	3.0	0.6877	12.6021	0.13	0.06	0.01
4	69.14	28.03	Prosopis cineraria	5	2.0	0.6877	2.19264	0.02	0.01	0.00
4	69.14	28.03	Prosopis cineraria	13	4.0	0.6877	25.796	0.26	0.12	0.03
4	69.14	28.03	Prosopis cineraria	18	5.0	0.6877	61.8555	0.62	0.29	0.07
4	69.14	28.03	Prosopis cineraria	15	4.0	0.6877	36.8225	0.37	0.17	0.04
4	69.14	28.03	Prosopis cineraria	13	4.0	0.6877	25.796	0.26	0.12	0.03
4	69.14	28.03	Prosopis cineraria	10	3.0	0.6877	12.6021	0.13	0.06	0.01
4	69.14	28.03	Prosopis cineraria	10	3.0	0.6877	12.6021	0.13	0.06	0.01
4	69.14	28.03	Prosopis cineraria	8	2.0	0.6877	4.83836	0.05	0.02	0.01
4	69.14	28.03	Prosopis cineraria	13	4.0	0.6877	25.796	0.26	0.12	0.03
4	69.14	28.03	Prosopis cineraria	15	4.0	0.6877	36.8225	0.37	0.17	0.04
4	69.14	28.03	Prosopis cineraria	10	3.0	0.6877	12.6021	0.13	0.06	0.01
4	69.14	28.03	Prosopis cineraria	18	5.0	0.6877	61.8555	0.62	0.29	0.07
4	69.14	28.03	Prosopis cineraria	13	3.0	0.6877	19.481	0.19	0.09	0.02
4	69.14	28.03	Prosopis cineraria	8	2.0	0.6877	4.83836	0.05	0.02	0.01
4	69.14	28.03	Prosopis cineraria	10	3.0	0.6877	12.6021	0.13	0.06	0.01
4	69.14	28.03	Prosopis cineraria	13	4.0	0.6877	25.796	0.26	0.12	0.03
4	69.14	28.03	Prosopis cineraria	15	4.0	0.6877	36.8225	0.37	0.17	0.04
4	69.14	28.03	Prosopis cineraria	13	3.0	0.6877	19.481	0.19	0.09	0.02
5	69.13	28	Prosopis cineraria	18	9.0	0.6877	109.78	1.10	0.52	0.13
5	69.13	28	Prosopis cineraria	8	4.0	0.6877	9.51707	0.10	0.04	0.01
5	69.13	28	Prosopis cineraria	15	5.0	0.6877	45.7823	0.46	0.22	0.05
5	69.13	28	Prosopis cineraria	8	4.0	0.6877	9.51707	0.10	0.04	0.01
5	69.13	28	Prosopis cineraria	8	3.0	0.6877	7.18725	0.07	0.03	0.01
5	69.13	28	Prosopis cineraria	10	6.0	0.6877	24.7884	0.25	0.12	0.03
5	69.13	28	Prosopis cineraria	8	5.0	0.6877	11.8328	0.12	0.06	0.01

Plot No.	Latitude	Longitude	Species Name	DBH (cm)	Tree height (m)	Wood Density (g/cm^3)	AGB (kg)	AGB (ton/ha)	AGC (ton/ha)	BGC (ton/ha)
5	69.13	28	Prosopis cineraria	10	5.0	0.6877	20.7476	0.21	0.10	0.02
5	69.13	28	Prosopis cineraria	8	4.0	0.6877	9.51707	0.10	0.04	0.01
5	69.13	28	Prosopis cineraria	13	6.0	0.6877	38.3192	0.38	0.18	0.05
5	69.13	28	Prosopis cineraria	13	7.0	0.6877	44.5407	0.45	0.21	0.05
5	69.13	28	Prosopis cineraria	15	7.0	0.6877	63.5798	0.64	0.30	0.07
5	69.13	28	Prosopis cineraria	10	8.0	0.6877	32.8238	0.33	0.15	0.04
5	69.13	28	Prosopis cineraria	8	5.0	0.6877	11.8328	0.12	0.06	0.01
5	69.13	28	Prosopis cineraria	10	5.0	0.6877	20.7476	0.21	0.10	0.02
5	69.13	28	Prosopis cineraria	13	6.0	0.6877	38.3192	0.38	0.18	0.05
5	69.13	28	Prosopis cineraria	8	7.0	0.6877	16.4327	0.16	0.08	0.02
5	69.13	28	Prosopis cineraria	8	4.0	0.6877	9.51707	0.10	0.04	0.01
5	69.13	28	Prosopis cineraria	10	5.0	0.6877	20.7476	0.21	0.10	0.02
5	69.13	28	Prosopis cineraria	13	3.0	0.6877	19.481	0.19	0.09	0.02
5	69.13	28	Prosopis cineraria	15	8.0	0.6877	72.4301	0.72	0.34	0.09
5	69.13	28	Prosopis cineraria	10	6.0	0.6877	24.7884	0.25	0.12	0.03
5	69.13	28	Prosopis cineraria	8	4.0	0.6877	9.51707	0.10	0.04	0.01
5	69.13	28	Prosopis cineraria	5	3.0	0.6877	3.25711	0.03	0.02	0.00
5	69.13	28	Prosopis cineraria	13	7.0	0.6877	44.5407	0.45	0.21	0.05
5	69.13	28	Prosopis cineraria	10	5.0	0.6877	20.7476	0.21	0.10	0.02
5	69.13	28	Prosopis cineraria	8	4.0	0.6877	9.51707	0.10	0.04	0.01
5	69.13	28	Prosopis cineraria	5	3.0	0.6877	3.25711	0.03	0.02	0.00
5	69.13	28	Prosopis cineraria	10	6.0	0.6877	24.7884	0.25	0.12	0.03
5	69.13	28	Prosopis cineraria	13	7.0	0.6877	44.5407	0.45	0.21	0.05
5	69.13	28	Prosopis cineraria	8	4.0	0.6877	9.51707	0.10	0.04	0.01
5	69.13	28	Prosopis cineraria	10	6.0	0.6877	24.7884	0.25	0.12	0.03
5	69.13	28	Prosopis cineraria	8	5.0	0.6877	11.8328	0.12	0.06	0.01
5	69.13	28	Prosopis cineraria	13	8.0	0.6877	50.7408	0.51	0.24	0.06
5	69.13	28	Prosopis cineraria	15	8.0	0.6877	72.4301	0.72	0.34	0.09
5	69.13	28	Prosopis cineraria	10	6.0	0.6877	24.7884	0.25	0.12	0.03

Plot No.	Latitude	Longitude	Species Name	DBH (cm)	Tree height (m)	Wood Density (g/cm^3)	AGB (kg)	AGB (ton/ha)	AGC (ton/ha)	BGC (ton/ha)
5	69.13	28	Prosopis cineraria	8	4.0	0.6877	9.51707	0.10	0.04	0.01
5	69.13	28	Prosopis cineraria	10	6.0	0.6877	24.7884	0.25	0.12	0.03
5	69.13	28	Prosopis cineraria	8	4.0	0.6877	9.51707	0.10	0.04	0.01
5	69.13	28	Prosopis cineraria	13	7.0	0.6877	44.5407	0.45	0.21	0.05
5	69.13	28	Prosopis cineraria	15	8.0	0.6877	72.4301	0.72	0.34	0.09
5	69.13	28	Prosopis cineraria	10	7.0	0.6877	28.813	0.29	0.14	0.03
5	69.13	28	Prosopis cineraria	13	5.0	0.6877	32.0727	0.32	0.15	0.04
5	69.13	28	Prosopis cineraria	15	6.0	0.6877	54.6989	0.55	0.26	0.06
5	69.13	28	Prosopis cineraria	13	8.0	0.6877	50.7408	0.51	0.24	0.06
5	69.13	28	Prosopis cineraria	10	7.0	0.6877	28.813	0.29	0.14	0.03
5	69.13	28	Prosopis cineraria	8	6.0	0.6877	14.1374	0.14	0.07	0.02
5	69.13	28	Prosopis cineraria	8	5.0	0.6877	11.8328	0.12	0.06	0.01
5	69.13	28	Prosopis cineraria	18	9.0	0.6877	109.78	1.10	0.52	0.13
5	69.13	28	Prosopis cineraria	15	5.0	0.6877	45.7823	0.46	0.22	0.05
5	69.13	28	Prosopis cineraria	10	4.0	0.6877	16.6872	0.17	0.08	0.02
5	69.13	28	Prosopis cineraria	8	2.0	0.6877	4.83836	0.05	0.02	0.01
5	69.13	28	Prosopis cineraria	5	3.0	0.6877	3.25711	0.03	0.02	0.00
5	69.13	28	Prosopis cineraria	8	4.0	0.6877	9.51707	0.10	0.04	0.01
5	69.13	28	Prosopis cineraria	10	5.0	0.6877	20.7476	0.21	0.10	0.02
5	69.13	28	Prosopis cineraria	13	6.0	0.6877	38.3192	0.38	0.18	0.05
5	69.13	28	Prosopis cineraria	15	7.0	0.6877	63.5798	0.64	0.30	0.07
5	69.13	28	Prosopis cineraria	13	8.0	0.6877	50.7408	0.51	0.24	0.06
5	69.13	28	Prosopis cineraria	10	4.0	0.6877	16.6872	0.17	0.08	0.02
5	69.13	28	Prosopis cineraria	8	4.0	0.6877	9.51707	0.10	0.04	0.01
5	69.13	28	Prosopis cineraria	5	2.0	0.6877	2.19264	0.02	0.01	0.00
5	69.13	28	Prosopis cineraria	13	6.0	0.6877	38.3192	0.38	0.18	0.05
5	69.13	28	Prosopis cineraria	15	6.0	0.6877	54.6989	0.55	0.26	0.06
5	69.13	28	Prosopis cineraria	10	3.0	0.6877	12.6021	0.13	0.06	0.01
5	69.13	28	Prosopis cineraria	10	3.0	0.6877	12.6021	0.13	0.06	0.01

Plot No.	Latitude	Longitude	Species Name	DBH (cm)	Tree height (m)	Wood Density (g/cm^3)	AGB (kg)	AGB (ton/ha)	AGC (ton/ha)	BGC (ton/ha)
5	69.13	28	Prosopis cineraria	8	2.0	0.6877	4.83836	0.05	0.02	0.01
5	69.13	28	Prosopis cineraria	13	6.0	0.6877	38.3192	0.38	0.18	0.05
5	69.13	28	Prosopis cineraria	15	7.0	0.6877	63.5798	0.64	0.30	0.07
5	69.13	28	Prosopis cineraria	10	3.0	0.6877	12.6021	0.13	0.06	0.01
5	69.13	28	Prosopis cineraria	13	4.0	0.6877	25.796	0.26	0.12	0.03
5	69.13	28	Prosopis cineraria	10	3.0	0.6877	12.6021	0.13	0.06	0.01
5	69.13	28	Prosopis cineraria	8	2.0	0.6877	4.83836	0.05	0.02	0.01
5	69.13	28	Prosopis cineraria	5	2.0	0.6877	2.19264	0.02	0.01	0.00
5	69.13	28	Prosopis cineraria	13	4.0	0.6877	25.796	0.26	0.12	0.03
5	69.13	28	Prosopis cineraria	15	7.0	0.6877	63.5798	0.64	0.30	0.07
7	69.12	28.01	Acacia nilotica	15	8.0	0.7691	80.7861	0.81	0.38	0.09
7	69.12	28.01	Acacia nilotica	13	6.0	0.7691	42.74	0.43	0.20	0.05
8	69.13	27.96	Prosopis cineraria	6	6.8	0.6877	11.1908	0.11	0.05	0.01
8	69.13	27.96	Prosopis cineraria	6	6.4	0.6877	10.5478	0.11	0.05	0.01
8	69.13	27.96	Prosopis cineraria	5	4.0	0.6877	4.31294	0.04	0.02	0.01
8	69.13	27.96	Prosopis cineraria	5	6.8	0.6877	7.23921	0.07	0.03	0.01
8	69.13	27.96	Prosopis cineraria	8	7.0	0.6877	17.5189	0.18	0.08	0.02
8	69.13	27.96	Prosopis cineraria	8	5.7	0.6877	15.2524	0.15	0.07	0.02
8	69.13	27.96	Prosopis cineraria	5	6.6	0.6877	7.03133	0.07	0.03	0.01
8	69.13	27.96	Prosopis cineraria	6	5.3	0.6877	6.83682	0.07	0.03	0.01
8	69.13	27.96	Prosopis cineraria	8	6.0	0.6877	14.1374	0.14	0.07	0.02
8	69.13	27.96	Prosopis cineraria	5	6.2	0.6877	6.61511	0.07	0.03	0.01
8	69.13	27.96	Prosopis cineraria	8	6.1	0.6877	14.3673	0.14	0.07	0.02
8	69.13	27.96	Prosopis cineraria	10	6.4	0.6877	26.4	0.26	0.12	0.03
8	69.13	27.96	Prosopis cineraria	5	5.1	0.6877	6.01329	0.06	0.03	0.01
8	69.13	27.96	Prosopis cineraria	6	6.1	0.6877	7.84229	0.08	0.04	0.01
8	69.13	27.96	Prosopis cineraria	6	4.1	0.6877	5.80392	0.06	0.03	0.01
8	69.13	27.96	Prosopis cineraria	6	5.1	0.6877	6.5849	0.07	0.03	0.01
8	69.13	27.96	Prosopis cineraria	6	4.3	0.6877	5.57476	0.06	0.03	0.01

Plot No.	Latitude	Longitude	Species Name	DBH (cm)	Tree height (m)	Wood Density (g/cm^3)	AGB (kg)	AGB (ton/ha)	AGC (ton/ha)	BGC (ton/ha)
8	69.13	27.96	Prosopis cineraria	10	5.1	0.6877	21.1525	0.21	0.10	0.02
8	69.13	27.96	Prosopis cineraria	5	4.1	0.6877	4.85961	0.05	0.02	0.01
8	69.13	27.96	Prosopis cineraria	6	5.3	0.6877	6.83682	0.07	0.03	0.01
8	69.13	27.96	Prosopis cineraria	6	4.4	0.6877	6.21805	0.06	0.03	0.01
8	69.13	27.96	Prosopis cineraria	8	5.1	0.6877	12.8611	0.13	0.06	0.02
8	69.13	27.96	Prosopis cineraria	8	4.2	0.6877	11.3213	0.11	0.05	0.01
8	69.13	27.96	Prosopis cineraria	8	5.1	0.6877	13.6834	0.14	0.06	0.02
8	69.13	27.96	Prosopis cineraria	9	5.5	0.6877	16.5803	0.17	0.08	0.02
8	69.13	27.96	Prosopis cineraria	6	5.2	0.6877	6.71089	0.07	0.03	0.01
8	69.13	27.96	Prosopis cineraria	6	4.5	0.6877	5.82769	0.06	0.03	0.01
8	69.13	27.96	Prosopis cineraria	6	5.1	0.6877	8.45122	0.08	0.04	0.01
8	69.13	27.96	Prosopis cineraria	9	7.1	0.6877	22.5113	0.23	0.11	0.03
8	69.13	27.96	Prosopis cineraria	8	7.2	0.6877	20.3445	0.20	0.10	0.02
8	69.13	27.96	Prosopis cineraria	6	4.4	0.6877	7.31713	0.07	0.03	0.01
8	69.13	27.96	Prosopis cineraria	10	6.2	0.6877	23.156	0.23	0.11	0.03
8	69.13	27.96	Prosopis cineraria	10	5.2	0.6877	22.6217	0.23	0.11	0.03
8	69.13	27.96	Prosopis cineraria	6	4.1	0.6877	5.32155	0.05	0.03	0.01
8	69.13	27.96	Prosopis cineraria	8	5.8	0.6877	14.5813	0.15	0.07	0.02
8	69.13	27.96	Prosopis cineraria	8	3.4	0.6877	9.21145	0.09	0.04	0.01
8	69.13	27.96	Prosopis cineraria	8	4.4	0.6877	11.1352	0.11	0.05	0.01
8	69.13	27.96	Prosopis cineraria	8	5.1	0.6877	13.6834	0.14	0.06	0.02
8	69.13	27.96	Prosopis cineraria	6	5.2	0.6877	8.61291	0.09	0.04	0.01
8	69.13	27.96	Prosopis cineraria	6	4.1	0.6877	6.8298	0.07	0.03	0.01
8	69.13	27.96	Prosopis cineraria	9	5.4	0.6877	16.286	0.16	0.08	0.02
8	69.13	27.96	Prosopis cineraria	9	5.2	0.6877	17.5499	0.18	0.08	0.02
8	69.13	27.96	Prosopis cineraria	6	5.1	0.6877	7.80392	0.08	0.04	0.01
8	69.13	27.96	Prosopis cineraria	6	4.1	0.6877	5.32155	0.05	0.03	0.01
8	69.13	27.96	Prosopis cineraria	5	4.3	0.6877	5.09084	0.05	0.02	0.01
8	69.13	27.96	Prosopis cineraria	8	5.4	0.6877	13.599	0.14	0.06	0.02

Plot No.	Latitude	Longitude	Species Name	DBH (cm)	Tree height (m)	Wood Density (g/cm^3)	AGB (kg)	AGB (ton/ha)	AGC (ton/ha)	BGC (ton/ha)
8	69.13	27.96	Prosopis cineraria	8	5.2	0.6877	13.1072	0.13	0.06	0.02
8	69.13	27.96	Prosopis cineraria	11	5.0	0.6877	22.8207	0.23	0.11	0.03
8	69.13	27.96	Prosopis cineraria	8	4.2	0.6877	11.3213	0.11	0.05	0.01
8	69.13	27.96	Prosopis cineraria	6	4.0	0.6877	5.19483	0.05	0.02	0.01
8	69.13	27.96	Prosopis cineraria	6	4.7	0.6877	6.08035	0.06	0.03	0.01
8	69.13	27.96	Prosopis cineraria	6	4.6	0.6877	7.64157	0.08	0.04	0.01
8	69.13	27.96	Prosopis cineraria	6	4.9	0.6877	6.90679	0.07	0.03	0.01
8	69.13	27.96	Prosopis cineraria	8	4.6	0.6877	12.3725	0.12	0.06	0.01
8	69.13	27.96	Prosopis cineraria	6	4.1	0.6877	6.30669	0.06	0.03	0.01
8	69.13	27.96	Prosopis cineraria	8	5.1	0.6877	12.8611	0.13	0.06	0.02
8	69.13	27.96	Prosopis cineraria	7	4.2	0.6877	7.54868	0.08	0.04	0.01
8	69.13	27.96	Prosopis cineraria	9	5.1	0.6877	17.2204	0.17	0.08	0.02
8	69.13	27.96	Prosopis cineraria	8	4.2	0.6877	11.3213	0.11	0.05	0.01
8	69.13	27.96	Prosopis cineraria	8	5.1	0.6877	13.6834	0.14	0.06	0.02
9	69.18	27.95	Acacia nilotica	13	6.0	0.7691	42.74	0.43	0.20	0.05
9	69.18	27.95	Acacia nilotica	15	7.0	0.7691	70.9148	0.71	0.33	0.08
9	69.18	27.95	Acacia nilotica	10	5.0	0.7691	23.1412	0.23	0.11	0.03
9	69.18	27.95	Acacia nilotica	15	8.0	0.7691	80.7861	0.81	0.38	0.09
9	69.18	27.95	Acacia nilotica	18	6.0	0.7691	82.4284	0.82	0.39	0.10
9	69.18	27.95	Acacia nilotica	11	8.1	0.7691	40.76	0.41	0.19	0.05
9	69.18	27.95	Acacia nilotica	13	6.2	0.7691	45.8692	0.46	0.22	0.05
9	69.18	27.95	Acacia nilotica	11	5.1	0.7691	25.9502	0.26	0.12	0.03
9	69.18	27.95	Acacia nilotica	10	6.1	0.7691	28.0978	0.28	0.13	0.03
9	69.18	27.95	Acacia nilotica	8	5.2	0.7691	15.554	0.16	0.07	0.02
9	69.18	27.95	Acacia nilotica	5	6.4	0.7691	8.37092	0.08	0.04	0.01
9	69.18	27.95	Acacia nilotica	28	8.2	0.7691	270.178	2.70	1.27	0.32
10	69.19	28.01	Prosopis cineraria	23	5.2	0.6877	109.568	1.10	0.51	0.13
10	69.19	28.01	Prosopis cineraria	24	4.2	0.6877	92.766	0.93	0.44	0.11
10	69.19	28.01	Prosopis cineraria	18	5.1	0.6877	66.6275	0.67	0.31	0.08

Plot No.	Latitude	Longitude	Species Name	DBH (cm)	Tree height (m)	Wood Density (g/cm^3)	AGB (kg)	AGB (ton/ha)	AGC (ton/ha)	BGC (ton/ha)
10	69.19	28.01	Prosopis cineraria	25	6.3	0.6877	155.492	1.55	0.73	0.18
10	69.19	28.01	Prosopis cineraria	19	5.9	0.6877	85.3595	0.85	0.40	0.10
10	69.19	28.01	Prosopis cineraria	12	4.2	0.6877	26.0079	0.26	0.12	0.03
10	69.19	28.01	Prosopis cineraria	14	5.2	0.6877	38.7261	0.39	0.18	0.05
10	69.19	28.01	Prosopis cineraria	11	5.0	0.6877	23.8934	0.24	0.11	0.03
10	69.19	28.01	Prosopis cineraria	19	7.6	0.6877	101.026	1.01	0.47	0.12
10	69.19	28.01	Prosopis cineraria	13	6.2	0.6877	42.7135	0.43	0.20	0.05
10	69.19	28.01	Prosopis cineraria	10	5.5	0.6877	23.8946	0.24	0.11	0.03
10	69.19	28.01	Prosopis cineraria	14	4.2	0.6877	32.586	0.33	0.15	0.04
10	69.19	28.01	Prosopis cineraria	18	6.0	0.6877	78.0801	0.78	0.37	0.09
10	69.19	28.01	Prosopis cineraria	11	5.4	0.6877	26.9394	0.27	0.13	0.03
10	69.19	28.01	Prosopis cineraria	13	6.1	0.6877	40.4772	0.40	0.19	0.05
10	69.19	28.01	Prosopis cineraria	14	6.2	0.6877	49.3616	0.49	0.23	0.06
10	69.19	28.01	Prosopis cineraria	14	5.3	0.6877	40.8915	0.41	0.19	0.05
10	69.19	28.01	Prosopis cineraria	15	6.4	0.6877	56.375	0.56	0.26	0.07
10	69.19	28.01	Prosopis cineraria	15	7.1	0.6877	66.58	0.67	0.31	0.08
10	69.19	28.01	Prosopis cineraria	17	6.9	0.6877	80.0435	0.80	0.38	0.09
10	69.19	28.01	Prosopis cineraria	16	6.7	0.6877	67.006	0.67	0.31	0.08
10	69.19	28.01	Prosopis cineraria	16	7.8	0.6877	80.1493	0.80	0.38	0.09
10	69.19	28.01	Prosopis cineraria	15	6.2	0.6877	58.3297	0.58	0.27	0.07
10	69.19	28.01	Prosopis cineraria	14	6.1	0.6877	46.9053	0.47	0.22	0.06
10	69.19	28.01	Prosopis cineraria	14	5.2	0.6877	38.7261	0.39	0.18	0.05
10	69.19	28.01	Prosopis cineraria	13	5.4	0.6877	34.5746	0.35	0.16	0.04
10	69.19	28.01	Prosopis cineraria	15	5.3	0.6877	46.8973	0.47	0.22	0.06
10	69.19	28.01	Prosopis cineraria	15	5.4	0.6877	49.3537	0.49	0.23	0.06
10	69.19	28.01	Prosopis cineraria	18	6.0	0.6877	75.9773	0.76	0.36	0.09
10	69.19	28.01	Prosopis cineraria	20	6.8	0.6877	105.742	1.06	0.50	0.12
10	69.19	28.01	Prosopis cineraria	16	6.2	0.6877	60.2109	0.60	0.28	0.07
10	69.19	28.01	Prosopis cineraria	15	6.1	0.6877	57.4113	0.57	0.27	0.07

Plot No.	Latitude	Longitude	Species Name	DBH (cm)	Tree height (m)	Wood Density (g/cm^3)	AGB (kg)	AGB (ton/ha)	AGC (ton/ha)	BGC (ton/ha)
10	69.19	28.01	Prosopis cineraria	16	6.9	0.6877	68.9575	0.69	0.32	0.08
10	69.19	28.01	Prosopis cineraria	13	6.0	0.6877	39.8295	0.40	0.19	0.05
10	69.19	28.01	Prosopis cineraria	13	6.2	0.6877	42.7135	0.43	0.20	0.05
10	69.19	28.01	Prosopis cineraria	13	5.1	0.6877	35.3003	0.35	0.17	0.04
10	69.19	28.01	Prosopis cineraria	13	6.0	0.6877	38.3192	0.38	0.18	0.05
10	69.19	28.01	Prosopis cineraria	13	5.2	0.6877	34.6376	0.35	0.16	0.04
10	69.19	28.01	Prosopis cineraria	11	4.1	0.6877	18.8023	0.19	0.09	0.02
10	69.19	28.01	Prosopis cineraria	11	3.1	0.6877	14.9848	0.15	0.07	0.02
10	69.19	28.01	Prosopis cineraria	10	4.2	0.6877	18.3653	0.18	0.09	0.02
10	69.19	28.01	Prosopis cineraria	8	3.0	0.6877	7.66232	0.08	0.04	0.01
10	69.19	28.01	Prosopis cineraria	11	4.2	0.6877	19.2498	0.19	0.09	0.02
10	69.19	28.01	Prosopis cineraria	13	5.0	0.6877	34.6246	0.35	0.16	0.04
10	69.19	28.01	Prosopis cineraria	13	6.0	0.6877	38.3192	0.38	0.18	0.05
10	69.19	28.01	Prosopis cineraria	13	6.1	0.6877	42.0409	0.42	0.20	0.05
10	69.19	28.01	Prosopis cineraria	11	6.2	0.6877	28.152	0.28	0.13	0.03
10	69.19	28.01	Prosopis cineraria	10	6.3	0.6877	25.9974	0.26	0.12	0.03
10	69.19	28.01	Prosopis cineraria	12	4.1	0.6877	24.4012	0.24	0.11	0.03
10	69.19	28.01	Prosopis cineraria	13	5.2	0.6877	34.6376	0.35	0.16	0.04
10	69.19	28.01	Prosopis cineraria	14	6.0	0.6877	47.8069	0.48	0.22	0.06
10	69.19	28.01	Prosopis cineraria	13	6.1	0.6877	42.0409	0.42	0.20	0.05
10	69.19	28.01	Prosopis cineraria	13	5.9	0.6877	39.1814	0.39	0.18	0.05
10	69.19	28.01	Prosopis cineraria	13	5.8	0.6877	37.0721	0.37	0.17	0.04
10	69.19	28.01	Prosopis cineraria	13	5.3	0.6877	35.2876	0.35	0.17	0.04
10	69.19	28.01	Prosopis cineraria	11	5.0	0.6877	22.8207	0.23	0.11	0.03
10	69.19	28.01	Prosopis cineraria	11	5.1	0.6877	24.3596	0.24	0.11	0.03
10	69.19	28.01	Prosopis cineraria	10	5.2	0.6877	21.5572	0.22	0.10	0.03
10	69.19	28.01	Prosopis cineraria	10	5.0	0.6877	21.7721	0.22	0.10	0.03
10	69.19	28.01	Prosopis cineraria	11	5.0	0.6877	22.8207	0.23	0.11	0.03
10	69.19	28.01	Prosopis cineraria	10	5.0	0.6877	21.7721	0.22	0.10	0.03

Plot No.	Latitude	Longitude	Species Name	DBH (cm)	Tree height (m)	Wood Density (g/cm^3)	AGB (kg)	AGB (ton/ha)	AGC (ton/ha)	BGC (ton/ha)
10	69.19	28.01	Prosopis cineraria	11	5.0	0.6877	22.8207	0.23	0.11	0.03
10	69.19	28.01	Prosopis cineraria	12	5.2	0.6877	28.3188	0.28	0.13	0.03
10	69.19	28.01	Prosopis cineraria	10	5.1	0.6877	22.197	0.22	0.10	0.03
10	69.19	28.01	Prosopis cineraria	11	5.2	0.6877	27.1295	0.27	0.13	0.03
10	69.19	28.01	Prosopis cineraria	10	5.1	0.6877	21.1525	0.21	0.10	0.02
10	69.19	28.01	Prosopis cineraria	11	5.2	0.6877	24.8257	0.25	0.12	0.03
10	69.19	28.01	Prosopis cineraria	12	5.3	0.6877	28.8502	0.29	0.14	0.03
10	69.19	28.01	Prosopis cineraria	10	5.4	0.6877	22.3661	0.22	0.11	0.03
10	69.19	28.01	Prosopis cineraria	11	5.0	0.6877	22.8207	0.23	0.11	0.03
10	69.19	28.01	Prosopis cineraria	10	5.6	0.6877	23.1742	0.23	0.11	0.03
10	69.19	28.01	Prosopis cineraria	11	5.7	0.6877	27.1529	0.27	0.13	0.03
10	69.19	28.01	Prosopis cineraria	10	5.1	0.6877	21.1525	0.21	0.10	0.02
10	69.19	28.01	Prosopis cineraria	10	5.3	0.6877	23.0462	0.23	0.11	0.03
10	69.19	28.01	Prosopis cineraria	11	5.4	0.6877	24.6009	0.25	0.12	0.03
10	69.19	28.01	Prosopis cineraria	10	5.0	0.6877	20.7476	0.21	0.10	0.02
10	69.19	28.01	Prosopis cineraria	10	5.6	0.6877	24.3185	0.24	0.11	0.03
10	69.19	28.01	Prosopis cineraria	10	5.2	0.6877	21.5572	0.22	0.10	0.03
11	69.1	27.99	Acacia nilotica	49	12.8	0.7691	1262.98	12.63	5.94	1.48
11	69.1	27.99	Acacia nilotica	32	11.4	0.7691	478.274	4.78	2.25	0.56
11	69.1	27.99	Acacia nilotica	34	11.3	0.7691	551.043	5.51	2.59	0.65
11	69.1	27.99	Acacia nilotica	28	13.0	0.7691	438.785	4.39	2.06	0.52
11	69.1	27.99	Acacia nilotica	38	12.2	0.7691	729.436	7.29	3.43	0.86
11	69.1	27.99	Acacia nilotica	30	5.6	0.7691	220.68	2.21	1.04	0.26
11	69.1	27.99	Acacia nilotica	28	6.6	0.7691	218.596	2.19	1.03	0.26
11	69.1	27.99	Acacia nilotica	15	4.1	0.7691	42.0725	0.42	0.20	0.05
11	69.1	27.99	Acacia nilotica	18	5.6	0.7691	77.0606	0.77	0.36	0.09
11	69.1	27.99	Acacia nilotica	23	9.6	0.7691	212.984	2.13	1.00	0.25
11	69.1	27.99	Acacia nilotica	10	5.2	0.7691	25.2315	0.25	0.12	0.03
11	69.1	27.99	Acacia nilotica	8	4.1	0.7691	12.3339	0.12	0.06	0.01

Plot No.	Latitude	Longitude	Species Name	DBH (cm)	Tree height (m)	Wood Density (g/cm^3)	AGB (kg)	AGB (ton/ha)	AGC (ton/ha)	BGC (ton/ha)
11	69.1	27.99	Acacia nilotica	6	3.1	0.7691	4.51802	0.05	0.02	0.01
11	69.1	27.99	Acacia nilotica	12	4.7	0.7691	28.6181	0.29	0.13	0.03
11	69.1	27.99	Acacia nilotica	10	4.2	0.7691	17.6603	0.18	0.08	0.02
11	69.1	27.99	Acacia nilotica	12	6.2	0.7691	37.5014	0.38	0.18	0.04
11	69.1	27.99	Acacia nilotica	12	3.4	0.7691	23.6024	0.24	0.11	0.03
11	69.1	27.99	Acacia nilotica	12	3.6	0.7691	24.9565	0.25	0.12	0.03
11	69.1	27.99	Acacia nilotica	8	4.2	0.7691	11.8686	0.12	0.06	0.01
11	69.1	27.99	Acacia nilotica	8	3.6	0.7691	9.57771	0.10	0.05	0.01
11	69.1	27.99	Prosopis cineraria	15	3.8	0.6877	35.0245	0.35	0.16	0.04
11	69.1	27.99	Prosopis cineraria	15	4.0	0.6877	36.8225	0.37	0.17	0.04
11	69.1	27.99	Prosopis cineraria	20	6.7	0.6877	106.815	1.07	0.50	0.13
11	69.1	27.99	Prosopis cineraria	15	5.0	0.6877	47.2836	0.47	0.22	0.06
11	69.1	27.99	Prosopis cineraria	8	4.2	0.6877	11.3213	0.11	0.05	0.01
11	69.1	27.99	Prosopis cineraria	7	2.1	0.6877	4.7494	0.05	0.02	0.01
11	69.1	27.99	Prosopis cineraria	13	6.0	0.6877	41.3681	0.41	0.19	0.05
11	69.1	27.99	Prosopis cineraria	13	6.2	0.6877	39.5654	0.40	0.19	0.05
11	69.1	27.99	Prosopis cineraria	11	4.1	0.6877	20.5896	0.21	0.10	0.02
11	69.1	27.99	Prosopis cineraria	9	5.2	0.6877	16.6109	0.17	0.08	0.02
12	69.19	28.03	Tamarix dioica	8	4.1	0.6206	10.0038	0.10	0.05	0.01
12	69.19	28.03	Tamarix dioica	5	2.1	0.6206	2.08033	0.02	0.01	0.00
12	69.19	28.03	Tamarix dioica	5	2.0	0.6206	2.18179	0.02	0.01	0.00
12	69.19	28.03	Tamarix dioica	6	2.3	0.6206	2.73836	0.03	0.01	0.00
12	69.19	28.03	Tamarix dioica	10	3.0	0.6206	11.4006	0.11	0.05	0.01
12	69.19	28.03	Tamarix dioica	12	6.4	0.6206	35.4919	0.35	0.17	0.04
12	69.19	28.03	Tamarix dioica	6	4.0	0.6206	5.56952	0.06	0.03	0.01
12	69.19	28.03	Tamarix dioica	10	6.2	0.6206	24.2976	0.24	0.11	0.03
12	69.19	28.03	Tamarix dioica	8	4.1	0.6206	10.0038	0.10	0.05	0.01
12	69.19	28.03	Tamarix dioica	10	5.1	0.6206	19.1357	0.19	0.09	0.02
12	69.19	28.03	Tamarix dioica	12	4.7	0.6206	23.2116	0.23	0.11	0.03

Plot No.	Latitude	Longitude	Species Name	DBH (cm)	Tree height (m)	Wood Density (g/cm^3)	AGB (kg)	AGB (ton/ha)	AGC (ton/ha)	BGC (ton/ha)
12	69.19	28.03	Tamarix dioica	11	4.9	0.6206	20.2418	0.20	0.10	0.02
12	69.19	28.03	Tamarix dioica	10	5.1	0.6206	19.1357	0.19	0.09	0.02
12	69.19	28.03	Tamarix dioica	8	6.0	0.6206	13.6348	0.14	0.06	0.02
12	69.19	28.03	Tamarix dioica	9	7.1	0.6206	22.6983	0.23	0.11	0.03
12	69.19	28.03	Tamarix dioica	10	7.2	0.6206	28.1155	0.28	0.13	0.03
12	69.19	28.03	Tamarix dioica	13	6.2	0.6206	37.2037	0.37	0.17	0.04
12	69.19	28.03	Tamarix dioica	8	4.2	0.6206	9.6264	0.10	0.05	0.01
12	69.19	28.03	Tamarix dioica	9	4.1	0.6206	13.2813	0.13	0.06	0.02
12	69.19	28.03	Tamarix dioica	10	4.0	0.6206	15.0962	0.15	0.07	0.02
12	69.19	28.03	Tamarix dioica	13	4.2	0.6206	26.4219	0.26	0.12	0.03
12	69.19	28.03	Tamarix dioica	13	5.6	0.6206	36.3122	0.36	0.17	0.04
12	69.19	28.03	Tamarix dioica	10	4.8	0.6206	18.0363	0.18	0.08	0.02
12	69.19	28.03	Tamarix dioica	8	4.9	0.6206	12.6417	0.13	0.06	0.01
12	69.19	28.03	Tamarix dioica	8	4.7	0.6206	10.7434	0.11	0.05	0.01
12	69.19	28.03	Tamarix dioica	9	4.7	0.6206	14.3848	0.14	0.07	0.02
12	69.19	28.03	Tamarix dioica	12	4.9	0.6206	24.1752	0.24	0.11	0.03
12	69.19	28.03	Tamarix dioica	13	5.6	0.6206	32.4083	0.32	0.15	0.04
12	69.19	28.03	Tamarix dioica	12	4.7	0.6206	23.2116	0.23	0.11	0.03
12	69.19	28.03	Tamarix dioica	13	4.2	0.6206	24.4746	0.24	0.12	0.03
12	69.19	28.03	Tamarix dioica	8	4.7	0.6206	10.7434	0.11	0.05	0.01