

Annual Report

EthioTrees Project



February 2021 – February 2022

Annual Report

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EthioTrees Project

Annual report February 2021 – February 2022

Submitted by: EthioTrees

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Summary

Project overview	
Reporting period	February 2021 – February 2022
Geographical areas	Dogua Tembien (Tembien Highlands), Tigray Region, Ethiopia
Technical specifications in use	See approved PDD EthioTrees

Table 1: Summary table

Project indicators	Historical	Added/ Issued this period (Feb. 2020-Feb. 2021)	Total
No. smallholder households with PES agreements	0	0	0
No. community groups with PES agreements (where applicable) by Feb 2021	18	2	20
Approximate number of households (or individuals) in these community groups	3434	450	3884
Area under management (ha) where PES agreements are in place	1892	846	2739
Total PES payments made to participants (USD)	144,417 USD*	50,891 USD**	195,308 USD
Total sum held in trust for future PES payments (USD)	0	0	0
Allocation to Plan Vivo buffer (tCO ₂)	5,937	2,251	8,188
Saleable emissions reductions achieved (tCO ₂)	53,419	20,259	73,678

Unsold Stock at time of Submission (PVC)	
-	-

Plan Vivo Certificates (PVCs) issued to date	53,419
Plan Vivo Certificates requested for issuance (Feb. 2021 – Feb. 2022 Vintage)	20,259
Plan Vivo Certificates available for future issuance	0
Total PVCs issued (including this report)	73,678

* see previous annual report.

** USD values based on EUR to USD conversion rates on 17/03/2021 (source: www.xe.com).

Part A: Project updates

A1: Key events

- The EthioTrees project in the Tembien Highlands remains fully operational and is expanding its impact in the region. In total 10,810m stone bunds and 740 percolation ponds have been constructed in 2021.
- In summary, a conflict erupted on 3 November 2020. In January 2021, the project area was occupied by external forces. During this period all communication with the EthioTrees team in Ethiopia was blocked but the Tembien team continued the day-to-day work. Later, the communication lines were restored. On Tuesday 22 June, external forces bombed the farmers market of Togoga (one of the project communities near Meam Atali). More than 50 Tigrayans were killed, including women and children, and more than 150 people were severely injured. One of the bombs hit and the nearby school, which is completely destroyed. In July 2021, after six months of occupation, the area was liberated by the Tigray Defence Forces. After the liberation, project communication restarted, slowly at first, but stable at present. It remains possible to make financial transactions.
- The liberation was followed by a humanitarian food and aid blockade; to date a “frozen conflict”. This blockade causes a widespread human-made famine in Tigray. In response to the famine, the project delivered support to the most vulnerable people in the area (pregnant, elderly and malnourished persons). The project organized two aid campaigns. In 2021, 2833 families got direct cash-for-food support using Plan Vivo Revenues and more recently, another 1052 families were supported through the distribution of wheat flour. The last campaign also helped IDPs living in refugee camps in Mekelle and vulnerable groups in Hagere Selam. Additionally, another 1732 people have received funds while helping to establish percolation ponds in the project exclosures.
- The environmental resilience of the project zones during the crisis is corroborated by an independent Conflict and Environment Observatory (CEOBS) study on the impact of the crisis on the vegetation cover across Tigray. This remote sensing based study indicates that there is no significant vegetation decrease in the project sites. This corresponds with field observations in the project areas by the project team.
- In a 2021 Plan Vivo blog post, the responsiveness of the project to the conflict is described and discussed in detail. We refer to the following link:
<https://www.planvivo.org/blog/carbon-credits-bridging-the-gap-in-times-of-crisis>
- Making use of the Flemish Climate Fund, the EthioTrees project expanded this year into

the Debremedhanit area, equivalent to 647 ha, and the Hawahiwa area (199 ha). Baseline and first-year project activities were carried out successfully.

- There have been project trainings in all project areas (31 trainings). Trainings are focused on environmental management of the exclosures in times of conflict.
- Guarding by forest rangers continued, and additional environmental investments (stone bunds, percolation ponds) were made in the project zones. In total 10,810m stone bunds and 740 percolation ponds have been constructed in 2021. For the construction investments, the project worked together with community members, providing them a daily labour income. The investments were co-funded using the Flemish Climate Fund.
- In 2022, the project is planning a large monitoring campaign (after 5 years) and a verification audit. At the same time, the project plans a large expansion towards adjacent areas in Kola Tembien. The expansion will follow best practices in forest landscape restoration, with the aim of supporting naturally-assisted regeneration, improve ecosystem services and strengthen community resilience during difficult times. The team will discuss with Plan Vivo on how to add new expansion zones to the plan vivo project (using annual reports or a new techspec).

A2: Successes and challenges

- One of the main successes this year include the humanitarian aid support programs. The project supported 3885 vulnerable families in the area. Beside the direct impact, these support programs also strengthened the project community base.
- Despite the conflict, the project was able to expand its activities in Debremedhanit and Hawahiwa to consolidate its overall activities in the region (except for Afedena and Tukul).
- The team in Tigray currently consists of 4 fulltime employees and will further grow over the upcoming year.
- The main challenge remains the frozen conflict and humanitarian blockade. Nevertheless, the project was able to get FAO (UN) approval to get direct, daily internet access at the Mekelle office.
- Activities and guarding stopped in Afedena and Tukul. While these sites were hit and at the frontline of the war, there remains a risk of landmines. Also, the baseline monitoring at the new Dawsra expansion site was interrupted due to the risk of mines. Safety measures will be assessed in depth before activities can continue at these sites.
- The project has not been able to plant seedlings, due to the absence of tree seedlings,

as tree nurseries were abandoned during the conflict.

- In total, 31 trainings and group discussions have taken place, with on average 98 attendees. The main focus of these discussions was the protection of the exclosures (keeping out the grazing) and maintaining management of the exclosures during a frozen conflict.

A3: Project developments

Below, we give an overview of the project developments that have affected the governance, operations, contractual relationships or legal basis of the project:

- There are no relevant updates to the project documentation.
- The EthioTrees staff deliberated and decided to continue and expand their useful work for the citizens of Tigray.
- The field coordinator of Debremedhanit joined the EthioTrees Staff, overseeing monitoring activities in the expansion area.
- With the exception of Afedena and Tukul, all forest rangers have been continuing their work.
- The project involved daily labourers from the project communities to develop project activities, providing them an income stream during insecure times. In total 1732 community members participated in soil and water conservation activities.

A4 Future Developments

- Further activities next year will focus on the 20 existing exclosures, including trainings, seedling planting and seedling irrigation, and the installation of soil and water conservation structures such as percolation ponds, trenches and soil bunds. We aim to invest the plan vivo funds in “village recovery projects”, at the initiative of the citizens.
- In 2022, the project objective is to scale its activities and impact. We have identified 8580 hectares to expand into the adjacent Kola Tembien area and we started baselining, activities and meetings at these new sites.
- A monitoring round and verification audit is expected in 2022, at which point carbon sequestration rates will be recalibrated and verified.

Part B: Project activities

B1: Project activities generating Plan Vivo Certificates

- We list the technical specifications being used in the project, the area covered and participants in table 2 below. We only include those areas where PES agreements have been signed.

Table 2: Project activity summary

Name of technical specification	Area (Ha)	No smallholder households	No Community Groups
Ecosystem Restoration in the Tembien Highlands	2739 ha	3884	20

B2: Project activities in addition to those generating Plan Vivo Certificates

- The community of Amanit decided to finalize the construction of two classrooms for the school.
- The project organized meetings in all project sites to identify and support 5617 of the most vulnerable people in the project communities. Thus, 2833 families got direct cash-for-food support using Plan Vivo Revenues while another 1052 families were supported through the distribution of wheat flour and 1732 people were involved in ecosystem restoration.
- The direct support included 663 extremely vulnerable people in the cities of Mekelle and Hagere Selam, of which 360 Internally Displaced Persons (IDPs) in Mekelle and 142 vulnerable families in Hagere Selam.
- It also included, with the help of Tesfay, support for 161 extremely vulnerable people in Hagere Selam, of which 50 Internally Displaced Persons (IDPs), 23 HIV victims, 7 sexually assaulted woman and 81 very poor woman and children.

Part C: Plan Vivo Certificate issuance submission

C1: Contractual statement

- This issuance is based on Plan Vivo maps and signed PES agreements with participants complying with all the minimum requirements stated in these agreements.

C2: Issuance request for projects where issuance is made on the basis of ongoing activities on land already managed by the project (calculated *ex-post*).

Table 3: Statement of tCO₂ reductions available for issuance as Plan Vivo Certificates based on activity for reporting period February 2021 – February 2022 for all sites.

Area ID	Total area (ha)	Tech. Spec	Saleable ER's (tCO ₂) available from previous periods	Total ER's (tCO ₂) achieved this period	ER's minus leakage of 2%	% Buffer	No. of PVCs allocated to buffer from ER's achieved this period	Saleable ER's (tCO ₂) from this period	Issuance request (PVCs)	ER's (tCO ₂) available for future issuances
Adi Lehtsi	412.00	Ecosystem restoration	0	4536.00	4445.00	10	445.00	4001.00	4001.00	-
Gidme Gestet	46.00	Ecosystem restoration	0	270.00	265.00	10	26.00	238.00	238.00	-
Meam Atali	83.00	Ecosystem restoration	0	731.00	716.00	10	72.00	645.00	645.00	-
May Getnet	51.00	Ecosystem restoration	0	281.00	275.00	10	28.00	248.00	248.00	-
May Hibo	53.00	Ecosystem restoration	0	272.00	267.00	10	27.00	240.00	240.00	-
Afedena	81.00	Ecosystem restoration	0	0	0	10	0	0	0	-
Adilal	83.00	Ecosystem restoration	0	671.00	658.00	10	66.00	592.00	592.00	-
Gemgema	65.00	Ecosystem restoration	0	309.00	303.00	10	30.00	273.00	273.00	-
Zban Dake	300.00	Ecosystem restoration	0	3413.00	3345.00	10	334.00	3010.00	3010.00	-
May Baeti	45.96	Ecosystem restoration	0	291.64	285.8	10	28.58	257.22	257.22	-
Lafa	44.97	Ecosystem restoration	0	228.76	224.18	10	22.42	201.76	201.76	-
Daero Hidag	112.05	Ecosystem restoration	0	936.78	918.04	10	91.8	826.24	826.24	-
Togul	36.00	Ecosystem restoration	0	0	0	10	0	0	0	-
Sesemat	46.00	Ecosystem restoration	0	510.18	499.96	10	50	449.96	449.96	-
Adi Meles	64.79	Ecosystem restoration	0	399.72	391.72	10	39.18	352.54	352.54	-

<i>Chele Quot</i>	50.00	<i>Ecosystem restoration</i>	0	277.82	272.26	10	27.22	245.04	245.04	-
<i>Katna Ruba</i>	44.00	<i>Ecosystem restoration</i>	0	480.40	470.8	10	47.08	423.72	423.72	-
<i>Gojam Sefra</i>	275.00	<i>Ecosystem restoration</i>	0	3002.52	2942.48	10	294.24	2648.24	2648.24	-
<i>Debremed hanit</i>	647.00	<i>Ecosystem restoration</i>	0	4511	4420.78	10	442.08	3978.70	3978.70	-
<i>Hawahiwa</i>	199.00	<i>Ecosystem restoration</i>	0	1848	1811.04	10	181.10	1629.94	1629.94	-
TOTAL	2739		0	22970	22510.42	10	2251.04	20259.38	20259	-

C3: Allocation of issuance request

- The table below details the allocation of issuances from this project.

Table 6: Allocation of issuance request

Buyer name/ Unsold Stock	No. PVCs transacted	Registry ID (if available) or Project ID if destined for Unsold Stock	Tech spec(s) associated with issuance
<i>Ethiotrees (first issuance)</i>	4,873	104000000014099	<i>Ecosystem Restoration</i>
<i>Ethiotrees (second issuance)</i>	5,856	104000000014099	<i>Ecosystem Restoration</i>
<i>Ethiotrees (third issuance)</i>	9,769	104000000014099	<i>Ecosystem Restoration</i>
<i>Ethiotrees (fourth issuance)</i>	5,572	104000000014099	<i>Ecosystem Restoration</i>
<i>Ethiotrees (fifth issuance)</i>	12,530	104000000014099	<i>Ecosystem Restoration</i>
<i>EthioTrees (sixth issuance)</i>	14,819	104000000014099	<i>Ecosystem Restoration</i>
<i>EthioTrees (this issuance)</i>	20,259	104000000014099	<i>Ecosystem Restoration</i>
TOTAL	73,678	104000000014099	<i>Ecosystem Restoration</i>

C4: Data to support issuance request

- We provide the monitoring data for areas of land and participants which support our issuance request in Annex 1.

Part D: Sales of Plan Vivo Certificates

D1: Sales of Plan Vivo Certificates

- To date, 53418 Plan Vivo Certificates have been sold (not including this issuance, which credits will be sold over the course of 2022).

Table 7: Sales of Plan Vivo Certificates to date

Buyer	Year of transaction	Credits bought (tCO ₂ -e)	Value per tonne (EUR)
Carbon Sink (IT)	2018	5000	Internal reporting only
Zero Mission (SE)	2018	5000	
Carbon Sink (IT)	2019a**	5000	
Zero Mission (SE)	2019a**	5450	
Carbon Sink (IT)	2019b**	5000	
Victor Buyck (BE)	2019	162	
Zero Mission (SE)	2020a**	550	
Zero Mission (SE)	2020b**	5696	
Carbon Sink (IT)	2020a**	5000	
Zero Mission (SE)	2020c**	1660	
Carbon Sink (IT)	2021 (April)***	10,000	
Carbon Sink (IT)	2021 (Feb)***	941	
Victor Buyck (BE)	2021	159	
Zero Mission (SE)	2021	3800	

*USD values based on EUR to USD conversion rates on 05/09/2019 (source: www.xe.com)

** letters a, b and c refer to the sales of credits in spring, summer and in autumn respectively

***USD values based on EUR to USD conversion rates on 17/03/2022 (source: www.xe.com)

Part E: Monitoring results

E1: Ecosystem services monitoring

- We provide annual monitoring results that support the request for new issuances in Annex 1.
- All monitoring targets were achieved, with the exception of targets at project site Afedena and Tukul, where heavy fighting took place and mines may be present.
- No other corrective actions needed to be agreed with participants during this reporting period.

E2: Maintaining commitments

- As no participants have resigned or been removed from the project, or had Plan Vivo Certificates allocated against their activities, we do not provide a table with their details in an Annex.

E3: Socioeconomic monitoring

- We provide the results of monitoring of socioeconomic impacts (survey) every 5 years after baselining (impact indicators). Nevertheless, on a yearly basis, the project monitors its activities (yearly activity-based indicators).

These activities include in this reporting period the organization of training sessions at the 20 different sites.

The restoration project has also clear benefits for the wider communities living around the project exclosures. The most important factors include reduction of erosion and gully, conservation of soil nutrients and groundwater. For instance, forest restoration will locally benefit water availability for the upslope communities. Overall, we expect a net gain in (ground)water availability, also for the upslope communities. This is clearly visible at the site of May Genet. More socioenvironmental investments will be made in 2022, through the sales of the Plan Vivo credits.

E4: Environmental and biodiversity monitoring

- The Flemish Climate Fund helped us to expand in the Debremedhanit area, equivalent to 647 ha, and the Hawahiwa area (199 ha).
- Thanks to the Flemish Climate Fund, we could measure biomass and soil carbon estimations. In total, 86 monitoring plots have been established in these two new exclosures.
- No other changes to the monitoring plans or protocols of the project need to be reported in the updates section of this report.

Part F: Impacts

F1: Evidence of outcomes

- We report research outcomes, patterns or trends from ongoing monitoring or other information which supports the impacts – socio-economic, environmental or cultural – which the project has had every 5 years after baselining. This will be done in 2022. In Annex 2, we provide a short description of activities with photographs.

Part G: Payments for Ecosystem Services

G1: Summary of PES by year

- We use the following formula to allocate PEServices to n villages (see PDD):

$$\text{PES allocation} = 1/n * 50\% \text{ PES} + \text{Size}(\%) * 50\% \text{ PES}$$
- Last year, on 20/01/2021 a grand total of 118,696 EURO or 144,417 USD (xe.com dd. 24/02/2021) derived from 38,518 Plan Vivo Certificates had been allocated over the course of the project's lifetime.
- In 2021, 46,298 EURO or 50,891 USD (Oanda dd. 17/03/2022) derived from the latest vintage (14,900 PVCs) was also allocated. This excluded all other support, e.g. about 80,000 USD from the Flemish Climate Fund, invested in expansion and other socioenvironmental support, see further.
- The 2021 total was allocated to 2833 families from the project zones who got direct cash-for-food support.
- There are no funds being held by the project coordinator at reporting period end and there are no withheld payments at reporting period end.
- All payments are made in line with the terms of PES agreements signed.

Table 8: Breakdown of reinvestment budget per enclosure

Name of enclosure	Name of Kushet	Area (ha)	Total Amount (ETB)	Share of allocation reinvested	Remarks
Lafa	Lafa	45	159900	1.54	
Sesemat	Gereb Endaboy Hailu	46	162850	1.56	
Afedena	Afedena	81	88000	1.21	<i>Afedena not fully allocated</i>
Tukul (Togul)	Mhini	36	150150	1.54	
Daero Hidag	Togogua	112	77000	0.51	<i>partly included in Meam Atali</i>
Adilihitsi & May Hibo	Limat	465	371050	0.79	<i>including May Hibo</i>
May Baati	May Baati	46	84000	0.80	

Gemgema	Hichi and Tsigaba	65	85000	0.72	
Gojam sefra	Debre gunful	275	316000	1.20	
Maem atal	Togogua	83	302800	2.33	<i>including part from Daero Hidag</i>
Zebandake & Katna Ruba	Dedben	344	401000	1.05	
Chelaqo	Akaw	50	141750	1.32	
Maygenet	Maygenet	51	30500	0.62	
Segenet	Maygenet		37000		<i>Belongs to Maygenet exclosure</i>
Adimeles	Debremedhanit	65	159500	1.35	
Gidmi gestate		46		0.00	
Teakuro part	Adilal	83	52700	0.40	
Total	18 exclosures	1893 ha	2619200 ETB = 50,891.1 USD	100%*	

*The reinvestment budget varies between the communities based on the community needs and the exceptional circumstances of the conflict. In the next year differences will be smoothened.

Part H: Ongoing participation

H1: Recruitment

- Recruitment of the associations / focus groups of all exclosures was completed before. All sites comply with the eligibility criteria set out in the PDD.

H2: Project Potential

- No participant or area under management is on the project's 'waiting list' i.e. where a PES agreement is not yet signed but a *plan vivo* is in use.

H3: Community participation

- We briefly report on the community meetings held throughout the reporting period

and attach the pictures of these to Annex 2.

- The following topics were discussed during the community meetings:
 - Awareness creation sessions on exclosure ecosystem protection during times of conflict
 - Resilience creation sessions on how to avoid affecting the environment
 - Vulnerable group identification sessions and setting up food aid.
 - Soil and water conservation sessions
 - Livelihood and climate mitigation sessions on how to use non-timber forest products.

Part I: Project operating costs

I1: Allocation of costs

- We completed the table below summarizing project costs during the reporting period and the sources of income used to meet these costs. The costs (excluding Plan Vivo investments) were fully covered using private donations and limited subsidies.

Table 9: Allocation of costs (for the Feb 2021 – Feb 2022 reporting period).

Expense	Narrative	Amount (USD\$)	Contribution from sale of PVCs	Contribution from other sources (Belgian subsidies)
Investments	Costs for soil and water investments, planting	80,000	0%	100% (Flemish Climate Fund)
Functioning	Materials, paper, equipment, transport costs	4,200	0%	100%
Personnel	Wages for project coordinators	15,200	10%	90%
Plan Vivo investments	See the socioecological investments described in section A1	50,891	100%	0%

Annexes

Annex 1. Monitoring results that supports the issuance request

Ecosystem Services Monitoring (note: red circle indicates which target value was met)

Activity	Activity Indicator (measure annually)	Annual Targets			Results
		Full Target Achievement	Partial Target Achievement	Missed Target	
Restoration activities	Area of each exclosure undergoing active restoration activities	>10%	=10%	<10%	Adi Lehtsi > 10% Gidme Gestet > 10% Meam Atali > 10% May Getnet > 10% May Hibo > 10% Afedena > 10% Adilal > 10% Gemgema > 10% Zban Dake > 10% May Baeti > 10% Lafa > 10% Daero Hidag > 10% Togul > 10% Sesemat > 10% Adi Meles > 10% Chele Quot > 10% Katna Ruba > 10% Gojam Sefra > 10% Debremedhanit > 10% Hawahiwa > 10% → Guarding and restoration activities were covering all areas
Tree Planting	Number of seedlings	4000 seedlings	3000-4000	<4000 seedlings	No seedlings planted *
	Survival Rate	>30%	25-30	<30%	No survival rate *

* If one or more of the indicator values is below its performance target for one monitoring period, the full issuance is received but corrective actions must be implemented. In 2022, seedlings will be planted again. Besides, much more stone bunds and percolations ponds were installed in 2021.

Socioeconomic Monitoring

Activity	Activity Indicator (measure annually)	Annual Targets			Results
		Full Target Achievement	Partial Target Achievement	Missed Target	
Capacity-Building	Number of organized trainings for landless farmers (M/V) per year per exclosure	1		0	Adi Lehtsi = 1 Gidme Gestet = 1 Meam Atali = 1 May Getnet = 1 May Hibo = 1 Afedena = 1 Adilal = 1 Gemgema = 1 Zban Dake = 1 May Baeti = 1 Lafa = 1 Daero Hidag = 1 Togul = 1 Sesemat = 1 Adi Meles = 1 Chele Quot = 1 Katna Ruba = 1 Gojam Sefra = 1 Debredehanit = 1 Hawahiwa = 1
	Participants from more vulnerable groups (women, youth, elderly people)	>25%		<25%	At all sites > 35%
Availability of grass fodder	Beneficiaries of grass fodder per exclosure	>3	<3	<1	In all exclosures: cut-and-carry system implemented
Countering displaced grazing	Number of observations of displaced grazing mentioned during the yearly meeting of association, other NTFP users and the village council	<2	2	>2	Adi Lehtsi = 0 Gidme Gestet = 0 Meam Atali = 0 May Getnet = 0 May Hibo = 0 Afedena = 0 Adilal = 0 Gemgema = 0 Zban Dake = 0 May Baeti = 0 Lafa = 0 Daero Hidag = 0 Togul = 0 Sesemat = 0 Adi Meles = 0 Chele Quot = 0

					Katna Ruba = 0 Gojam Sefra = 0 Debremedhanit = 0 Hawahiwa = 0
Countering timber harvesting on public lands	Number of observations of timber harvesting on public lands mentioned during the yearly meeting of association, other NTFP users and the village council	<2	2	>2	Adi Lehtsi = 0 Gidme Gestet = 0 Meam Atali = 0 May Getnet = 0 May Hibo = 0 Afedena = 0 Adilal = 0 Gemgema = 0 Zban Dake = 0 May Baeti = 0 Lafa = 0 Daero Hidag = 0 Togul = 0 Sesemat = 0 Adi Meles = 0 Chele Quot = 0 Katna Ruba = 0 Gojam Sefra = 0 Debremedhanit = 0 Hawahiwa = 0

Environmental Monitoring

Activity	Activity Indicator (measure annually)	Annual Targets			Result and mitigating actions
		Full Target Achievement	Partial Target Achievement	Missed Target	
Water Management	Number of Percolation Ponds per enclosure	2	<2	<1	Adi Lehtsi > 2 Gidme Gestet > 2 Meam Atali > 2 May Getnet > 2 May Hibo > 2 Afedena > 2 Adilal > 2 Gemgema > 4 Zban Dake > 2 May Baeti > 2 Lafa > 2 Daero Hidag > 2 Togul > 2 Sesemat > 2 Adi Meles > 2 Chele Quot > 2 Katna Ruba > 2 Gojam Sefra > 2 Debremedhanit > 2 Hawahiwa > 2

Annex 2. Project photo report

Figures 2.1 (a,b,c,d,f) Emergency food support for extreme vulnerable households in the project areas and IDPs in Mekelle



Figures 2.2 (a,b,c,d) Emergency food support for extreme vulnerable households in Hagere Selam



Figures 2.3 (a-d) Community meetings in tukul area and in Hagere Selam





Figures 2.4 (a-c) Community meetings in Adilal and Adizmera sites



Figures 2.5: Soil and water conservation constructions in Adilal (Hawahiwa and Teakuro)



Annex 3. Baseline of Debremedhanit and Hawahiwa

Here we add the baseline data and credit quantification for the new sites: Debre Medhanit and Hawahiwa. The sites were baselined in July 2020 (notification to Plan Vivo on 2 June 2020). We follow the same methodology and table formats as described in the approved PDD.

Soil and biomass data

Exclosure	Debre Medhanit (43 plots)		Hawahiwa (43 plots)	
Compartment	20x20 m	5x5 m	20x20 m	5x5 m
Average DBH (cm)	4.88	1.36	4.11	0.89
Average height (m)	2.67	1.07	2.32	0.86
St. dev. DBH (cm)	3.24	0.56	1.79	0.59
St. dev. height (m)	0.81	0.45	0.66	0.46
Average number of trees per plot	167.79	10.70	134.67	48.16
AG biomass: carbon content per compartment (kg C)	733.51	2.24	266.17	5.97
AG biomass : carbon content per ha (tonC/ha)	19.23		6.65	
Average SOC%	1.97%			
Average soil depth (m)	0.173			
SOC (tonC/ha)	45.33			
Area (ha)	647		199	

Carbon benefit calculation

$$TCB = (TC_{climax} - TICS) / 20$$

This yields:

$$TCB \text{ (Debre Medhanit)} = (TC_{climax} - TICS) / 20 = (102.5 - 64.56) / 20 = 1.90 \text{ tC/ha/yr}$$

$$TCB \text{ (Hawahiwa)} = (TC_{climax} - TICS) / 20 = (102.5 - 51.98) / 20 = 2.53 \text{ tC/ha/yr}$$

Summary

By taking into account the area and the project period (20 years), as well as the molar conversion factor of 3.67 (Mekuria et al., 2011), we calculated the total benefits:

$$TCB \text{ (Debre Medhanit)} = 1.90 \times 647 \text{ ha} \times 3.67 = 4511 \text{ tCO}_2 \text{ per year}$$

$$TCB \text{ (Hawahiwa)} = 2.53 \times 199 \text{ ha} \times 3.67 = 1848 \text{ tCO}_2 \text{ per year}$$

Plan Vivo maps











