Completion Report

Digital solution for climate smart agricultural production, Ethiopia

NCF 9, Project No NCF-C9-0492

Grantee: Farmforce AS

Local Partner(s): Tradin Organic Agriculture B.V, Sunvado Manufacturing PLC, Hugintech AS

Project start date: 04/01/2021

Project end date: 04/07/2023

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Contents

ANNEXES

1. EXECUTIVE SUMMARY

The aim of this project was to demonstrate how digital data management can increase the implementation of climate smart agriculture practices and test supply chain actors and consumers' willingness to pay premiums for such products.

The main project outcomes were an increased uptake of CSA (Climate Smart Agriculture) practices amongst target smallholder farmers, and supply chain actors' awareness on CSA practices benefits increased, and willingness to pay tested.

The project team of Farmforce, Tradin Organic and Sunvado worked to identify a suitable project to implement with Sunvado's avocado farmers in the Sidama region of Ethiopia. After a baseline assessment was conducted with a sample of farmers, the project team decided to implement an avocado tree planting programme with the group of farmers. In total, 60,000 avocado seedlings were distributed to 2,715 farmers, and planted across approximately 2,200 ha. In addition, Farmforce was used to capture digital farm and tree data, which combined with satellite monitoring calculates how much carbon the new trees capture and store over time, generating carbon credits - a new form of income for these smallholder farmers, and a verified way for brands and retailers to make their avocado oil products carbon neutral. Farmforce is now also used to track participation in Tradin's other technical assistance programs; which include training on cover-cropping, vermicompost and beekeeping. All three activities see good response and adoption by farmers, positive impact in the climate-resilience and -performance of the fields, and new funding has been secured to scale these practices.

There were many learnings throughout the project, particularly related to digital data collection from farmers in this region. Digitisation is still very new in this area of Ethiopia and therefore a lot of extensive training was required to make sure data collectors were gathering correct data from farmers. These challenging conditions on the ground led to a reduction in overall farmers reached, and by the end of the project, just under 20,000 farmers were reached, including 4,383 hectares of field polygons mapped. In addition, Farmforce refined their climate smart features in their platform, now including Cool Farm Tool calculator integration, integrated deforestation monitoring, and support for carbon credit data collection on the ground through our flexible survey and field mapping modules.

Parallel to this, Tradin Organic also worked to understand customers' general knowledge, valuation, and willingness to engage with carbon credits. The conclusion is that it is still quite low, therefore the strategy has changed to improving the level of knowledge and build a position/reputation for Tradin (and its partners) as a trusted/credible leader in this developing domain.

2. ACHIEVEMENT OF RESULTS

2.1 Achievement of outcomes and outputs[1]

Expected outcomes and outputs	Indicator(s):	Achievement of outcomes and outputs:
Outcome 1: Increased uptake of CSA practices amongst target smallholders	1.1.1 Baseline measurements taken. 1.1.2 Number of beneficiaries reached 1.1.3 Number of people with improved livelihoods. 1.1.4 Number of people with increased resilience to climate change (amount of farmers applying practices). 1.1.5 % of target group applying specific CSA practice (per CSA practice defined as part of the project). 1.1.6 Tons of CO2 emissions reductions per annum.	In addition, a baseline was established for a total of 8 farmers at 2 different cooperatives. The farmers represented a sample of sub-farming systems. A total of 19,773 farmers had their polygons mapped and digital profiles completed, enabling them access to carbon credit schemes. 2,715 farmers received avocado seedlings, and ongoing support to ensure they are well supported. The CO2 reductions represented per avocado tree per annum is 50kg/annum. The total capacity of the 75k planted seedlings per annum = 3,750 tonnes of CO2e. 13% of farmers have received and are maintaining new avocado seedlings.
Output 1.1: CSA module designed, developed and integrated in the Farmforce digital platform.	1.1.1.1 Detailed specification document for the CSA module in place - which includes ability to scale beyond project scope. 1.1.1.2 Feedback on fit for purpose of module from test group (users/end consumers). 1.1.1.3 List of requirements received from 2 experts and 10 persons in test group. 1.1.1.4 Module built according to time and cost.	A detailed specification document for the CSA module was completed and the following Farmforce features were used and developed during the project: • Digital farmer database • Offline field mapping on Farmforce's mobile application • Farmforce Basic and Enterprise deforestation module • Farmforce Cool Farm Tool GHG calculator integration • Flexible survey module to capture carbon credit data

[1] Detailed logframe with achievements available in Annex 2.

		We sought feedback from a total of 9 people, from Tradin, external advisors, and external Farmforce customers, and this was incorporated into the specification document.
Output 1.2: Pilot CSA module field tested with a selection of sesame farmers and avocado farmers, and module updated and refined based on feedback and lessons learnt	1. Mid-term audit completed 2. Number of farmers involved in the pilot. 3. Percentage of CSA module data points being collected for pilot farmers	The project focus had to be limited to the avocado farmers, due to civil war breaking out in the sesame region. Field mapping and field visit surveys were tested and feedback received and incorporated before deploying to a larger farmer group.
Output 1.3: Local stakeholders trained in collecting data and using the module	1. Number of stakeholders trained. Target: Field staff covering 37,500 farmers 2. Exam pass rate. Target: 90% pass rate	A total of 54 people were trained, of which 49 were retained as field staff (91% pass rate).
Output 1.4: Pilot CSA module rolled out to all the farmers and requirements for global scaling developed	1. % stakeholder feedback incorporated into the module. 2. Number of pilot farmers from which we gather feedback. 3. Number of farmers from which a baseline is established.	All feedback incorporated from feedback from Sunvado and field staff. Baseline thoroughly conducted from a sample of 8 farmers.
Outcome 2: Supply chain actors awareness on CSA practice benefits increased, and willingness to pay tested	1. Number of customers reached with developed communication material. 2. Number of contracts signed.	Throughout this project, various communication and engagement efforts have been undertaken to educate and enthuse the organic market on CSA, its benefits and the concept of carbon credits. The verification scheme and carbon marketplace where the carbon credits out of this project will be offered are still under development. Concrete next steps will be presented to customers in the near future.
Output 2.1: Targeted communication tools developed, tested with Tradin Organic customers, and refined.	1. Communication material developed 2. Number of customers received feedback from.	Communication material developed: - Project video - Interview in MVO Magazine (in Dutch) - Second project video; explainer on carbon credits - Case story in ACOMO Annual Report (see page 75)

		- Sales 2-pager on the avocado sourcing in Ethiopia, including description of this project and QR code to the project video Feedback from clients and conversations with NGO's, government etc. is positive and clients seem interested in carbon claims, but the engagement options need to become more concrete in next steps.
Output 2.2: Willingness to pay premiums linked to environmental performance tested with Tradin Organic customers.	1. Number of customers presented the project to. 2. Scheme developed. 3. Number of contract proposals.	The verification scheme and carbon marketplace where the carbon credits out of this project will be offered are still under development. Concrete next steps will be presented to customers in the near future.

2.2 Deviations from the planned outputs and activities

The original project scope included working with Tradin's sesame farmers, however the civil war in Ethiopia heavily affected the sourcing regions and they were no longer able to participate in the project.

The indicators for number of beneficiaries were reduced, in order to focus our efforts and resources on providing good follow-up support to farmers and ensuring good quality data collection. We experienced issues with data quality from data collectors, and had to use additional time and resources to correct the data. In addition, farmers needed more support and follow up than anticipated, therefore a decision was made to redirect efforts to providing sufficient support, and ensuring good quality data was being captured.

The verification scheme and carbon marketplace where the carbon credits out of this project will be offered are still under development. Therefore, no concrete proposals or contracts have been developed yet.

We have also had to conclude that the general knowledge, valuation, and willingness to engage (let alone, pay) with carbon credits in is still quite low – in society and in the market. On the other hand, there have never been more corporate commitments on Science-Based Targets, Net Zero or other similar initiatives. Combined with upcoming regulation, especially in the EU with the EU CSRD and EU Green Claims regulation, this does make it likely that carbon offsetting and insetting will play a bigger role in coming years. Therefore, we changed our strategy to first improving the level of knowledge on carbon credits and build a position/reputation for Tradin Organic (and its partners) as a trusted/credible leader in this developing domain.

2.3 Achievement of NCF indicators

NCF core indicator	Results (quantitative)			Clarifications/Means of verification
Number of beneficiaries reached	women		523	This data comes from Farmforce IMS, which stores digital records of all farmers that received seedlings from the Tree Planting Programme, and all farmers whose digital records were captured and fields mapped. For each individual farmer the assumption is that there are 3 additional persons per hh. In addition to this, 60 women from the seedling nursery site sold their seedlings at a fair price with convenient logistics, and 14 male farmers (seedling grafters) also sold their seedlings at a fair price with convenient logistics.
	men		19,250	
	total		19,773 (79,092 including household members)	
Number of people with increased resilience to climate change	women		77	This data comes from Farmforce IMS and represents farmers who received seedlings.
	men		2,638	
	total		2,715 (10,860 including hh members)	
Number of people with improved livelihoods	women		77	This data comes from Farmforce IMS and represents farmers who received seedlings.
	men		2,638	
	total		2,715 (10,860 including hh members)	
New decent jobs created	full-time	women	2	Full-time staff are the field staff trained to use Farmforce and working on data collection including polygon mapping. Part-time staff are people hired to help with plot identification (48 in total, of which 5 women) and seasonal staff in distributing the seedlings.
		men	25	
		total	27	
	part-time	women	5	
		men	43	
		total	48	
	seaso-nal	women	30	
		men	35	
		total	65	

3. CLIMATE CHANGE

This project has contributed to climate change mitigation and adaptation in various ways. Most concretely, 60,000 trees were planted across 2,200 hectares, and alongside a cover crop initiative, these interventions will capture and store 217,000 tCO2e in a 20 year period. Because they are productive trees, placed on managed farmland, their survivability rates are high.

Indirectly, the farmers involved will benefit from now being connected to the digital space and getting access to CSA information. Besides tree-planting (for higher yield and carbon sequestration) and cover-cropping (for additional yield from other crops, better water retention and erosion-prevention), participation in Tradin Organic's ongoing vermicompost (for organic fertilization and supporting the build-up of soil organic matter) and beekeeping (to safeguard and improve pollination) projects is now being recorded digitally, and options for scaling and sharing learnings and information are increased by it now being digital.

In terms of wider impacts, Farmforce now has a comprehensive suite of features within the Farmforce software to support customers with climate change mitigation and/or adaptation efforts with the smallholder farmers they work with. GHG gas emissions on field can be calculated through simple surveys that can be used in the Farmforce mobile application, and the data used to calculate field GHG emissions through Farmforce's integration with Cool Farm Tool.

For example, Farmforce's customers will increasingly be held liable for the deforestation and forest loss on the fields used to grow the agricultural raw materials they buy from their customers, consumers, the public, and regulators. Farmforce customers can now use Farmforce to estimate the degree of deforestation (loss of tree cover) on the fields that were used to cultivate the raw commodities they buy. This can be done at a scale of 100,000+ fields for Farmforce's major customers. A module in Farmforce was developed that features traceability and integrated deforestation monitoring, allowing producers to prove their products are deforestation-free.

In addition, Farmforce's digital farmer data base, configurable surveys and polygon mapping feature can be used to capture key datapoints that can be used monitor key climate metrics, generate carbon credits, and follow up on climate mitigation/adaptation initiatives.

4. DEVELOPMENT IMPACTS AND CROSS-CUTTING ISSUES

First mile digitization creates unprecedented transparency and traceability in food supply chains. This project has digitally mapped data on almost 20,000 farmers, where before this information was locked away in individual papers. By digitizing surveys and opening the option of digital information provision to farmers,

environmental sustainability is monitored and promoted at a new scale. The carbon credit development on the 60,000 trees planted creates the prospect of a new, additional source of income for farmers, contributing to their income and livelihood stability. The project also opens the pathway for subsequent projects dedicated to promoting gender equality and social inclusion (both in terms of field staff, as well as in training projects for farmers), and provides learning for scaling to other regions. Very directly for Sunvado, the field staff have significantly increased their technical and digital skills and can better leverage this going forward, including that they can increase their scope in terms of ground, farmers and topics they cover.

5. ASSESSMENT OF THE RESULTS AND IMPACTS OF THE PROJECT

5.1 Relevance

Ethiopia is highly vulnerable to climate change and ranks 163 (of 181) in the ND-GAIN index (2016). Studies predict a considerable shift in climate patterns, with large differences across regions. This will result in devastating consequences for the agricultural sector in terms of productivity, a sector that 85% of the country's population depends on. While arable farming is not a great contributor to emissions, it does need to adapt to be able to continue to deliver – which is why we continue to push for end consumer backed premiums to incentivize farmers to adopt CSA practices that will help them adapt more effectively to climate change and may to some degree also help to mitigate emissions.

In addition, the European Parliament and The European Council have recently approved EUDR, which aims at regulating deforestation at the farm-level and restricting the sale of any deforestation-related products within the EU. The regulation scope concerns the following goods: cocoa, coffee, soy, palm oil, wood, rubber and cattle. The regulation will mandate crop importers to perform anti-deforestation due diligence, which entails: mapping fields and verifying that source crops are deforestation free, ensuring that data is available for auditing on any imported produce or goods, storing such records for at least five years after importing.

EUDR is a major driver for all organisations sourcing these commodities, and many of Farmforce's existing customers besides Tradin Organic, so this has been a huge priority for Farmforce to be able to support organisations in monitoring and tackling deforestation.

5.2 Effectiveness

Outcome 1 - Increased uptake of CSA practices:

Overall the project resulted in an increase in CSA practices, with participating farmers receiving avocado seedlings, and conducting a tree planting activity with these farmers. The reason this intervention was selected was due to the cost-benefit ratio of the intervention, practical feasibility in the field and farmer willingness to carry out such practices without immediately being rewarded. Additional fruit bearing trees on farmers' fields represent an additional source of revenue for farmers, and they are therefore more likely to maintain the trees. The concept of carbon credits is too abstract to be communicated and understood by farmers, therefore an additional incentive is needed to encourage adoption of these practices.

Farmforce is now also used to track participation in Tradin's other technical assistance programs; cover-cropping, vermicompost and beekeeping. All three activities see good response and adoption by farmers, and new funding has been secured to scale these practices.

The number of beneficiaries reached was lower than originally anticipated at the start of the project due to several challenges faced on the ground. Firstly, the plan was also to work with Tradin Organic's sesame farmers in the Tigray region of Ethiopia, but due to the civil war the sourcing site was shut down and we were unable to work with this group of farmers.

Outcome 2 – Supply chain actors awareness on CSA practice benefits increased, and willingness to pay tested:

The verification scheme and carbon marketplace where the carbon credits out of this project will be offered are still under development. Therefore no concrete proposals or contracts have been developed yet.

Through conversations and research, we did already conclude that the general knowledge, valuation, and willingness to engage (let alone, pay) with carbon credits in is still quite low – in society and in the market. Therefore, we changed our strategy to first improving the level of knowledge and build a position/reputation for Tradin Organic (and its partners) as a trusted/credible leader in this developing domain. We created advertorials, gave interviews to media and created bespoke videos to which we are receiving positive response from a wide audience.

Unfortunate developments are that the organic market has taken a downturn since late 2022 – with higher prices and lower sales, especially in Europe. Current interest of customers to discuss new efforts is minimal, and there is no willingness (or better; ability) to pay. In addition, the voluntary carbon market is under heavy scrutiny since beginning of 2023 after damaging research was published on a leading provider; Verra.

However, it is also clear that there have never been more corporate commitments on Science-Based Targets, Net Zero or other similar initiatives. Combined with upcoming regulation, especially in the EU with the EU CSRD and EU Green Claims regulation, this does make it likely that carbon offsetting and insetting will play a bigger role in coming years. Going forward, we will continue talking about carbon farming in our marketing and individual conversations with customers.

5.3 Efficiency

Digitalisation in this part of Ethiopian agriculture is a very novel concept, and there were therefore lots of expected challenges and a learning curve in the implementation of the project. We faced challenges in obtaining the correct technology (smartphones) for use by the Sunvado field staff for data collection, which led to some delays. Recruitment of competent field staff with sufficient smartphone experience was also a challenge, with 5 out the original 19 field staff recruited that needed to be replaced due to a lack of familiarity with a smartphone. In addition there were some cases of cheating, theft, and field staff incorrectly doing their job due to misunderstanding of the importance and relevance of the task.

However, despite these initial challenges, we strongly believe that this upfront investment will have very high efficiency gains for Sunvado's sourcing operations in Ethiopia. Data collection is now standardised, stored in digital format, and the data can now be easily used to get the farmers access to carbon credits, identify farmers' needs for training and support, and for monitoring and evaluation of various initiatives with this farmer population. Previously, very important farmer data was collected manually by paper, and subsequently shared with a typehouse to type up into digital format. This was not efficient and very prone to human error.

Digital data also enables live verification of data quality. For example, Sunvado staff are able to monitor in real time field staff activities with farmers and analyse the data efficiently for any quality concerns.

In terms of project cost management, we established a project steering group, and conducted quarterly reviews of project progress. This was used to make key decisions, review risks, and track project progress to time and costs. The project went over budget in several cost lines but by proactively monitoring this, we were able to manage these overspends in the larger project. In terms of the on the ground intervention with Sunvado's farmers, we assessed the cost/benefit ratio, and used this to select the most cost-effective measure. In order to stick to timelines, we identified a need to hire more data collectors, and also requested a reduction in indicators, reducing the number of farmers that we reached, while focussing more on data quality and providing sufficient support to farmers that received seedlings.

5.4 Impact

Besides the carbon sequestered by this project, farmers will benefit from additional avocado yield in 3-4 years and hopefully supplement their income with carbon credits after 4-5 years as well. Realization is starting to grow that they can engage and collaborate with buyers of their produce beyond just selling them their crops.

For Sunvado and Tradin Organic, this was one of the first 'first-mile' digitization projects to actively implement in origin. As international food chains are becoming more regulated and the market has a much stronger focus on transparency and traceability, the experience and learnings from the project are extremely valuable. For smallholder farmers to retain access to the EU (and global) market and to get access to the potential benefits/rewards for efforts like carbon farming, they need to digitize, but with often lacking the funds, access and knowhow there is a key role to play for producers/exporters.

The work and learnings on this project have contributed to Farmforce's software which is supporting many customers in their management of smallholder farmers. To date Farmforce is in use across 32 countries, working with 27 crops and 935,000 farmers have digital profiles. In addition, the software has been used to map 615,000 fields for deforestation. Every day customers use Farmforce software to effectively support their smallholder farmers, ensure compliance, and monitor and track climate smart initiatives. Digital farmer identities and polygon data unlocks access to carbon markets for these farmers and enables financial rewards for climate smart practices.

5.5 Sustainability

The choice for avocado seedlings to be planted in this project was deliberate, as productive trees of the target crop ensure a high incentive for the farmers to maintain them well and ensure their sustainability. Adding the element of digital tracking for carbon credits enables better and easier monitoring, so interventions or support can be targeted and implemented timely. Together with the continued technical assistance projects that Sunvado and Tradin manage in the region, a very high survivability rate of the trees can be expected.

The partners in this project are continuing to work together after the project close. The avocado farmers were already supplying Tradin Organic through Sunvado before this project, and will continue to do so after the project – now with two main differences; there is now digital exchange of information (so social & environmental impacts are monitored more closely than before, and advice & support is delivered faster and more targeted), and the parties have the prospect of a new, additional source of income in the carbon credits (once the verification scheme and carbon marketplace are finalized).

The features in Farmforce will continue to be used beyond the project across many other projects and geographies, therefore the positive effects from this project will

persist. We see increasing interest from customer in carbon credits and therefore expect to support a growing number of carbon credit projects with our customer base.

5.6 Coherence

The software that has been built to support the Tradin and Sunvado in this project has been built to be general enough to be used in a wide variety of use cases, and support other Farmforce users in climate mitigation efforts.

In addition the data collected by Sunvado on the farmers can be used for a wide range of purposes, not just for carbon credits. Sunvado used the data collection activity to also gather information on farmers training needs, farmer financing needs and tree health status. In addition, the polygons of fields captured could be used for deforestation checks or tree growth monitoring with satellite technology.

The deforestation features built in Farmforce are compatible with efforts in the sector, and any customer that has existing polygons of farmers' fields can load the existing data into Farmforce and run deforestation checks. In addition, Farmforce can used to support a customer in efforts to digitise information on their farmer population, capture polygons, and then use this digital farmer database for a wide range of purposes to benefit the farmers.

6. INNOVATION

Establishing and utilising farmer digital identities is a key innovation within this project. Now the majority of Sunvado's avocado farmers are registered in Farmforce and data has been captured on their field coordinates, seedlings on each field, metrics on seedling growth over time, and other valuable data points that can be used to qualify the farmers farming activities for carbon credits.

The carbon market is also still full of innovation. Only at the end of this project did the Integrity Council for the Voluntary Carbon Market publish standards for credits, which hopefully will increase uptake of (credible) credits. It is clear that there is potential in diversifying farmer income and improving livelihoods by valorising carbon sequestration, but there are still many ways being explored on how to do this exactly. We didn't know of any significant carbon sequestration projects with smallholder farmers in Ethiopia before starting this project.

Farmforce's deforestation monitoring features are innovative in that they enable traders to run deforestation checks at large scale across their population of farmers, conducting due diligence and therefore retaining access to export markets for farmers.

7. POTENTIAL FOR SCALING UP AND FOLLOW-UP INVESTMENTS

The partners in this project are continuing to work together after the project close. The avocado farmers were already supplying Tradin Organic through Sunvado before this project, and will continue to do so after the project – now with two main differences; there is now digital exchange of information (so social & environmental impacts are monitored more closely than before, and advice & support is delivered faster and more targeted), and the parties have the prospect of a new, additional source of income in the carbon credits (once the verification scheme and carbon marketplace are finalized).

For that prospect to materialize, the market adoption of (credible) carbon credits needs to grow i.e. the willingness to pay needs to increase and be followed through. As long as this is not yet the case, grant financing for projects like this one will remain necessary. Overall, most technical assistance projects with smallholder farmers still require grant financing, which Tradin continuously works on.

Farmforce is a digital solution that is used at scale globally across many supply chains. The tools developed and approaches used in this project, are highly applicable across commodities. Farmforce is seeing increased interest from organisations working with smallholder farmers in the field of carbon credits, as well as stronger regulatory requirements to digitise supply chains.

In addition, we are rolling out our deforestation module with existing customers and see demand increasing in the coming years as many organisations sourcing from EUDR impacted commodities require better traceability systems to show compliance. These initiatives will likely be funded by the traders themselves, so we do not foresee grant financing required to support the scale up of this module.

8. RISKS

The following risks were identified during the project, and did materialise:

- Unable to reach entire target farmer group due to quality issues, staff shortages, and gaps in training comprehension. This risk did materialise despite the teams best efforts to recruit and train field staff effectively. The impact this had on the project was some delays, due to additional time spent retraining and recruiting additional field staff, plus a need to conduct some rework with data collection to ensure the correct quality of information gathered from farmers.

- Civil war in Ethiopia impacting Sunvado's sesame sourcing regions. Unfortunately we could not work with any sesame farmers as part of the project, due to the extreme disruption faced by Tradin's sourcing operations in the region.

The following risks were monitored and effectively mitigated:

- Data collected is not of a high enough quality to be useful to the project. The way we mitigated this was to continuously monitor data collected, develop data quality checks within Farmforce, and where issues are found, identify the root cause and take appropriate action. In some cases, this meant letting go of some field staff, or conducting retraining to ensure good understanding by field staff.

- Farmforce features are not scalable due to context dependent nature of CSA advice. This was a key consideration in the project, and we intentionally designed the software to be as generic and widely applicable as possible. In addition, we integrated with Cool Farm Tool as a GHG calculator due to it's wide reach, as it integrates all major crops.

9. MONITORING AND EVALUATION

This project was actually started with a major evaluation exercise; doing a feasibility study with multiple baseline and scenarios of CSA-practices to determine what the most impactful and sustainable intervention program would be, including the potential for carbon credits.

The digitization part of the project is a monitoring effort in itself, creating a more continuous exchange between farmers and Sunvado's agronomists, field- and technical assistance staff. The development of the CSA-module included in-field training and structured feedback session with the various users, to ensure it would work for all targeted stakeholder groups.

A Steering Group with representatives from all involved partners monitored progress and evaluated results. Various carbon experts provided input for and reviewed all GHG data and assumptions used throughout the project.

10. LESSONS LEARNT

i. GHG emissions calculations for smallholder farmers

- Data quantity and quality – there is a huge amount of data required to calculate emissions and run calculations in for example Cool Farm Tool. Not all of this is intuitive and understandable for a farmer who does not have any understanding of GHG emissions. As a result we see a strong need to simplify data collection as much as possible to ensure that is it possible to gather this information at scale, while also ensuring good quality data.

- Calculating the potential for carbon sequestration is challenging when farmers have limited awareness on the issue. For example, when conducting the feasibility study data collection field survey, not all questions could be answered. It is recommended to work closely together with the data analyst to confirm that the data collected is accurate.

ii. Project implementation:

- It is a challenge to make a profitable business case out of carbon sequestration only. This makes it difficult for a commercial business to invest in the interventions needed for carbon sequestration. Especially if there is limited subsidy available for the agricultural inputs, such as seedlings. It is important to calculate the business case simultaneously with the results from carbon sequestration in order to assess the business case of a project.
- Farmers behavior when receiving the seedlings was also challenging. Some of the farmers got upset when their plots where not selected due to not enough available space. They came to the seedling distribution moment and disturbed the process. A recommendation for this would be to be clearer about our plot identification and selection process, especially to the village leaders. In that way they can be of support when the farmers are misbehaving.

iii. Data collection:

- Selecting field staff with the right skills to visit the farmers with a digital visiting format was difficult. We had to replace many of our extension staff, because they did not perform the tasks properly. A recommendation would be to have a fixed and more elaborate testing system in place to make sure we hire the staff with the right skills.
- Having clean data, especially for the GPS polygons is very time taking. Extension staff needs to travel to the farmers frequently, due to mistakes in the mapping. Also checking the polygons in a program such as ArcGIS is time taking. Having a field assistant that knows both online and in field information is essential, we now have an assistant and hope to be more efficient with our time.

iv. Customer willingness to pay:

A key lesson learnt is that we have to increase general knowledge on carbon credits, internally and externally, and build a profile of being a trusted partner in this space. There is great interest but also hesitance and misunderstanding on carbon sequestration and valuation. We changed our market research strategy to first improving the level of knowledge and build a position/reputation as trusted/credible leaders in this developing domain. Hence the focus has been on explainer videos and informative content. We are considering other tools as well, such as a webinar. The next step then is to do more concrete outreach to selected clients of Tradin, once the verification scheme and carbon marketplace are up and running. We hope that the carbon credit market continues to mature over the next year, and that with consistent messaging about it, companies grow receptive to us offering carbon credits.

11. OUTREACH

Results have been collected and shared in a range of formats, through blog articles, videos shared on Linkedin, and annual reports. A list of content produced is given below:

- Blog: How Farmforce is promoting carbon credits in agriculture
- Video: What are carbon credits?
- Video: Collaborating for climate-smart agriculture in Ethiopia
- Report: Accomo annual report (page 75)
- Article: Interview in MVO Magazine (in Dutch)
- Biohandel advertorial edition Nov 2022 (in German)
- Flyer: 2-pager on the avocado sourcing in Ethiopia, including description of this project and QR code to the project video (sent to clients and used at trade shows etc)

12. FINANCIAL SUMMARY

Table 1. Project financing per partner

	Financing (EUR)					
	NCF	Farmforce	Hugin	Tradin	Sunvado	Total
Farmforce	213 973	126 105				340 078
Hugin	124 986		50 000			174 986
Tradin	15 442			44 901		60 343
Sunvado	82 121				55 039	137 159
Total	436 521	126 105	50 000	44 901	55 039	712 566

13. ONCLUSIONS AND RECOMMENDATIONS

Overall, this project has delivered excellent learnings for all partners involved, and we will continue to build on the progress made in the project to build on climate smart initiatives in both Farmforce an Tradin Organic and their sourcing regions.

The project faced many challenges, but the teams continued to work closely together to reach solutions and adapt. The 20,000 farmers involved in the project will now benefit from being connected to the digital space and getting access to CSA information. Participation in Tradin Organic's ongoing CSA programmes is now being recorded digitally, and options for scaling and sharing learnings and information are increased by it now being digital.

Farmforce has a strong suite of features in our digital platform to support customers across the globe in climate smart projects, from carbon credits, to deforestation monitoring, to GHG assessments.

In addition, the partnership between Farmforce and Tradin Organic remains close, and will continue after the project has ended.

Annex 1 Project completion fact sheet

Project Name:	**Digital solution for climate smart agricultural production**		
Project no.	NCF 9 Project No NCF-C9-0492		
Country:	Ethiopia	**Financing:**	
		EUR	**%**
Nordic Partner:	Farmforce AS	126 105	18%
Local Partner:	Hugintech AS	50 000	7%
	Tradin Organic Agriculture B.V	44 901	6%
	Sunvado Manufacturing PLC	55 039	8%
Other Partner:			
	NCF grant disbursed	436 521	61%
	Total		**100%**
Classification:	Combination		
Project cycle:	Project start date: 04/01/2021 Original closing date: 04/07/2023 Actual closing date: 04/07/2023		
Short project description:	Demonstrating how digital data management can help increase implementation of climate smart agricultural (CSA)/regenerative practices, and test willingness to pay a premium for such products.		
Project performance:	Expected Outcomes and Outputs	**Achieved**	**End-of-project status**
	Increased uptake of CSA practices amongst target smallholders	Partially	19,773 farmers digitally onboarded and 60,000 avocado seedlings distributed
	Supply chain actors awareness on CSA practice benefits increased, and willingness to pay tested	Partially	Various communication and engagement efforts have been undertaken to educate and enthuse the organic market on CSA, its benefits and the concept of carbon credits. Opportunities to discuss more concrete steps with customers and test willingness to pay for carbon credits or carbon-neutral products have been minimal so far.
Climate change outcomes and impacts:	This project has contributed to climate change mitigation and adaptation in various ways. Most concretely, 60,000 trees were planted across approximate 2200 hectare, and alongside a cover crop initiative, these interventions will capture and store 217,000 tCO2e in a 20 year period. Because they are productive trees, placed on managed farmland, their survivability rates are high. Indirectly, the farmers involved will benefit from now being connected to the digital space and getting access to CSA information. Participation in Tradin Organic's ongoing vermicompost and beekeeping projects is now being recorded digitally, and options for scaling and sharing learnings and information are increased by it now being digital.		
Development outcomes and impacts:	This project has digitally mapped data on almost 20,000 farmers, where before this information was locked away in individual papers. By digitizing surveys and opening the option of digital information provision to farmers, environmental sustainability is monitored and promoted at a new scale. The carbon credit development creates the prospect of a new, additional source of income for farmers, contributing to their income and livelihood stability. The project also opens the pathway for subsequent projects dedicated to promoting gender equality and social inclusion, and provides learning for scaling to other regions.		

NCF core indicators

NCF core indicator	Results (quantitative)			Clarifications/Means of verification
Number of beneficiaries reached	women		523	Farmforce IMS data
	men		19,250	
	total		19,773	
Number of people with increased resilience to climate change	women		77	Farmforce IMS data
	men		2,638	
	total		2,715 (10,860 incl household members)	
Number of people with improved livelihoods	women		77	Farmforce IMS data
	men		2,638	
	total		2,715 (10,860 incl household members)	
New decent jobs created	full-time	women	2	Sunvado records on hired staff during the project
		men	25	
		total	27	
	part-time	women	5	
		men	43	
		total	48	
	seaso-nal	women	30	
		men	35	
		total	65	

Annex 2 Results Framework

Original Milestone deliverable	Total original project target	Revised Milestone deliverable/ target	Achieved Milestone target	Completed (yes/ no/ partially)	Results
Outcome 1: Increased uptake of CSA practices amongst target smallholders	1.1.1 Baseline measurements of target group are taken. Target: 1 item 1.1.2 Number of beneficiaries reached (users of pilot). Target: 37,500 persons 1.1.3 Number of people with improved livelihoods. Target: 20% of beneficiaries, 7,500 persons 1.1.4 Number of people with increased resilience to climate change (amount of farmers applying practices). Target: 30,000 persons 1.1.5 % of target group applying specific CSA practice (per CSA practice defined as part of the project). Target 30% 1.1.6 Tons of CO2 emissions reductions per annum. Target: 22,515 tonnes of CO2e	1.1.2 Number of beneficiaries reached (users of pilot). Target: 25,000 persons 1.1.3 Number of people with improved livelihoods. Target: 20% of beneficiaries, 5,000 persons 1.1.4 Number of people with increased resilience to climate change (amount of farmers applying practices). Target: 20,000 persons		Partially	1.1.1 = Yes, a baseline was taken from 8 farmers across a sample of plots. 1.1.2 = 19,773 farmers digitally onboarded 1.1.3 = 2,715 farmers received seedlings 1.1.4 = 2,715 1.1.5 = 13% of farmers have received and are maintaining new avocado seedlings 1.1.6 = aEsti has used new data collected during the reporting period to generate an updated figure to use as average CO2 sequestration potential for an avocado tree in the Sidama region in Ethiopia. Their best available estimate is: 50 kg (0,05 t) / annum, which is consistent with the metric used in the business case development (figure by Soil and More). The total capacity of the 75k planted seedlings per annum = 3,750 tonnes of CO2e. This figure may be further refined as the dataset is enriched over time.

Output 1.1: CSA module designed, developed and integrated in the Farmforce digital platform.	1.1.1.1 Detailed specification document for the CSA module in place - which includes ability to scale beyond project scope. Target: 1 item 1.1.1.2 Feedback on fit for purpose of module from test group (users/end consumers). Target:12 persons 1.1.1.3 List of requirements received from 2 experts and 10 persons in test group. Target: 1 item 1.1.1.4 Module built according to time and cost. Target: less than 20% deviation on time and cost.		1.1.1.1 Yes, specification document has been developed. 1.1.1.2 – feedback from 9 people (outside Farmforce organisation) obtained. 1.1.1.3 – complete, requirements list obtained from Tradin and ESTI. 1.1.1.4 – 4/7 items of the CSA module developed. The back-end components which were supposed to be ready before the development of CSA functionality started got delayed, hence this required more effort than first initiated.	Partially	1.1.1.1 Specification document attached in Annex 1. 1.1.1.2 : We sought feedback from a total of 9 people, from Tradin, external advisors, and external Farmforce customers. Further feedback will be obtained from end users once the module is "live", hence why this is partially complete 1.1.1.3 Incorporated into Specification Document 1.1.1.4 Some features built but to be continuously refined during Milestone 2 and 3
Activity 1.1.1:Understand data and validation requirements and develop functional requirement specification	N/A			Yes	
Activity 1.1.2:Assess possible external data providers	N/A			Yes	
Activity 1.1.3: Software Development according to the specifications (FSD)	N/A			Partially complete	
Activity 1.1.4: Test functionalities	N/A			Partially complete	Some elements of development have been postponed, hence it has not been fully tested. This activity will be moved to the next milestone.
Activity 1.1.5: Develop communication material to key stakeholders in the value chain	N/A			Yes	

Output 1.2: Pilot CSA module field tested with a selection of sesame farmers and avocado farmers, and module updated and refined based on feedback and lessons learnt	1. Mid term audit completed 2. Number of farmers involved in the pilot. Target: 50 3. Percentage of CSA module data points being collected for pilot farmers		1. Mid-term audit completed 2. 3 Sunvado staff and 19 field staff using the module 3. All parameters of the survey and field mapping activities are to be completed per farmer	Partially	Field mapping and field visit surveys were tested and feedback received and incorporated before deploying to a larger farmer group.
Activity 1.2.1: Implementation including training of small pilot group	N/A			Yes	
Activity 1.2.2: Assess use cases, conduct lessons learnt survey and obtain feedback from users	N/A			Yes	
Activity 1.2.3: Update pilot CSA module with findings from pilot	N/A			Yes	
Output 1.3: Local stakeholders trained in collecting data and using the module	1. Number of stakeholders trained. Target: Field staff covering 37,500 farmers 2. Exam pass rate. Target: 90% pass rate		1. 24 field staff trained 2. 79% pass rate (19 out of 24 field staff passed)	Yes	14 out of original group of 19 field staff were trained successfully, followed by a rehiring of 5 additional staff who were trained. Total number of successfully trained field staff is 19.
Activity 1.3.1: Training materials and manuals developed	N/A			Yes	
Activity 1.3.2: Conduct trainings of field and office staff, onsite with remote follow up – use a training of trainer's approach	N/A			Yes	
Output 1.4: Pilot CSA module rolled out to all the farmers and requirements for global scaling developed	1. % stakeholder feedback incorporated into the module. Target: 70% 2. Number of pilot farmers from which we gather feedback. Target: 20 3. Number of farmers from which a baseline is established. Target: 20		1. 100% of stakeholder feedback was incorporated i to the data collection surveys developed.	Partially complete	All feedback incorporated from feedback from Sunvado and field staff. Baseline thoroughly conducted by Soil and More.

			2. It made most sense for this feedback to come from Sunvado and field staff. Hence feedback from 22 people was collected. 3. A baseline was established for 8 farmers		
Activity 1.4.1: CSA module rolled out to 25% of farmer group	N/A			Partially complete	To date, a verification exercise has been completed with 7,865 farmers to identify if they were interested in receiving seedlings, and also do confirm that their plots had sufficient space to accept seedlings. From this list, a group of 2,715 farmers were identified who received seedlings and were supported in planting these within appropriate areas in their fields. These 2,715 farmers will be visited by the 19 field staff recruited, who will digitally map their fields, and record details required to generate carbon credits from their newly planted seedlings.
Activity 1.4.2: CSA module rolled out to entire farmer group	N/A			Partially complete	The CSA module was rolled out to 19,773 farmers. The reason the entire target population (25,000) was not visited, is summarised in the narrative description below. was due to: • rains, • farmers who did not have sufficient documentation (landowner certificate) to quality for carbon credits • farmers who have moved away from their plots to the city • travels times between farmers was longer than initially expected, so the number of farmers that a field staff could visit in a day was lower than predicted • Farmers not willing to give information (either they refuse to give information, or share incorrect information)
Activity 1.4.3: Develop use cases and lessons learnt to show evidence of potential and result	N/A			Complete	Use cases understood, and lessons learnt have been incorporated into future development plans.
Activity 1.4.4: Develop requirements to scale the CSA module beyond this project	N/A				Carbon Credits inception document drafted for future Farmforce plans, and deforestation features launched and live with existing customers, with future development plans mapped out.

Outcome 2: Supply chain actors awareness on CSA practice benefits increased, and willingness to pay tested	1. Number of customers reached with developed communication material. Target: 50 2. Number of contracts signed. Target: over 3			Partially	Various communication and engagement efforts have been undertaken to educate and enthuse the organic market on CSA, its benefits and the concept of carbon credits. Opportunities to discuss more concrete steps with customers and test willingness to pay for carbon credits or carbon-neutral products have been minimal so far. More in the narrative text below
Output 2.1: Targeted communication tools developed, tested with Tradin Organic customers, and refined.	1. Communication material developed (yes/no). Target: 2 documents 2. Number of customers received feedback from. Target: 5		3. 4.	Partially	1. Additional communication material developed: - Second project video; explainer on carbon credits (posted on LinkedIn) - Case story in ACOMO Annual Report (see page 75) - Avocado oil 2-pager (attached to the report, it is not yet available online but sent to (potential) customers directly and used in print at tradeshows and fairs) 5. 2. Further anecdotal feedback has been collected, but indicated it was not the right timing to engage in more formal ways due to the current market conditions. Tradin's Customer Survey planned has been postponed for the same reason. See full description in narrative text below.
Activity 2.1.1: Identification of interested customers	N/A			Partially	The identification of interested customers is an ongoing process, as the carbon credit topic is discussed with virtually every customer that shows interest in Tradin's sustainability projects.
Activity 2.1.2: Quantitative and qualitative research to understand what information is required by customers	N/A			Partially	The identification of interested customers is an ongoing process, as the carbon credit topic is discussed with virtually every customer that shows interest in Tradin's sustainability projects.
Activity 2.1.3: Develop communication materials targeting key customers	N/A		See 2.1	Partially	
Activity 2.1.4: Presenting communication materials to targeted key customers to receive feedback	N/A		See 2.1	Planned for Milestone 3	
Activity 2.1.5: Refining communication materials	N/A			Planned for Milestone 3	All materials created throughout the project have been received well, but no new versions of any of the materials were created after feedback. This is mostly because all

					signals are that the project status and market do not yet allow a more concrete offering.
Output 2.2: Willingness to pay premiums linked to environmental performance tested with Tradin Organic customers.	1. Number of customers presented the project to. Target: 3 2. Scheme developed. Target: Yes 3. Number of contract proposals. Target: 1		See 2.1;	Planned for Milestone 3	1. Project has been presented to >3 customers and has featured in several public communication pieces and social media. 2. The stage of the project has not allowed a concrete scheme to be developed. 3. There is no contract proposal yet and no such proposal has therefore been shared with customers.
Activity 2.2.1 : Identification and selection of interested customers	N/A			Partially	The identification of interested customers is an ongoing process, as the carbon credit topic is discussed with virtually every customer that shows interest in Tradin's sustainability projects. Selection is strictly speaking not necessary, as the carbon credits resulting from the project will be sold through ESTI's market platform to interested Tradin customers and, if necessary, other companies.
Activity 2.2.2: Discuss with selected customers (of Tradin Organic) how such schemes could work	N/A				
Activity 2.2.3: Refine scheme based on customer feedback	N/A			No	See 2.1.5
Activity 2.2.4: Contract signing	N/A			No	See 2.1.5

Annex 3 Pictures

Figure 1 - Field mapping practice in Sidama region, Ethiopia. Credit: Marjan Riepma

Figure 2 - Avocado seedling. Credit: Marjan Riepma

Figure 3 - Farmforce staff providing training to field staff on Farmforce IMS solution. Credit: Marjan Riepma

Figure 4 - Field staff training. Credit: Marjan Riepma

Figure 5 - Training. Credit: Marjan Riepma

Annex 4 Other supplementary deliverables/documentation/links

N/A

Annex 5 Impact story

Tradin Organic has been sourcing organic ingredients across the globe since the 1980's. In Ethiopia, Tradin opened Sunvado: an avocado processing plant in 2019, to create oil out of an avocado variety not suitable for the fresh market. This meant creating a new export product and, boosted by achieving organic certification, a higher income for about 60,000 smallholder farmers!

Having a team on the ground with dozens of field staff, we got to know the farmers and their challenges well. Many improvements have been made over the years, and training on good agricultural practices is well attended. But climate change is posing new challenges and many fields are not yet resilient to these impacts. The Sidama region where the avocados grow is not yet suffering the droughts, storm or erosion seen in other parts of the country, but the risks are significant. At the same time, there are opportunities. Most farmers have more space on their fields and could plant a lot more biomass, which sequesters carbon which could slow or reduce climate change. Could this even be a new form of 'harvest' and thus income for these family farmers?

This is why we initiated this project, to take our climate-smart agriculture practices to the next level. Using Farmforce, we created digital profiles for nearly 20,000 farmers and their fields, so we can track their participation in climate-smart agriculture interventions (like tree planting, cover cropping, vermicompost or even beekeeping), and collect data to help determine what is working well. First signs are that these

practices indeed boost yield, soil health and the climate resilience of the fields. Most of those interventions were ongoing but the project enabled the planting of 60,000 new avocado trees at around 2,700 farmers. Farmforce created a new module to capture the geolocations of the fields and new trees planted, so that the farmers can be eligible to get rewarded for the carbon they sequester, for example through carbon credits. Such credits would offer companies up the value chain, up to brands and retailers, a best-practice way of reducing or insetting their scope 3 emission carbon footprint.

In addition, the learnings and technology developed by Farmforce can be used across their global customer base, at scale across many commodity supply chains. Farmforce is seeing increased interest from organisations working with smallholder farmers in the field of carbon credits, as well as stronger regulatory requirements to digitise supply chains.

Watch our project video to learn more from various team members involved in this project.