Completion Report

Platform for Climate Resilience and Risks of the Nicaraguan Agricultural Sector, Nicaragua, NCF9, NCF-C8-0028

Grantee: ***Ingemann Supply A/S.***

Local Partner(s): Ingemann Nicaragua, S.A.

Ingemann Soluciones, S.A.

Project start date: 25*/11/2019*

Project end date*: 25/05/2022*

June 28th , 2022.	Person responsible

TABLE OF CONTENTS

ANNEXES

1. EXECUTIVE SUMMARY

The project was implemented in Nicaragua. Due to its geographical location in the Central American region, its levels of poverty, and exposure to extreme weather events, it has become one of the most vulnerable countries to the effects and impacts of climate change. This situation has been reflected in the global climate monitoring indicators and the reports of the fifth and sixth IPCC summits. Hurricane Mitch, in October 1998, accounted for the death of 3,045 people and the loss of more than 70% of the country's productive capacity, including crops, livestock, communication systems, etc. Moreover, the country's vulnerability has not yet been overcome since hurricanes Iota and Eta (November 2020). These recent events have shown that the country has a high degree of vulnerability. Likewise, recurrent droughts have subjected the country to extreme famine conditions, mainly in the municipalities of the dry corridor.

In this context, reliable and timely agroclimatic information makes the difference between being exposed to the severe impacts of climate change *vis-à-vis* being able to manage the risk promptly and reduce losses of both human lives and livelihoods. Therefore, the project contributed to the improvement of the Agroclimatic platform to assess the risk levels of crops in the face of future climate scenarios at the farm level of agricultural producers. Furthermore, it improved the Bioclimatic platform associated with 57 weather stations and ten phenological observations for climate monitoring. These were useful to determine:

1. The influence of climate on crop development.
2. The appearance of pests and diseases.
3. The proper management and agricultural practices to local conditions.

Both platforms generate highly relevant information for decision-making by producers and financial entities concerning the agricultural sector. In the case of Agroclimatica, an innovative platform was created to assess the risk at the farm level of the institutions' agricultural and cattle clients. The assessment was based on the type of climate (current and future), soil, crops, pastures, genetics, and management. Accordingly, it also provides a detailed report of the possible scenarios that allow knowing the risk score, the factors that generate it, and alternative varieties and crops that are more appropriate for the farm. Similarly, it shows the expected harvest volume produced according to the purpose of the cattle and the estimation of the carbon footprint that leaves the activity.

Bioclimatica generated 930 daily forecasts and 1,458 agrometeorological bulletins with information on what happened on the farm in the last ten days and expected scenarios for the next ten days. It also issued recommendations for crop management according to expected conditions, three early warnings before extreme weather events, and beneficial information for the adaptation of management practices following the requirements of the farm.

The project considered producers and financial entities as the main subjects to contribute to their increased resilience to climate change. For their part, 3,135 producers used the information from both platforms, of which 2,821 adopted new practices. In the case of

agricultural producers, nine practices were adopted. For livestock it was 10and 13 for beekeeping. Jointly this positively impact the environment, productivity, and reduction of risks in the face of climate change.

The project evidenced the benefits of making informed decisions since, in terms of productivity, a substantial increase was observed that allowed them to improve their income by an average of 32% for agricultural producers, 22% for cattle producers and 34% for beekeepers producers. It was also shown that productivity percentages are higher when the producer diversifies, achieving an increase in income of up to 48%.

The two financial institutions that participated in the project used Agroclimatica in their agricultural sector business strategies, reducing delinquency from 30% to 7% and increasing their credits to women from 105 to 225 loans.

Based on the results presented, examining the indicators and means of verification, we can affirm that the project achieved the planned outcomes and objectives, noting that the goals were overachieved in some cases. However, some adjustments were made during the project implementation to maximize the expected results. These adjustments were necessary since the Agroclimatic platform was also enabled in English and multi-country.

The Agroclimatic and Bioclimatic platforms, as well as the experience of the project, can be replicated in countries affected by climate change, which urgently require tools for informed decision-making, increase their financial inclusion and improve the livelihoods of small and medium-sized agricultural producers.

2. PROJECT ACHIEVEMENTS

2.1 Achievement of outcomes and outputs

Expected outcomes and outputs	**Indicator(s):**	**Achievement of outcomes and outputs:**
Agricultural Producers and financial institutions in Nicaragua actively use Agroclimatic information for risk management and the Adoption of Good Agricultural Practices.	Approved business strategy and marketing plan.	The business strategy and marketing plan were developed and approved, facilitating the sustainable implementation of the two digital agriculture platforms (Agroclimatica and Bioclimatica).
	Number of agricultural producers who	The implementation strategy of the project and the correct selection of the sample of the population of producers allowed a more significant number of producers to adopt good agricultural practices. These practices are based on climate resilience,

	adopt resilient practices.	achieving 2,821 producers who improved their management practices in their productive items of 1,500 initially proposed.
	Number of agricultural producers with agroclimatic information needed to reduce climate risk in their production systems.	The easy access to the platforms and the strategy of dissemination and delivery of information by the project allowed 3,135 agricultural and livestock producers to have the necessary information promptly to make decisions on investments and management of their productive items, achieving an over-compliance of 104% concerning the initial goal of the project (3,000 producers).
	Financial sector institutions that measure agroclimatic risk in their credit operations.	Two financial entities piloted and adopted the Agroclimatic platform to measure the risk levels in their agricultural credit portfolio. The platform allowed them to understand the conditions that generate risks and opportunities due to factors of climate, soil, genetics, and management of crops and cattle, meeting 100% of the project goal.
Research improvement and methodological validation applied in the platform for agroclimatic risk management.	Number fo weather stations operating and transmitting data.	The project carried out an expansion of the design, installation and commissioning of a network of 57 meteorological stations, exceeding the initial objective of 45 stations. The information from the stations is used by the Agroclimatic and Bioclimatic platforms.
	Platform for agroclimatic risk management operating operatively, according to user requirements.	During the Agroclimatica and Bioclimatica project, more reports and relevant information for decision-making for the producers and financial institutions have been adapted according to users' requirements. For example, the agroclimatic platform has an Agroclimatic Risk Score, harvest projector, climatically resilient crop identifier, and a CO2 meter.
	Soil samples to calibrate digital maps used by the platform in the assessment of edaphological risks.	The soil analyses based on the 870 samples taken from the farms of producers (from an initial goal of 280) facilitated the expansion of resolution up to 30 meters in digital maps of the variables of texture, fertility, drainage, vocation, slope, and depth of soil. These variables are decisive in evaluating productive systems within the framework of the Agroclimatica platform, increasing the precision in evaluating agricultural risk in the soil component.
	Agroclimatica multicountry platform	Agroclimatic, a biogeophysical data platform to determine risk levels in the agricultural sector, has been developed and implemented in Nicaragua. The platform was configured for the English language and enabled to work in different

		countries, considering the urgent need for producers and financial institutions to have information for decision-making in the face of climate change. It is necessary to incorporate information on crops, soil, and climate of the countries where the operation of Agroclimatic is required.
	Number of posts for phenological observations in priorized crops and cattle.	The observation of the climate and its relationship with the behavior of crops and cattle is achieved through what we know as "phenological observation." In the project, a network of 10 phenological posts was designed and established in the country's prioritized crops and main livestock areas. The goal of the project was to establish 10 phenological stations.
	Methodologies and use for agroclimatic risk management validated.	A methodology was developed and validated to determine agricultural and cattle risk levels, considering climate, soil, and many practical aspects. In addition, the method to relate climatic factors with the phenology of crops and livestock was developed and validated. Critical elements of the methodologies were reviewed by experts from the Institute of Climate and Atmospheric Sciences, School of Earth and Environment from the University of Leeds, who issued recommendations to improve risk calculation procedures, data, and each product of the platform.
Strengthening producer organizations and financial institutions in the face of climate change	Training for technical and management teams of financial institutions that incorporate the use of the agroclimatic risk management platform.	At the end of the Project, 36 workshops were held out of 30 scheduled. They were ensuring that the technical and managerial teams of the financial entities develop knowledge and skills to use the platform and interpret the reports of the risk factors to incorporate them into the management of the agricultural credit portfolio, allowing safer investments in the face of climate change.
	Approved business strategy and marketing plan.	The business strategy and marketing plan were developed and approved, facilitating the sustainable implementation of the two digital agriculture platforms (Agroclimatica and Bioclimatica).
	Technical facilitators of replication processes for the producers of associations trained in agroclimatic risk management.	Technicians from the organizations massify the replication of the processes developed by the project towards the producers. It achieved the training of 39 technicians out of an initial goal of 20. It is common to use this methodology to train leading producers.

2.2 Deviations from the planned outputs and activities

During the implementation of the project, opportunities were identified to increase the chances of success and impact of the project through the incorporation of new products and activities that implied modifications in the initial plans, which are summarized in the following table:

<table>
<tr><th colspan="4">PRODUCTS AND ACTIVITIES</th></tr>
<tr><th>Planined</th><th>Executed</th><th>Added</th><th>Clarifications</th></tr>
<tr><td>Consultancy, study for review and validation of the platforms</td><td>Experts from the University of Leeds carried out evaluation consulting and recommendations for improvements to the platforms.</td><td rowspan="3">Sales representative, Manager Operations</td><td rowspan="3">In the development of the executed activities, the financial resources were optimized, and the balances were oriented to add new activities related to the marketing strategy with the financial sector institutions and the operation of the platform.

There was an over-compliance in soil samples, given that 81 were executed with the project and 789 soil analyses were obtained through an alliance with Catholic Relief Services (CRS) to complete 870.</td></tr>
<tr><td>Physical and chemical analysis of soil samples (Laboratory services)</td><td>Soil sampling and laboratory analysis were carried out at strategic sites in the country to improve the resolution of the platform's digital cartography, achieving 870 of 280 soil samples planned.</td></tr>
<tr><td>Consulting for the update and development of applications (App)</td><td>Company specialized in geoinformatic services, carried out consultancy for updating and improving the platform.</td></tr>
<tr><td>Consulting for the registration of patents and property rights, referring to the Agroclimatic and Bioclimatic platforms.</td><td>The consultancy was not carried out. Executing activities with the greatest impact on the development of the platforms were the greatest priority</td><td>New design to create the multicountry Agroclimatic platform in English;
Incorporation of remote sensing technologies and software development as a complement to the climate and phenology observation network to improve the accuracy of agroclimatic forecasts.</td><td>The platforms use open source code, which makes it difficult to register patents and copyrights in the short term. Therefore, it was considered more pertinent and relevant to develop activities to strengthen robust algorithms and methodologies to provide higher levels of confidence in risk assessments and climate forecasts.</td></tr>
</table>

2.3 Achievement of NCF indicators

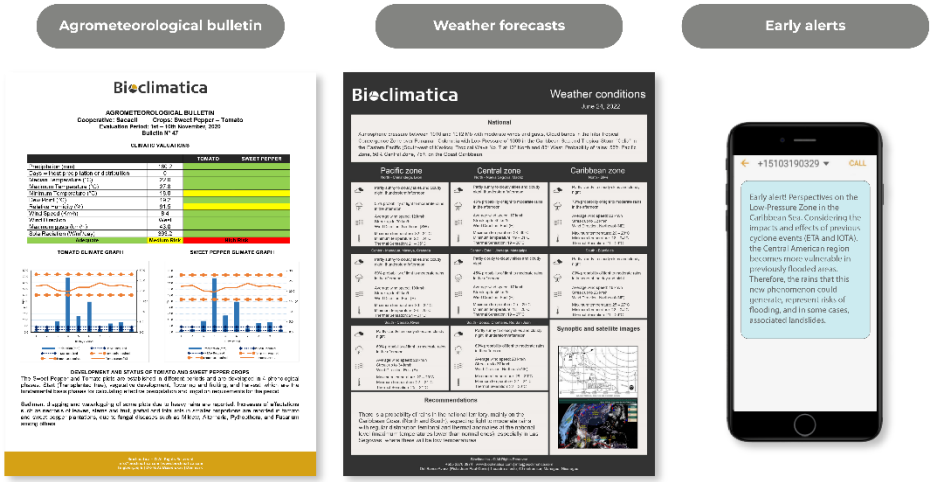
NCF core indicator	Results (quantitative)		Clarifications/Means of verification
Number of beneficiaries reached	women	741	Producers received information and training in managing the platforms and using agrometeorological information applied to their productive activities. Report the number of producers on the platform, Workshop report bulletins and agrometeorological; forecasts issued, report on the app's operation, and report on SMS published.
	men	2394	
	total	3135	
Number of people with increased resilience to climate change	women	667	Based on the training processes and systematic use of information provided by the platforms, the producers progressively incorporated nine agricultural practices, 10 in livestock and 13 in beekeeping, with positive impacts on the environment, productivity, and reduction of risks in the face of climate change. Report Monitoring System.
	men	2154	
	total	2821	
Number of people with improved livelihoods	women	667	The development of capacities and the incorporation of Good Practices in the productive systems allowed substantial productivity improvements and consequently an increase in their income up to 32% in the case of farmers, 22% in livestock producers, and 34% in beekeepers. Report Monitoring System.
	men	2514	
	total	2821	

3. CLIMATE CHANGE

Nicaragua is a highly vulnerable country to climate change due to its geographical location, exposure to extreme events, and poverty levels (the second poorest in Latin America), so national policies and producers' efforts are prioritized mainly at adaptation. However, within the framework of the project, good agricultural practices were developed based on conservation agriculture and agroforestry systems that, in addition to contributing to adaptation, also contributed to mitigation processes.

The selection of good practices and prevention measures adopted by the producers was based on a process that began with the risk reports issued by Agroclimatic. Then it was followed up by installing ten phenological observation posts associated with a network

monitoring of the climate of 57 meteorological stations. The information from the stations was used to issue 1,458 Agrometeorological Bulletins, 930 daily weather forecasts, and three weather alerts for extreme events during the life of the project.



In the context of adaptation, 2,821 producers managed climate risk by applying organic fertilizers, contouring crops, using soil cover crops, integrating the management of pests and diseases, and working to protect and conserve water. Moreover, they managed to improve the organic matter in the soil (stubble), use protective equipment during crop management, use live and dead barriers, reduce agricultural burning, and command and control gullies and tillage based on crop needs and soil characteristics, among other practices. These results were evidenced by making three measurements to a representative sample of 282 producers (9% of the total population). The initial measurement corresponds to the start-up phase of the project (first three months), a second intermediate measurement at 18 months after the start of the project and a final measurement at month 30 of project execution.

These activities were monitored and had a positive impact on the environment and the productivity of agricultural activities, as shown in the following table:

Good Agricultural Practices				
Sector	Measurement			Number of Adopted Practices
	Initial	Intermediate	Final	
Agriculture	17	23	26	9
Livestock	33	36	43	10
Beekeeping	66	71	78	12

In adopting practices, it can be observed that, in addition to adaptation, there is an evident contribution to mitigating greenhouse gas emissions. This result is due to reduced nitrogenous substances for soil fertilization, less agricultural burning, and less use of live barriers. The producers dedicated to livestock made use of agroforestry systems, ensuring

CO2 fixation processes in their respective farms since the manure (high methane producer) was used to prepare organic fertilizers. In this regard, it should be noted that the Agroclimatic platform has incorporated a carbon footprint quantifier into its algorithms, allowing you to estimate the fixation or emission rates according to the item and the climate conditions, soil, genetics, technological level, management, etc. This will allow financial institutions to measure the impact of their credits on the environment and the causal factors of climate change, as well as manage environmental sustainability strategies.

It should be noted that during the development of the project, Nicaragua was directly impacted by two powerful hurricanes in a relatively short period of time, which caused severe damage to activities in the agricultural sector. However, the beneficiary producers of the project adopted preventive measures in advance thanks to the early warnings generated and communicated by the project that reduced the impact of the damage. Among the main measures adopted we can mention:

1. Evacuation route and shelter centers were clearly identified by the adult members of each family.

2. Large trees near houses were trimmed.

3. Protection applied to windows and doors.

4. The families of producers had food and medicine in reserve.

5. Producers maintained the drainage systems in crop areas, mainly those places susceptible to flooding.

6. Producers reinforced greenhouse infrastructures to withstand strong winds.

6. Cattle were gathered in safe places.

7. The apiaries were moved to secure, indoor locations.

8. After the hurricanes, the Project contributed to crop damage mitigation with the support of 152 technological packages.

4. DEVELOPMENT IMPACTS AND CROSS-CUTTING ISSUES

The project adopted the strategy of investigating, improving, and validating the methodologies that allowed assessing the level of risk in the face of probable scenarios in the producers' farms. Along with the investigation, efforts were made to strengthen the organizations of producers and financial institutions to understand the levels of risk, adopt practices and measures to manage the risks, and advance in the construction of more resilient production systems for the accelerated climate change processes.

In this sense, research was carried out on agroclimatic requirements of crops and climate modeling to select reliable models for future climate trends. The research objectives are:

- To investigate the edaphological requirements of crops and their phenotype based on their genetic characteristics.
- To estimate risk assessment.
- To evaluate the expected harvests in different scenarios, according to the producers' sowing.

These results were decisive for the producers to have more knowledge of the possible impacts of climate change and allowed them to adopt good agricultural practices. Furthermore, the financial entities were able to measure the risks and anticipate measures for an informed placement strategy of financial resources for the agricultural sector, reduction of losses in the credit portfolio, and increase in volumes in the number and amount of credits.

Based on the articulated processes developed during the project's implementation, Nicaragua's agricultural producers and financial institutions could actively use Agroclimatic information for risk management and the Adoption of Good Agricultural Practices. In this context, the project showed the following impacts on the lives of producers, financial institutions, and the environment:

The project reached 3,135 producers, dedicated mainly to primary grain crops, vegetables and coffee, cattle raising, and beekeeping. A common denominator of the producers is the low level of schooling, little access to public services and technical assistance, and no access to information regarding climate change. They are a family nucleus integrated from 5 to 6 members, and geographically they are located in agricultural frontier zones with high exposure to extreme weather events. Regarding the objectives of the project, the conditions were improved to the extent that they adopted better practices and consequently had better levels of productivity while improving their income, as shown in the following table:

Sector	% Increase in Revenue
Agriculture	32%
Livestock	22%
Beepkeeping	34%

These results were evidenced by using data collection instruments at the beginning of the project. A second measurement was made 18 months after the start of the project. A final measure was taken after 30 months of project execution. The main instrument was structured surveys to a sample of 9% equivalent to 282 representative producers in terms of planting area, productive items, schooling, experience, etc. This sample size provides reliable information at 95% and with a margin of error of 5%.

The project considered the following socio-economic variables:

1. Number of family members,
2. Members of school-age people,
3. Number of working members,
4. Family members who have migrated,
5. Reasons why they have migrated,
6. Whether or not they receive support services,
7. Whether or not they receive loans,
8. Income from labor sales,
9. Income from agricultural activities (segregating agriculture and livestock),
10. Income from transfers,
11. Production costs, and
12. Expenses.

These variables were analyzed to identify the income increase due to the project's execution.

In this regard, we can say that informed decision-making, the adoption of anticipated measures to reduce risks, and the adoption of good practices were decisive for farmers to reduce losses and increase their resources by up to 29% on average. Moreover, we note that for producers who diversify their activities, as in the case of cocoa with basic grains, the income increase is higher, reaching up to 46%. By combining coffee and basic grains, producers reached an average of up to 39%, while producers of a single crop, for example, onion, had a 12% increase.

On the other hand, the proper management of local resources had a positive impact on the environment, since deforestation, agricultural burning and the use of toxic substances were reduced. Soil conditions in 47,969 hectares dedicated to agriculture, livestock and beekeeping also improved with the increase in organic matter. The reduction and adequate management of erosion and the technical control of the crop favored the processes of adaptation and mitigation in the face of climate change. On the other hand, the proper management of local resources positively imacted the environment since there was a reduction in deforestation, agricultural burning, and the use of toxic substances. Soil conditions were improved with the increase in organic material too. The reduction and adequate management of erosion and technical control of the crop favored adaptation and mitigation processes in the face of climate change.

The informed decisions and the excellent development of the productive activities by the producers had a positive impact on women's access to financing, increasing the number of loans and improving the quality of the portfolio at the Women and Community Economic Development Foundation. Finally, the project made measurements at the beginning of using the www.agroclimatica.com platform, going from 105 credits to 225 in the last measurement. Likewise, the quality of the portfolio improved, going from a default of 30% to 7%.

Women and Community Economic Development Foundation (FUMDEC)

Indicators	02/29/2020	02/28/2021	02/28/2022
Women with farm loans	**105**	**205**	**225**
% of loans in arrears	**30%**	**20%**	**7%**

The management and technical team of the Caja Rural Mano a Mano Savings and Credit Cooperative, estimated that the use of Agroclimatic has contributed significantly in making decisions about the agricultural credit portfolio; giving them inputs to decide whether or not to grant financing and recommendations that producers must follow to mitigate the impact of adverse weather conditions.

Analyzing the logic in which the project was developed and the social, economic, and environmental results, we can conclude that producers are more resilient to climate change in their respective production units.

5. ASSESSMENT OF THE RESULTS AND IMPACTS OF THE PROJECT

5.1 Relevance

According to the Long-Term Climate Risk Index monitored by the Organization of the United Nations for Food and Agriculture (FAO), Nicaragua is among the 15 countries with the greatest adverse effects on a global level. Also, during the last period of information available (year 2018-2020) Nicaragua was the third country with the highest prevalence of undernourishment in Latin America and the Caribbean with 19.3% of its population.

Given this context, it was urgent that the producers, in addition to knowing about climate change, could have an instrument to quantify the level of risk of their production systems in the face of current and future climate scenarios. This was provided by the project that also ensured that systematic information on the evolution of atmospheric phenomena was present as well as timely alerts for decision-making to adopt early measures to reduce impacts and risks in the production units.

The project was developed in correspondence with the"National Policy of Action in the Face of Climate Change, decree No.35 of February 22, 2022" that is based on three main objectives:

• "Align climate action to the Fight Against Poverty Plan 2022-2026

• Strengthen our population's response capacity to climate change's impacts.

• Strengthen the intersectoral nature of climate action: environment, forests, biodiversity, energy and transportation, cities and settlements".

The project was in line with the stated objectives since it strengthened the decision-making of small and medium-sized producers, this in turn made it possible to increase production levels, which was reflected in an average increase in income of 29% amongst the beneficiares. The recommendations adopted by the producers were focused on climate adaptability and conservation of natural resources. The project also leaves two platforms that help financial institutions, producer organizations and individual producers to be more resilient to climate change.

Throughout the project, the Union of Agricultural Producers of Nicaragua (UPANIC), the main union chamber of producers in the country, requested support to know the prospects of rainy periods. This application includes the ability to predict the presence of the phenomenon known as “El Niño”, that is, extreme events and characteristics of the heat wave period. This last part is essential to define the most appropriate periods for planting the different productive items and establish a follow-up plan for the development of export items. In this context, the project provided understandable technical documents and explanations to union leaders and regularly provided newsletters and information guides. The contribution of the project has been very relevant since UPANIC, in alliance with the Agricultural Stock Exchange, periodically publishes the bulletins and forecasts generated periodically within the framework of the project. The demand for these services shows that the project had a significant impact on national life.

The project was fully consistent with the current NDF strategy:

1. Increase the capacity of low-income countries to mitigate and adapt to climate change

2. Encourage and promote innovations in areas susceptible to climate change.

3. Build alliances between Nordic actors and partner countries, both private and public organizations

4. Contribute to sustainable development and poverty reduction

5. Leverage additional funding for climate action

The contribution of the Nordic Fund facilitated the construction and validation of Agroclimatic and Bioclimatic, which, being correctly used by financial entities and producers, has made productivity andprofitable. In addition, it has had a positive impact on the environment, specific risks have been reduced and it has contributed to tackling climate change, including that related to greenhouse gases (e.g. CO2 calculator in the agricultural credit portfolio developed for this project).

The project managed to meet all its objectives and currently, the platforms created are contributing to climate resilience and increased productivity in Nicaragua with prospects for expansion to the Central American region and other vulnerable countries.

5.2 Effectiveness

The design and implementation strategy of the project made it possible to achieve the objectives, goals and results efficiently, exceeding in some cases the originally proposed goals and ensuring that the research processes developed and the construction of two innovative tools (Agroclimatic and Bioclimatic) generate information reliable for producers and financial entities.Those that systematically adopt these good practices experience increase in their productivity, positively impacting their livelihoods and the environment. Furthermore, the financial entities acquired new tools to increase their portfolio and reduce late payments in agricultural credits. Accordingly, the project manages to strengthen financial entities and improve understanding of the issue of climate change and effective practices that ultimately translate as the best indicators of resilience to climate change.

The objectives and results of the project were achieved in a complex socio-political context within the global problem of the Covid-19 pandemic. This situation forced everyone to take extraordinary measures to reduce the risk to the staff and the families of the producers. In the project case, a series of regulations supervised by Ingemann was followed. These resulted in not having a higher level of incidents in the staff and advance in the work with producer organizations to achieve the project's goals.

On the other hand, the project implementation strategy required alliances with eight producer organizations. These have a network of technical facilitators who, duly trained, were able to transmit knowledge to the project's target population, even exceeding the initially planned goal of 3,000, ending with 3,135 producers empowered and active in managing agroclimatic risks.

We should mention that in the implementation of the project, cooperative relationships were established with organizations such as the Catholic Relief Service (CRS). This relationship allowed the increased soil sampling and analysis without increasing the project costs. Because of this, achieving a greater density of control points was possible to adjust the precision of the digital cartography of soils used by the Agroclimatic and Bioclimatic platforms.

The efficiency in the implementation of the project made it possible to expand its scope as it developed, enabling the platform to function in multiple countries and, in addition to Spanish, also in the English language.

5.3 Efficiency

In a context of climate vulnerability, the COVID-19 pandemic and a sociopolitical crisis in Nicaragua. The project met -and in some cases exceeded- the planned objectives. Regarding budget execution, all activities were carried out as planned. In cases where changes were required, these were analyzed and approved in a timely manner, which allowed optimization of financial resources. Below are examples of some of the measures utilized by the project to ensure efficiency in delivery and an overall higher impact:

- The research processes in developing the algorithms so that the platforms could work and evaluate the risks were carried out with the least possible number of technicians and specialists with extensive knowledge. They also worked with a minimum staff that was expanded with the contribution of the network of technical facilitators. As a result, alliances were established.

- In the same way, the Agroclimatic monitoring resulted from financial entities that had the necessary personnel to carry out the tests without these personnel costs being charged to the project. In developing the executed activities, the allocation of financial resources to consultancy was optimized.

- A consultancy was carried out to review the procedures used in Agroclimatics with experts from the University of Leeds (whose costs were optimized according to the budget), and the recommendations derived from the report were applied to our solution.

- There was an over-compliance in soil samples, given that 81 were executed with the project. Through an alliance with Catholic Relief Services (CRS), 789 soil analyzes were obtained to complete 870.

- The platforms use open source code, which makes it difficult to register patents and copyrights in the short term, which was the original objective of the project. Therefore it was decided to realloacate the funding resereved for patens. This was instead used to strengthen the platforms algorithms and methodologies to provide higher confidence in risk assessments and weather forecasts. Funding was also used to translate the platforms to English to enable a scale-up to anglophone markets.

5.4 Impact

The essential thing in implementing the project has been that producers and financial entities are more resilient to the problems and challenges posed by climate change, mainly in Nicaragua, a highly vulnerable country. Likewise, the project has significantly impacted social, environmental, and economic aspects, given that these components were considered in the design, implementation, and monitoring, which indicate positive effects for the medium and long term, aligned with the Objectives of Sustainable Development 1,2,8,13 and 15.

In the social and economic aspects, the family nucleus was considered the beneficiary of the project activities. They actively participated in training and implementing good practices to face climate change problems. As a result, these families had greater productivity and could improve their income to 32% in agricultural activity, 34% in beekeepin and by up to 22% in cattle raising.

From the social point of view, the project monitored and followed up on the conflicts resulting from the socio-political situation in Nicaragua, contributing with a contingency plan to facilitate the implementation of activities with producers and their families without generating conditions of violence that were registered in other areas of the country.

Regarding environmental aspects, a problem of great importance in the country is deforestation for the development of agricultural activities, with annual rates well above those reported in other Central American countries.

Other significant problems are the soil erosion processes in which the country annually loses its productive capacities, given that improper management severely affects crop yields in different areas of the country. In this context, the project promoted and achieved the planting of crops without deforestation and the development of livestock activities with agroforestry systems for carbon capture.

The project also developed a series of practices aimed at protecting and conserving water and soil, reducing the risks of erosion in the project's intervention areas. This set of actions has had a positive impact not only on increased productivity but also on the recovery of the cultivable regions. These regions used adaptation measures to climate conditions determined by the Agroclimatic platform and systematically monitored with Bioclimatica. The social, economic, and environmental benefits generated during the project can continue to be promoted both in Nicaragua and other countries since, among other things, the two validated tools are available both at a technical level and with a positive impact on the project.

5.5 Sustainability

The project's sustainability is valued from three perspectives. The first relates to the continuity of using agroclimatic information on time and developing good practices adopted during the project. The second refers to the financial entity in that the risk analyses issued by Agroclimatic accompany its credit portfolios. The third is related to the continuity of operation and functioning of the platforms by the entity implementing the project.

The probability that the producers will continue using the agroclimatic information is high. Given that the validation of the information and its use allowed them to make a qualitative leap in their income and resource management, they considered that the platforms were vital for the correct decision-making on aspects of productive farm activities. These activities include planting dates, fertilizing dates, measures to mitigate the risk of pests and diseases, types of varieties and crops appropriate to the conditions of their farms, etc.

In the case of financial institutions that have adopted Agroclimatic, the results showed a decrease in delinquency and mobilization costs and a greater knowledge about the best access to financing. It includes the opportunity to create financial products for new types of crops or other crops that are agroclimatically appropriate for the farm. Making the platform part of their business strategy and risk mitigation plan was a good decision. It allows producers to create a safer investment and, at the same time, generate a positive social impact. At the end of the project, there are two contracts for use with financial institutions

in Nicaragua, 5 contracts for use of the platform in Honduras (2 Banks and 3 Savings and Credit Cooperatives) and more than 12 financial institutions in Guatemala and El Salvador. have shown intentions to use the platform.

Ingemann, as the executing entity, has decided to give continuity to the project's efforts by expanding the platform to other financial entities and producers in the country. This strategy includes opportunities for expansion outside of Nicaragua through projects sponsored by financial entities. That ensures the continuous improvement of the platforms and sustainability in the short, medium, and long term.

5.6 Coherence

The United Nations framework convention on climate change and the Convention of the Parties, together with the IPCC, have made calls to the international community, countries, governments, and cooperation entities to join efforts in the fight against accelerated and severe climate changes on a global scale and with serious impacts at a local level.

In this context, climate change laws have been designed and approved in Nicaragua. The environmental law was reformed to align it with international efforts. Moreover, the private sector has been developing strategies that consider the environmental issue and climate change as essential. International cooperation agencies (Official and Non-governmental) have been developing projects in areas of the country that are sensitive to climate change, for example, the dry corridor.

These actions are based on the high degree of vulnerability that the country has in the face of climate change. As evidenced in 2015 by the world climate reports by the German Watch, Nicaragua has one of the highest risks and vulnerabilities in the world. Therefore, the actions being implemented respond to the country's situation in the face of this global phenomenon.

In this context, the project becomes entirely consistent with the efforts of the international community, mainly within the framework of the 2030 agenda articulated with the Sustainable Development Goals (SDGs). These efforts are also aligned with government efforts, their climate strategies, the international community, and the efforts of organized producer associations in the country.

Since the project has improved the understanding of the impact of climate change at the local level, the stakeholders have developed digital agriculture platforms to facilitate the risk assessment of crops, pastures, and cattle. Also, they have developed methodologies to prepare easy-to-understand bulletins for technicians, promoters, producers, and short-term forecasts. These methodologies are helpful so that different institutions and producers make informed decisions and reduce their risk of loss while taking advantage of the opportunities that the context of climate change also offers.

6. INNOVATION

The project, in its main components, is innovative. In the case of Bioclimatica, the methodology capable of observing, recording, and sending through an app the phenological phases of crops from sowing to harvest was improved. It includes cultural work, damage from extreme weather events, effects of pests and diseases, and yields, articulating all these variables with the weather conditions observed through a network of stations associated with phenological positions. One of the main characteristics of this innovation is that the observation of the crops is carried out by the producers with the advice of the field technicians.

That the same producer is able to observe his crops, report it through an app and that the information comes back to him with recommendations, is an enhancing experience for the producer that also has a demonstration effect on other producers in the community. In addition, it helps the producer to better understand the behavior of their crops with respect to climatic conditions, that in turn facilitates the adaptation process.

An innovative product has been the issuance of an Agrometeorological Bulletin that periodically reaches producers, by digital means, including SMS. These bulletins provide information on the behavior of the weather and the state of the crops in the previous ten days, it also includes the weather forecast for the next 10 days and recommendations of good agricultural practices that contribute to overcoming and preventing the main problems in the crops.

The bulletins allow the producers to periodically review the status of their crops, and adapt their practices to the behavior of the climate on their farm. This process helps them achieve the end of the production cycle.

The Agroclimatic platform is unique in its logic, scientific nature, and applicability for financial institutions. Among the multiple benefits, it is easy to use since it allows in a short time, even non-expert users in the agricultural sector to carry out analysis and make decisions based on an agroclimatic score at the farm level. Also, the platform in its score allows identifying the most appropriate crops and varieties according to the current and future conditions of the producer's farm, as well as knowing the expected harvest volumes and the estimated carbon footprint left by the activity, whether it is agricultural or livestock.

7. POTENTIAL FOR SCALING UP AND FOLLOW-UP INVESTMENTS

The installation and operation of the platforms, together with the phenological stations and the climate monitoring network, are replicable. They have guides and manuals developed precisely to replicate or expand the experience. Once the project is finished, follow-up activities are planned with the producer organizations and financial institutions that currently use the platforms. In Honduras, 2 banks and three savings and credit cooperatives have signed a contract for the use of the platform and at least 12 institutions from El Salvador and Guatemala have shown interest in using it.

Among the changes approved during the execution of the project was included translating the platform into English. This allow Agroclimatic to be prepared for its expansion in Anglo-Saxon countries.

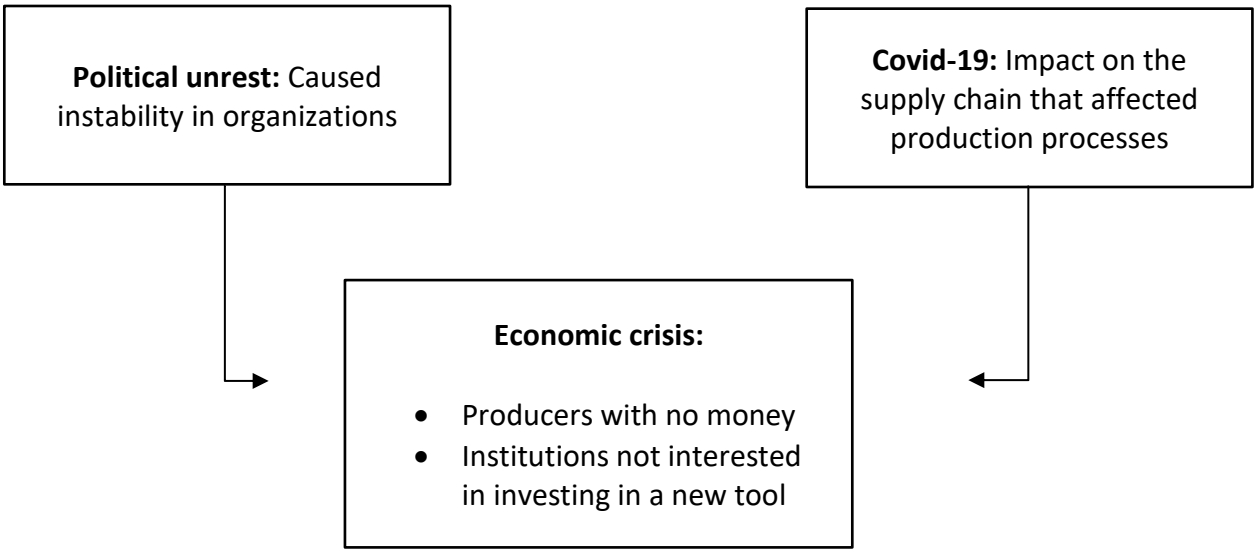
The expansion of the platform service will depend on the resources that the institutions are willing to contribute and Ingemann's resources. Due to the socioeconomic conditions in Nicaragua, the project will also be highly determined by the opportunity to obtain financing through grants. The platforms would play an essential role in implementing a sustainable production strategy in countries where agricultural activity is primordial in generating food and jobs. This is especially true in the face of the impacts of climate change.

Replicating the project experience is a great opportunity that can be materialized through the provision of resources both from financial entities and with the support of subsidized funds, especially at the beginning. Funding of the project is crucial while local entities assume the commitment of sustainability in the medium and long term.

To replicate the experience in other countries, Ingemann will hold in July 2022 the first round of investors interested in sustainably operating the platform in different countries affected by climate change and in those that require more tools such as those validated during the project are urgently needed.

8. RISKS

The project was developed under two main risk factors of great relevance due to their nature, characteristics, and impacts. On the one hand, the country's sociopolitical crisis has worsened since 2018, and, on the other, the COVID-19 pandemic. To mitigate these risks the project built and applied a plan of measures and monitoring for both risk factors, taking due diligence in the event of two risks that materialized:



The project developed a contingency plan to be able to manage the risks associated with the socioeconomic crisis that Nicaragua is experiencing and the challenges posed by Covid-19.

- Economic crisis prevents producers from paying for Agrometeorological services. In the implementation of the project, Ingemann established coordination and alliances with producer organizations that provide assistance and support to producers in different product areas. Given the impossibility for producers to assume payment due to the socio-political crisis and the impact of the pandemic on the supply chain that affected production processes, three of the five organizations took the commitment to contribute partially to the cost of agrometeorological services.

- The economic crisis prevents institutions from being interested in incorporating a new tool into their processes. During the execution of the project, one of the two participating financial institutions provided financial resources for the use of agroclimatic risk analysis.

In addition, the project promoted a strategic alliance with the Nicaraguan Microfinance Chamber, which contains the country's leading financial institutions, to disseminate and publicize the scope of Agroclimatic as potential users.

The sociopolitical situation in Nicaragua must continue to be monitored as it tends to worsen, according to reports from the United Nations High Commissioner for Human Rights. This vision is shared by the Inter-American Court of Human Rights and the Assembly of the Organization of American States. This implies a critical challenge to ensure that the platforms in Nicaragua operate widely for the benefit of producers and financial institutions since it is estimated that from the beginning of the project (November 2019) to the date of completion (May 2022), 157 (24%) of a total of 655 branches of financial institutions in the country has closed.

9. MONITORING AND EVALUATION

A monitoring system was designed to aid implementation of the project in its components, activities, and geographical areas. The design was based on the objectives established in the project desisn. Similarly, the monitoring system supported the development of activities and the quality of the products generated from the project. We paid close attention to the project's impact on the social and economic life of the agricultural sector's final beneficiaries, producers, and financial institutions.

The main objective was to obtain data that would progressively assess the use of information and products of the project, including the effects of its usage with respect to productivity, field management, environmental benefits, and improvement of the income.

Structured surveys were applied to measure the adoption of good agricultural practices and changes in income. To gather this data the project sampled 282 producers (9% of population) that were representative in terms of planting area, productive items, schooling, experience, etc. This sampling size provides information reliable at 95% and with a margin of error of 5%.

The results obtained were processed at the beginning (month 1) , intermediate stage (month 18) , and end of the project (month 30). The results were shared and discusseds with the producer organizations and financial institutions, who positively valued the project's scope and its effects, achievements, and impacts. Accordingly, the producers provided their testimonies, which were sent to the NCF in writing and videos. Annex 3 and Annex 5 provides a snapshot of these.

Technically, experts from the University of Leeds examined the algorithms and calculation logic of agroclimatic risks. They issued their opinions and recommendations for improvements related to weighting systems, calibration of data from climate models, and more relevant approaches to addressing estimates of CO2 fixation and emission, which were pertinent and promptly adopted in the improvements made to the platform during the implementation of the project.

10. LESSONS LEARNED

LESSON 1:

Finding	Mitigation Action	Recommendation
Permanent site for climate monitoring: Climate monitoring requires long series of data and, therefore, the location sites of the stations must be permanent. During the process of installing the weather stations on the farm of the small producers, we found that, in one of the cases, the farm where the station was installed changed owner and there was a risk of closing the station.	The project previously made agreements both with the producer organizations and with each producer, so that in the event of the sale of the farm, the seller ensures that the new buyer keeps the selected site available for the station.	It is advisable in future projects to obtain a public deed in which the land is available for the installation and permanent operation of the stations.

LESSON 2:

Finding	Mitigation Action	Recommendation
Climate information helps reduce operating costs and losses: The availability of climate information in a timely manner and its use by producers contributed to reducing operating costs and losses in their production systems.	Early warnings about dangerous climatic events prevented losses of apiaries in the process of moving beehives by producers associated with the project, while others who did not receive information had almost total losses due to sudden flooding of rivers near the apiaries.	Early warning transmission systems must be ensured to be active for messages to be effective.

LESSON 3:

Finding	Mitigation Action	Recommendation
Climate resilience is for everyone: The project demonstrated that building climate resilience is not just for professionals and members of the scientific community.	The producer families became involved in local processes to understand the behavior of the climate and the possible effects on their livelihoods. Producers of primary level of academic training were able to administer and manage the climatic data of the phenological stations and posts under international norms and standards that ensured the reliability of the data generated.	Projects that work on processes of change in production systems must involve a family nucleus and consider the knowledge of small and medium-sized producers to give them technical and scientific support but in an understandable and applicable way.

LESSON 4:

Finding	Mitigation Action	Recommendation
The group methodology from a learning-by-doing approach allows optimizing resources: The project validated group work methods, which are efficient in the use of resources and facilitate learning processes from sharing experience from producer to producer and experimenting in model farms.	Throughout the project and in particular after hurricanes Iota and Eta, the project held group training sessions to help cocoa farmers improve their plantations based on the best experiences of other farmers.	To optimize resources and expand the scope of methodologies developed by the projects, the creation of many group sessions is recommended, with the participation of leading producers as main mentors for each session.

LESSON 5:

Finding	Mitigation Action	Recommendation
The producer as an active beneficiary: The producers as beneficiaries of the project are directly and voluntarily involved in the development of actions to the extent that the knowledge generated is applicable and based on their needs. The level of involvement is such that they contribute time and resources to contribute to the purposes of the project.	During the project, the producers have provided land for the phenological stations and posts, demonstration plots and time dedicated daily to gathering climatic and phenological information.	The scientific information and technologies generated in a project must be sufficiently simple, practical and applicable in the context of the producers to achieve their active involvement and ensure the desired impacts.

11. OUTREACH

During this project period, we have developed the following elements for the dissemination of information and results of the project that we propose to be shared, as the Nordic Climate Facility deems appropriate. The dissemination items are the following:

11 videos of testimonies from different farmers and technicians about the impact of the project on their activities:

- Video testimony Guadalupe Laguna: https://youtu.be/sFPjtW-zMUg

- Video testimony farmer Flor de María Castillo: https://youtu.be/OVmfrzMwpcc

- Video testimony farmer Eva Zelaya: https://youtu.be/yaWQE0g-hik

- Video testimony Romel Morales: https://youtu.be/xC-4_H5Y6Bg

- Video testimony farmer Lester Herrera: https://youtu.be/oovdsD7v98s

- Video testimony farmer Karen Molina: https://youtu.be/dKNeawLr0XY

- Video testimony farmer Eusebio López Ramírez: https://youtu.be/WhVR43hpTZU

- Video testimony farmer Dora Velásquez: https://youtu.be/6PsmfGz3a7w

- Video testimony farmer Santiago Álvarez: https://youtu.be/J0DnuV6iMW8

- Video testimony farmer Morlin Averrúz: https://youtu.be/FkB-HCK10Os

- Video testimony farmer Deybi Torres: https://youtu.be/o_Vm8S4xnko

Webpages of the Agroclimatica and Bioclimatica platforms:

- www.agroclimatica.com

- www.bioclimatica.com

- www.climatica.farm

Other videos:

- Agroclimatica Introduction: https://youtu.be/413Xdj9ulCk

- How to create risk score analysis of a crop: https://youtu.be/Ns_1dV6o17Y

We express our interest in jointly developing articles and publications. Photos of the project owned by Ingemann, who authorizes the Nordic Climate Facility for dissemination, are attached to the SmartMe.

12. FINANCIAL SUMMARY

Table 1. Project financing per partner

Expenditures, EUR	NCF	Ingemann Supply A/S	Ingemann Nicaragua S.A	Ingemann Soluciones S.A	Total
Ingemann Supply A/S	67,348.98	176,351.60			243,700.58
Ingemann Nicaragua S.A	202,940.96		156,107.67		359,048.63
Ingemann Soluciones S.A	197,447.11			7,853.71	205,300.82
Total	**467,737.04**	**176,351.60**	**156,107.67**	**7,853.71**	**808,050.02**

13. CONCLUSIONS AND RECOMMENDATIONS

The Project was designed under a different vision and context than those presented during its implementation. This change led to the development of a contingency plan to able to manage the risks associated with the socioeconomic crisis that Nicaragua is experiencing and the challenges posed by Covid-19. This change was necessary, primarily due to the country's context, with a very vulnerable population given the poverty levels and the deterioration of public health systems. Regardless of the context in which the project was executed, all outputs were delivered successfully. Furthermore, the project was executed on time and within budget.

In this context, the Project was implemented in partnership with producer organizations and financial entities that suffer from the impacts of climate change and a difficult socio-economi landcape domestically. The project produced new knowledge and tools for these beneficiaries that contributed to the following achievements:

1. Edaphoclimatic information of the country's leading seasonal and perennial crops is investigated and available as a relevant input in the quantification of risks.

2. It is possible to improve the projection of climatic data by increasing the density in the national territory and their reliability to assess agroclimatic risks.

3. Improving the digital cartography of grounds, used by the platforms to assess the physical and chemical quality of the soils, is achieved through the sampling and analysis of soils.

4. Innovative methodologies are developed to assess risk levels in crops and cattle, supporting validation in observation through phenological posts whose method is innovative and easy to apply by producers.

5. The network of climatic and phenological stations strengthened in the Project becomes a source of valuable information for producers and financial institutions since it allows them to minimize risks and optimize opportunities in climate change.

6. The information and knowledge that the producers acquired during the implementation of the Project allowed the adoption of good agricultural practices with positive impacts on the environment. This relates to better conservation of water and soil. Deforestation was also minimized and agricultural burning were avoided.

7. The excellent management of the information and the knowledge acquired by the producers allowed them to improve their income levels up to 32%, attributable to the productive activities supported by the Project.

8. Financial entities adapted the Agroclimatic tool and manage to increase their number and volume of Agricultural credit while reducing the late payments rate from 30% to 7%.

9. The good results of the Project show that the actions carried out were pertinent to the problems experienced by producers and financial institutions due to climate change. As such it demonstrated the relevance of Agroclimatic and Bioclimatic in the management of agroclimatic risks.

10. Platforms are available that, in short periods, can measure the level of current and future agroclimatic risks on the producers' farms. This allows them to know the expected productivity, the best varieties and crops for the farm, while also estimating the carbon footprint that the agricultural activity leaves.

Based on the experience developed by the Project and the challenges posed by climate change, it is recommended:

1. Whenever possible, climate and crop observation systems should be developed with participation in the field, which, in addition to providing reliable data, allows the validation of other methods to collect information indirectly, such as remote sensing, etc.

2. Climate change projects must always provide opportunities for producers, community members, and local actors to participate in knowledge management actively. The last part is essential since the Project has shown that the issue is not only for professionals and the scientific community - but is a problem that involves everyone. We are all part of the solution.

3. Given that the methodology used in the Project was validated and obtained successful results, its replication and expansion to other countries should be pursued.

4. Although the platforms validated during the Project are impactful and used by both producers and financial institutions, projects with this type of innovation require adequate time for users to familiarize with the technology before it can be applied in their production and business plans.

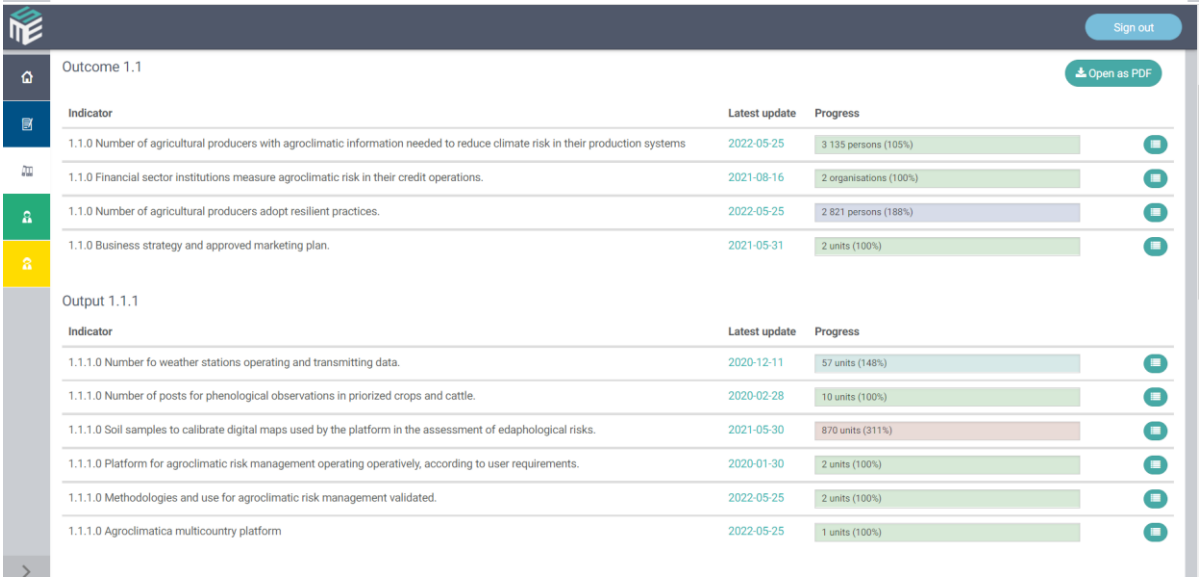
Annex 1 Project completion fact sheet

Project Name:	**Platform for Climate Resilience and Risks, of the Nicaraguan Agricultural Sector**		
Project no.	NCF-C8-0028		
Country:	Nicaragua	**Financing:**	
		EUR	**%**
Nordic Partner:	Ingemann Supply A/S	176,351.60	22
Local Partner:	Ingemann Nicaragua S.A	156,107.67	19
Other Partner:	Ingemann Soluciones S.A	7,853.71	1
	NCF grant disbursed	467,737.04	58
	Total	**808,050.02**	**100.00**
Classification:	Adaptation		
Project cycle:	Project start date: 25/11/2019 Original closing date: 25/05/2022 Actual closing date: 25/05/2022		
Short project description:			
Project performance:	**Expected Outcomes and Outputs**	**Achieved**	**End-of-project status**
	Agricultural Producers and financial institutions in Nicaragua make active use of Agroclimatic information for risk management and Adoption of Good Agricultural Practices.	3,135	Target achieved
	Improvement of the research and methodological validation applied in the platform for agroclimatic risk management through crop observation posts, weather stations and soil analysis.	10 crop observation posts, 57 climatic stations and 870 soil analyzes were carried out.	Target achieved
	Strengthening producer organizations and financial institutions in the face of climate change	-36 agroclimatic risk workshops were held. -The business strategy and marketing plan were developed and approved -39 technicians were trained. -2 financial entities piloted and adopted the Agroclimatic platform.	Target achieved
Climate change outcomes and impacts:	Within the framework of adaptation, 2,821 producers managed climate risk by adopting good agricultural practices. Farmers adopted 9 new practices, cattle producers 9 and beekeepers 12.		
Development outcomes and impacts:	The project reached 3,135 producers. They are integrated family nuclei of 5 to 6 members, geographically located in the agricultural frontier areas with high exposure to extreme weather events. We can affirm that making informed decisions, the adoption of anticipated measures contributed to the farmers will increase their income by up to 32% on average and up to 12% in the case of livestock producers.		

NCF core indicators	NCF core indicator	Results (quantitative)		Clarifications/Means of verification
	Number of beneficiaries reached	women	741	Producers received information, training in the management of the platforms and in the use of agrometeorological information applied to their productive activities.
		men	2394	
		total	3135	
	Number of people with increased resilience to climate change	women	667	Based on the training processes and systematic use of information provided by the platforms, the producers progressively incorporated 9 agricultural practices, 10 in livestock and 13 in beekeeping with positive impacts on the environment, productivity and reduction of climate change.
		men	2154	
		total	2821	
	Number of people with improved livelihoods	women	667	The development of capacities and the incorporation of good practices in the productive systems allowed substantial improvements in productivity and consequently an increase in their income up to 32% in the case of farmers, 22% in livestock producers and 34% in beekeepers.
		men	2514	
		total	2821	

Annex 2 Results Framework

Activity	Discussion	Due date	Responsible person	Latest update	Status	
1.1.1.1 Installation of meteorological stations	Discussion	30.11.2020	Unassigned	15.06.2021	Ready	Edit Revert
1.1.1.2 280 Analysis of physical and chemical characteristics of the soil.	Discussion	30.05.2021	Unassigned	15.06.2021	Ready	Edit Revert
1.1.1.3 Storage and protection of agroclimatic information	Discussion	31.05.2020	Unassigned	26.05.2022	Ready	Edit Revert
1.1.1.4 Continuous improvement of the platform	Discussion	25.05.2022	Unassigned	26.05.2022	Ready	Edit Revert
1.1.1.5 Weather stations transmitting climate data	Discussion	30.11.2020	Unassigned	15.06.2021	Ready	Edit Revert
1.1.1.6 Baseline and monitoring system.	Discussion	31.05.2020	Unassigned	15.06.2021	Ready	Edit Revert
1.1.1.7 Development of monitoring plan and list of actions to expose the personnel and assets of the project as little as possible to potential escalation of the socio-political situation in Nicaragua. The monitoring plan and the activities will be monitored throughout the project, and NCF will be given a summary of this in each progress report	Discussion	31.05.2020	Unassigned	15.06.2021	Ready	Edit Revert
1.1.1.8 Validation of the scientific consistency of the methodology to determine risk profiles applied to the agricultural sector.	Discussion	25.05.2022	Unassigned	26.05.2022	Ready	Edit Revert
1.1.1.9 Development of Agroclimatica multicountry platform and in English	Discussion	25.05.2022	Unassigned	26.05.2022	Ready	Edit Revert



Sign out

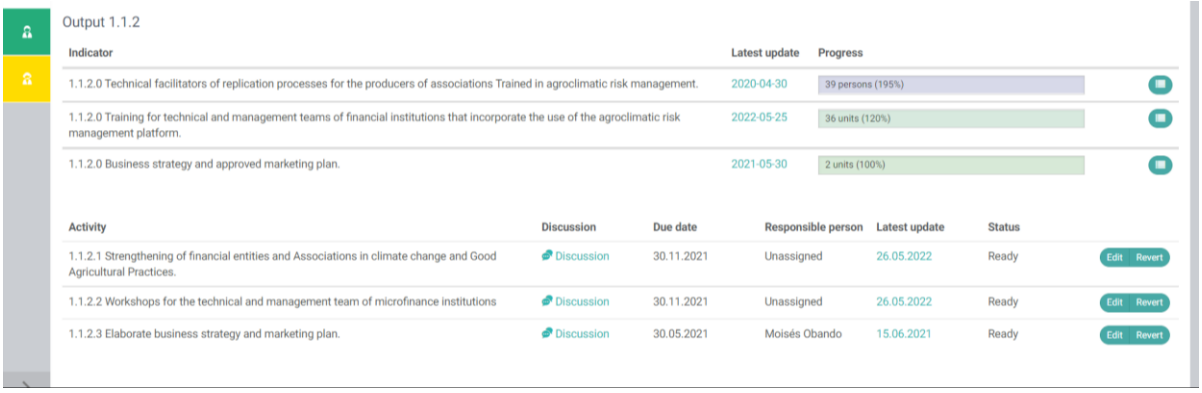
Outcome 1.1

Open as PDF

Indicator	Latest update	Progress
1.1.0 Number of agricultural producers with agroclimatic information needed to reduce climate risk in their production systems	2022-05-25	3 135 persons (105%)
1.1.0 Financial sector institutions measure agroclimatic risk in their credit operations.	2021-08-16	2 organisations (100%)
1.1.0 Number of agricultural producers adopt resilient practices.	2022-05-25	2 821 persons (188%)
1.1.0 Business strategy and approved marketing plan.	2021-05-31	2 units (100%)

Output 1.1.1

Indicator	Latest update	Progress
1.1.1.0 Number fo weather stations operating and transmitting data.	2020-12-11	57 units (148%)
1.1.1.0 Number of posts for phenological observations in priorized crops and cattle.	2020-02-28	10 units (100%)
1.1.1.0 Soil samples to calibrate digital maps used by the platform in the assessment of edaphological risks.	2021-05-30	870 units (311%)
1.1.1.0 Platform for agroclimatic risk management operating operatively, according to user requirements.	2020-01-30	2 units (100%)
1.1.1.0 Methodologies and use for agroclimatic risk management validated.	2022-05-25	2 units (100%)
1.1.1.0 Agroclimatica multicountry platform	2022-05-25	1 units (100%)



Output 1.1.2

Indicator	Latest update	Progress
1.1.2.0 Technical facilitators of replication processes for the producers of associations Trained in agroclimatic risk management.	2020-04-30	39 persons (195%)
1.1.2.0 Training for technical and management teams of financial institutions that incorporate the use of the agroclimatic risk management platform.	2022-05-25	36 units (120%)
1.1.2.0 Business strategy and approved marketing plan.	2021-05-30	2 units (100%)

Activity	Discussion	Due date	Responsible person	Latest update	Status	
1.1.2.1 Strengthening of financial entities and Associations in climate change and Good Agricultural Practices.	Discussion	30.11.2021	Unassigned	26.05.2022	Ready	Edit Revert
1.1.2.2 Workshops for the technical and management team of microfinance institutions	Discussion	30.11.2021	Unassigned	26.05.2022	Ready	Edit Revert
1.1.2.3 Elaborate business strategy and marketing plan.	Discussion	30.05.2021	Moisés Obando	15.06.2021	Ready	Edit Revert

Annex 3 Pictures

1. *Data for healthy crops*

   Eusebio López has a cacao pod in his hands, and Santiago Álvarez has a cellphone where he receives the agrometeorological bulletins and early alerts for applying good agricultural practices in the cacao plantations.

2. *The power of climatic data*

Dora Velásquez is a farmer of basic grains from Nicaragua. She has been losing up to two crop yields planting due to the lack of rain. Now she uses the information provided by Agroclimatica through her cellphone to choose the adequate sowing date, and her yields have exponentially grown!

3. *Knowledge for generations*

Juan Flores is a farmer who teaches his son how to collect climatic data from the meteorological station on their farm. After they collect the data, they send it through an application. The data received is processed and transformed into specific good agricultural practices recommendations.

Annex 4 Impact story

Growing crops with the guide climatic data

Eusebio López is a cacao farmer and a technical assistant for the ACAWAS farmer association in Waslala, Nicaragua. One of the most important things about the climatic data and agricultural practices recommendations he receives from Agroclimatica is that he can make the decision. For example, in the case of cacao, he now knows to regulate the shade of the trees, create drainage to avoid puddles on the plantation, and thus avert fungi diseases in the harvest that causes the death of crops.

With the information provided by Agroclimatica in bulletin format, Eusebio can determine the date he can sow to prevent losses due to summer season problems. And at the time of production, choosing when to collect the harvest is one of the crucial steps of crop cultivation.

Eusebio says that farmers didn't have any information in the past, and they sowed randomly. Drought and winter attacked them vigorously. But as there was no information, they sowed traditionally. Now the report of Agroclimatica has helped them greatly because, for him, it is a point of reference for making good sowings and helps at the time of harvesting.

For his cacao production, the Agroclimatica tells him, for example, that when there are rainy periods like this year, they must prune, regulate shade and make drainage ditches in the places of puddles.

For Eusebio, the information provided by Agroclimatic and Bioclimatic has been of great importance for the life of the crops with which they work in Waslala, mainly cocoa.