THE CLIMAKERS

Stories from the field

Volume 1

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Graphic Project
ZOWART

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Foreword

To nurture their crops and forestry, sustain their livestock and perform aquaculture and fishery activities, farmers depend on soil, water and air: resources that are at the core of their daily lives.
However, these resources are currently greatly impacted by a changing climate.
Being on the frontline of climate change, farmers of the world are exposed to more and more extreme weather events. Although across the continents the climate challenges may vary, the overall effects apply to all geographical areas. Therefore, it may happen that in some areas severe droughts have the potential to create a systemic shift in agriculture, while in others record floods have put the overall farming activities under a severe threat.
With increasing global warming, the frequency, intensity and duration of weather-related events, including heat waves, are projected to increase through the 21st century[1]. The frequency and intensity of droughts are also projected to increase, particularly in areas that are extremely food insecure already. Also, the frequency and intensity of rainfall events are projected to expand in many regions. Worldwide, farmers practicing sustainable agriculture are an essential part of the climate solution.
Farming systems that prioritize soil health management, implement fertilizer Best Management Practices (such as the 4Rs of Nutrient Stewardship[2]), make an efficient use of water and enhance biodiversity offer the greatest potential for a resilient food systems future transformation. Sustainable local and regional food systems are essential for climate change adaptation and mitigation where innovations, including on-farm renewable energy are key to shifting to a low carbon economy.
Under the overall initiative of "The Climakers", this publication provides a collection of best farming practices showing the great progress made by the agricultural sector to increase its resilience and mitigation potential. Farmers are the only group who can adapt to and mitigate climate change at the same time and are also those who have done it for centuries. This is the first volume of a series of successful agricultural practices that form a Farmers Driven Climate Change Agenda, showing that agriculture is the solution to climate change. However, Farmers Driven does not mean that they work alone. In fact, the opposite is true, as it is in Farmers' interactions with the wider agricultural value chain actors that solutions are found. Farmers' choices about nutrient management, crop protection, seeds, mechanization, processing and marketing are the foundation of an efficient and sustainable agricultural sector. In that sense the focus is not only on the farmers but on the whole food chain, through a Farmers Driven perspective. The farmers are actually at the forefront of any process, so somehow, they are taking the lead also for the other actors of the chain, upstream and downstream.
There is no one-size-fits-all solution: solutions vastly differ from one region to another. That is exactly what this collection of practices is showing.
Two straightforward questions guided us in collecting experiences from across the globe: what can farmers do to mitigate and adapt to climate change? And what do they need to be successful in that?
Farmers learn more from other farmers than from anyone else. The idea of this publication is to ensure that successful experiences from one region are made available to the widest audience so that they can inspire other farmers and other countries that may replicate the best practices or scale them up, adapting them to local needs. This collection of practices shows the wisdom, experience and expertise of farmers across the globe on what works for them on their farm. Farmers own the solutions because they have survived in each corner of the world for centuries, adapting to an ever-changing environment.
It is vital that processes remain science-led: that is why one of our partners - CCAFS, the CGIAR Research Program on Climate Change, Agriculture and Food Security - ensures, from practice to practice, that the actions are informed by the best available science. Therefore, the Climakers initiative is both nature-driven and science-driven.
We, members of the Climakers Alliance, firmly believe that the way we produce food can become more nature-and climate-friendly and that in this process part of the heritage that we are passing on to future generations will be how to farm smarter and how to ensure that nature survives along with agriculture in a more sustainable world for everybody.

1 "Climate Change and Land", IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems. 2018
2 The 4R Principles of Nutrient Stewardship entail applying the Right nutrient source, at the Right rate, at the Right time, in the Right place. This global framework, developed by the fertilizer industry, is applicable to each country and region worldwide and can be combined with conservation practices (such as crop rotation, reduced tillage, mulching and cover cropping).


AGRICULTURE ALLIANCE OF THE CARIBBEAN
AACARI


EUROPEAN COUNCIL OF YOUNG FARMERS
CEJA


EASTERN AFRICA FARMERS FEDERATION
EAFF
Voice of all farmers in Eastern Africa


SACAU


UMNAGRI
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WORLD FARMERS' ORGANISATION


CGIAR
RESEARCH PROGRAM ON
Climate Change,
Agriculture and
Food Security
CCAFS


csayn
Climate Smart Agriculture Youth Network


Procasur
Harvesting Innovations, Spreading Opportunities.


CropLife
INTERNATIONAL


ifa
INTERNATIONAL
FERTILIZER ASSOCIATION


ISF International Seed Federation
Seed is Life


TAIWAN ICDF


FARMING FIRST

Introduction

Farmers are the only economic actors in the world who are able to mitigate and adapt to climate change at the same time. None in the world is more vulnerable to climate change than the farmers and no other economic actor can do more in a short window of time to address it than the farmers: they are at risk because of extreme weather events, which threaten their production and revenues, especially in some areas that experience high levels of food insecurity already. At the same time, farmers must feed the planet, produce energy and clothes and ensure the survival of humankind.

Although the agricultural sector is often identified as one of the causes of the climate change, farmers hold an important part of the solution. In fact, they have a unique practical expertise, a combination of formal education, traditional knowledge and experience from living and working on the land and with nature that allow them to be key actors in successfully tackling the climate change challenge.

The Farmers Driven Climate Change Agenda promotes a bottom-up paradigm in the policy-making process on climate change in agriculture, where the Nationally Determined Contributions, NDCs, are based on the best practices that farmers have already identified as successful, built on new science-based solutions and are aligned with farmers' needs to achieve the economic, social and environmental viability of the wider agricultural sector.

The Climakers are the members of the Farmers Driven Climate Change Alliance, namely the farmers of the world, who are leading this initiative and other stakeholders – including private sector, civil society, research centres, multilateral organizations – that are committed to provide bottom-up, pragmatic and successful solutions to climate change.

In 2018 at COP24 "The Climakers" initiative was launched as the first ever climate action led by the farmers.

THE CLIMAKERS

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THE CLIMAKERS

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BANGLADESH

NUTRIENT-RICH FISH ENHANCEMENT IN SEASONALLY FLOODED RICE FIELDS

Moshiur Rahman/WorldFish

Presenter

WorldFish - CGIAR[1]

Description

In the Jhalakathi and Pirojpur districts of Bangladesh, the integrated rice field fisheries that operate within the seasonally inundated floodplains are vital for employment and food security for most of the rural population.
However, salinity intrusion, increasingly erratic rainfall, intensifying rice production and unregulated fishing are interacting drivers, reducing people's ability to fish, harvest rice and grow crops.
Climate-driven stressors, and other environmental or social shocks, operate at multiple scales. Building generic adaptive capacity to a single threat, or building generic adaptive capacity, may not translate into sufficient capacity to shocks a community might experience. For example, salinity intrusion — a phenomenon caused by increased tidal penetration, higher temperatures and sea level rise — threatens food production in rice field fisheries and in coastal deltas more broadly.
In 2017, WorldFish and partners tested the effectiveness of cement rings as artificial microhabitats that provide fish with a deep-water shelter. This small deep-water environment protects fish when rice fields start to dry up, the remaining water increases in temperature and levels of dissolved oxygen decrease, creating an unfavourable environment for fish.
At the end of the monsoon season, smaller fish remaining in the rings can be caught and cultured in homestead ponds in preparation for the next dry period — a time when many farmers struggle to earn an income because their crop yields are diminished. Excess fish from the homestead ponds can then be sold, providing farmers with a supplemental income, a secondary livelihood and new flexibility to change livelihood strategies. Even if severe flooding ruins the rice crops, farmers can still catch nutritious fish for income or food.

Results

By ensuring that fish can survive in the rice fields year-round, the cement rings help maintain fish biodiversity, and enhance and stabilize fish productivity for food security. Early results show that this very simple household asset can lead to an increase in both fish biodiversity and fish biomass, demonstrating the technology's promise for reversing the observed decline of indigenous fish populations.
The adaptive capacity built from fish rings may not be sufficient to overcome all the effects of salinity intrusion or the cumulative impacts of salinity, temperature and extreme weather events. This reinforces the multi-scalar nature of shocks and adaptive capacity discussed in this framework.

Climate smartness[2]

This practice is addressing two important Climate Smart Agriculture (CSA) pillars: adaptation and productivity to increase food security and income. The improved management of rice crop for increasing fish production generates benefits to farmers even when severe flooding occurs, which clearly addresses increase of resilience to climate variability regarding food security. However, capacity building for farmers in understanding climate and its relations with agricultural activities could enhance adaptive capacity to climate change and variability. It would be recommended to assess how the practice might be contributing to mitigation pillar, considering additional crop management options that might reduce input intensity in rice and therefore, in fish production.
For more information about CSA, in a study of CIAT and World Bank (2017a), it is possible to identify several practices for Bangladesh evaluated around 8 key criteria: Water, Carbon, Nitrogen, Energy, Knowledge/Info risk, Yield, Income and Soil.

1 Roscher M., Eam D., Suri S., Van der Ploeg J., Hossain Md E., Nagoli J., Cohen P.J., Mills D.J. and Cinner J., 2018

2 This is done in the framework of climate-smart agriculture (CSA) approach. Climate-smartness in agriculture means understanding impacts of climate change and variability along the agricultural activity, which includes planning of what crop to plant, when to plant, what variety to plant and what type of management practices are needed to reduce impact on the environment (e.g. emissions reduction), maintain or increase productivity (e.g. yields) while increasing resilience and improving livelihoods.

BELGIUM

KLIMREK

Presenter

Innovatiesteunpunt - Innovation Centre for Agricultural and Rural Development, embedded within Boerenbond & Landelijke Gilden

Description

Climate change is strongly felt by Flemish farmers due to periods of extreme weather events. The last two Summers were extremely hot and dry, while the Summer of 2016 was extremely wet. The Flemish farmers suffered from falling yields and uncertain harvests. On this point, for Flemish farmers it is not clear how they could run their farm in a more climate-friendly way. Lists of climate measures are available, but the impact of the implementation on the company economics and on other environmental aspects (like acidification, for example) is unclear. Innovatiesteunpunt together with ILVO and Vito developed an answer to this: the Klimrek project. In Klimrek, partners develop an innovative strategy that allows the farmer to implement the right set of climate measures on his farm, taking into account their economic and technical feasibility. The right set of climate measures means effective measures that yield a net climate gain (reduction in CO2-eq) and safeguard the yield as much as possible in a changing climate. This is called 'the climate trajectory'.

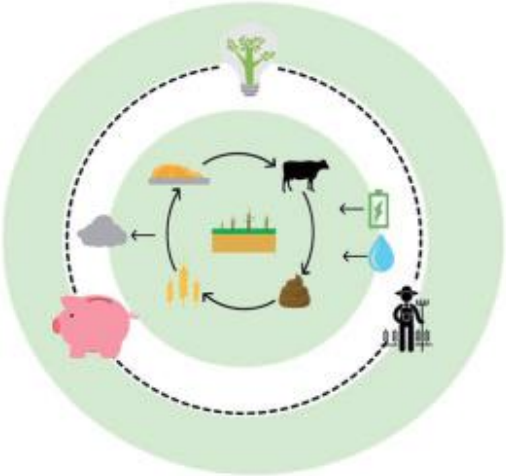
The climate trajectory:

(1) gives the farmer an insight into the climate impact of his farm and into the consequences of climate change on his farm and

(2) provides the farmer with tailor-made guidance for taking the most suitable climate measures for him.

Farmers themselves choose which measure(s) they want to apply.

Klimrek differs from existing initiatives (for example carbon footprint calculators) in its total approach: it evaluates ecological and economic performance and estimates economic feasibility, starts from life cycle analysis and avoids problem shifts, considers carbon storage, provides customized scenarios, analyses and recommendations for adapted business management, guides up to and includes implementation, and provides a benchmark set for companies and sectors.



From the website:
https://www.innovatiesteunpunt.be/nl/projecten/klimrek

The target group of Klimrek are the Flemish dairy farmers (6658), pig farmers (4145) and arable farmers (5610), supplemented by member organizations, sector associations, food industry, suppliers, governments, knowledge institutions and advisers.

Results

As a result, knowledge about climate impact generally increases and the threshold for implementing climate measures disappears. By rolling out the climate trajectory on a large scale, the transition to climate-smart agriculture is started.

Climate smartness

It is worth highlighting the importance of capacity building and the empowerment of farmers around climate understanding and how to plan according to farmers' needs and climate vulnerability. This initiative is knowledge-intensive on climate change impacts and consequences, which is one of the CSA indicators for adaptation. It is important to mention that agricultural practices become climate-smart once you link your planning, management and harvesting activities with climate behaviour, that is, the agricultural activities need to consider current climate vulnerabilities and potential agro-climatic risks given the weather forecast.

BELIZE

COMBATING CLIMATE CHANGE

Presenter

Family farmer - Belize

Description

Farmers in Belize are experiencing several effects of climate change, notably higher temperatures, less rainfalls, lack of water in watersheds, contamination of watersheds, less predictability of farm activities (when to grow what), pests and plant diseases.

In order to cope with the challenge of adapting to and mitigating climate change, several practices are being implemented by farmers in Belize, sometimes in cooperation with the National government:

- Study on how the potential of rivers and watersheds is used (government of Belize along with farmers and other user groups) for irrigation purposes;
- Development of agro-silvopastoral systems, consisting in a combination of timber, plants or fruit trees and production of vegetables used by farmers;
- Rearing of exotic animals under hunting threat and integrated farming system;
- Cover structures to combat flies and decrease use of pesticides;
- Transforming agro-waste into animal feed or composting material (i.e chicken manure used for the sugar and banana production;
- Production of biofertilizers;
- Processing produce in order to be less dependent from imports and gain additional value added from production;
- Organic production with self-certification;
- Water catchment/storage of water/water harvesting;
- Back gardening;
- Turn farms in agro-tourism/agro-ecotourism.

Results

- Better water management;
- Resilience to water scarcity;
- Lessen the burden on land dedicated to livestock;
- Less use of pesticides;
- Diversification of farm income.

Climate smartness

On the Belize initiative, developed by the government and the farmers, it is worth highlighting that the implementation of a whole portfolio of adaptation and mitigation practices facilitates achieving an optimal state of resilience because from a systemic perspective, isolated practices won't make enough contributions compared to a tailored group of practices.

Practices such as watershed management, water management, diversification of production and income diversification of producers contribute to increasing adaptation, while the use of trees and protected zone conservation are more mitigation focused. The portfolio of practices promoted by "Combating Climate Change" project contributes considerably to an overall increase in farmers' income. Considering the above, it is possible to acknowledge that such portfolio of practices is contributing to a climate-smart agricultural development in Belize.

It is recommended to assess the implementation of additional practices, which are being implemented in the region and can support climate-smartness goal in Belize by improving yields and climate resilience of the farmers (CIAT and World Bank, 2018). Moreover, capacity building regarding climate and weather information is essential to support long-term impact and guarantee climate smartness despite of climate variability. Empowering farmers on the use of climate information for planning and management purposes may ensure a better-informed decision making processes considering their context specific conditions.

CAMBODIA

FARMERS' ADVISORY SERVICES

Presenter

The Cambodian Farmers Federation Association of Agricultural Producers (CFAP Cambodia)

Description

In Cambodia, droughts, floods, heavy rains and high temperatures threaten and destroy farmers' crops, especially affecting smallholders.

Irrigation systems are not very solid in the Country, as there is limited capacity to store water for uses in dry season while in rainy season floods often occur. Moreover, the majority of existing lakes, rivers and canals became shallow and are disappearing from year to year in a worrying way.

In addition to that, increased temperatures of about 42 Degrees Celsius in some months, in particular April to June, almost occurred every year in these last decade.

Smallholders in Cambodia have very limited capacity to make their farms resilient to the impacts of climate change such as heavy rains, drought and strong wind that can destroy their crops easily. Increasing temperatures put more pressure on smallholders in Cambodia as they lack of capital to extend their farms, while most rural farming families are in debt with high interest rates.

In response to these concerns, CFAP conducted various studies/researches through meetings with farmer members in operational areas in Cambodia to assess what challenges and problems they were facing. Some of the challenges they raised regarded i.e. lack of irrigation systems, lack of water sources, droughts, floods, poor soil quality, youth migration to urban areas, no access to capital and markets.

Participants in these meetings also got the opportunity to discuss in group how to find applicable solutions for their farming communities by themselves in response to their challenges with the support of CFAP's experts as the federation of smallholders. After the meetings, the federation had sufficient evidences to develop action plans, in order to seek for external funding to support farmers:

- The federation developed and designed a household pond model to ensure that smallholders can grow vegetables in a year-round with sufficient water source to cover their small plots of vegetable farmland of at least 250 square meters;
- Posters, leaflets and cropping calendar were prepared for distribution to farmer members with clear explanation of technical protocols and schedule of growing crops, veggies and rice as well as treatment for animals (poultries);
- Training manuals for extension workers/trainers were provided together with technical training onsite to farmer members and advisory support accordingly to make sure that sub-national farmers' organisations as members are qualified to provide technical training courses to farmer members in a professional manner;
- The federation also provided specific training of trainers (ToT) to local experts at the sub-national level for giving e xtension services to farmer members directly at their respective constituency with coaching support by CFAP;
- On-site training about household ponds, windmills, water pumping machines, brick raising beds, and new agricultural practices by using plastic mulch and net houses for vegetable production were given by CFAP. Training lessons, were conducted at CFAP's training center;
- The federation provided facilitation services for farmers as well, fostering their access to markets value chain, through networking among smallholders and big buyers/traders, street sellers and supermarkets;
- Moreover, the federation acted in support of small scale businesses of sub-national farmers' organisations (SNFOs) through collective sale of rice seeds, vegetables, feeding rice, poultries and other commodities included pineapple and melon to super markets and also amongst the SNFOs vis-à-vis. Involvement of sub-national farmers' organisations included the federation herself into other development programmes in Cambodia such as IFAD's projects.

Results

Smallholders received intervention from the project as planned, and even though the amount of support was small and limited, it was a real opportunity for smallholders to share knowledge and upscale. Moreover, best practices were studied further for scaling-up to other farming communities or operational areas of the federation in the future.

Those who received knowledge and materials could continue to apply new practices to overcome challenges faced and sharing experiences with other farmers. Youth got interested in agriculture and might not migrate from the villages as many as before. Smallholders could grow in a rotation system with quality and avoiding producing more than local market demands. Smallholders could grow in a year-round with household ponds, raised beds, net houses, water pumping machines, windmills etc,.

Knowledge about agricultural technical skills, marketing, business planning, economic literacy, financial and organizational management were applied for the institutional sustainability and services delivering to farmers for long run. The added value of farmers' organisations was also understood well by farmers, in particular farmer leaders. No negative impacts during and after the project execution were found. Smallholders got access to collective sale and purchases with better prices.

Climate smartness

The involvement of the producers in this initiative in terms of knowledge empowerment is essential for its success and sustainability, this is one of the most important aspects to highlight from the project. "Farmers Advisory Services" project has focused on increasing adaptation to climate change and variability through the implementation of water harvesting and efficient pumping and distribution. This practice also enables continuous production throughout the year, which contributes to increasing adaptation and productivity CSA pillars.

One key element to consider in these initiatives in order to enable scaling processes is to build the capacity of farmers in understanding climate, how it affects crops and which are the tools available to make better-informed decisions in the short and medium terms. This might also support the generation of production surplus in addition to self-consumption production so that farmers can have additional income. Moreover, the project may also address the mitigation pillar of CSA by exploring pumping systems with alternative energy sources in order to reduce the use of fossil fuels.

CANADA

SUSTAINABILITY PRACTICES ON FARM

Presenter

The Canadian Federation of Agriculture (CFA)

Description

As the frequency of events like droughts increases under climate change, crop yields would decrease. This would increase the vulnerability of producers to climate change, particularly in semi-arid regions of Canada.
Warmer Summers could also cause problems for livestock producers related to heat-wave deaths. This is especially true in poultry operations. Other impacts could be reduced milk production and reduced reproduction in the dairy industry, as well as reduced weight gain in beef cattle. In addition, droughts and floods could reduce pasture availability and the production of forage, forcing producers to find alternative feed sources or reduce their herd size.
There are several possible effects climate change could also have on crop pests and disease. These would include increased weed growth, due to higher levels of atmospheric Carbon Dioxide (CO2) and an increased prevalence of pests and pathogens in livestock and crops. The increased range, frequency and severity of insect and disease infestations are also potential impacts.
While these changes will not have large effects on greenhouse gas (GHG) emissions from crop production systems, they could cause an increase in energy use associated with the manufacture, transportation and application of pesticides.
Within the Federation, farmers experimented the following practices in order to mitigate and adapt to climate change:

- **Agricultural Nitrous Oxide Emission Reductions:** Managing applied nitrogen (N) sources in a more comprehensive and sophisticated way to reduce nitrous oxide (N2O) emissions associated with nitrogen fertilizer application.
  These BMPs are integrated into a new technology called a Comprehensive 4R (Right Source at the Right Rate, the Right Time and the Right Place) Nitrogen Stewardship Plan.
- **Conservation Cropping:** Also known as conservation tillage and zero tillage, it reduces or eliminates use of tillage machinery, such as combines.
- **Intercropping:** The process of growing crops (e.g. cereals and legumes) in close proximity,can increase soil organic carbon and soil organic matter and thus, carbon sequestration.
- **Winter Cover Crop:** The process of growing crops post-harvest to ensure that croplands are not bare throughout the winter. Winter crop cover reduces soil erosion and maintains soil organic matter, increasing the cropland's ability to sequester and store carbon.
- **Biofuel Production and Usage:** Feedstock for biofuel may be produced from a number of agri-food processes, sucas crushing of oilseeds and refining of vegetable oils.
- **Energy Generation from the Combustion of Biomass Waste:** The use of biomass to generate thermal energy and/or power can reduce greenhouse gas (GHG) emissions when the biomass energy is used to displace energy derived from fossil fuel combustion. Agricultural residues from manure and animal bedding can serve as biomass sources.
- **Reduced Age at Harvest of Beef Cattle:** Reduces emissions associated with the raising of beef cattle by reducing the number of days required to get a feeder calf from birth to harvest.
- **Reducing Greenhouse Gas Emissions from Fed Cattle:** This protocol for reducing greenhouse gas emissions in fed cattle ad dresses digestion and manure storage/handling sources of livestock greenhouse gas emissions.
- **Selection for Low Residual Feed Intake Markers in Beef Cattle:** Selective breeding of cattle using a genetic marker for low residual feed intake (RFI) can result in cattle that are more efficient in their feed utilization compared to other cattle.
- **Woodland Conservation & Reforestation:** Woodland and reforested areas serve as carbon sinks. Added benefits include soil erosion reduction.
- **Riparian Buffer Strips, Windbreaks & Shelterbelts:** Involve use of wooded areas to protect farmlands from the erosive effects of waterbodies and winds. This erosion control prevents loss of soil organic matter needed to ensure carbon sequestration.

Results

From 1981 to 2011, agricultural best management practices helped reduce Canada's annual biological farm emissions from 1.1 million tonnes to -11 million tonnes, effectively making agriculture a carbon sink. Canada's crop sector alone has sequestered the equivalent of 61.4 million tonnes of carbon since 1986 for a total value of just under $1 billion (around 750 million US $) when priced at $15 (around 11 US $) per tonne under Canada's federal carbon pricing regime. Furthermore, agriculture supports landscape scale adaptation through soil conservation, air quality and localized cooling during heat events.

Climate smartness

The different practices promoted in the project, contribute significantly to the three CSA pillars, as they are focused on mitigation and adaptation to climate change and mainly the cost-effectiveness of crops. Most of the practices promoted in the project are identified within a global CSA evaluation carried out by Sova et. al., 2018.

It is worth mentioning that those practices are more focused on nitrous oxide emissions, production and use of biofuels. Changes in the management of cattle and forest systems are mostly related to mitigation, understood as the reduction of emissions and the capture of greenhouse gases.

The practices focused on crop management and the use and conservation of water sources, are more related to the increase of the adaptive capacity of productive systems.

It is necessary to consider the incorporation of additional practices that are currently working in the region, which can improve the yields and climate resilience of the farmers. Similar, it is essential for the optimal implementation of climate-smart agriculture practices the strengthening of the climate information flow to the producers, as well as the empowerment regarding to the use of climate information, to ensure better decisions in the future, adjusted to their socioeconomic and environmental conditions.

COLOMBIA

CLIMATE SMART VILLAGE APPROACH

Presenter

CGIAR-CCAFS[3], Ecohabitats Foundation and Asociación de Juntas de Acción Comunal del noroccidente de Popayán - Cauca-Colombia (Association of Community Action Boards of the northwest of Popayán - Cauca-Colombia).

Description

The main impacts of climate change are: drought, strong winds, hails, excessive rainfall and uncertainty on when and what to plant.

The main effects are:

- economic losses due to production or quality reduction;
- food insecurity due to non-production periods due to climate variability, thus they have to buy their food in the city (Popayan);
- Soil deterioration, due to lack of knowledge on soil nutrition needs and management during drought or flooding periods;
- Lack of access and availability of water for irrigation, especially during seasons with low precipitation.

Great practices have been implemented with Ecohabitats - CCAFS-CIAT support. These are:

- Home garden with plastic cover, rainwater harvesting, water storage tank and drip irrigation;
- Biofactories: sites to produce solid and liquid organic fertilizers with mountain micro-organisms, and zinc roof used for rainwater harvesting;
- Reservoirs on and under land (with plastic cover that allow storage of 30,000 to 40,000 liters of water, covered with shade meshes to prevent the decomposition of the leaves in the water and the deterioration of its quality;
- Mechanical water pump to extract the groundwater, adapted with a bicycle to facilitate the extraction;
- Different kind of home gardens (circular, vertical, traditional) adapted to the needs of the family;
- Crop diversification, including the pilot experience of vegetable production in greenhouses of 400 m2;
- Introduction of varieties of bean tolerant to drought and biofortified beans and corn. All of the above, under a community approach led by the local partner Ecohabitats and the support of CCAFS and CIAT, through the field schools for adaptation approach, land planning for adaptation, participatory research, and social innovation, among others.

3 Being CCAFS the presenter of this initiative no "Climate Smartness" assessment was included in this practice.

Results

• Families adapted to climate variability with knowledge in the design and implementation of adaptation measures and farm planning incorporating climate factors;
• 3 young leaders, 18 adults trained to implement adaptation measures and with the experience and capacity of replicate measures in other municipalities of the country;
• A start-up led by a young woman, as an evidence that the farm is a capital for the new generations;
• A vegetable marketing chain linked to over 60 organizations led by women farmers in coordination with governmental and non-governmental organizations;
• 7 communities strengthened with ties of solidarity and valuing knowledge as part of its adaptation mechanisms;
• Pilot experience for Latin America, consolidated in a territory with high vulnerability to climate change that serves as an apprenticeship to other territories and countries.

DENMARK

SUSTAINABLE PIG FARMING

Presenter

Landboungdom (Rural Youth)

Description

The climate is a real challenge for the whole world: the average global temperature is increasing. More extreme weather conditions are observed. Farmers are greatly affected by the weather condition. Even a single hot Summer resulting in a bad harvest has the possibility to ruin local farmers' economic prospects for years to come. As the weather changes, the crops and seeds used by local farms are not necessarily in their natural habitat any longer. Food production impacts the climate and, as a result, new and innovative solutions are needed to feed a growing population while considering the climate challenges the world is facing.
Rural Youth identified best practices in adaptation and mitigation of climate change on pig farming:

- Emissions could be reduced by about 22% by removing manure more frequently from pigsties into manure tanks. This method is called frequent evacuation. In short, it implies transferring manure from the pigsty to a manure tank more quickly. Instead of evacuating the manure every five to six weeks, it is evacuated once a week.
  Since the temperature of the manure tank is lower than that of the pigsty, methane emissions are lower, significantly reducing greenhouse gas emissions. It is estimated that methane emissions from pork production could be reduced by 22% by applying the frequent evacuation method in 90 % of pigsties.
- Renovating existing buildings help minimize the use of materials and creating functional state-of-the-art stables. Thereby we are tapping into the circular economy ensuring better management of the earth's resources. The growth of the world economy and the growing world population will mean increased global demand and an increase in re source consumption. This implies a more circular mindset. Thus, renovation of for example old, out of use, poultry buildings into pig stables ensures a proper recycling of materials and waste prevention through repaired or upgraded investments.
- Efficient and short transportation of farm animals help lessening livestock emissions and ensure animal welfare. Optimal location of a slaughterhouse means that pigs do not need to be on the road for more than 20 minutes before they arrive at the local slaughter.

Results

• Implementing frequent evacuation systems is not free of charge and it is estimated that for example full implementation of the frequent evacuation method would cost the industry 2 million euros (around 2.2 million US $) per year.
• Investing in buildings is an indispensable necessity. Using existing buildings at our farm means the cost of renovation is somewhat higher, however taken into consideration the alternative investment in new buildings the financial scope is somewhat limited. Moreover, the local community is now rid of buildings that otherwise would be dilapidated.
• Short transporting of animals: transport represents almost a quarter of Europe's greenhouse gas emissions and is the main cause of air pollution in cities. As we are able to transport pigs in short distances, the pollution from the livestock supply chain are held at a minimum. This proves local jobs in rural areas benefitting the community, welfare for the animals and lessen the emissions from transportation.

Climate smartness

The promoted practices on this project are focused mainly on the reduction of greenhouse gas emissions from both animal excreta management, material recycling and use reduction in fossil fuel use. The project may additionally benefit if the use of climate information is carried out to plan and manage pork production, in terms of improving potential stresses that climate may be generating and, therefore, affecting the productivity of the system.
If the information is available, it might be worth sharing how the implementation of the practices is reducing production costs and /or increasing revenues for the farmers.
In the same way, it might be important to explore further low-cost mechanisms that would enable scaling out/up the practice to other areas.

ETHIOPIA

FARM AFRICA'S MARKET APPROACHES TO RESILIENCE

Presenter

Farm Africa

Description

Lowland Ethiopians are some of the most climate vulnerable people in the world, relying primarily on rain-fed livestock and agricultural production as a source of income in the face of frequent and unpredictable droughts and floods. The little weather information available to communities is often not reliable due to the very localised nature of the rainfall and the generalised nature of forecasts. As a result, local governments have limited skills and capability to plan and respond to climate shocks. Due to the remote locations, there is also limited access to financial services, which is a critical factor in helping households diversify income streams in the face of climate shocks.

Few people are engaged in climate-smart agricultural practices, and communal systems to manage natural resources such as forests and rangelands suffer from the 'tragedy of the commons' as natural resources are treated as a common good. All of this combined exacerbates vulnerability to climate shocks both for agro-pastoralists and pastoralists alike. The traditional migration to urban centres, which might relieve stress on rangelands, is hampered as few employment opportunities exist, especially for rural migrants.

Farm Africa's Market Approaches to Resilience (MAR) project has made rangeland-dependent agro-pastoralists better able to cope with natural shocks such as drought in the Afar, Somali and SNNP regional states of Ethiopia.

The MAR project has taken a "systems" approach that aims to bring about transformative changes in the ability of people in lowland Ethiopia to deal with climate shocks. The project, which was part of the £140 million (around 180 million $) Building Resilience and Adaptation to Climate Extremes and Disaster (BRACED) programme funded by the UK government, simultaneously addresses multiple drivers of climate vulnerability.

The MAR project supports households, businesses and communities in better managing their resources and everyday risks. It works with private investors to address climate risks by promoting appropriate economic opportunities and designing financial models that help smooth risk. It also stimulates the appropriate diversification of economic activity among the most vulnerable, through public and private sector partnerships.

These include:

- Promoting insurance by providing support to the innovative design, pricing, marketing and outreach of services to communities;
- Building local government capacity for green towns;
- Helping establish village savings and loans associations;
- Supporting microfinance institutions to incorporate climate risk into their risk management portfolios and help them develop innovative credit products;
- Strengthening rapid-onset emergency response by working with the private sector to manage contingency funding;
- Supporting financial institutions to expand mobile banking to remote areas and exploring the potential for other mobile applications to improve information flow;
- Strengthening climate information by funding weather station infrastructure;
- Supporting participatory rangeland and natural resource management.

Results

Between 2015 and 2018:

- 6,284 people were helped to set up 327 Village Savings and Loan Associations (VSLAs), which issue loans to finance the start-up of small businesses. Estimation of benefits of income generated from the loans to be nearly five times the costs of setting up the VSLAs;
- Pastoralists were able to access livestock indemnity insurance for the first time;
- Project participants diversified their incomes by undertaking new green jobs in urban areas, adopting new farming practices, such as vegetable farming and beekeeping, and investing in new businesses;
- Food supply was increased for a third of project participants through access to VSLA loans during emergencies, im proved natural resource management and investments in livestock and farming practices;
- Livelihoods were made more climate resilient through the regeneration of depleted grazing lands, increasing the availability of food for livestock. Radio weather broadcasts and advice from 224 Early Warning and Environmental Committees means farmers are better able to anticipate, prepare and respond to shocks;
- Most of these outcomes relied on multiple interventions, highlighting the benefit of taking a holistic approach to building climate resilience.

Climate smartness

The promoted practices in this project are mainly focused on financial services as a mechanism to strengthen adaptation to climate change, especially in terms of guaranteeing access to resources to respond to climate events that have impacted producers. Similarly, it focuses on the implementation of a meteorological network that allows producers to monitor climatic conditions on their region. Therefore, this initiative contributes in terms of increasing the producers' adaptation and improving the stability of their income, which is part of the CSA approach.

However, it would be important to guarantee the optimal use of the information collected from the weather stations, as well as strengthen the capacities of the producers in the interpretation and use of the data, making emphasis on linkage of climate and crops to support them in the decision making processes to better manage agricultural systems. It would also be useful to prioritize practices that may be funded through the financial mechanisms (some of them in CIAT and BFS/USAID, 2017), as well as to understand whether the approach is post-event or also aims for preventing crop-losses prior to the climate extreme events.

Moreover, it would be interesting to include financing alternatives in the future that encourage producers to adopt CSA practices that in addition to increase adaptation and increase income from productive systems, also contribute to emission reductions or to the capture of greenhouse gases as a co-benefit.

FINLAND

FOREST MANAGEMENT

Presenter

Jesse Mårtenson – young farmer

Description

In Finland, forestry farmers have already witnessed effects of climate change:

- Change in the distribution of certain tree species (eg. Spruce);
- More frequent mass occurrence of certain pest insects (eg. Spruce bark beetles);
- Patterns in precipitation have changed and Winters have got milder. It is a challenge for the forestry sector since felling and collection of trunks from the forests are mostly performed with heavy machinery. This technique is based on the presumption that the ground is frozen and can therefore carry a heavy load without damaging the soil structure;
- Frequency of occurrence of heavy wet snow accumulated on trees has increased, which in turn creates suitable cir cumstances for pathogens when heavy snow brakes branches and tops of trees;
- Hard winds and storm damages are more common. In the future, it is predicted that tree growth will slightly increase because of temperature increase that is connected to the climate change. Higher pressure from pests and pathogens is expected in this case as well.

Jesse Mårtenson utilises a forest management plan that the local forestry advisory service has provided.
The plan ensures the continuous growth of trees in the forests. That means that the forest management practices are divided into smaller stands of trees of similar age. This creates a mosaic of trees in different growth stages and ensures that there are always trees growing and sequestering carbon from the atmosphere.
Trees grow faster in a managed forest where growth is enhanced by providing optimal light conditions through thinning.
After the final felling is performed, trees are planted to regain the growth of the forest as soon as possible.
Planting the trees also gives the farmer the opportunity to optimize species of trees for different growth environments.
Fast renewal reduces leakage of CO_2 as a result from degradation of organic material after the logging and conserves the carbon that has been stored in the soil.
Moreover, to prevent pathogens and pests from spreading, farmers are always removing trees that have fallen or have been injured by abiotic or biotic factors.
Thinning and utilization of residues from management practices also prevents uncontrolled forest fires.
On the farm, Jesse Mårtenson has invested in a bio burner with a heat exchanger, that allows him to burn the residues from the forest practices and using renewable energy on the farm for heating in wintertime. On the farm, they are also using the same system for generating heat for drying cereals. Usually the heat that is required for drying the cereal is ge-

Results

On Jesse Mårtenson's farm, forest management has provided job opportunities both on farm and within the local rural community.
These practices are also fundamental for providing the forest industry in Finland with raw material. Because of management practices the farm was able to collect approximately 1 250 tonnes of CO2 stored in wood from the forest. Each cubic meter of stem wood sequesters approximately 750 kg of carbon dioxide, according to "Climate benefit of the Nordic Forests", Nordic Forest Research (SNS) and the Nordic Council of Ministers, 2017.
The forest's management plan also takes into account other environmental factors such as water management and biological diversity. In the management plan, valuable key biotopes have been identified on forests, preserving these biotopes. Financial outcome from the forest has enabled many on-farm investments, mainly to develop and modernize farming practices.

Climate smartness

The practice promoted in this project is focused mainly on forest management to address deforestation; therefore, it is both contributing to adaptation and mitigation. Income generation is also an important component of this practice considering the farmers can use wood as a source of income and due to better management practices, pests and diseases are better controlled. Finally, all the activities described also contribute to the optimal use of crop residues and by-products, mainly as fuels. Thus the project is contributing to climate smart agriculture since its implementation is enhancing all three CSA pillars (adaptation, mitigation, and productivity).
Additionally, practices that allow the improvement of the soil condition that have been already impacted by the use of heavy machinery could be included in the project, as an additional conservation strategy of increasing productivity and reduce emissions.