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


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WORLD FARMERS' ORGANISATION


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Agriculture and
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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'.

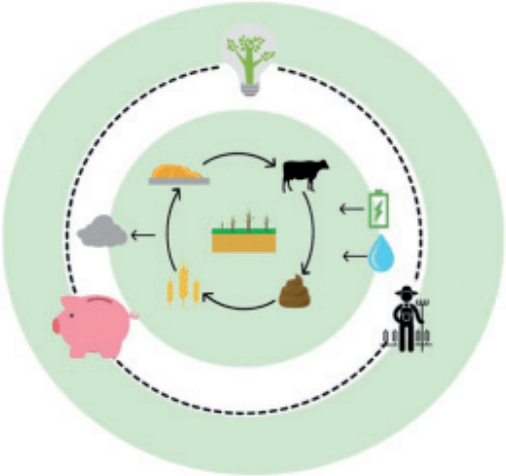
The climate trajectory:

(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 (CO_2) 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 (N_2O) 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.

FINLAND

SUSTAINABLE MANAGEMENT OF LAND

Presenter

Central Union of Agricultural Producers and Forest Owners - MTK

Description

Extreme weather events – drought, heat and heavy rains – more than before plus shorter Winters and snow cover are affecting Finland.

MTK's Climate Programme has four pillars:

- Emissions down;
- Sequestration up;
- Replaced by renewables;
- Adaptation as a key.

The programme recalls the essential role of productive plant growth and photosynthesis in sequestering carbon dioxide from the atmosphere. It recalls research and information to reveal the capacity of active farming and forest management in sequestering and storing carbon and in substituting for fossil materials and energy. The programme shows how farmers and forest owners are key players, contributing to tackle climate challenges:

- On farmland, crop rotation by perennial grasses sequestrate carbon and improves soil structure to adapt. This means that after heavy rains puddles disappear quickly and soil holds heavy machinery, also after the grass period. Soil is also easier to till and retain moisture when soil organic matter increases;
- Green cover by growing crops and reduced tillage reduce emissions which means mitigation, likewise manure spreading by placement below soil surface;
- In forest, trees need to be thinned to make them grow and small trees need to be taken care of to be able to grow and sequester carbon which means mitigation;
- Overall, the sustainable management of land which maintain green cover and renew the growth after harvest on farmland and forest is a practice for mitigation, and also crucial part of adaptation as roots heal soil to adapt.

Results

The productivity of soils remains, and the resilience to produce during less favourable seasons is strengthened, because of increased soil organic matter on farmland. In forests, the active management reduces risks of insects or fires.

Climate smartness

It is worth highlighting that this initiative has clearly defined aspects within the CSA approach because the four pillars of the MTK's Climate program are completely aligned with CSA. The promoted practices on the project aim for sustainable production, emissions reduction, carbon sequestration, and increasing the resilience of agricultural systems to different climatic events.

It is recommended to include building capacity processes that allow strengthening how farmers understand and use climate information so that they make better-informed decisions considering their context-specific conditions and CSA practices available to implement.

FRANCE

CARBON-AGRI

Presenter

The French livestock institute (IDELE), the interprofession of meat and milk (Interbev and CNIEL) and farmers associations (CNE).

Description

Since 2013, ruminant breeding sectors have been engaged in the fight against climate change.
Today more than 12,000 cattle farms are involved in low carbon initiatives. Many technical levers for reducing GHG emissions and increasing carbon storage are offered to farmers to reduce the carbon footprint of milk and meat produced.
In order to certify these emission reductions and this additional carbon storage, the French livestock institute (IDELE), the interprofession of meat and milk (Interbev and CNIEL) and farmers associations (CNE) developed the "CARBON AGRI" methodology, which is labeled by the new "Low Carbon Label" created by the French Ministry of Ecology.
France Carbon-Agri association, created by breeders' representatives, facilitates the implementation of agricultural projects to reduce GHG emissions in France. The objective is to involve and support farmers and their technical partners in their low carbon initiatives and create the link with the actors – communities, companies – who want to support financially and transparently innovative projects for the climate.
Many economic players (Paris City Hall, BNP Paribas, La Poste, J.O. Paris 2024, Metropole of Nancy, etc.) testified their desire to achieve carbon neutrality and support the low carbon transition. The Label "Bas-Carbone" provides a certified framework for the development of local voluntary compensation projects.
This is a low carbon voluntary policy creating a training phenomenon involving all stakeholders. An innovative compensation perspective, this label will remove the obstacles to change.

Results

On September 30, 2019, the Ministry of Ecological and Solidarity Transition approved the CARBON AGRI methodology. This certification makes operational the certification of low carbon projects implemented on farms. In this context, France CARBON AGRI association was created to ensure project engineering and thus provide support to regional or national project sponsors. The first call for projects is now open, the project holders and / or farmers can come forward with the association or the Institute of Livestock.

Climate smartness

The political support and the particular commitment of the leaders of this initiative have helped its scaling, as a result of a public-private partnership.
In addition to that in CARBON AGRI description , it is mentioned that, in order to promote mitigation with the creation of low carbon labels, the project has created the opportunity for some farmers to have access to new markets and improve their income. For all the above, CARBON AGRI is line up with CSA pillars by reducing emissions and increase producers' income.
It is recommended to generate a portfolio of practices that helps to reduce GHG emissions, increase productivity and improve the adaptive capacity of the cattle system to climate variability events.

FRANCE

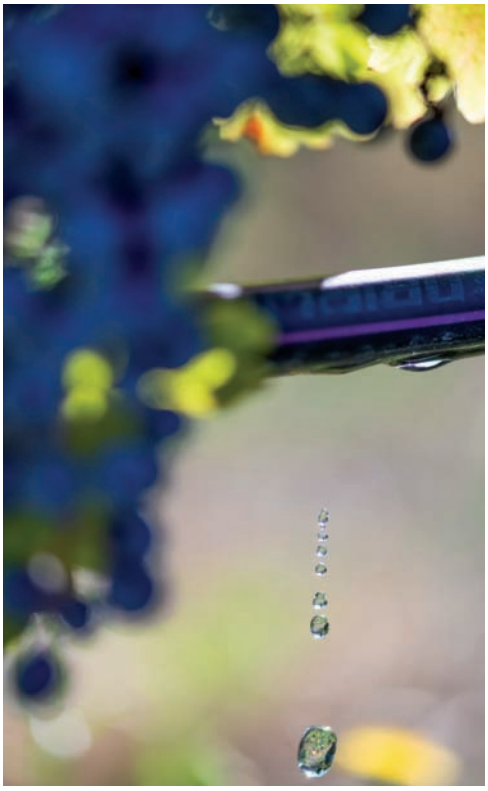
PRODUCING WINE IN CLIMATE CHANGE

Presenter

Samuel Masse - Young farmer, CEJA

Description

In Southern Europe, the main effects of climate change observed are the intensification and increase in the duration of intense episodes such as drought or heavy precipitations resulting in floods.
The most recent example dates back to June 21st, 2019, with a heat wave that destroyed 30% of the farm production at a temperature of 46°C.
However, most of the effects are less spectacular and more insidious. For the past 5 years, on Samuel Masse's farm, they have seen a significant drop in agricultural yields, with plants that are increasingly affected by episodes of dryness. They have also been able to observe the impacts on the fauna and more particularly the insects and the birds with a strong decrease of the populations and the migrators who arrive and leave earlier.
To adapt to the effects of climate change, the young farmer has set up (on half the vineyard) a network of drip to irrigate the vines and moderate the effects of intense water stress. In parallel, to avoid erosion during heavy rains, they have rebuilt the old stone walls bordering the plots. Another positive effect of these walls is that they are excellent hotel insect.
To go in this direction, they have planted hedgerows on the edges of the plots and trees to welcome the birds but also to help the bats who are essential allies to regulate the population of insects. With the climatic warming they have decided to plant varietals of vine naturally resistant to the effect of dryness coming from Spain.



Results

Regarding irrigation, the main difficulty refers to the cost and especially the implementation that required a lot of work. Moreover, being in organic agriculture, they had to suspend the pipes to be able to work the soil between the vines.
The irrigation allowed to secure the income by having more regular harvests.
However, the positive effect is the regularity of the yield of grapes but also a better quality in the maturity of the grapes because too intense water stress blocks the sugars and therefore their ripening.
Other developments (dry stone walls, hedges, etc.) allowed to reduce pesticide use by having a better regulation of the insect population such as Cochylis and Eudemis (moth).

Climate smartness

Practices on irrigation, implementation of live/dead fences to reduce erosion and the use of vines varieties with drought tolerance are considered CSA practices, which contribute mainly to adaptation and productivity pillars with mitigation co-benefits in some cases. It is worth highlighting that live fences have adaptation co-benefits concerning insects, which reduces the chances of crop losses. Moreover, practices that involve tree-planting help significantly to increase carbon sequestration, therefore, contributes to mitigation.
The initiative might benefit from including other practices, which can be identified by farmers if building capacity processes are put in place. For example, strengthening capacity on understanding climate information is important the climate information flow strengthens with farmers, ensuring that in the future they can make better-informed decisions considering their socioeconomic and environmental conditions.
It is highly recommended to seek solutions that are cost-effective, as it increases the chances that the practices will be implemented by farmers over time. Therefore, it would be useful to implement practices that have already been assessed regarding their cost-effectiveness prior to promoting them to farmers and sharing with them both the synergies and trade-offs when implementing each practice.

GERMANY

SLURRY AND MANURE BIOGAS

Presenter

Deutscher Bauernverband (DBV) - German Farmers' Association

Description

The last years brought severe weather challenges for German agriculture, including the spread of invasive insects (for instance, drosophila suzukii in 2015) and an increase of late-frost events (2017) that caused damages in the fruit and wine sector, extreme weather events such as heavy rainfalls during harvest and sowing season (2018) that hindered agricultural practices, and heat-waves such as in 2018 and 2019 including the extreme drought in 2018 that reduced grain harvests in some areas by 70% and led to feed (grass) shortages for livestock. For the future, climate adapted plant breeds will be essential as well as irrigation infrastructure and access to irrigation water.

Farmers already adapt to climate change by applying more conservation agricultural techniques such as reduced tillage to keep water in the soil, diversifying farm income and using insurances.

DBV has set the target to increase the proportion of manure used in biogas plants from the current 20% to 60% by 2030. Overall, DBV aims at reducing greenhouse gas emissions in agriculture by 30% by 2030 on a 1990 baseline. This equals another 10 percentage points on a 2018 baseline.

The increase in slurry fermentation from about 20% to 60% is expected to save methane emissions in agriculture by around 3 million tonnes of CO2 equivalent. Furthermore, the biogas produced in the biogas plant replaces fossil fuels in various sectors (electricity, heating, fuel), thereby saving greenhouse gas emissions outside agriculture. Biogas from all feedstock sources saved 15 million tonnes CO2 equivalent by replacing fossil energy. In addition to the positive effects on the climate, liquid manure utilization in biogas plants has a number of other positive effects, such as lower odour emissions from digestate compared to manure, better nutrient availability for plants and fewer germs and weed seeds.

The energy recovery of manure in biogas plants creates additional added value in rural areas through the construction and operation of the plants and represents an additional source of income and income diversification for agricultural enterprises.

Results

- Reducing greenhouse gas emissions in agriculture by 30% by 2030;
- Increasing the proportion of manure used in biogas plants from the current 20% to 60% by 2030.

Climate smartness

It would be useful to take advantage of the energy generated through the biogas plants to increase performance of other CSA practices such as irrigation mechanisms, water pumping systems, among others.

GHANA

MARKET ORIENTED COCONUT PRODUCTION

Presenter

Nzema Jomoro Coconut Farmers' Association

Description

Climate change has resulted in heavy, repeated and long periods of rain, which initially lead to an increased coconut harvest in the rainy season, that then results as a surplus. This leads to marketing challenges and reduced prices, with low incomes for farmers. Meanwhile, in the dry season, there is a reduced coconut production, with higher prices.
To overcome these challenges, the members of the association determined to go with the dynamics of demand and supply by storing coconuts during the period of surplus, in order to get more income and profit during the dry season, when there is high demand for coconut and resulting price increases. This has enabled group members to coordinate to cart their produce collectively into urban areas with more increased profits.

Results

This practice implemented by coconut producers has resulted in reduced waste and generated stable level of income in the year-round.

Climate smartness

The leadership of this initiative is in charge of a national farmers' association (COFAG), this may help its scaling and guarantees benefits for many.
The described practice is completely framed within the CSA approach, which is based on the pillars of adaptation, mitigation and productivity, since by controlling the quantities offered to the market, the producers reduced the climate impacts on their incomes, improving their adaptive capacity. In addition, they have reduced their GHG emissions by reducing the waste generated in the production and sale process.
The practice can be improved if the waste is used to generate energy or biofertilizers (further reducing its emissions). Furthermore, if coconut transformation is included, producers can generate added value to the product and thus generate greater income to the association.

GRENADA

ORGANIC FARMING DEMONSTRATIONS

Presenter

The Grenada Organic Agriculture Movement (GOAM)

Description

Too much water, too little water, rainfall intensity, too high temperatures and pest and diseases continue to be the most noticeable impacts on the farming system in Grenada. What is missing is hard data to ascertain whether or not these anomalies or occurrences are due to climate change or some other phenomenon.

Thanks to funding from Global Environment Facility (GEF) and the Integrated Climate Change Adaptation Strategies (ICAS), GOAM implemented demonstrations of best practices to combat climate change. These demonstrations included:

- Composting;
- Biochar production;
- Mulching;
- Establishment of wind breaks;
- Organic pesticides;
- Making of compost tea;
- Vermiculture;
- Use of swales to manage water flow.

GOAM collaborated with other farmers' organizations to demonstrate other practices, for instance crop rotation and the use of repellents and attractants to control pest.

Results

The timeframe of the projects did not allow to fully measure the impact of these practices on the farming system. However, post project monitoring of some of the sites is showing interesting results. There is more knowledge now in providing workable solutions to farmers who request information of organic practices that can be used in an organic farming system.

Climate smartness

The practices promoted in the project contribute significantly to the three CSA pillars as they focus on mitigation, and adaptation to climate change, as well as crop's profitability. Most of the practices promoted in the project are identified highlighted in Sova et. al. (2018) report as one of the most important CSA options globally.

It is worth mentioning that all the practices contribute to climate change adaptation in the first place, however, some such as wind breaks and Biochar production, have significant contribution to the mitigation pillar.

The project may benefit of including additional practices tailored to the specific needs and conditions of the farmers, which can be done through a deeper understanding of weather and climate behaviour, linkages with agricultural production and mechanisms to use forecasts to better plan and manage crops and overall agricultural activities. This can be done through participatory methodologies for building capacity on climate for farmers' decision-making processes.

For more information about CSA, in the study of World Bank, CIAT and CATIE (2014), it is possible to identify several practices for Grenada evaluated around 6 key criteria: Water, Carbon, Nitrogen, Energy, Climate, and Knowledge / Info.

INDONESIA - SULAWESI ISLAND

IMPROVING COCOA BEAN YIELD AND QUALITY

Presenter

Former International Plant Nutrition Institute (IPNI) in collaboration with local sustainability program Cocoa Care

Description

Cocoa is a key crop for many Indonesian smallholder farmers, who own more than 90% of the country's plantations. In recent years, however, a combination of ageing trees, pests, diseases, poor soil health and nutrient depletion has seen cocoa bean yields fall from around 750kg/ha in the 1980s to below 400 kg/ha over the last two decades.

Despite producing 65% of Indonesia's output, smallholders in Sulawesi have poor knowledge of cocoa farming and limited access to farm inputs such as fertilizers and finance. Many of them are in a downward spiral of poverty, with some ready to give up growing cocoa entirely despite increasing global demand.

In 2013, a project was launched to train smallholder cocoa farmers in Sulawesi and demonstrate the benefits of proper nutrient management and develop local fertilizer recommendations.

Farmers and their families were trained in 4R Nutrient Stewardship management practices – applying the Right nutrient source, at the Right rate, at the Right time, in the Right place – alongside other best management practices (BMP) for cocoa farms, such as pest management and pruning.

In addition, they received farm tools, fertilizer, compost and high-quality cocoa tree seedlings and family members were taught business management. Participating farmers were also assigned Cocoa Carers - well-trained and experienced local cocoa farmers with model farms of their own to demonstrate BMP and yield potential.

Results

The project showed that BMP and balanced fertilization increased both the yield and quality of cocoa, ensuring a sustainable income for cocoa farming families. BMP created improvements within three months, while adding 4R managed fertilizers produced average yields of over 1,000 kg/ha, over twice the regional average of 500 kg/ha.

With most cocoa traditionally harvested in Sulawesi between June and August, limited cash income usually restricts farmers' ability to invest in inputs for the rest of the year. Participating farmers, however, could produce crops regularly throughout the year, ensuring a continuous cash flow to reinvest and spend on food.

By producing high yields of superior quality, commercially viable cocoa beans, the project helps smallholder farmers, their families and the surrounding rural area benefit economically.

Working closely with local smallholder farmers and encouraging knowledge transfer, the project ensures that the wider agricultural community can also benefit from improved practices.

By teaching farmers responsible 4R nutrient management and best practices for soil health, the project helped protect the environment by ensuring that nutrient losses are minimized, and soil is healthy, increasing its ability to store water and carbon.

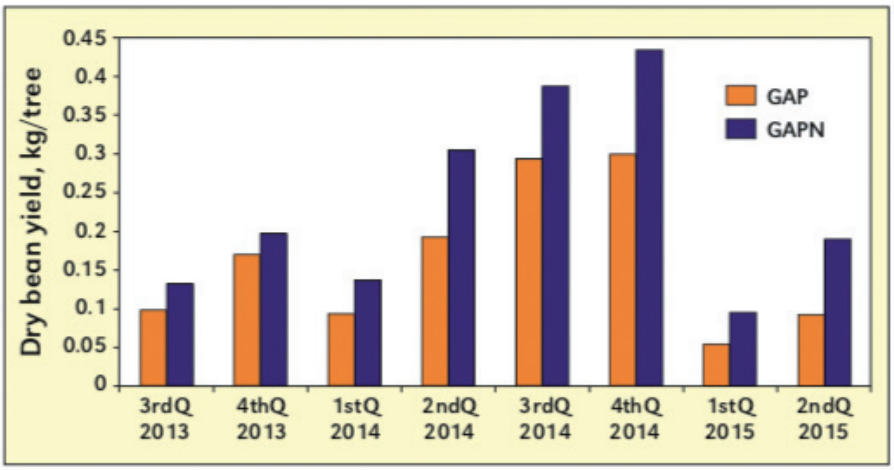
The project has also helped to identify the most appropriate fertilizer formulations and management practices to help Sulawesi cocoa farmers increase their yields..

Climate smartness

First, it is worth highlighting the involvement of experienced farmers and an expert on cocoa management through the implementation of the project, as this can improve the future sustainability of the initiative and it is also an effective strategy to use with the intention for further scaling of the practices.

With respect to the CSA pillars (adaptation, mitigation and production), the optimal application of fertilizers to plants, mainly nitrogen, helps to reduce greenhouse gas emissions, especially nitrous oxide (mitigation). Moreover, by reducing investments in fertilizers, the total income of the producers increases, which also increases the productivity of the cocoa crop.

The project may benefit of building capacity processes to increase farmers' knowledge on climate, its use for crop planning and management. This will definitely increase the ability of farmers to make better-informed decisions on their agricultural activities using weather forecasts and understanding the potential implications in terms of crop losses, as well the measures they may need to take to reduce negative effects.



IRELAND

SUSTAINABILITY IN MCAULIFFE PIG FARMS

Presenter

McAuliffe Pig Farms

Description

Commercial pig production in Ireland is an indoor system. Therefore. it is not directly affected by climate change compared to a tillage or grassland-based production system. However, as 70% of the cost of production is related to feed, the effects of climate change on crops is a worry as this can affect the growing and harvesting of the crop leading to both scarcity and quality issues. Soya is the most common protein source for pig diets and is mainly grown in the USA and South America. The use of soya can contribute to deforestation and increased food miles.

Extreme heat can reduce feed intake in pigs and reduce productivity. Extreme weather conditions can also affect the ability of pig housing to remain energy efficient.

Water use is quite high in commercial pig production and the threat of water scarcity is an ongoing challenge, particularly in areas affected by water shortages. The farm has worked with pig nutritionists to reduce the amount of soya protein in the diet by 20%, which subsequently reduces the pig's ammonia emissions by 15%. Feed is frequently produced in areas removed from pig production, so it is important to look at ways to reduce on reliance on these feeds to continue to reduce greenhouse gas emissions.

On the farm, pig slurry is not seen as waste, but as a valuable fertilizer. Farmers carried out research with clean-tech company Dionergy using their EL300 aerator in the slurry tank. Dionergy's treatment solutions are plug and go installations that sit on and floats on top of the waste in tanks.

Water scarcity is taken into account by collecting all the rainwater from roofs in large underground tanks to reuse for washing purposes. Rooms are washed and disinfected between each batch of pigs.

An additional investment regards the heating of piglets by plastic pads which are in turn heated by air to water heat pumps. These heat pads act as hot water bottles, as hot water is pumped into them. An air to water heat pumps system consist of four major elements that allow the refrigerant to pass from the liquid state to the gas: a compressor, a condenser, an expansion valve and an evaporator;

- A fan passes air over the evaporator, the refrigerant absorbs heat from the outside air. The refrigerant boils and evaporates at a low temperature giving us vapour;
- The vapour passes into the compressor and compression increases the temperature;
- The warm vapour is condensed is the heat exchanger and the rejected heat is passed onto the heating and hot water system;
- The condensed vapour returns to liquid, passes back through expansion valve, reducing pressure and temperature, ready to start cycle again.

All pig buildings have been renovated in recent years to improve insulation which controls temperatures more effectively using high grade insulation. Moreover, the farm uses high-tech ventilation control systems and ECBlue Low Energy Consumption ventilation fans.

Results

The air to water heat pumps mentioned above has led to energy savings of up to 75%. This is the equivalent in oil terms of approximately 18,000 litres per year.
The use of rainwater harvesting system for cleaning and disinfection is just a small part of a biosecurity programme. As the farm runs a high health herd, farmers carry out measures to prevent the entry and spread of disease. All visitors must be 'pig clean' for 72 hours. All visitors including the team working on the farm must shower in each day. Fresh clothes and footwear are provided. Foot dips with disinfectants are used at the entrance of each pig house. Food safety is an important part of sustainable pig meat production and biosecurity practices help reduce food safety scares at farm level. High health standards lead to increased consumer confidence and increased production efficiency.

Climate smartness

The practices promoted in pork production systems are mainly focused on reducing greenhouse gas emissions during the process to improve the adaptation of production systems, which are directly vulnerable due to climate variability.
Certain climatic conditions can stress the animals and reduce their productivity; moreover, pork production is highly dependent on water availability and feed, therefore when these are scarce prices may go up. This project is addressing all pillars of CSA focusing in reducing emissions, increasing productivity and reducing vulnerability of productive systems under a climate change context.
A capacity-building component on understanding and use of climate information may benefit the project goals. Participatory methodologies to strengthen the capacity of farmers in order to plan and manage their production system considering historic and future climate behaviour may empower them to make better-informed decisions on their activities. Weather forecast may provide elements to understand prices variability on relevant inputs for pork production. Moreover, it could guide decision making towards water storage practices.

ITALY

TORRE DELLE CARCIOLE FARM

Presenter

Torre delle Carciole Farm

Description

The farming sector is particularly vulnerable to climate change that has caused extensive damage to agriculture. In Italy, damages caused by the climate change in the last decade amount to 14 billion euros (around 15.4 billion US $) and are due to the alternation of extreme events, from prolonged periods of drought to violent waves of bad weather that have devastated crops, structures and infrastructures. Italy holds the European leadership in terms of number of companies operating in the organic sector, and even this primacy is being put at risk by climate change that affects the typical Made in Italy products and the crops, particularly due to the arrival of alien species that are killing fruit and vegetables.
Torre delle Carciole farm started the cultivation of Phyllostachis Pubescens Edulis bamboo in 2014, in order to have a short rotation timber production for the sale of fine wood to the processing industry. The waste and unsold part is valued as a raw material for the production of electrical and thermal energy with a positive environmental impact. The bamboo in its final uses has a neutral or positive CO2 impact.

Results

CO2 positive energy from Bamboo is a project based on the speed of growth of bamboo and its thermodynamic characteristics. It is ecological and protects the environment. No treatments nor fertilizers are needed, bamboo derivatives have a positive CO2 footprint, absorb 35% more of H20, avoid soil erosion, desertification and purify water. The goal is to have an autonomous cycle from planting to processing and use of the finished product with guaranteed basic profitability. From a general perspective, farmers from all over the world will have to feed an increasing population in forthcoming years, putting in place sustainable production models that are suitable for achieving global adaptation to meet the climate change challenge. Research and innovation can play a key role in helping farmers to improve their sustainability models, so there is a need for incentives and reward mechanisms in this sense. With particular regard to CO2 positive energy from Bamboo project, the main challenges to implement were:

- Minimizing water resources consumption by using innovation. More in detail, to reduce the water footprint it was necessary to invest in innovation with an ad hoc piping system for irrigation and fertigation (drip irrigation systems);
- Investing in chippers with adequate output to obtain a size suitable for Syngas plants;
- Learning to know at an engineering level the operation and maintenance of the syngas to guarantee their operation at least 7,000 hours per year.

Climate smartness

A key element of this project is that since its inception is designed to diversify production within the farm, use by-products for the generation of energy and reduction of greenhouse gas emissions, and implement several practices that allow the bamboo production process highly efficient in the use of water and fertilizers.
Its approach is definitely within the framework of CSA contributing to adaptation, mitigation and productivity pillars.

ITALY

MATRICA

Presenter

Coldiretti National Confederation

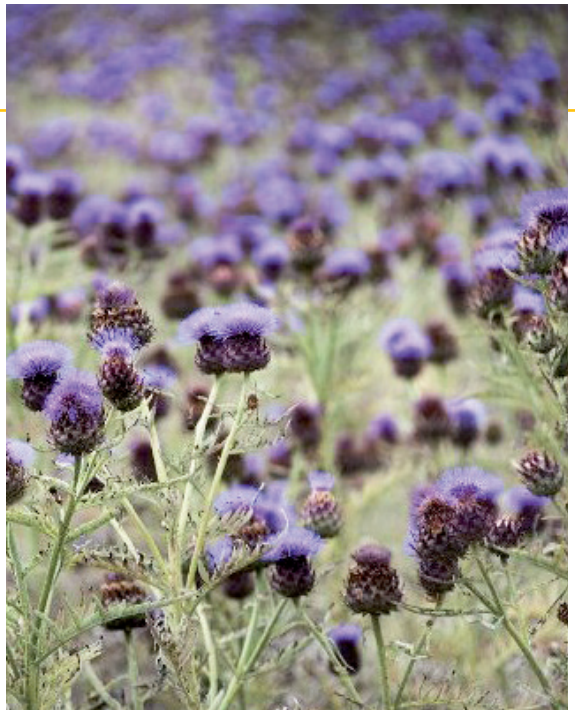
Description

In 2015, the Italian farmers' organisation Coldiretti signed an agreement with the company Novamont for the establishment of a new agro-industrial value chain for bioplastics and bio-lubricants. This joint venture is named Matrica and is focused on the exploitation of the cardoon. The cardoon is a naturally occurring species, grown on abandoned and uncultivated lands, that spontaneously grows in a large area of the Sardinia region; it does not need water irrigation, provides an anti-erosion effect and it has a good adaptability to harsh territories, if compared to other productions.
This input - together with other agricultural waste - is sold by farmers to the Matrica bio-refineries, which transform these elements into biochemical, bases for bio-lubricants, monomers for bioplastics and bio-additives for rubber.
The core idea is to create an agricultural value chain that respects the territory, valorises abandoned non-irrigated areas and introduces a bio-refinery deeply integrated into the territory in synergy with the food supply chain and aimed at producing high added-value products exploiting local raw materials.

Results

The project introduces a new model of regional development based on a collaboration between agriculture and the innovation industry and that gives practical application to the concepts of circular economy and innovation, at the same time providing additional sources of income for farmers and increasing vitality of rural areas. Main results are:

- The exploitation of abandoned lands, considered no longer profitable for food production;
- The creation of an integrated supply chain, gathering together farmers and industry;
- Efficient use of agricultural waste and/or residues;
- Cascade use of resources;
- Creation of new income opportunities for farmers;
- Development of new innovative and sustainable products.



Climate smartness

This project is designed to diversify production within farms and use highly tolerant species to drought conditions, to generate raw materials with commercial value in the biochemical industry. Additionally, by including the use of crop residues, contributes to the reduction of greenhouse gas emissions. Therefore, the project is framed in the three CSA pillars: adaptation, mitigation, and productivity.
It is important to highlight the agreements made with the processing industry, since this type of trade agreements guarantee the success of this type of initiatives, which is important for scaling up of these innovative production systems.

JAMAICA

RIO MINHO WATERSHEDS

Presenter

Jamaican Network of Rural Women Producers

Description

The main cause of climate change is the concentration of carbon dioxide in the atmosphere, coming mainly from fossil fuels, carbon dioxide, nitrogen and other gases. Jamaica's contribution to global emissions is very little compared to other countries, due to less industrialisation and presence of infrastructures. However, Jamaica's commitment to mitigate emissions is high: in Jamaican national policy, the country has set targets for the reduction of the dependence on fossil fuels and set targets for reforestation. Targets has been set as well in relation to reduction of emissions from vehicles by cutting down the importation of older vehicles which are less fuel efficient. Jamaica is also turning to more renewable sources of energy. The Country signed the Paris Agreement and have set a 30% target to reduce emissions by 2030. It is part of the group 'Seventy-Seven', maintaining a significant voice in international forums bringing the voice of farmers.
Jamaica has in place a national policy framework on climate change. This policy outlines the strategies that Jamaica will employ in order to effectively respond to the impact and challenges of climate change. The Country led the way in terms of political action, as the first one to create a Ministry with responsibility of climate change.
Practices are being implemented to manage watersheds that are being degraded throughout the Country. One important example can be identified in the project on Rio Minho watershed, where dams have been built in order to manage the run of the water coming from the hillside, channelled for irrigation purposes.
Moreover, farmers are looking for sustainable water harvesting techniques (reservoir ponds), instead of unsustainable catchment systems.

Results

Even though Jamaica is a small country - and not only Jamaica but other Caribbean islands - risks are large. In other bigger nations, if sea levels rise 2 feet they can retreat to a mountain, if in the Caribbean Sea levels rise above 2 feet, people may become climate refugees. In the Caribbean it is important to share best practices, to learn from each other and to make the necessary representation on behalf of rural farmers. There is a need for farmers to aggregate and be part of the discussions at International level through their representations.

Results of best practices implemented in the country are:

- Better water management;
- Resilience to droughts.

Climate smartness

It is worth highlighting that the project focused on the implementation of collective benefit practices and practices of an individual nature, which allow climate risk management at different scales, this contributing more effectively to the success of the project.

The project is mainly focused on helping producers to adapt to climate change and variability with regards to water resource management. The practices implemented allow farmers to have water available during both the rainy and dry seasons. In the same way, by promoting practices that allow crops to develop in dry seasons, the income is increased through enabling farmers to sell their products throughout the year. Therefore, this project is climate-smart since it is framed within two of the fundamental pillars of this approach, which are adaptation and productivity.

To be more comprehensive, the project could include practices focused on the conservation of the basin and the implementation of forest systems that help improving the hydrological cycle, which may be beneficial for the objectives of this initiative.

Additionally, this type of practice, which includes the use or conservation of tree species, enables adding the mitigation component to the initiative, since carbon sequestration in tree biomass could also be considered.

MONTSERRAT

RESILIENCE, INNOVATION AND KNOWLEDGE

Presenter

The Montserrat Farmers Association

Description

Climate change is bringing more intense rainfall during the wet season and longer periods of drought during the dry season. This creates greater challenges to farmers. The heavy rain creates problems for land tillage operations on arable lands especially on the soils where clay content is high and if the tractor operations are not timely the farmer is forced to operate on soil with improper tilth.

Heavy rainfall causes erosion, flooding and in some instances, crops are waterlogged so they lodge, suffer from rotted roots or rotted produce.

The prolonged drought negatively affects productivity as the crops require more water. Plants often wilt or are affected by vertebrate pests like iguanas eating their foliage.

Bare patches of land left after a serious drought also contributes to more serious erosion when rain comes.

Another serious threat is the increased frequency of devastating hurricanes which affect both the living and farming conditions of the farmer. Damage to property, machinery and crops can be extensive and recovery can be costly. Sometimes after a strong hurricane, new invasive pests are introduced, these can prove to be a challenge to control.

The best practices adopted include:

- Water harvesting;
- Drip irrigation;
- Protected agriculture;
- Contour farming and establishing proper drainage.

Farmers are encouraged to harvest water mainly through the use of tanks that collect water from the roof of houses and farm buildings where they exist. Dams or small ponds are also encouraged where feasible. Solar pumps have been recently introduced. They are used to pump water from ponds or cisterns to these water tanks and then the water is gravity fed through the drip irrigation system. Contour barriers in combination with windbreaks are also used. Protected agricultural practices have grown in importance initially as a response to the volcanic eruption but now proving to be important regarding climate change as well.

Greenhouses provide protection from acid rain and are used for pest control. They are very expensive to establish and maintain. The structures are susceptible to hurricanes and although the recommendation is to take off the covering during a storm it can be quite challenging especially in years when the storm frequency is high. There is also the problem of heat generated in the greenhouses and hoop houses and to avoid the expense of extractor fans which do not work well in Montserrat, the farmers have been using shade netting as a ceiling in modified greenhouses where the entire house has an insect netting covering and vents.

The greenhouses also are effective in pest control as insects are screened out and every effort is used to ensure that they cannot get in. It also protects the plants from vertebrate pests like the rodents (rats, mice and agouti), iguanas and birds like the pearly eyed thrasher and feral chickens.

Results

• Water harvesting: Montserrat is very hilly, so many areas are not suitable for drip irrigation, but where possible this is encouraged in combination with water tanks from which the water is usually gravity fed.

• Contour barriers in combination with windbreaks: as the parcels of land become smaller, this poses a great challenge. In an estate setting, large areas could be contoured, and proper drainage established and even if the land is divided among several farmers the contours drains and windbreaks remain established. This is not the present situation in Montserrat, and one farmer can quite easily be affected negatively by another farmer or a householder (depending on where he/she is farming) who does not practice proper soil conservation.

Climate smartness

The diverse practices promoted in the project support the bases of CSA since they focus mainly on adapting to climate change and increasing the profitability of crops. Most of the practices promoted in the project are identified among the main ones in terms of a global CSA evaluation at a global scale by Sova et. al., 2018.

The project also recommends working on some practices that contribute in terms of carbon capture or reduction of greenhouse gas emissions, aiming to increase the affinity of the initiative with the CSA approach.

It is also recommended to include other additional practices in the region to the ones that are in the implementation phase, which can be identified by the producers themselves. In order to do this, it is important to strengthen the flow of climate information towards producers, as well as their empowerment when it comes to use such information, in order to ensure that in the future they can make good decisions, adjusted to their socioeconomic and environmental conditions. Likewise, working on building community awareness and strengthening social networks in these communities show up as relevant factors that can help producers to understand that what they do on their farms can affect other producers. This helps to scale promoted practices and contributes to sustainability over time.

NEPAL

ORGANIC AGRICULTURE AND CLIMATE CHANGE ADAPTATION: A CASE STUDY OF A SMALL FARMER

Presenter

Nepal Agriculture Cooperative Central Federation Limited - NACCFL

Description

Punya Ghimire, a small farmer of Maharanijhoda, Jhapa had been practicing non-organic farming for 8 years. After testing the soil of his land, the farmer noticed that the soil was being degraded and acidic due to overuse of fertilizers. For this reason, he decided to be trained in organic agriculture and started farming accordingly, adopting agricultural practices with the aim to mitigate climate change:

- **Seed treatment:** utilization of organic methods for treatment of seeds such as hot water treatments, disinfectants, herbal treatments, treatments with trichoderma, usage of salt for rice seeds etc.;
- **Soil treatment:** application of well-decomposed farm yield manure, vermi-compost, and compost;
- **Weed management:** manual or mechanical control of weeds. No use of weedicide on farm;
- **Fertilizer management:** well-decomposed farm yield manure is applied in order to prevent diseases. Organic fertilizers, such as compost, have been used for crops. Different organic fertilizers have been used as per recommended doses. Different types of beneficial microorganisms such as trichoderma and rhizobium have been incorporated in the soil;
- **Pesticides and insecticides management:** integrated pest management practices are carried out on the farm. Bio-pesticides and insecticides have been preferred for the management of pests. Several types of insect traps have been used in the farm. Different beneficial microorganisms like Bacillus thuringiensis, egg parasite Trichogramma, Beauveria bassiana have been used to manage whiteflies, thrips, aphids and weevils. Lecanicillium spp. are deployed against white flies, thrips and aphids. Metarhizium spp. are used against pests including beetles, locusts and other grasshoppers, hemiptera, and spider mites. Paecilomyces fumosoroseus is effective against white flies, thrips and aphids;
- **Diseases control:** beneficial microorganisms such as Bacillus subtilis and Trichoderma viridae are also used to control plant pathogens. Crop rotation, intercropping have also been practiced in the field for the control of diseases. Different home-made bio-fungicides, bio-bactericides have been used to control diseases.

Results

Organic agriculture is taken as one of the appropriate farming systems which has twin objective of climate change mitigation and adaptation. Organic farming mainly depends upon crop rotations, use of crop residues, well decomposed farm yield manure, mineral rock and bio-fertilizer, natural pesticides and insecticides. Organic agriculture reduces emission of greenhouse gases. It is because of the avoidance of chemical fertilizers in farm. Thus, it enhances the carbon content of soil. Organic farming is also more energy efficient. It is reported that the use of energy is 20 to 50% less in comparison to the conventional farming system (Pimentel et al., 2005; Schader et al., 2011 and Muller) As organic farming avoids the use of insecticides, pesticides, hormones, etc. it helps in mitigating the climatic change. Organic farming easily sequesters carbon in the soil. (Panwar et al., 2010; IFOAM, 2009).

Climate smartness

As described in the project results, practices promoted contribute to all CSA pillars (adaptation, mitigation and productivity), because these practices increase adaptive capacity, yields and incomes from agricultural systems, as well as, support the reduction of greenhouse gas (GHG) emissions and increase soil carbon sequestration.

The project may benefit from including other practices (some of them in CIAT et al., 2017), which can be identified by the farmers themselves if participatory processes for building capacity are put in place. This may be done through strengthening farmers understanding of historic and future climate information and its effect on agricultural systems. Such processes may increase farmers resilience in terms of providing them tools for better-informed decision-making processes which may be tailored on their needs, socioeconomic and environmental contexts.

NORWAY

CLIMATE SMART AGRICULTURE CALCULATIONS

Presenter

Norwegian Farmers` Union

Description

Farmers experience more rain and more intensive rain, with avalanches. They experience more of the same type of weather for longer periods of time.
The weather is also "wilder" and more extreme weather events occur, including droughts. For example, during the Summer of 2018 farmers in many parts of Norway experienced extreme drought. Changes in the ecosystems also affects the farmer.
Norwegian farmers' Union is about to start a program called climate smart agriculture, where farmers get help to calculate climate emissions on his/her farm and how they can be reduced. The program calculates emissions, benchmarks towards other productions and simulates which measures are most efficient. The aim is to adopt better systems for documentation and calculation of potential for reduced climate footprint for each farm for better sharing of knowledge. In 2017, a hunt for 100 climate solutions in agriculture started as part of the project. Use of biodiesel in tractors, breeding more climate friendly cows and climate smart trenching are some of the solutions identified.
Training of climate counsellors has also been run all through the country. The project is owned by a coop called Landbrukets Klimaselskap AS (Agriculture`s climate company). The coop is owned by 15 Norwegian agricultural companies, organisations and coops. It is financed by the owners and government funds.
Norwegian farmers are already seeing the challenges with a changing climate. They have to cope with the change in weather conditions. Farmers need to improve the soil quality and preserve ecosystems. They need to get more control on the inputs on the farm, and to build up necessary capacity to sow and harvest in a shorter period of good weather. There are huge differences from farm to farm about which climate measures will be most efficient. Through the climate smart project, farmers will get help to measure his emissions and find out how to run the farm more climate efficiently.

Results

The expected outcome of the climate smart agriculture project is lower climate gas emissions from the farm by getting a better overview of where the emissions come from and how emissions can be cut in the agricultural sector. The farmer will get tools to run the farm more climate friendly through the project.

Climate smartness

It is worth highlighting that this initiative is led by a national producers' association, which may enable its scaling up and out, and ensures benefits to a larger group of farmers. As described in the project profile, the approach focuses on reducing GHG emissions, which constitutes one of the main pillars of CSA. Moreover, practices promoted within the project have also a significant contribution to adaptation to climate change of agricultural systems, which makes the project even more climate-smart.
Building capacity of climate advisors is a very important aspect of the project as farmers can refer to them to assess their climate behaviour. Methodologies are available in order to share climate information to farmers, so they can understand the linkages between climate and crops, which will allow farmers a better-informed decision-making processes on their agricultural activities. It might also be useful to monitor the impact of the practices implemented in terms of income generation; therefore, the project could also determine if it is also contributing to the CSA pillar on productivity.

SAINT KITTS AND NEVIS

FARM RESILIENCE TO CLIMATE CHANGE

Presenter

Farm – Saint Kitts

Description

Climate change has been affecting Saint Kitts area in different ways. Farmers had to cope up with disastrous weather events like hurricanes, while running out of water during prolonged droughts.

Other effects of climate change experienced in Saint Kitts are:

- Pests and alien species;
- Loss of seasonality of production;
- Change in produce (black spots etc).

In order to cope up with those effects of climate change, the experience of the presented farm in Saint Kitts show the adoption of several best practices:

- Own production of fertilisers not to be reliant from providers;
- Production of organic fertilizers and pesticides customized on the different plantations;
- Investments in water tanks;
- Free range chickens that help fertilize the soil;
- Diversification of income (i.e making oil out of nuts produced on the farm).

Results

- Resilience from extreme events;
- Wiser use of pesticides;
- Circular use of what is grown on the farm;
- Positive change in soil composition.

Climate smartness

The different practices promoted in the project, contribute significantly to the three CSA pillars, since they focus on mitigation and adaptation to climate change, and the increase in profitability 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 highlighted that the project promotes circular economy practices, where all products and by-products are used for the development of the production process within the farms, which results in the reduction of greenhouse gas emissions. The inclusion of additional practices is recommended, with the purpose of supporting farmers to improve yields and climate resilience. In addition, it is essential for the optimal implementation of climate-smart agriculture to strengthen climate information flows to producers, as well as the empowerment regarding the use of climate information, to ensure better decisions in the future, adjusted to their socioeconomic and environmental conditions.

SAINT KITTS AND NEVIS

ADAPTATION TO CLIMATE CHANGE

Presenter

Taiwan International Cooperation and Development Fund, ICDF

Description

According to World Bank data, Saint Kitts and Nevis have already been affected by climate change:

- Temperature has risen by 6.06 degrees Celsius since the '60s; by 2050 temperature in Saint kitts and Nevis will increase by 1.3 Celsius;
- Speed of wind has increased;
- The number of dry days is expected to increase;
- Sea levels are expected to rise between 0.3 and 0.5 metres by 2090;
- Extreme weather events: 12% increase in hurricanes, 4%increase in floods and 3% increase in droughts.

ICDF started several projects in the region, in order to tackle the challenge of climate change for the agricultural sector:

- Gathering of early warning information: installation of weather stations for real time data, integrated with the collaboration with ICT centres for the storage of data and with CIMH, the Caribbean Institute of Meteorology and Hydrology;
- Developing and introduce crop disaster mitigation and prevention techniques. This is done by:
  - Assessing challenges faced by the agricultural sector with farmers;
  - Developing and/or introduce crop disaster mitigation and prevention techniques: in model farms and farmers' demo fields with crop cultivation trials (introducing relevant Taiwanese varieties) and disease and pest monitoring in response to extreme weather conditions;
  - Cultivation management methods, materials and equipment. Some cultivation techniques:
  - Nursery;
  - Plant Spacing;
  - Mulch;
  - Rationalized fertilization;
  - Irrigation;
  - Flower/fruit thinning;
  - Training and Pruning;
  - Pest control;
  - Crop rotation to avoid soil sickness.

Results

- Availability of information for farmers;
- Increase in yields;
- Control pest diseases;
- Annual reports on crop disaster mitigation and prevention techniques.

Climate smartness

The diverse practices promoted in the project contribute significantly to the three central cores of CSA, since it focuses on increasing crops profitability, mitigation and climate change adaptation. Most of the practices promoted by this project are identified as part of the most relevant ones at a global scale, according to the review and evaluation made by Sova et. al., 2018.

The implementation of weather station networks as well as setting up early warning systems are relevant aspects in this project, since they will allow producers to have access to weather information helping them in decision making. Nevertheless, it would be interesting to use medium term forecasts that allow better crop planning and management processes some months ahead. In order to do this, it is key to empower producers on access and use of weather information and its linkage with agricultural activities. By doing this, producers will be able to identify the aspects to be strengthened in their production systems and based on previous experiences, they would be able to implement more CSA practices.

SCOTLAND

TORLOISK FARM MANAGEMENT

Presenter

Torloisk Farm

Description

In Scotland, climate change and the resulting change in weather patterns have already notably affected the growing season and increased the life cycle and activity of many plant and animal parasites/pests. Colder springs in the West are causing a shortening of the growing season and warmer winters allow livestock parasites to thrive all year round.

The increase in extreme weather patterns has caused grass production and crop harvest issues as a result of dry or wet spells being more concentrated and storm activities having notably increased. The much higher rainfall rates in many parts of Scotland is causing limited field access to machinery as well as livestock poaching, leading to a narrow harvest window and animals having to be housed for longer periods between autumn and spring. This adds further pressures in form of a greater need to purchase external inputs such as feeding and bedding, and potentially increased animal health issues associated with housed livestock.

The main focus on the farm to adapt to climate change is to selectively breed for animals suited to specific environment and climate and which are therefore more capable of dealing with the challenges thanks to their superior genetic potential, as well as to adjust health management and feeding regime in response to changing weather patterns in order to ensure that animal health and welfare is not compromised.

The main focus of Torloisk farm to try to mitigate the effects of climate change is to work with traditional breeds best suited to the farm type and able to thrive on minimum external inputs in order to be as self-sufficient as possible and keep any purchased inputs to a minimum. This helps to significantly reduce GHG emissions associated with the manufacturing and processing of these inputs and the associated travel incurred for the delivery of those goods to the farm. Another focus is to increase and improve efficiencies via genetic trait improvement to produce more output per unit of input, and to manage the grassland in such a way that it does not require high levels of fertiliser input and is able to sequester carbon.

Practices implemented on the farm:

1) Genetic trait selection and performance recording (adaptation and mitigation);
2) Adjusting health management (adaptation);
3) Grassland management (adaptation and mitigation);
4) Changing the feeding management (adaptation).

Results

- Genetic trait selection and performance recording (adaptation and mitigation): the selective breeding and detailed performance recording has led to better animal health and welfare by reducing incidences of ill-thrift and poor animal health, better overall performance of the farm's stock, and better use of both on-farm resources and external inputs. It has had a significant financial impact by reducing costs and increasing income, and the improved efficiency of the system thanks to these measures has reduced the impact on the environment and carbon footprint. Working with animals that are perfectly suited to the environment in the region/area also means that they deliver important environmental benefits by maintaining and enhancing local plant and animal habitats, therefore allowing local species to thrive and biodiversity to be encouraged.
- Adjusting health management (adaptation): the adjusted health management has ensured that animal health and welfare are maintained throughout the year despite the increased parasitic activity. The increased need for purchased animal health products to protect livestock from parasites has led to higher financial costs to the business and the resulting emissions associated with the manufacturing and delivery of the products has led to a higher impact on the environment.
- Grassland management (adaptation and mitigation): the better grassland management overall has led to better grass production on the farm from less fertiliser inputs which has led to a higher profitability to the business and less emissions associated with fertiliser manufacturing and delivery, therefore delivering benefits to the environment. The more natural grassland management has also been of particular importance to a range of important and endangered plant and animal species which can thrive on these areas. The natural and traditional appearance of the landscape as a result is of wider benefit both socially and economically by attracting tourism to the area.
- Changing the feeding management (adaptation): the adjusted feeding management has ensured that animal health and welfare are maintained throughout the year despite the more challenging growing conditions. The increased need for purchased feeding where the growing season is poor has led to higher financial costs to the business and the resulting emissions associated with the growing, processing and delivery of the feeding has led to a higher impact on the environment.

Climate smartness

It is important to highlight that this project was designed to respond to possible climate change impacts on livestock systems and create a highly productive and efficient process on the use of available resources. Practices focused on food management are highly related to mitigation, as they help reduce the amount of methane and nitrous oxide emissions, two of the most important greenhouse gases. On the other hand, the practices on genetic selection and sanitary management are more focused on climate adaptation. All these actions, in a certain way, contribute to increase the system's productivity, which is reflected in a higher income for producers.
The project addresses the CSA approach and its three pillars: adaptation, mitigation and productivity. Additionally, it is important that the project focuses on supporting the strengthening of weather information flows so that farmers have access to that information. Moreover, their empowerment regarding the use of such information is highly relevant to the process, in order to ensure that producers can continue implementing CSA practices based on the identification of the aspects to be strengthened in their productive systems and adjusted to their socioeconomic and environmental conditions.

SOUTH AFRICA

PRODUCTION FINANCE IN DISASTER AREAS

Presenter

The Southern African Agri Initiative (SAAI)

Description

A third of South Africa is currently facing a drought crisis that has reached such serious levels that entire communities are in trouble, including agricultural businesses. This is the third consecutive year that the dry conditions loom, in some areas even longer, and it has caused a major debt problem for most part of family farmers. Because of ongoing debt, farmers are unable to get financing and obtain production loans.

Instead of using land as collateral, the project consists in a supply contract or production contract that stipulates a price and a supply date; inputs are then financed based on that. Comprehensive harvest insurance is a requirement for the project as well.

Participating family farmers are organised into a traditional agricultural co-operative. The co- op will enter into a supply contract, lend money for seed, fertiliser, diesel, pesticides and insurance, and rent for the mechanisation that farmers need.

Regardless of how solidly such a scheme is structured, even in the most favourable scenario a producer will need his own minimum contribution of 30% to obtain financing. In order to cover that 30%, the five largest input suppliers were requested to each leave 6% of their invoices in the pool until the supply contract is honoured. In Saai's proposed plan, the input suppliers will help carry a portion of this risk.

Saai and its network partners also offer assistance in this regard. Crowd funding, fundraising projects and corporate donations will contribute to a newly established collateral fund. There are even some well-known artists who offered to donate proceeds of their concerts to the fund. The fund will serve as a first risk buffer and contribute to make the project and its farmer beneficiaries bankable. Should the co-op not be able to repay its debts to the banks, the collateral fund will take responsibility for a percentage of the debt.

In 2015 the Southern African Confederation of Agricultural Unions (SACAU) started a similar pilot project in Arusha, Tanzania during which excellent agricultural technical advice was shared by input suppliers. A portion of their profits was still on the farmlands and they were readily available to advise the farmers and look after their interests.

Results

This innovative financing model is currently aimed at farmers whose farming activities have been debilitated by the drought in certain areas of South Africa. If implemented successfully, it has huge potential for production finance in other disaster areas, communal areas and for beneficiaries of land reform, where land cannot be offered as security against loans.

Climate smartness

Climate-smart financial mechanisms are very important as a way to reduce agro-climatic risks and therefore, increasing resilience to climate variability. This initiative may benefit from tailored capacity building in local adaptation planning in order to understand how using current climate vulnerability and short-term weather forecasts, farmers can plan their agricultural activities (crop planning, management and harvest) accordingly. Therefore, it could reduce the probability of yield losses when knowing how weather may behave and how each crop may be affected (e.g. water stress indicators). This will reduce the chance of losing the investment and better prepare to deal with climate variability.

In some countries, index insurance products have been developed and put in place in order to secure farmers investments even before finishing the cropping season, because the triggers are associated to climate variables rankings according to the crop, agro-ecological zone, among other criteria (Greatrex et al. 2015).

SWEDEN

GREPPA NÄRINGEN - FOCUS ON NUTRIENTS

Presenter

Federation of Swedish Farmers (LRF)

Description

Main effects of climate change consist of more extreme weather, storms, droughts, flooding and high temperatures. Winter crops are moving north in Sweden. There is a higher impact from fungus and insects.

Big, harsh debate on farmers responsibility for climate change, while there is a big lack of proportion towards other emissions. The meat sector is especially in focus and accused of emissions. The debate affects the belief in the future for farming and will to invest.

"Greppa näringen" or "Focus on Nutrients" is the largest single commitment in Sweden to reduce losses of nutrients to air and water from livestock and crop production. The project also focuses on the safe use of crop protection products. Focus on Nutrients is a joint venture between The Swedish Board of Agriculture, The County Administration Boards, The Federation of Swedish Farmers and a number of companies in the farming business.

The purpose of the project is to:

- Reduce losses of the greenhouse gases: nitrous oxide, methane and carbon dioxide;
- Reduce losses of nitrate from farmland;
- Reduce ammonia emissions from manure;
- Reduce losses of phosphorus from farmland;
- Avoid losses of pesticides into surface and groundwater;
- Increase energy efficiency on farms.

In order to fulfil these objectives, the project focuses on increasing nutrient management efficiency by increasing awareness and knowledge. The farmer is in focus and therefore the core of the project is education and individual on-farm advisory visits.

Photo credits: Mårten Svensson (from website of the project http://greppa.nu/om-greppa/om-projektet/in-english.html)

Results

- Soil compaction results:
  - Awareness of soil compaction has increased;
  - The proportion of farmers who customize tire pressure and tires has doubled from 40% to 80%.
- Results of feed adaptation:
  - In the dairy farms, the proportion of farmers who take into account their forage analysis has increased from 62% to 92%;
  - Farmers who are actively working to reduce feed losses have increased from 49% to 92% .
- Wetland Advisory:
  - Over the years, Greppa Näringen advisers have made over 3500 wetland advisory services in Sweden;
  - Greppa Näringen has supported the construction of around 500 wetlands.
- Reduce nitrogen losses:
  - Plantation farms reduced by 7.5 kilos of nitrogen per hectare (-17%);
  - Pig farms reduced by 13.5 kg of nitrogen per hectare (-13%) ;
  - Dairy farms reduced by 8.6 kg of nitrogen per hectare (-6%).
- Reduced phosphorus losses:
  - Farm with plant production;
  - Phosphorus deficit has increased from -1.4 to -4 kg of phosphorus per hectare.
- Pig farms:
  - The surplus of phosphorus has decreased from about 8 kg of phosphorus per hectare to just over 1 kg.
- Dairy farms:
  - The surplus of phosphorus has decreased from about 5 kg of phosphorus per hectare to 3 kg.

Climate smartness

GREPPA NÄRINGEN initiative is highly focused on reducing GHG emissions, that is, mitigation pillar of climate-smart agriculture. As per the figures shown, it has resulted in outstanding benefits. Adaptation is also being addressed through the nutrient perspective of soils and forages themselves. Capacity building component is also highlighted in this initiative, which is an essential practice for farmers to create awareness, understanding the implications of management practices in the environment and in their overall productivity. Knowledge exchanges may be a good way to scale the lessons learned through this experience.

It would be important to consider the feasibility of including silvo-pastoral systems that may reduce animal stress during summer season.

USA

STONEY CREEK – NO TILLAGE FARM

Presenter

Stoney Creek Farm

Description

Weather has turned wet during the past four years. Farmers have received two to three times the average moisture and the have seen more extremes in temperature and weather.

The effects of this on the landscape is a massive increase in water erosion and wind erosion. Water infiltration rates on the average farm fields have dropped significantly, causing run-off, creek/riverbank destabilization, and flooding.

On Stoney Creek farm, farmers operate a 100% no-till system with increased diversity of o cropping enterprise through the addition of cover-crops through inter-seeding and planting after the harvest of row crops. Cattle are raised on pasture and on these cover-crops and are no longer kept in confinement. With increased water infiltration and increased soil organic matter on pastures and in cropping fields, the health of crops and animals in Stoney Creek has improved immensely. Increased soil health has allowed farmers to decrease the rate of use of synthetic fertilizers and they now use much less pesticides than before.

They also now have soil structure which allows them to be on the fields after rain events without leaving tracks or ruts while their neighbours sometime wait days to get back out on their fields. This can affect profitability. They no longer need treated seed technologies because the system has become healed. They also no longer spray any insecticide or fungicide on any part of the farm because the health of plants has been restored through improved soil health.

Results

Farmers in Stoney Creek have seen many improvements:

- Improved soil structure eliminating tillage;
- Increased rainfall infiltration (8-12" per hour);
- Increased soil organic matter (3-4% in 10 years);
- Increased soil health;
- Increased livestock health and decreased antibiotic use for livestock;
- Increased nutrient density of livestock feed raised on the farm.

They have seen decreased water and wind erosion because they keep soil covered and try to keep a living root in the soil for as long as possible each season. They have also seen a massive increase in wildlife of all forms on the farm. The best improvement is increased profits because they have reduced input costs of seeds, chemicals, and fertilizers, while they have improved their own runoff/erosion.

Climate smartness

Helping reaching the goals of the three base cores of CSA, had also contributed to improve livestock wellbeing and increase biodiversity inside the farm.

Implementation of crop cover, soil and pastureland management practices have contributed mainly to climate vulnerability reduction, while feeding management practices and the reduction of the use of chemical fertilizers have helped on greenhouse gas reductions. All the practices implemented in this project contribute to increase the income and productivity of producers.

Additionally, it is recommended to include on this project the strengthening of climate information flows towards producers, as well as their empowerment regarding the use of such information, in order to ensure that producers continue with the implementation of CSA practices.

ZAMBIA

MOOTO FARMS

Presenter

Mooto farms limited

Description

Zambia has not been spared by the effects of climate change. The amount of rainfall is minimal and temperatures have continued raising making farming very difficult and expensive.

Most farmers in Zambia cultivate maize since it is the staple food. Due to the shortage of rainfall, the maize crop is slowly failing to perform, resulting in hunger in the low-income class and very high prices for those that manage to harvest a little in order to compensate for their loss in the failed crop.

The cost of production is very high and since the yield is very low due to drought, this increases the poverty levels of the farmers.

In order to cope up with those challenges, farmers of Mooto Farms implement the following:

- Planting early maturity crops and also diversifying from maize only to other drought resistant crops such as cashew nuts, cassava and millet;
- Providing shade using shade nets for small trees on the nursery to prevent them from the scorching sun;
- Practicing vegetative propagation through soft wood grafting to ensure that they have high breed produce, early maturity, high yield and good quality produce;
- Pruning trees to make sure they are exposed to the required sunlight for photosynthesis and high yield;
- Coordinating with support groups, such the metrological department for weather updates, to make informed decisions;
- Using the recommended pesticides to ensure crops are healthy and free from diseases;
- Practicing irrigation by use of bole hole water supply powered by generator and use drip irrigation systems;
- Coordinating with agro-dealers to ensure having inputs on time to avoid delays and disturbances in framing programs;
- Practicing conservation farming;
- Having planted economic value trees such as mangoes, oranges, nuts, lemons, paw paw and other fruits to lessen the burden on maize;
- Having sensitized other farmers to avoid bad farming practices of burning bushes, cutting down trees for charcoal and other uses;
- Practicing mixed farming that is poultry, piggery, fish farming and crops. This chain is good as these activities support each other. Example chicken manure can be feed for the pigs, pig dung can be used as feed for fish, and water from the fishponds can be used as manure for the crops;
- Making sure to be up to date with market trends and prices.

Results

- Early maturity crops reduce on crop failure as the crops will mature fast within the short rain season;
- Because of the rightful information, losses are minimized;
- Conservation farming assists in the retention of the little water collected during the rains. This assists in keeping the crops moist and reduces water loss through evaporation;
- Because more trees are planted, this assists to cool the high temperatures on the farms and increases the chances of rainfall;
- The planting of fruit trees helps the diversification of income, as farmers are able to sell fruits as well. Most fruits produce throughout the year, thereby assisting Mooto farms with a continuous flow of income;
- Tree plantations are easy to manage and are cheaper and have long term benefits;
- Cashew nuts are valuable products also because the cost of production is minimal and the harvest can last for about 50 years.
- The cashew nut plantations do not need a lot of water, therefore, it reduces costs of production.

Climate smartness

MOOTO FARMS initiative include a number of practices, which may contribute to all CSA pillars. For example, diversification of crops, the use of early and drought resistant varieties and irrigation contribute significantly to adaptation and resilience, while reduction/elimination of burning bushes and cutting down trees is effective for mitigation.

The use of weather forecast and agro-climate information might help significantly the effectiveness of the practices proposed by MOOTO FARMS. Combination of recommended pesticides with organic inputs might reduce negative impact on soils and GHG emissions generation. Efforts in building capacity showed in the initiative is highly valuable, strengthening knowledge regarding future climate behaviour, crop management and planning activities would significantly increase adaptive capacity of rural families.

For more information about CSA in Zambia, in the study of World Bank and CIAT (2017b), it is possible to identify several practices for Zambia evaluated around 8 key criteria: Water, Carbon, Nitrogen, Energy, Knowledge / Info risk, Yield, Income and Soil.

ZIMBABWE

CONSERVATION AGRICULTURE: EFFICIENT USE OF NATURAL RESOURCES

Presenter

Zimbabwe Farmers Union (ZFU).

Description

More than 70 per cent of the population in Zimbabwe relies on agriculture for its livelihood. The sector provides the best prospects for large-scale food security, economic development and poverty eradication. This key sector is now under increasing threat from climate change. Agriculture both affects and is affected by climate change. No other sector is more climate sensitive. The changing global climate threatens agricultural systems, livelihoods and the environment worldwide. Particularly vulnerable are the millions of smallholder farmers in Zimbabwe with limited means for coping with the risks posed by a changing climate. Rain-fed agricultural systems on which most of them depend will be adversely affected by extreme weather conditions and events (heat stress, droughts, floods), which are expected to increase in frequency and intensity. The proliferation of pests and diseases in areas where they have typically not been prevalent will also have severe negative impacts on productivity. There is urgent need to support adaptation measures by such farmers and other stakeholders that will increase the sector's resilience to a changing climate.

Although the causes of climate change are primarily from the use of fossil fuel, the agriculture sector is also culpable. The sector directly accounts for about 14 per cent of global greenhouse gas (GHG) emissions, and indirectly much more as agriculture is also the main driver of deforestation and other land-use changes that account for an additional 17 per cent. The responsibility of various categories of farmers is however substantially different. Although agriculture's potential for climate change mitigation still remains to be fully understood, there is growing consensus that emissions reduction and removal of greenhouse gases (mitigation) from agriculture will be necessary if global mitigation efforts are to be successful.

While climate change introduces new challenges to food and agricultural production, in Zimbabwe, new opportunities have emerged for the agricultural sector. The renewed interest in conservation agriculture is one such opportunity.

Zimbabwe Farmers Union sought to harness this momentum to lead a transition to a climate smart agriculture by promoting large scale adoption (scaling up) of this practice. This intervention facilitated farmer led scaling up of conservation agriculture by smallholder farmers in Zimbabwe.

Conservation Agriculture (CA) is an option that has great potential. This farming technology makes more efficient use of natural resources through integrated management. Through the application of the three main principles of reducing soil disturbance, maintaining a permanent soil cover and practising crop rotations, CA improves the soil's physical and chemical properties and reduces run-off and soil erosion while increasing water infiltration. As such the practice has major advantages in dealing with water stress in cropping systems. CA has been shown to improve drought tolerance for crops, increasing yields and encouraging diversified cropping systems that are accompanied by significant environmental benefits.

Results

Conservation Agriculture (CA) is being practised to varying scales in Zimbabwe. The area under CA in Zimbabwe represents less than 1% of the global total. Adoption of the practice is poorest among smallholder farmers who are constrained by poor access to information, lack of assets and limited financing to support such investments. Unfortunately, these farmers are the most vulnerable to climate change and therefore needed urgent support to transform their production systems towards a climate smart agriculture. The role of ZFU in facilitating large scale adoption of CA is widely recognised by many stakeholders who concur that FOs can coordinate partnerships with both public and private players to support smallholder farmers.

ZFU implemented the best practice using demonstration plots that were hosted by school based Young Farmers Clubs (YFCs). The immediate local community surrounding the school participated in the intervention by experiential leaning at the demonstration plot by participating at Avery stage of the cropping cycle from land preparation to harvesting.

The farmers would then apply the CA technology at their individual household farms. Exchange visits were incorporated into the event through holding of field days at the best performing demonstration plot to foster peer learning.

The resources for the intervention were from NORAD through the Southern African Confederation of Agricultural Unions"

The intervention impacted 600 young farmers and 8000 community farmers who are gradually shifting from conventional to CA. Yield level for the participating farmers improved from an average of 1 tonne/ha to 3tonne/ha. Interest in agriculture amongst the youths was increased. Equipment rings were introduced to benefit the participating communities. Agricultural extension workers were trained in the various aspects of CA. Crop diversification, especially the use of legumes improved the soil and soil degradation is gradually slowing down.

Climate smartness

Conservation agriculture is one of the most common climate-smart practices across all regions especially in maize crop according to Sova et al. (2018). Climate smartness of this practice is high considering its contribution to all pillars (adaptation, mitigation and productivity). Conservation agriculture is a practice that can be implemented more easily by the farmers themselves, which tend to be perceived as having a lower number of institutional, economic, information, social and environmental barriers.

Opportunities to strengthen synergies across CSA pillar include the combination with other practices such as agroforestry systems, crop rotation and fertilizer management, in order to increase smartness in the system.

According to Thierfelder et al. (2017), conservation agriculture systems maintain higher infiltration rates and conserve soil moisture, which helps to overcome seasonal dry spells.

For more information about CSA, in the study of World Bank, CCAFS and CIAT (2018), it is possible to identify several practices for Zimbabwe evaluated around 8 key criteria: Water, Carbon, Nitrogen, Energy, Knowledge / Info risk, Yield, Income and Soil.

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