smart skills
smart sustainable agriculture

Course 5: Climate-Smart Agriculture (CSA) Techniques

M2: Adapting Crop Production to Climate Variability

Co-funded by the European Union

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contents

This module guides learners through how Climate change is transforming the way we grow food. Rising temperatures, more frequent droughts, erratic rainfall, and new pests are putting global agricultural production at risk. To ensure food security and sustainability, farmers must adopt smart and innovative strategies to adapt to these new conditions.

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What will you learn in this module?

You will discover how to:

1. Select crops that are more resistant to climate change.
2. Modify sowing and irrigation cycles according to weather
3. Use artificial intelligence and predictive models to optimise production.

01

SELECTING CLIMATE-RESILIENT CROP VARIETIES

Why is it important?

Resilient agriculture allows us to increase productivity, reduce risks and protect natural resources, guaranteeing sufficient food for future generations.

An indispensable input for climate-smart crop production is quality seeds and planting materials of well-adapted varieties. It is impossible to harvest good crops with bad seeds (FAO, 2011).

Selecting Climate-Resilient Crop Varieties

Assessment of Local Conditions

Integration of Local & Scientific Knowledge

Multiple Stress Tolerance

Genetic Improvement & Sustainable Seeding Systems

Institutional Support and Access to Seeds

Continuous Monitoring & Updating of Varieties

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Selecting Climate-Resilient Crop Varieties

- **Local assessment:** Analyse climate, soil and water (climate models and historical data).
- **Integrated knowledge:** Combine traditional knowledge and research (improved seeds, biodiversity).
- **Multiple tolerance:** Select crops resistant to drought, high temperatures and parasites.

Innovative Varieties and Continuous Improvement

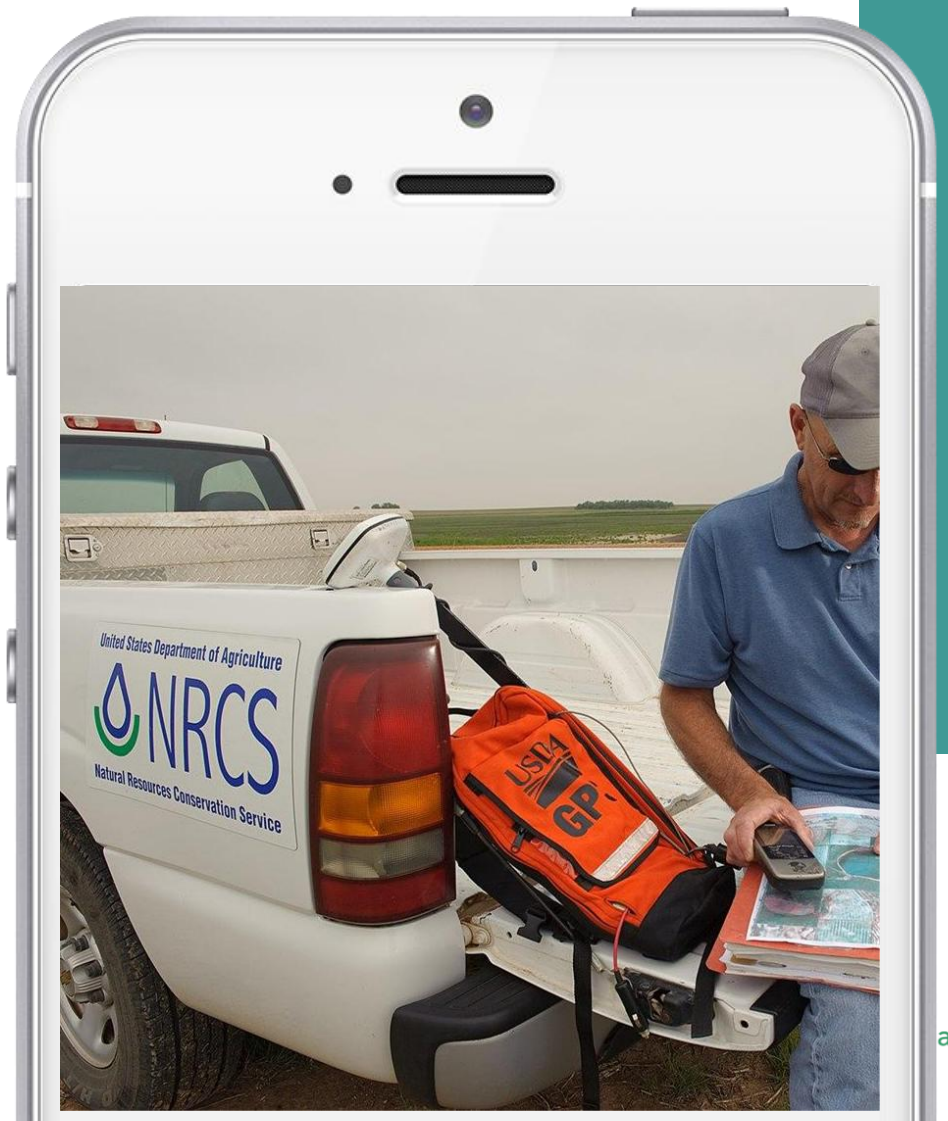
- **Genetics & sustainable sowing:** Early varieties and selection programmes to reduce stress.
- **Institutional support:** Access to resistant seeds (seed banks, exchange networks).
- **Constant monitoring:** Update varieties based on data and collaborate with research institutes.

02

ADJUSTING PLANTING SCHEDULES & IRRIGATION PRACTICES

Planning water use

- **Analysis of the water balance:** Evaluate how much water is available at field and basin level, to avoid negative impacts on downstream land.
- **Deficit irrigation:** Maximise yield per volume of water used, distributing irrigation at times when the crop needs it most.



agriculture

More efficient irrigation technologies

Reduction of evaporation losses: Drip or micro-irrigation systems help save water. As discussed in Course 2.

Renewable energy: The use of solar-powered pumps reduces energy costs and environmental impact. As discussed in Course 4.

Flexible sowing schedules

Pearl Millet: The Drought-Resistant Grain

Adapt crop calendars to weather forecasts: Sow earlier or later to avoid periods of water stress or extreme events.

Crop rotations to optimise soil use and nutrient supply, thus reducing the need to expand cultivated areas.

Adapting Agricultural Production to Climate Variability

03

AI & PREDICTIVE MODELS FOR AGRICULTURAL PLANNING

Precision Farming and Remote Monitoring

- **Sensors and drones:** these detect the state of health of the crops in real time (e.g. water stress or presence of parasites).
- **Automated irrigation systems:** integrated with weather stations, they regulate the water supply according to the actual needs of the crops.

Decision Support Technologies

- **Weather forecasts and early warning systems:** These allow farmers to act in advance against extreme events.
- **Predictive software:** This suggests the best periods for sowing and harvesting, reducing losses and waste of resources.
- **ICT and digital platforms:** These favour the exchange of information between farmers and research centres (data on climate, soil, market prices).

Benefits for Climate Resilience

Efficient use of resources: Targeted use of fertilisers and water limits emissions and environmental impact.

Reduction in energy costs: Renewable technologies (e.g. solar pumps) and less use of high-powered machinery.

Higher productivity: Better planning reduces the risk of crop loss.

AI in Agriculture: Overview and Advantages

The Power Of AI's Impact On Smart Greenhouses For Sustainable Farming

- **Artificial Intelligence (AI):** algorithms that analyse data for faster and more accurate decisions.
- **Applications:** weather forecasts, drones for pest detection, smart irrigation.
- **Benefits:** waste reduction, better yield, lower environmental impact.

04

LETS PRACTICE

Interactive Activity:

Decision-Making Scenario

You are a farmer in a drought-prone area. Which strategy do you choose?

1. **Grow drought-resistant varieties.**
2. **Modify sowing to avoid critical periods.**
3. **Use AI to predict rainfall and optimise irrigation.**

Feedback:

All strategies are valid and can be combined to improve agricultural resilience!

GREAT JOB!

Continue with **Module 3** to find out how to **conserve soil** and **sequester carbon** with a view to how to truly practice climate-smart agriculture!

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