Climate and Drought Resistant Agriculture

An educational and action-oriented guide for groups and farmers to build climate and drought resilience

GLOBAL CLIMATE Pledge

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01. What is Climate and Drought Resistant Agriculture? Why is it Important? Why is it Urgent?

1.1) What is Climate and Drought Resistant Agriculture?

Climate and Drought Resistant Agricultural aims to incorporate farming techniques that are effective in the face of climate change and exacerbated drought conditions.

Such techniques can involve shifting agricultural practices to be more sustainable, using technologies that mitigate water use, and growing drought tolerant crop varieties.

1.2) Why is it Important?

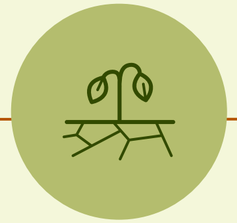
1.2) Why is it Important?

The importance of climate and drought resistance in agriculture boils down the adverse affects climate change has on natural cycles and in turn on crop yields for smallholder farms.

Climate Change

Climate change affects natural cycles and exacerbates natural events and disasters.
Heightened natural events could look like exacerbated wet and dry seasons that cause an imbalance in ecosystems around the world.

Droughts



Regions that are more dry and already drought prone feel the effects of droughts more strongly with the onset of climate change.
This not only impacts local ecosystems, but also local populations.
For instance, regions in Africa, the Americas, and South Asia, exacerbated droughts have negatively impacted crop yields, especially in smallholder farms.

Small Holder Farms

The direct negative impact of droughts and climate change on agriculture and populations across the globe make it imperative that countermeasures and adaptation strategies be implemented in such high risk areas.

1.3) Why is it Urgent?

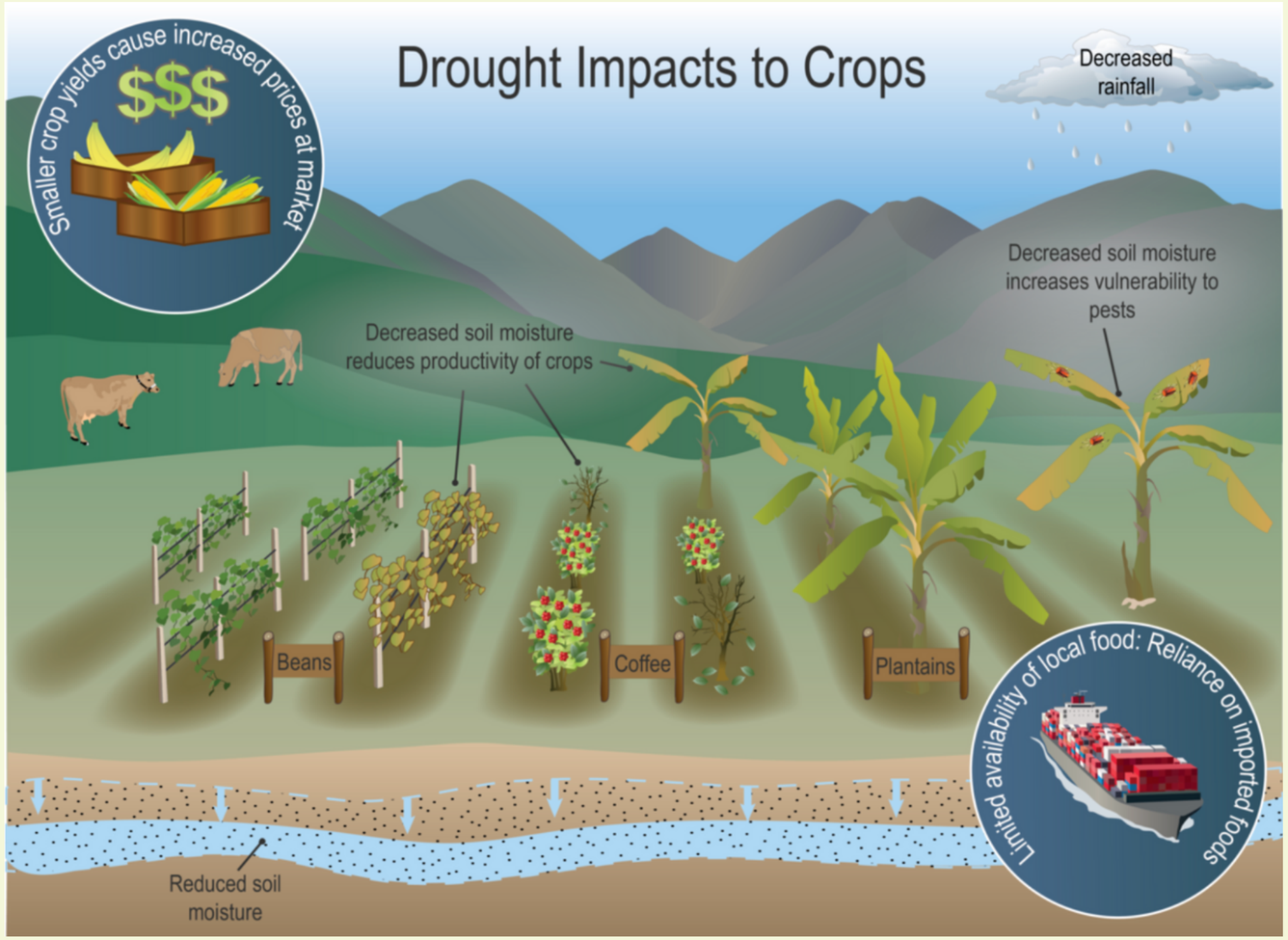
Background Image Source: When the Dry Spell Doesn't End: What Are Farmers' and Insurers' Next Moves In the face of a Megadrought?

1.3.a) Why is it Urgent?

The urgency behind implementing climate and drought resistant practices comes from the disasterous short and long term consequences of drought conditions on crops and ecosystems.

Short Term Impacts

- Decreased soil moisture leads to crop desiccation and encourages pest invasions
- Stunts crop growth
- Decreases crop yields, which increases consumer prices
- Droughts limit water available for washing crops, causing sanitary issues



Source: Drought Impacts to Crops in the U.S. Caribbean

Long Term Impacts

- Prolonged drought conditions affect staple crops
- Over pumping of groundwater and aquifers for irrigation which can lead to salt-water intrusion and land subsidence*

*Land Subsidence is the sinking of land which occurs as groundwater gets depleted

1.3.b) Why is it Urgent?: Staggering Statistics

Ensuring Prosperity in a Water-stressed World

- "As many as 3.5 billion people could experience water scarcity by 2025".
- Demand for water is "predicted to grow by up to 30% by 2050".

Simultaneous Droughts Could Threaten Global Food Security, Says Study

- Climate change "will increase the probability of co-occurring droughts 40 percent by the mid-21st century"

3 Climate-Resistant Food Solutions for Smallholder Farmers

- "climate change could depress global crop yields up to 30% by 2050, putting approximately 50 million more people at risk of undernourishment"

02. Regions Affected

2.1) Countries and Regions Affected

Africa

Ethiopia, Kenya, Somalia,
West Africa, Zimbabwe

Americas

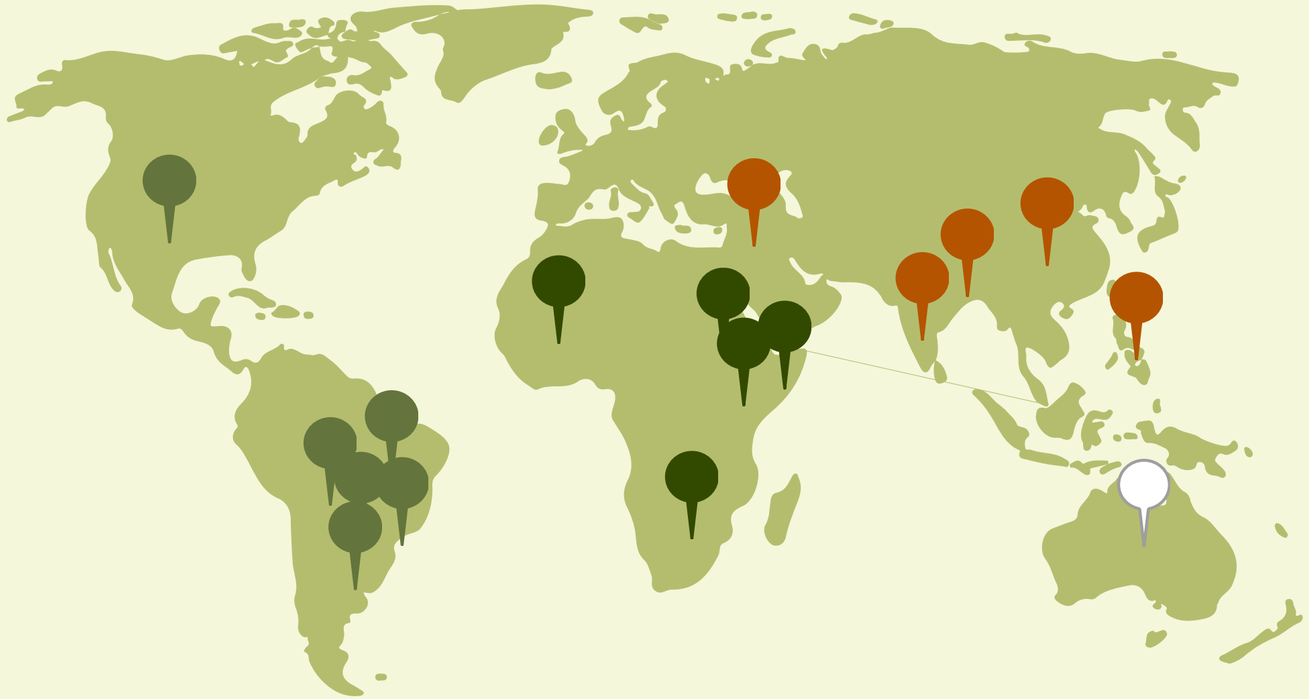
Argentina, Bolivia, Brazil,
Paraguay, United States, Uruguay

Asia

China, India, Middle East,
Nepal, Philippines

Oceania

Australia



03. How is Climate and Drought Resistant Agriculture being Achieved?

3.1) Creating Climate and Drought Resistant Agriculture

Actions to promote climate and drought resistance span across a variety of areas. Below are areas and topics that will be further explored in the slides to follow.

Agricultural Practices (3.2)

- Climate Smart Agriculture
- Dry Farming
- Silvopasture Systems
- Sustainable Farming Practices

Crops (3.3)

- Drought-Tolerant Crops

Legislation (3.4)

- Working Against Punitive Seed Laws

Technology (3.5)

- Greenhouses
- Aquaponics

3.2) Agricultural Practices

To ensure effective farming in the face of climate change, farmers need to take a holistic approach to farming that incorporates both livestock and a variety of crops.

In doing so, farmers will be operating sustainably and as such will be better prepared to adapt to climate change.

3.2.a) Climate Smart Agriculture

Climate Smart Agriculture, or CSA, is an agricultural approach that guides actions towards creating agri-food systems and practices that are more green and climate resilient.

3.2.b) Climate Smart Agriculture: Example Use Case

Source: 'Times are Hard and Uncertain': Senegal Adopts Climate Smart Agriculture to Mitigate Effects of Climate Change

Senegal:

- Through the West Africa Agriculture Productivity Program (WAAPP), funded by the World Bank, farmers in Senegal are provided with the following Climate Smart Agriculture resources and solutions to ensure high crop yields despite dry seasons:
  - Provided 423,000 farmers with 14 high-yielding, early maturing, and drought resistant dry cereal varieties which boosted productivity by 30%

More about WAAPP:

- In 2015 WAAPP delivered 10,500 tons of seeds to up to 200,000 farmers in in Guinea, Liberia, and Sierra Leone as a part of Ebola recovery.

3.2.c) Dry Farming

Dry farming is exactly what it sounds like! It is the growing of crops with little to no water.

With this method of farming, less than 20 inches or 50 centimeters of water are used per year. This form of agriculture agrees best with the following crops:

- Tomatoes
- Pumpkins
- Watermelon
- Ragi (a type of millet native to East Africa and commonly used in India)
- Apples

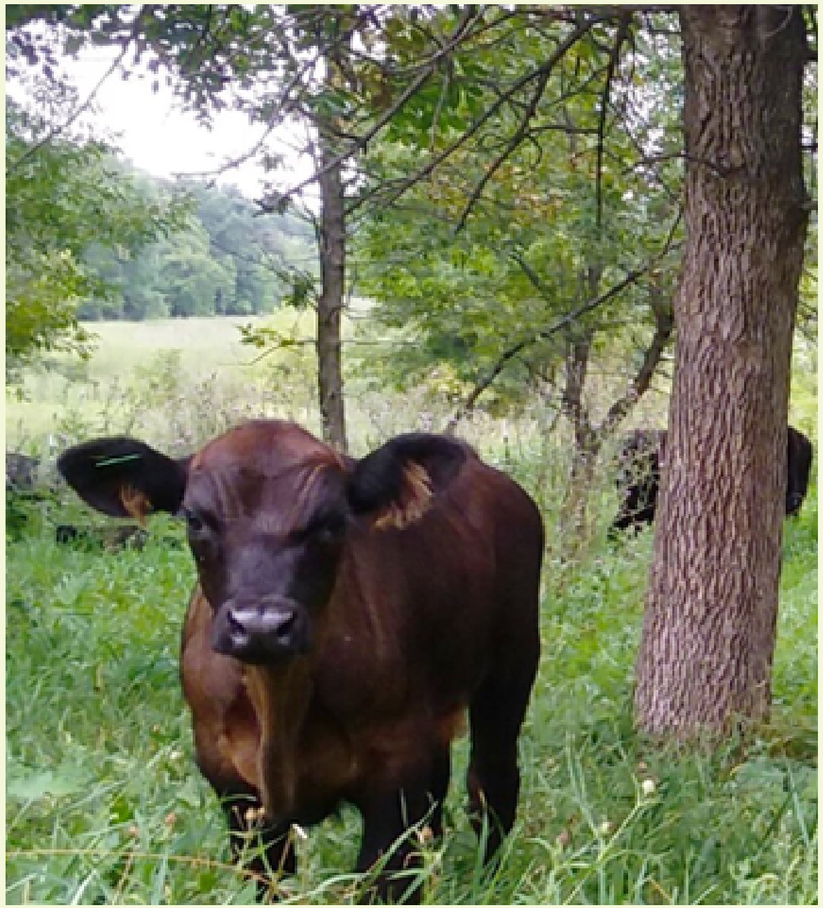
For a more comprehensive list of dry farming crops visit: agwaterstewards.org

Source: Dry Farming Techniques in the Maritime Pacific Northwest

3.2.d) Silvopasture Systems

Silvopasture is a practice that grows crops, trees, and raises livestock on the same land for more sustainable farming. This method of farming produces results and operates similarly to regenerative agriculture*.

*Regenerative Agriculture is an approach to farming that prioritizes sustainability through conservation and rehabilitation techniques



Source: Silvopasture Case Studies

3.2.e) Silvopasture Systems: Example Use Case

Early Boots Farm, Minnesota:

- Tyler Carlson and Katie Droske have been using silvopasture for a few years and have noticed multiple benefits including...
  - Increased grazing area
  - Increased productivity, even in drought
  - Trees improve cattle comfort by providing shade during hot seasons and act as windbreakers during the winter
- Tips to remember:
  - Carefully consider where to plant trees to maximize their benefit
  - Research poisonous vegetation in your area to ensure you grazing animals remain unharmed while grazing

3.2.f) Sustainable Farming

Sustainable farming includes the following practices:

- Diversifying crop rotations and intercropping*
- Integrating livestock with crop production systems
- Improving soil quality
- Minimizing off-farm flows of nutrients and pesticides
- Implementing more efficient irrigation practices

This farming practice aims to integrate environmental health with economic gain and social equity.

*Intercropping - growing a variety of crops on the same plot of land

3.3) Crops

Exacerbated droughts due to climate change can look like extended drought periods that start earlier in the year. This combined with the fact that certain crops don't reach maturity until later in the season can lead to decreased yields. If drought periods begin prematurely, when crops have not had the time to mature enough for harvesting, farmers lose out on any potential gains from their harvests.

3.3.a) Crops by region

Grains

Regions:
- Africa, Asia, Oceania

Varieties:
- Sorghum (cereals)
- Millet

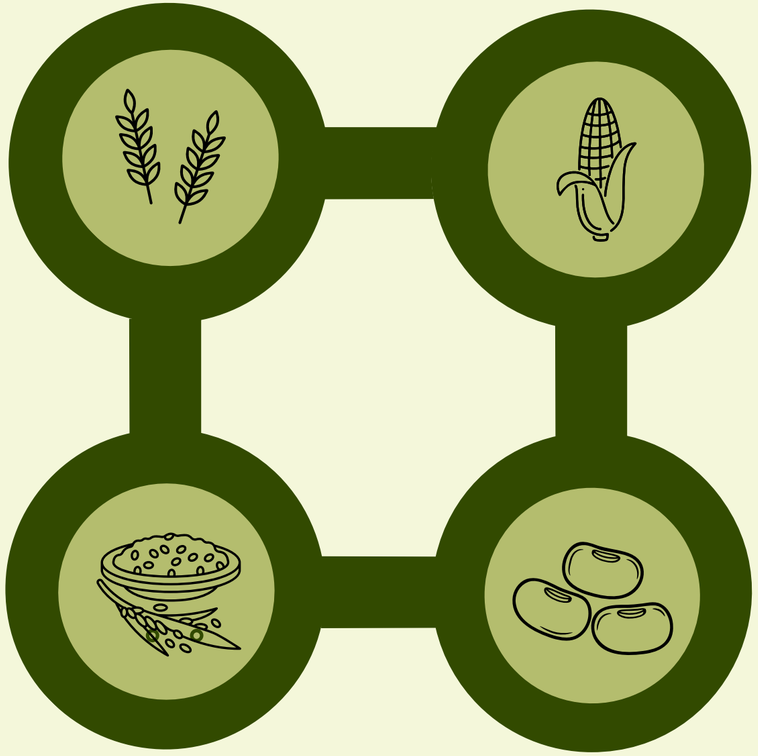
Agricultural Benefits:
- Can grow in arid climates
- Takes fewer days to mature (<110 days vs 120 days)

Rice

Regions:
- Asia

Varieties:
- Sahbhagi Dahn (India)
- Sahod Ulan (Philippines)
- Sookha Dhan (Nepal)

Agricultural Benefits:
- Heat-tolerant (early morning flowering to escape midday heat)
- Can yield 0.8 - 1.2 hectares more than varieties that are not drought tolerant



Drought-Tolerant Maize

Regions:
- Africa, Americas

Agricultural Benefits:
- Water efficient
- Improved nutrient use
- Strong root systems

Soybeans

Regions:
- Americas, Asia

Agricultural Benefits:
- Drought Escape (quick maturation to escape the drought season)

3.3.b) Crops: Example Use Case

Source: CIMMYT drought tolerant maize: A key innovation for millions of farmers, says FAO

Zimbabwe:

- Using drought-tolerant maize, farmers during dry years were able to harvest up to 600 kilograms more per hectare
- This resulted in a surplus work ~$240 USD

3.4) Legislation

Going forward, it is imperative that farmers are able to adapt to climate change. One way to do so is through advancements in technology.

Through the use of technology, adaptation to climate related issues and responsible use of resources is achievable.

3.4.a) Punitive Seed Laws and Success Stories

Punitive Seed Laws

- Punitive Seed Laws unjustly punish farmers for trading seeds, especially regarding trading modified seeds for drought-tolerant crops.

Chile

- Victory against the privatization of seeds after four years
- Actions taken: demonstrations, media campaigns, workshops, meetings with church leaders and with government officials

Source: Chile Derails "Monsanto Law" That Would Privitize Seeds

Niger

- Farmers' victory against the piracy of a local onion
- French company, Technisem privatized and modified the onion, robbing farmers of selling the crop
- Government intervened, changed the name of the onion so Technisem only had rights to the onion they modified

Source: A successful onion project in Niger

3.4.b) Legislation Around the World

Africa

Ghana:
- Plant Breeders' Rights Bill
- Bill prioritizes commercial agriculture over peasant farmers

Mali:
- Seed privatization that is disadvantageous for peasant farmers

Tanzania:
- Farmers' seed sharing is under criminal law

The Americas

Brazil:
- National Policy for Agro-ecology and Organic Production (2012)

El Salvador:
- Free trade in favor of Monsanto (a commercial manufacturer of drought tolerant seeds)

Europe

Austria
- Fighting for legislation in favor of biodiversity and farmers' rights

France
- Strict property and marketing laws imposed on seeds

Germany
- A victory for the defense of farm-based seeds and a campaign to save the "Linda" potato

United Kingdom
- Legal restrictions on selling old seed varieties

Asia

India:
- People's Biodiversity Register
- Biodiversity Act

Indonesia:
- Farmers jailed for producing drought tolerant seeds

Philippines
- The fake promises of "Golden Rice"

South Korea
- Women farmers campaign for native seeds

Thailand
- Resisting free trade agreements in order to protect local seeds

*For more information, visit: Seed laws that criminalize farmers: resistance and fightback

3.5) Technology

Going forward, it is imperative that farmers are able to adapt to climate change. One way to do so is through advancements in technology.

Through the use of technology, adaptation to climate related issues and responsible use of resources is achievable.

3.5.a) Technology: Greenhouses & Aquaponics

Greenhouses

An enclosed structure that regulates temperature and minimizes water usage.

Regions:
- India
- West Africa

Benefits:
- Affordable
- Can increase crop yields while minimizing water usage

Source: Aquaponics at Growing Power, Milwaukee

Aquaponics

A closed aquaculture ecosystem.

Regions
- Europe
- Americas
- Asia

Benefits:
- Increased yields while using less water
- Natural fertilizer from aquatic organisms

Source: Innovative Greenhouses Help Farmers Adapt to Climate Change

3.5.b) Technology: Example Use Case

Greenhouses: India

- Yadav Bhavanth. from Telangana, India, worked with non profit Kheyti to build a greenhouse for his farm
- The greenhouse is made with breathable aluminum coated cloth which reflects sunlight, keeping inside temperatures low
- The greenhouse uses 90% less water and increases crop yields by 5 to 8 times

More on Kheyti*:

- Non profit that works with banks to secure loans on farmers' behalf

*For more information on Kheyti, visit kheyti.com

04. Group Actions for Change

4.1) Projects for Groups

An Overview

- Volunteering at Farms
- Buying produce from farmers affected by drought
- Encouraging businesses and supermarkets to buy produce from local farms
- Voting for politicians and bills that aid farmers
- Political advocacy
- Fundraising projects for farms to transition to drought resistant agriculture practices

4.1.a) Group Projects (More details)

Volunteering at Farms

Africa:

- Agriculture Volunteer Program with Go Volunteer Africa
- Can participate in group volunteering projects on farms with Inside Africa Volunteer

Around the World:

- International Volunteer HQ
  - Can volunteer anywhere around the world for a myriad of causes
  - Some agriculture-related projects include:
    - Sustainable Agriculture in Nepal and Tanzania
    - Sustainable Farming in Rome
    - Eco-Agriculture Conservation in Costa Rica
  - To find similar projects, filter project type to be "Environment and Conservation"

Fundraising Projects

Another way to support farmers affected by droughts is to run fundraising projects and donating all proceeds to such farmers.

This money will help farmers transition to more sustainable farming practices, purchase and use drought-tolerant seeds, and support themselves during harsh drought seasons that deplete their crop yields.

Fundraising ideas include:

- Bake Sales
- Walk-a-thons
- Raffles
- Penny Wars

Political Advocacy

- Letter writing campaigns
- Demonstrations
- Media campaigns (internet. radio, television, social media)
- Meetings with government officials

05. Resources for Farmers

5.1) Resources for Farmers

An Overview

- Locust Management (Food and Agriculture Organization)
- Sustainable Development Goals (West Africa Agricultural Productivity Program)
- Greenhouses (Kheyti non profit)

5.1.a) Farmer Projects

Managing Locusts

Region: East Africa and Yemen

Details: eLocust3 tablet developed by the Food and Agriculture Organization and partners and donors helps track locust swarms to locate and terminate locusts before they can decimate crops.

Sustainable Development Goals

Region: West Africa

Details: Program developed by the West Africa Agriculture Productivity Program (WAAPP) to provide climate smart crop varieties, technologies, and techniques

Greenhouses

Region: India

Details: The non profit Kheyti develops greenhouses and assists farmers with getting loans to buy these greenhouses. Kheyti's goal is to help small farms adapt to cliamte change.

06. Conclusion & Additional Resources

Climate and Drought Resistant Agriculture aims to ensure farmers are equipped to succeed despite the onset of climate change. This is achieved through the introduction of sustainable and climate smart agriculture, climate-tolerant crops, legislation, and adaptive and resources responsible technology.

Individuals and groups alike have the power to help farmers adversely affected by droughts and climate change, both through individual actions that address climate change as a whole, and through targeting actions that focus on aiding farmers in drought prone areas.

Additional Resources & Literature

- World Bank: Climate-Smart Agriculture
- Dispatch from Ghana: Agriculture benefits more than just farmers
- 'Times are Hard and Uncertain': Senegal Adopts Climate Smart Agriculture to Mitigate Effects of Climate Change
- 3 Climate-Resistant Food Solutions for Smallholder Farmers
- Understanding Droughts
- Climate Smart Agriculture
- Why Regenerative Agriculture
- Innovative Greenhouses Help Farmers Adapt to Climate Change
- Design of Affordable Greenhouses for East Africa
- Silvopasture: a sustainable livestock production system
- Drought Tolerance in Soybeans: Methods for Improvement
- Boosting soybean prodiction for improved food security and incomes in Africa
- A high-tech response is helping countries win battle against Desert Locusts
- Seed laws that criminalize farmers: resistance and fightback
- How Farmers Adapt to Climate Change

Additional Resources & Literature Continued

- Governing Seeds in East Africa in the Face of Climate Change: Assessing Political and Social Outcomes
- Farmers shock as sharing seeds could land them six months in jail
- Crop Changes
- Companies' Climate Promises Face a Wild Card: Farmers
- Drought Impacts to Crops in the U.S. Caribbean
- CIMMYT drought tolerant maize: A key innovation for millions of farmers, says FAO
- Drought-Tolerant Corn Hybrids Yield More in Drought-Stressed Environments with No Penalty in Non-stressed Environments
- Silvopasture Case Studies
- Chile Derails "Monsanto Law" That Would Privatize Seeds
- A successful onion project in Niger
- File:Aquaponics at Growing Power, Milwaukee.jpg
- Dry Farming

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