

Aquaponics systems can help to mitigate the impact of climate change in Africa and advance food security.

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Aquaponics is a unique farming method that combines recirculating aquaculture, the practice of raising fish, with hydroponics, the method of growing plants in a soilless environment. In an aquaponics system, fish and plants are cultivated together in a symbiotic environment where they mutually benefit from each other's presence. The fish produce organic waste, which is converted by beneficial bacteria into nutrients that plants can absorb. In turn, the plants filter and purify the water, creating a healthy environment for the fish. This closed-loop system is highly efficient, using significantly less water than traditional farming methods and eliminating the need for synthetic chemical fertilizers.

The concern about traditional agriculture's impact on land, water, and resources has led to a surge in interest in sustainable farming methods which can mitigate the impact of climate change. Aquaponics is seen as a highly efficient farming solution that addresses these multiple farming challenges. By using less water compared to conventional farming, reducing the need for synthetic chemical fertilizers, and minimizing waste, aquaponics presents a promise for producing food without damaging our environment.

Impact of Climate Change on Food Security in Africa:

Climate change significantly impacts food security in Africa, where many communities





are already vulnerable due to socioeconomic challenges. The impacts are multifaceted and include changes in temperature, precipitation patterns, and the frequency of extreme weather events like flooding and droughts. Small scale or subsistence farmers for instance do not have the same resilience compared to commercial farmers. Commercial farmers can apply technology and innovation to their advantage in mitigating the impact of climate change on their production to be much more economical sustainable. A miso (failure of harvest) can mean the end of the road for the small scale or subsistence farmer who in many instances will not have the resources available to start all over again.

Here's an overview of how climate change can affect food security in Africa:

1. Agricultural Productivity

- **Crop Yields:** Rising temperatures and unpredictable rainfall can reduce crop yields. Crops such as maize, wheat, and rice, which are staples in many African countries, are particularly sensitive to temperature changes.
- **Growing Seasons:** Changes in climate can alter the length of growing seasons, affecting planting and harvesting times, which can lead to reduced agricultural

productivity. The effects on seasons of a changing climate are already being seen across many countries and vary from region to region: temperatures have risen across seasons, growing seasons have become longer, precipitation patterns have changed, and extreme precipitation events have increased in frequency and severity.

2. Water Availability

- **Droughts:** Increased frequency and intensity of droughts can lead to water shortages, severely impacting irrigation and reducing crop yields.
- **Flooding:** Conversely, extreme rainfall and flooding can damage crops, erode soil, and disrupt planting schedules.

3. Livestock and Fisheries

- **Livestock:** Heat stress and reduced water availability can affect livestock health and productivity, leading to lower milk and meat production.
- **Fisheries:** Changes in water temperatures and ocean acidification can affect fish populations, impacting coastal communities that rely on fishing for their livelihoods.

4. Pests and Diseases

- **Increased Pests:** Warmer temperatures can



expand the range of agricultural pests and diseases, leading to greater crop losses.

- **Disease Vectors:** Changes in climate can also affect the spread of diseases that impact both crops and livestock, further threatening food security.

5. **Economic Impact**

- **Reduced Income:** Lower agricultural productivity can lead to reduced income for farmers, affecting their ability to purchase food and invest in sustainable practices.
- **Market Prices:** Disruptions in food

production can lead to higher market prices for food, making it less affordable for vulnerable populations.

6. **Nutrition and Health**

- **Food Quality:** Climate change can affect the nutritional quality of food crops, with potential reductions in essential nutrients.
- **Food Access:** Increased food prices and reduced availability can lead to higher rates of malnutrition, particularly among children and other vulnerable groups.



7. Migration and Conflict

- Displacement: Climate-induced food shortages can lead to migration as people move in search of better living conditions, which can strain resources in receiving areas.
- Conflict: Competition over scarce resources, such as water and arable land, can lead to conflicts, further destabilizing food security.

Mitigation and Adaptation Strategies:

- Climate-Resilient Crops: Developing and promoting the use of drought-resistant and heat-tolerant crop varieties.
- Improved Water Management: Implementing efficient irrigation systems and water conservation practices.
- Diversified Livelihoods: Encouraging diversification of income sources to reduce dependency on climate-sensitive agriculture.
- Early Warning Systems: Establishing early warning systems for extreme weather events to help communities prepare and respond effectively.
- Sustainable Practices: Promoting sustainable agricultural practices that improve soil health and increase resilience to climate change, regenerative agriculture

for instance.

The Role of Aquaponics:

Aquaponics, a sustainable method of food production, it combines aquaculture (raising fish) and hydroponics (growing plants in water) in a symbiotic environment. The farmer in this case has much more control on the environmental conditions especially if a greenhouse is used for the system. This method can play a significant role in mitigating climate change through several key mechanisms:

1. Efficient Resource Use

Water Conservation: Aquaponics uses up to 90% less water compared to traditional soil farming because water is recirculated and reused within the system.

Reduced Land Use: As a soil-less farming method, aquaponics can be set up in urban areas, reducing the need to clear forests or natural habitats for agricultural land.

2. Reduced Carbon Footprint

Local Food Production: By enabling local food production, aquaponics reduces the need for long-distance transportation of food, which



lowers greenhouse gas emissions associated with transport.

Lower Energy Consumption: Compared to traditional agriculture, aquaponics can be more energy-efficient, particularly if renewable energy sources are integrated into the system.

3. *Reduced Chemical Use*

No Synthetic Fertilizers: The waste produced by fish provides an organic nutrient source for the plants, eliminating the need for chemical fertilizers that are energy-intensive to produce.
Minimal Pesticides: Aquaponic systems often require fewer pesticides, as the controlled environment can reduce pest infestations.

4. *Carbon Sequestration*

Plant Growth: Plants absorb carbon dioxide as they grow. An aquaponic system can thus contribute to carbon sequestration.

5. *Waste Reduction*

Nutrient Recycling: The system recycles nutrients, reducing waste and pollution associated with conventional farming and aquaculture.

6. *Increased Resilience*

Climate Resilient: Aquaponics systems are less susceptible to extreme weather conditions and can be maintained in controlled environments, making them more resilient to climate change impacts.

Challenges and Considerations:

Initial Setup Costs: Aquaponics systems can be expensive to set up initially, requiring investment in infrastructure and technology.
Technical Knowledge: Successful operation requires a certain level of expertise and ongoing management to maintain the balance between fish and plants.

Energy Use: While potentially lower than traditional farming, energy use in aquaponics, especially in temperature-controlled environments, must be managed carefully to ensure sustainability.

Conclusion:

The impact of climate change on food security in Africa is profound and multifaceted, requiring a combination of immediate and long-term strategies to mitigate its effects. Collaborative efforts between governments, international organizations, and local communities are essential to build resilience and ensure food security for future generations.

Aquaponics offers a promising pathway to more sustainable food production that can help mitigate climate change impacts. By efficiently using the available resources, reducing carbon emissions, and fostering local food production, aquaponics systems can contribute to a more resilient and sustainable agricultural future.

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