Focus on biodiversity

A series of articles addressing the importance of biodiversity in agriculture. Farming for a better future.

Biodiversity: productive, sustainable, resilient farming

Agriculture depends on biodiversity

Biodiversity is the biological variety of life on earth: the variety of animals, plants, fungi and microorganisms. Each works together to maintain balance and support life in our ecosystems. Healthy, diverse ecosystems provide us with clean air, freshwater, food and resources. Biodiversity has been the basis of agriculture ever since it emerged some 10,000 years ago. It has enabled farming systems to evolve, resulting in the crops and livestock we know today. Biodiversity and agriculture are strongly interdependent. Biodiversity is necessary to maintain the ecosystem functions of agricultural systems.

Balance of ecosystems

Today, humanity is putting increasing pressure on the planet. We are using more resources than ever, which can upset the balance of ecosystems and reduce biodiversity. Understanding the importance of biodiversity can help farmers to apply sustainable farming practices, leading to more resilient ecosystems, greater food security and overall societal wellbeing. This is the first article in a series in which we explore the relationship between biodiversity and agriculture, which strongly influences the farmer's productivity, sustainability, resilience, and ability to comply with home-country laws.

Four important aspects of biodiversity

Biodiversity is essential for the sustainable production of agricultural products and the benefits these provide, including food security, nutrition and livelihoods. It influences our agricultural systems in four main ways.

First, biodiversity maintains ecosystem services that are essential to human survival. It enables soil and water functions, maintenance of soil fertility and biota, and facilitates pollination processes.

Second, biodiversity ensures genetic diversity, which enables species to adapt to changing environments and evolve. It increases their tolerance to frost, high temperature, drought and waterlogging, as well as their resistance to diseases, pests and parasites. This is particularly important considering climate change. Our ability to adapt to these changes depends on genetic diversity.

Third, biodiversity allows for the adaptation of agricultural systems. All domesticated crops and animals result from human management of biodiversity, which is continuously responding to new challenges to maintain and increase productivity under constantly varying conditions. As the variation in the types of seeds and plants we grow increases, so does our ability to adapt to environmental and economic pressures.

Fourth, biodiversity sustains rural incomes and livelihoods. Agricultural biodiversity provides humans with food and raw materials for goods, such as cotton for clothing, wood for shelter and fuel, plants and roots for medicines, and materials for biofuels.

Biodiversity strengthens ecological and economic resilience

Biodiversity can be viewed from two perspectives: internal biodiversity and external biodiversity. Internal diversity is the farmer's choice of crops, defined at two levels. One level is the mix of crops, so choosing to grow not only one crop, such as soy, but to also produce coffee and corn, for instance. This increases resilience. If a single crop is widely grown, a pest or disease to which it lacks resistance can lead to a dramatic fall in production and income. The second level of internal diversity is having various strains of a particular crop, so not one type of corn but three types, for instance. If one type is affected by a disease, other types may be resistant, ensuring greater stability in the overall crop.

Environmental factors

External diversity refers to the composition of the farm and the farm's ecosystems. For instance, a biodiverse farm may consist not only of irrigated crops but also mixed production systems with non-irrigated crops, livestock, forests and fisheries.
In a time of drought, a farm that is close to a forest or with trees can increase the possibility that the ecosystem retains more water, thanks to the roots of the trees that prevent the water from evaporating. This makes the farm more resistant to external environmental factors beyond the control of the farmer. External diversity strengthens resilience.

Secure finance

Financial institutions recognize the threat of global loss of biodiversity and the significant negative impacts it can have. The 2020 World Economic Forum report identified biodiversity loss as one of the most critical risks humanity will face in this decade. At the same time, the financial services and banking sectors recognize that farmers who embrace biodiversity can strengthen their ecological and economic resilience. That's why increasingly financial institutions develop programs to support the transition to productive, biodiverse agriculture. One example is Rabobank's AGRI3 Fund. This identifies four key areas to secure finance:

1. forest recovery and sustainable forest management;
2. production intensification and best-practice implementation;
3. certification and traceability;
4. digital farming and sustainability innovation.

Integrating genetic diversity in farms

Genetic diversity refers to the range of different traits within a species. A species with high genetic diversity has many individual types with a wide variety of different traits. Genetic diversity is critical for a population to adapt to changing environments, and so critical for sustainable farming.

There is a strong need to increase genetic diversity in modern agriculture. While more than 6000 plant species have been cultivated for food, fewer than 200 make substantial contributions to global food output. Only nine accounted for 66% of total crop production in 2014. The situation with livestock is similar. Global livestock production is based on about 40 animal species, with only a handful providing the majority of global output of meat, milk and eggs.*

Series on biodiversity

This is the first in a series of articles on biodiversity.
Other articles in this series will address:

- Biodiversity's contribution to farming productivity and importance for policy compliance
- How farmers can improve the biodiversity in their production systems
- Measuring biodiversity in production systems

As stated by the Food and Agriculture Organization of the United Nations, world food production is dependent on a small number of plant and animal species. Increasing genetic variety in cultivated and domesticated species is a central concern in food production today. Genetic diversity increases the choices available to producers to develop better-adapted and diverse production systems. Farmers who embrace biodiversity are investing in higher levels of sustainability and resilience.

*Source: The State of the World's Biodiversity for Food and Agriculture. Food and Agriculture Organization of the United Nations. FOA Commission on Genetic Resources for Food and Agriculture Assessments • 2019

Recommended Reading:

Convention on Biological Diversity. Why is it important? Convention on Biological Diversity, February 2022.
The State of the World's Biodiversity for Food and Agriculture. Food and Agriculture Organization of the United Nations. FAO Commission on Genetic Resources for Food and Agriculture Assessments, 2019.