



© FAO/17010/© Bizzari  
© FAO/17247/A.Obadi



# BIODIVERSITY FOR MAINTENANCE OF AGRO-ECOSYSTEM FUNCTIONS

**B**iodiversity, the variety and variability of animals, plants and micro-organisms at the genetic, species and ecosystem levels, is necessary to sustain key functions of the ecosystem, its structure and processes.



© FAO/18606/© Blaak

## What is an Agro-ecosystem?

Agro-ecosystems are ecosystems in which humans have exercised a deliberate selectivity on the composition of living organisms. Agro-ecosystems are distinct from unmanaged ecosystems as they are intentionally altered, and often intensively managed, for the purposes of providing food, fibre and other products; hence they inherently have human community, economic and environmental-ecological dimensions.

## Why is Biodiversity Important for the Maintenance of Agro-ecosystem Functions?

Maintenance of biodiversity within an agro-ecosystem is necessary to ensure the continued supply of goods and services such as:

- (i) evolution and crop and livestock improvement through breeding – the interaction between the environment, genetic resources and management practices that occurs *in situ* within agro-ecosystems ensures that a dynamic portfolio of agricultural biodiversity is maintained and adapts to changing conditions;
- (ii) biological support to production – support is provided by the organisms that make up the biological diversity of the agro-ecosystem. For example, soil fauna and micro-organisms, together with the roots of plants and trees, ensure nutrient cycling; pests and diseases are kept in check by predators and disease control organisms, as well as genetic resistances in crop plants themselves; and insect pollinators contribute to the cross-fertilization of outcrossing crop plants; and
- (iii) wider ecological functions – valuable ecological processes that result from the interactions between species and between species and the environment include the maintenance of soil fertility, water quality and climate regulation.



© FAO/15827/© M. Mikalad

## EXAMPLES OF AGRICULTURAL BIODIVERSITY'S ROLE IN THE AGRO-ECOSYSTEM

**Pest control.** Predators, parasitic wasps and micro-organisms play a key role in controlling agricultural pests and diseases. For example, more than 90% of potential crop insect pests are controlled by natural enemies living in natural and semi-natural areas adjacent to farmlands. Many methods of pest control, both traditional and modern, rely on biodiversity.



**Pollination.** There are more than 100 000 known pollinator species (bees, butterflies, beetles, birds, flies and bats). Pollination mediated by components of agricultural biodiversity is an important function in agro-ecosystems. The global financial value contributed to agriculture each year by pollinators, representing 9.4% of the world agricultural production used for human food in 2005, is approximately € 153 billion.

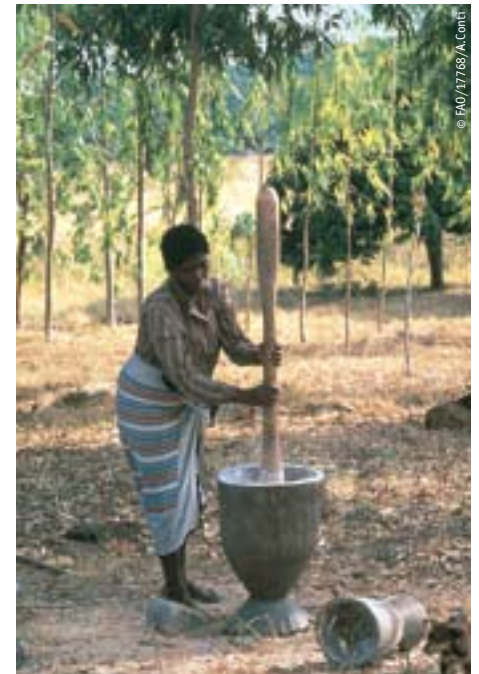
**Biomass production and yield efficiency.** Diverse agro-ecosystems (fish polycultures, mixed herds, intercrops, integrated agro-sylvo-pastoral) are generally highly productive in terms of their use of energy and unit land area (or unit water volume). This efficiency is largely a product of the systems' biological and structural complexity, increasing the variety of functional linkages and synergies between different components.



## THE NEED TO BETTER UNDERSTAND BIODIVERSITY IN AGRICULTURE

Biodiversity is indeed an important regulator of agro-ecosystem functions, not only in the strictly biological sense of impact on production, but also in satisfying a variety of needs of the farmer and society at large.

Understanding the lifecycles, ecological responses and interactions within and between the organisms that provide ecological services enables agro-ecosystem managers to build on and enhance the essential services provided by biodiversity. Managers can reduce external input requirements, increase productivity and improve the sustainability of the ecosystem.



Further information about the work of FAO on biodiversity is available at: [www.fao.org/biodiversity](http://www.fao.org/biodiversity)