Food and Agriculture Organization of the United Nations

The role of biocontrol in Sustainable Food and Agriculture to reach the Sustainable Development Goals

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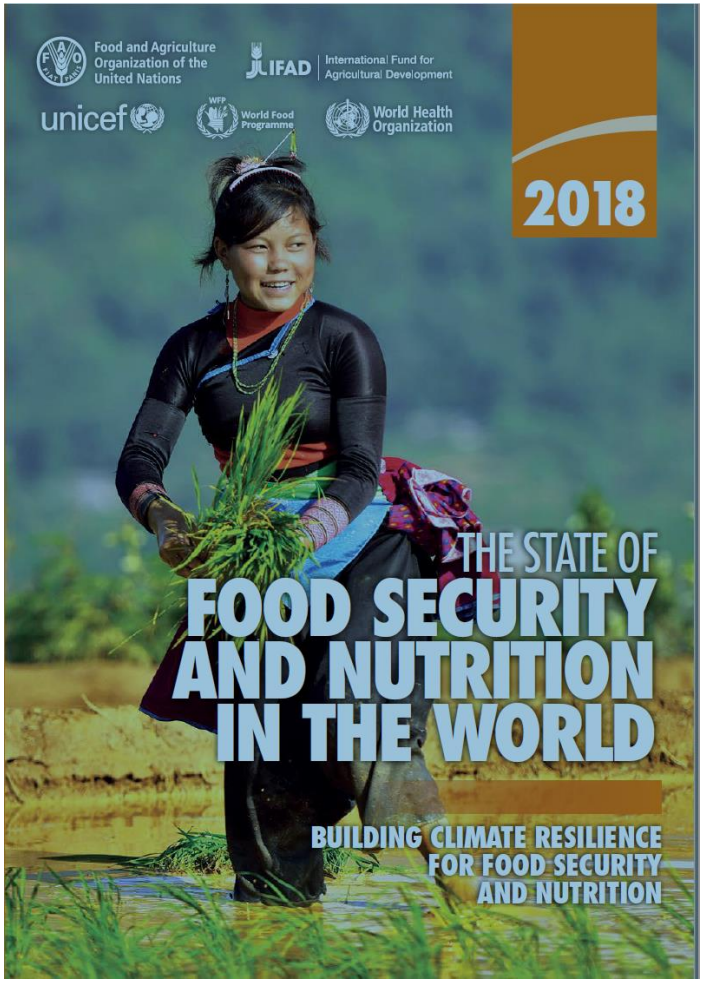
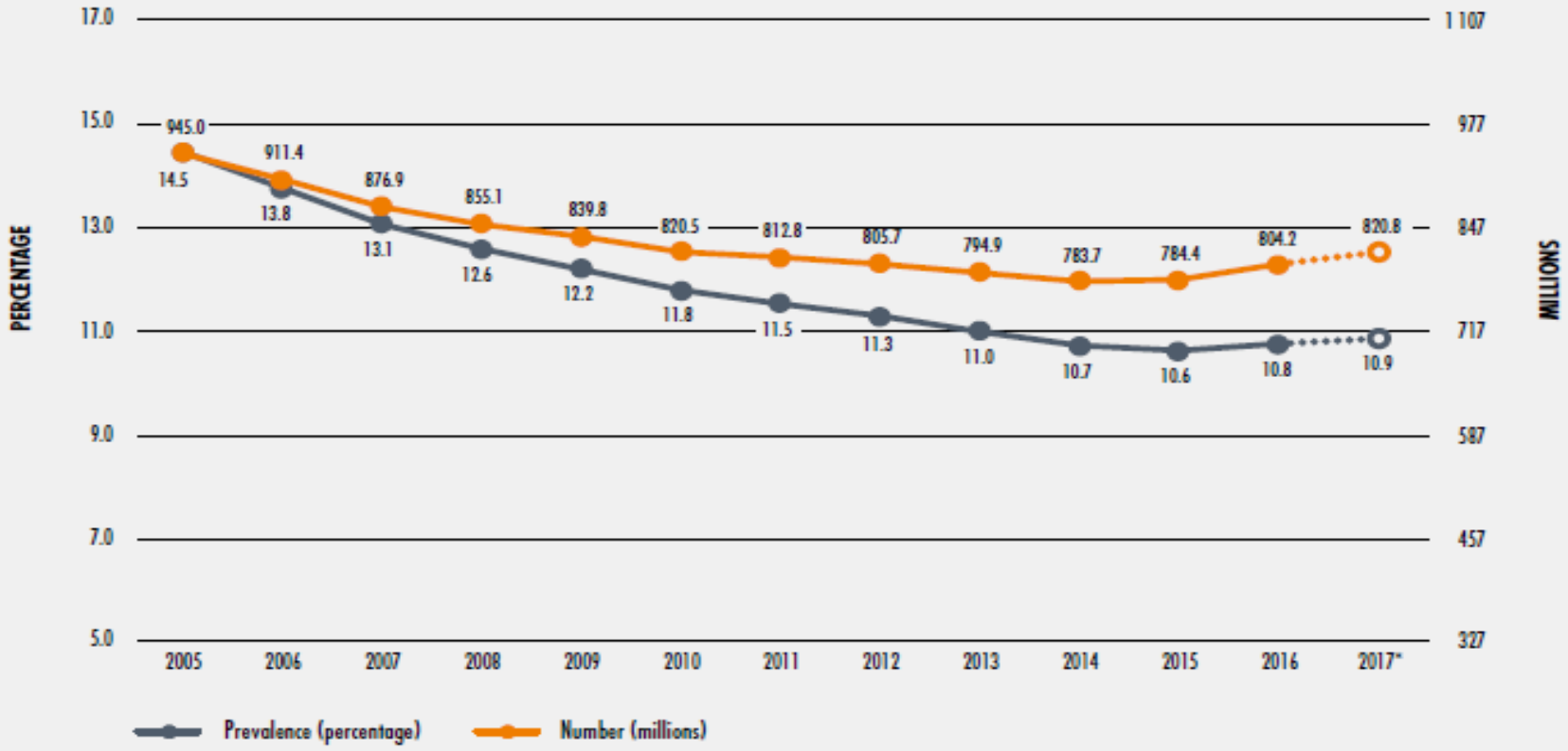
Contents

The Challenge

Hunger is on the rise, after over a decade of decline.



THE NUMBER OF UNDERNOURISHED PEOPLE IN THE WORLD HAS BEEN ON THE RISE SINCE 2014, REACHING AN ESTIMATED 821 MILLION IN 2017



* Projected values, illustrated by dotted lines and empty circles.
SOURCE: FAO.

The 5 main challenges of agriculture

1.

Agricultural demand will increase significantly due to population growth, rising incomes and urbanization

The 5 main challenges of agriculture

2.

To meet rising demand, output will have to expand, but **under increasingly tight production constraints**

The 5 main challenges of agriculture

3.

Climate change is already affecting agriculture, but agricultural production is also a major cause

The 5 main challenges of agriculture

4.

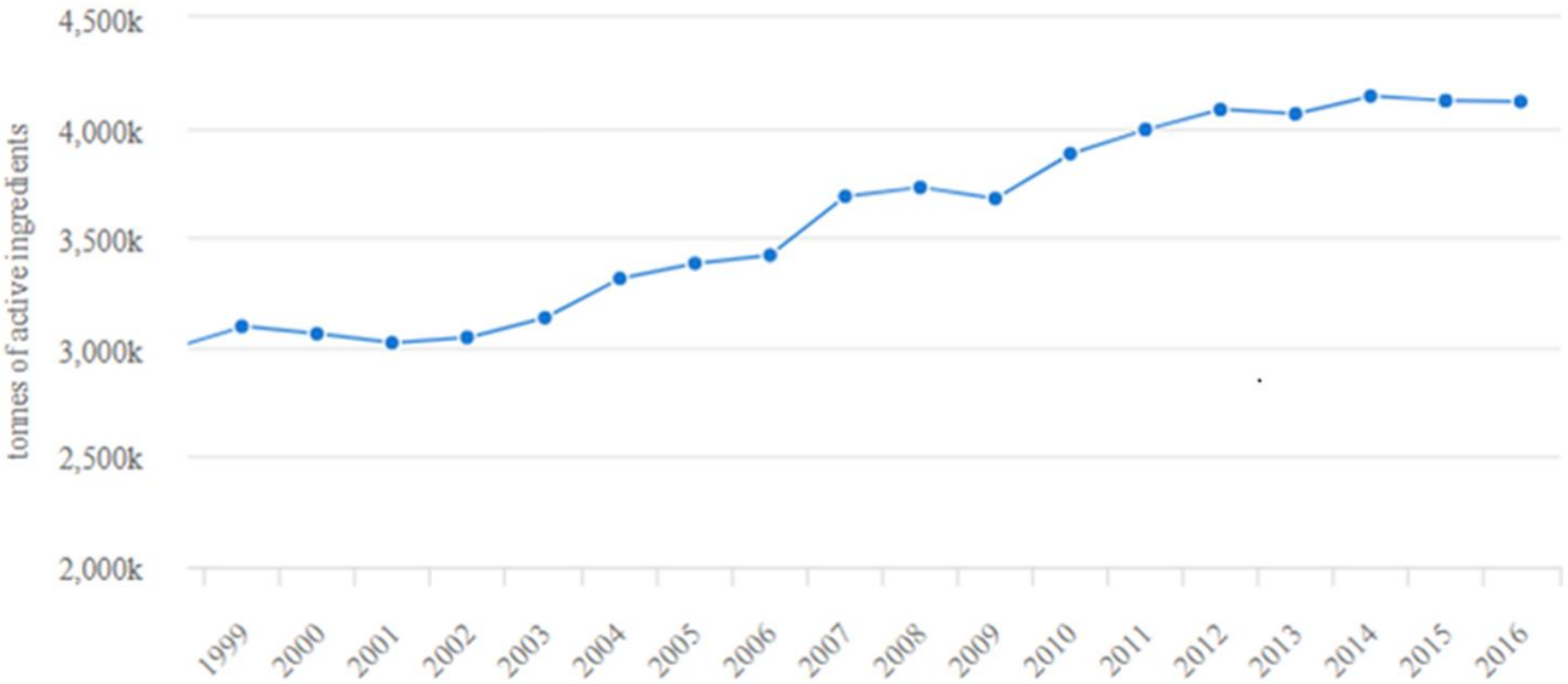
Successes in hunger and poverty reduction are undeniable, but **much more needs to be done**

The 5 main challenges of agriculture

5.

Food systems are changing, jeopardizing many landless and smallholder farmers

Pesticides use, World + (Total)
1999 - 2016

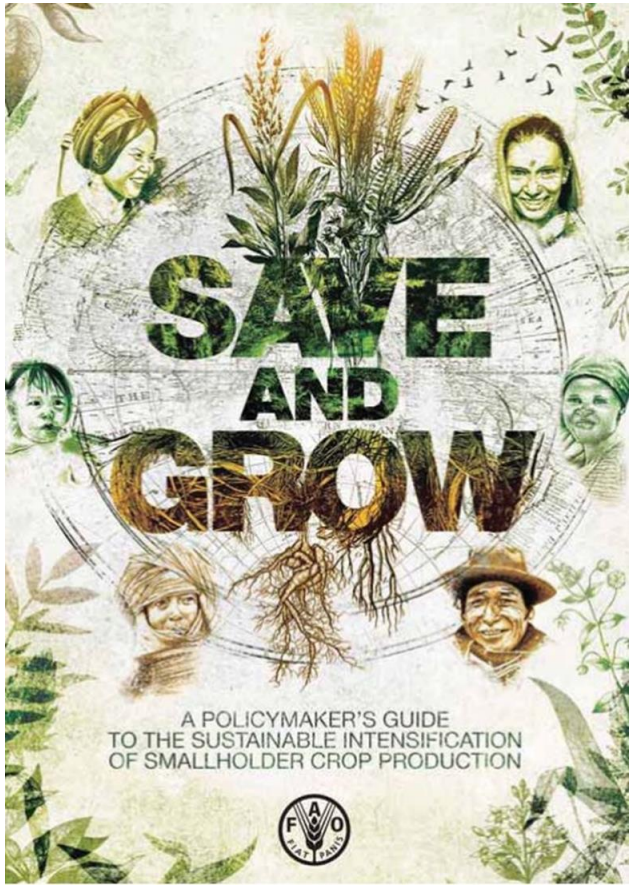


FAOSTAT, 2018

Sustainable Food and Agriculture

Sustainability in Crop Production through

- Eco-system approach
- Healthy soils for enhanced crop nutrition
- Conservation Agriculture
- Efficient use of inputs
- **Integrated Pest Management**



Integrated Pest Management

- Emphasis on **prevention**:
  - Quarantine measures (IPPC)
  - Physical control
  - Biological control
  - Host plant resistance
  - Agronomic measures (crop rotation….)
- **Curative** methods as a last resort:
  - Pesticides

Biocontrol

Using an organism to reduce the population density of another organism, including the control of animals, weeds and diseases.

Approaches to biocontrol

1. Classical biocontrol
2. Periodical release of natural enemies
3. **Enhancing indigenous natural enemies: ecosystem-based approaches**
4. Biopesticides

Potential economic impact of biological control

Pest	Countries under economic analysis	Estimated cost saving in millions of US $
Cassava mealybug	27 countries in Africa	7,971 – 20,226
Cassava green mite	Benin, Ghana and Nigeria	2,157
Mango mealybug	Benin	531
Water hyacinth	Benin	260

Source: Neuenschwander, Nature (2004)

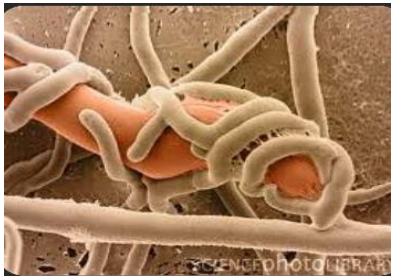
Biopesticides

Biopesticides are biologically based control agents. They are obtained from organisms including plants, bacteria and other microbes. Making use of biopesticides, pests can be managed through predatory, parasitic, or chemical interventions rather than with synthetic chemical plant protection products.

Scope: biopesticides are used against crop diseases and manage pests in a more environmental friendly way. They are an important component of integrated pest management (IPM).

Categories:

- **Microbials:** bacteria, fungi, viruses and nematodes (Plant Pathogens)
- **Botanicals:** plant extracts and essential oils, exhibiting insecticidal or fungicidal properties.
- **Semiochemicals:** synthetic analogues of insect pheromones that can be used to lure insects into traps or repel them from crops.
- **Macrobials:** living insects used to control pest populations.



Biopesticides use – global trends

- Globally, the use of bio-pesticides is **growing by 5-10% annually**
- Bio-pesticide global market could reach more than $US 10 billion.
- About 1400 bio-pesticide products (1,000 active ingredients) sold annually.


11/08/2011

Advantages of biocontrol – ecologically

- **Less toxic** and therefore **safer to animals and humans**.
- **Low toxicity to wildlife**
- **Degrade and decompose quickly**
- **No risk of pest resistances**.
- **No concern of residues in food**
- **Long term effectiveness** and key component of Integrated Pest Management (**IPM**) programs

Advantages of biocontrol – economically and social

- Benefit **markets** from the potential of niche products/services from associated biodiversity and affiliated ecosystem services
- Benefit **farmer well-being**
- Benefit **society**

Commercial biocontrol agent

Farmer-cultured biopesticide

Contribution to Sustainable Food and Agriculture

- SDG 1: Biocontrol can help to **reduce agricultural costs** and allocation of resources

- SDG 2: Biocontrol is an important component of sustainable **crop protection, sustainable crop production and sustainable agriculture.**

Contribution to Sustainable Food and Agriculture

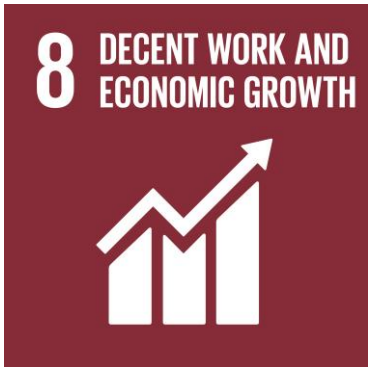
- SDG 3: Biocontrol contributes to **reduce pesticide use and the risks associated with it.**

- SDG 5: By utilizing ecosystem services and novel biocontrol methods, **women can play a more integral part in agriculture,** without some of the access-to-resources-barriers they may otherwise face when seeking other inputs.

Contribution to Sustainable Food and Agriculture

- SDG 6: Biocontrol can **help reduce negative impacts of pesticides** on water and water organisms.

- SDG 8: Biocontrol approaches can **help reduce farm input costs** and empower smallholder farmers to use alternative control methods.



Contribution to Sustainable Food and Agriculture

- SDG 12: By utilizing ecosystem services, biodiversity, and on-farm inputs, biocontrol can help to **reduce negative externalities of agricultural production and move towards more sustainable food and agriculture.**

- SDG 13: Biocontrol can help farmers and agroecosystems to become **more resilient** and thus **reduce risks associated with climate change.**

Contribution to Sustainable Food and Agriculture

- SDG 15: By harnessing nature, making use of biodiversity, biocontrol fosters and helps to increase the wider use **of biodiversity.**

- SDG 16: Indigenous and traditional knowledge can help foster the co-creation and application of such knowledge to the benefit of farmers and ecosystems

FAO's work on biocontrol

- Harnessing nature as key part of Integrated Pest Management (IPM): crucial role of biocontrol

- **Fall Armyworm** in Africa: FAO promotes ***biocontrol*** in the fields for a higher rate of natural predators such as ants, earwigs that eat FAW eggs, and plant pathogens; ***use of microbials, botanicals and pherehorme***.

- Guidelines and workshops for the registration of biopesticides ***and assist countries in registration of biopesticides***

- **Guidelines on specifications for microbial pest control agents** (to be published end 2018)

Comparison of aspects related to the development and application of chemical and biological control

	chemical control	biological control
success ratio	1:200000	1:20
developmental costs	180 million US$	2 million US$
developmental time	10 years	10 years
risk of resistance	large	nil/small
specificity	low	high
harmful side effects	many	nil/few

Source: Bale et al., 2004

Thank you