Food Security and Biotechnology in Africa

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MODULE 2
BIOTECHNOLOGY: HISTORY, STATE OF THE ART, FUTURE.

LECTURE NOTES: UNIT 5
FOOD SECURITY AND BIOTECHNOLOGY IN AFRICA: OPTIONS AND OPPORTUNITIES

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*This **Unit 5 of Module 2** is an integral part of the **six Master's level course modules** (each of 20 hrs) in the field of agricultural biotechnology as elaborated by the EDULINK-FSBA project (2013-2017) which are:*

- *Module 1: Food security, agricultural systems and biotechnology*
- ***Module 2: Biotechnology: history, state of the art, future***
- *Module 3: Public response to the rise of biotechnology*
- *Module 4: Regulation on and policy approaches to biotechnology*
- *Module 5: Ethics and world views in relation to biotechnology*
- *Module 6: Tailoring biotechnology: towards societal responsibility and country specific approaches*

PRESENTATION OF MODULE 2

INTRODUCTION

Achieving food security in its totality (food availability, economic and physical access to food, food utilization and stability over time) continues to be a challenge not only for the developing nations, but also for the developed world. The difference lies in the magnitude of the problem in terms of its severity and proportion of the population affected. According to FAO statistics, a total of 842 million people in 2011–13, or around one in eight people in the world, were estimated to be suffering from chronic hunger. Despite overall progress, marked differences across regions persist. Africa remains the region with the highest prevalence of undernourishment, with more than one in five people estimated to be undernourished. One of the underlying causes of food insecurity in African countries is the **rapid population growth (**Africa's population is expected to reach 2.4 billion in 2050) **that makes t**he food security outlook worrisome. According to some projections, Africa will produce enough food for only about a quarter of its population by 2025. How will Africa be able to cope with its food security challenge? Is biotechnology is key to food security in Africa?

Biotechnology's ability to eliminate malnutrition and hunger in developing countries through production of crops resistant to pests and diseases, having longer shelf-lives, refined textures and flavors, higher yields per units of land and time, tolerant to adverse weather and soil conditions, etc, has been reviewed by several authors. If biotechnology per se is not a panacea for the world's problems of hunger and poverty, it offers outstanding potentials to increase the efficiency of crop improvement, thus enhance global food production and availability in a sustainable way. A common misconception being the thought that biotechnology is relatively new and includes only DNA and genetic engineering. So, agricultural biotechnology is especially a topic of considerable controversy worldwide and in Africa, and public debate is

fraught with polarized views and opinions. Therefore, working at the sustainable introduction of biotechnology for food security in Africa requires a strong conceptual understanding by the learner (stakeholders and future stakeholders) of what is biotechnology.

GENERAL OBJECTIVE OF THE MODULE:

The main objective of this module is to offer a broad view of biotechnology, integrating historical, global current (classical and modern) and future applications in such a way that its applications in Africa and expected developments could be discussed based on sound knowledge of processes and methods used to manipulate living organisms or the substances and products from these organisms for medical, agricultural, and industrial purposes.

SPECIFIC OBJECTIVES:

On successful completion of this module, the learner should be able to:

- Demonstrate knowledge of essential facts of the history of biotechnology and description of key scientific events in the development of biotechnology
- Demonstrate knowledge of the definitions and principles of ancient, classical, and modern biotechnologies.
- Describe the theory, practice and potential of current and future biotechnology.
- Describe and begin to evaluate aspects of current and future research and applications in biotechnology.
- Select and properly manage information drawn from text books and article to communicate ideas effectively by written, oral and visual means on biotechnology issues.
- Demonstrate an appreciation of biotechnology in Africa especially in achieving food security.

COURSE STRUCTURE

The content of the course is organized in five units as followed:

- Unit 1: Introduction to biotechnology, history and concepts definition
- Unit 2: The Green Revolution: impacts, limits, and the path ahead
- Unit 3: Agricultural biotechnology: the state-of-the-art
- Unit 4: Future trends and perspectives of agricultural biotechnology
- **Unit 5: Biotechnology in Africa: options and opportunities**

UNIT 5:
FOOD SECURITY AND BIOTECHNOLOGY IN AFRICA: OPTIONS AND OPPORTUNITIES (03 HOURS)

PRESENTATION

Objective

This unit on options and opportunities of Biotechnology in Africa was designed to address these issues targeting food security. The objective is to present an overview of Food Insecurity in Africa and to discuss the importance of sustainable agriculture in Africa as a key to achieve food security focusing on current and future technologies to increase productivity that are accessible, appropriate and adapted to the needs of smallholders.

Content

The unit is composed of 3 sections:

1. Overview of Food Insecurity in Africa (*approx. 01 hour*)
2. Case study (*approx. 01 hour*)
3. African Food Security Prospects (*approx. 01 hour*)

Course Delivery

Lecture Slides

The slides used in lectures are summaries that have as main objective to guide the learner in his personal work (mainly reading the selected literature).

- ***Reading the slides is not an adequate substitute for attending lectures. The slides do not contain anything that the instructor says, writes on the board, or demonstrates during lectures.***

Lecture Notes

The Lecture notes offer an overview of a subject (you will need to fill in the detail) and detailed information on a subject (you will need to fill in the background). It encourages taking an active part in the lecture by doing reference reading.

- ***This unit includes two learner assignments that relate to reading synthesis.***

To continue

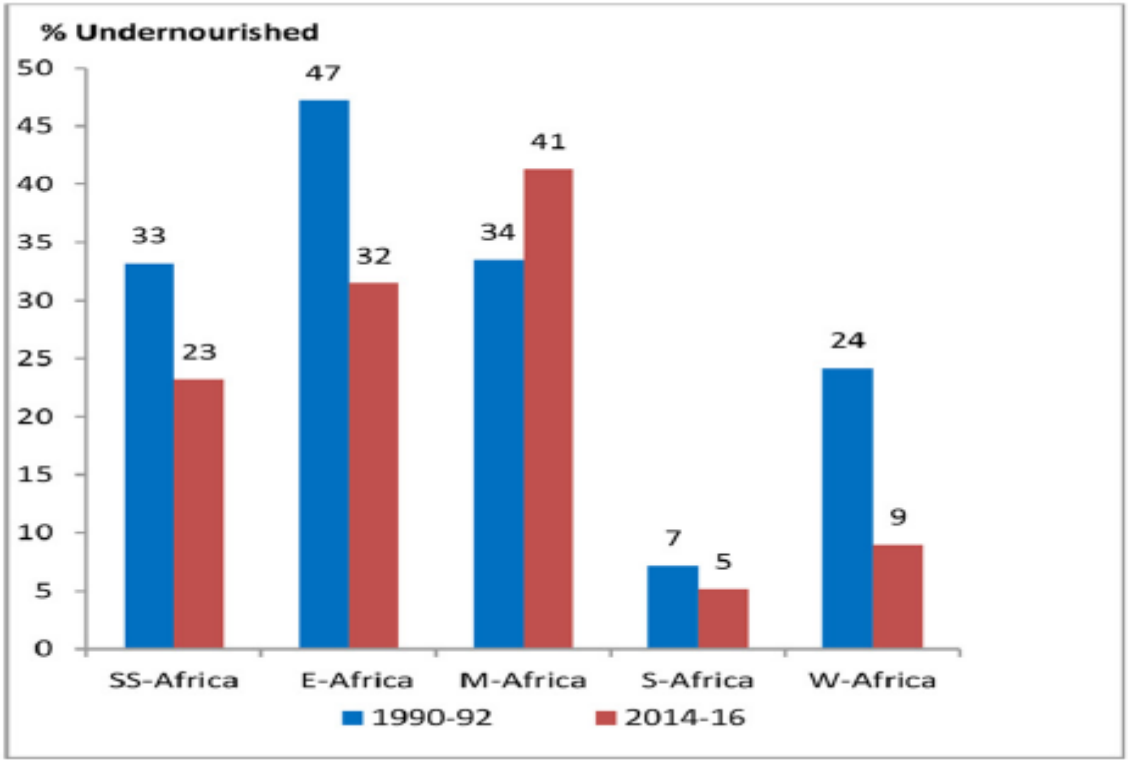
- ***This Unit intends to be introductory to the complex debate on "biotechnology and food security in Africa". The interested reader will be able to deepen his knowledge thanks to the detailed information presented in MODULE 6 of FSBA course on "Tailoring biotechnology: towards societal responsibility and country specific approaches"***

OVERVIEW OF FOOD INSECURITY IN AFRICA

The issues of food security and poverty in the developing world and especially in sub-Saharan Africa have dominated public debate and are an issue of global concern. Exacerbating these issues is the com-plex subject of population growth. It is estimated that world popula-tion will bit the 8 billion mark in the year 2025; most of the increase is expected in the developing world. Population growth has direct implications for available land (and this in the light of decrease in arable land worldwide). For Africa, where the rural population is close to 70 percent in most countries and where consequently the main economic and social activity is farming, these facts are an issue of grave concern. The challenge for developing countries is to ensure that their citizenry enjoys food security (IELRC). The role of biotechnology in the economic transformation of Africa is the subject of academic and public discourse in the region. The discourse has placed emphasis on whether the technology has potential to enlarge Africa's food security status. While a wide range of policies is required to address some of the structural rigidities that undermine prospects of achieving the necessary food security status, biotechnology can enhance agricultural production in the region.

Prevalence of undernourishment

In line with the 2015 deadline set for achieving the Millennium Development Goal targets, Sub-Saharan Africa (SSA) made some progress towards halving the proportion of its population suffering from hunger (MDG 1.C target). Overall, the prevalence of hunger in the region declined by 31 percent between the base period (1990-92) and 2015, according to the latest estimates of the State of Food Insecurity in the World (SOFI 2015 report). In other words, approximately one person out of four in SSA is estimated to be undernourished today compared to a ratio of one out of three in 1990-92. This progress towards the MDG 1.C target has been made with substantial differences among the four sub-regions in SSA. Progress has been recorded across the sub-regions with the exception of Middle Africa (Fig. 1/5). Advancement has been particularly remarkable in Western Africa which successfully reduced by 63 percent the proportion of its people suffering from hunger; the proportion declined from 24.2 percent in 1990-92 to 9 percent in 2014-16 (FAO 2015).



Source: FAO, 2015

Fig. 1/5: Prevalence of undernourishment in SSA (1990-92 and 2014-16)

Compared to other sub-regions, Western Africa has made significant progress, having reduced the number of undernourished people (WFS) by almost 13 million between 1990-92 and 2014-16 (Table 1/5), despite a significant population growth and recurrent droughts in Sahel countries. However, such progress is insufficient to reach the WFS target of halving the number of people undernourished by 2015 (FAO 2015).

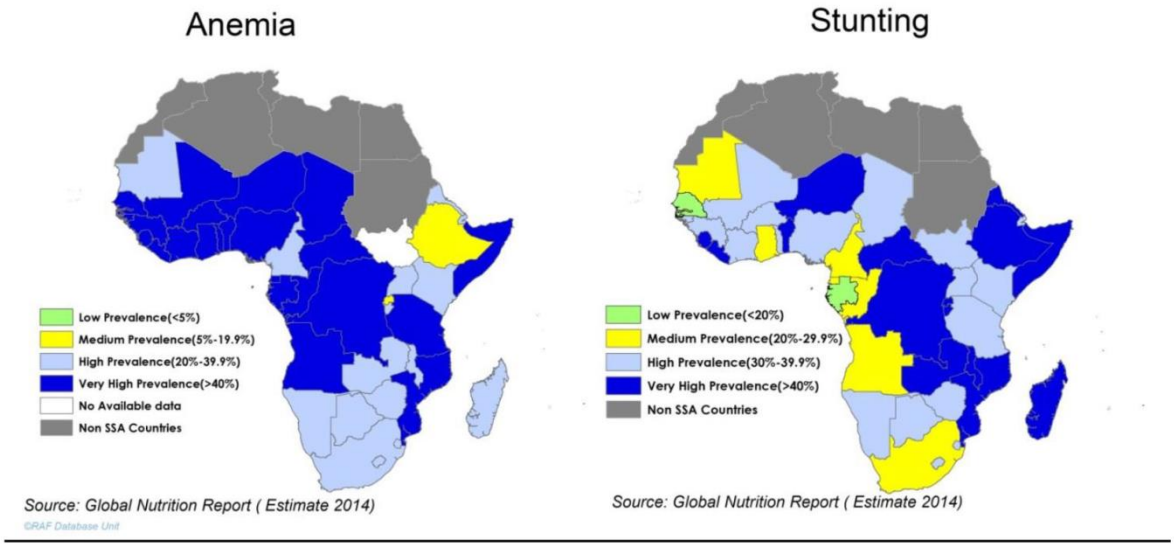
Progress towards WFS and MDG targets

As a major consequence of these malnutrition situations, there is a high prevalence of anemia in reproductive women and stunting in children under five years in Sub-Saharan Africa (Fig. 2/5). In most countries it is estimated that 3 out of 10 children under five years of age are still stunted. The annual average reduction of stunting in SSA is lower than what is required to achieve the World Health Assembly (WHA) targets (Fig. 3/5).

Table 1/5: Number of undernourished (millions) in Africa, 1990-92 and 2014-16

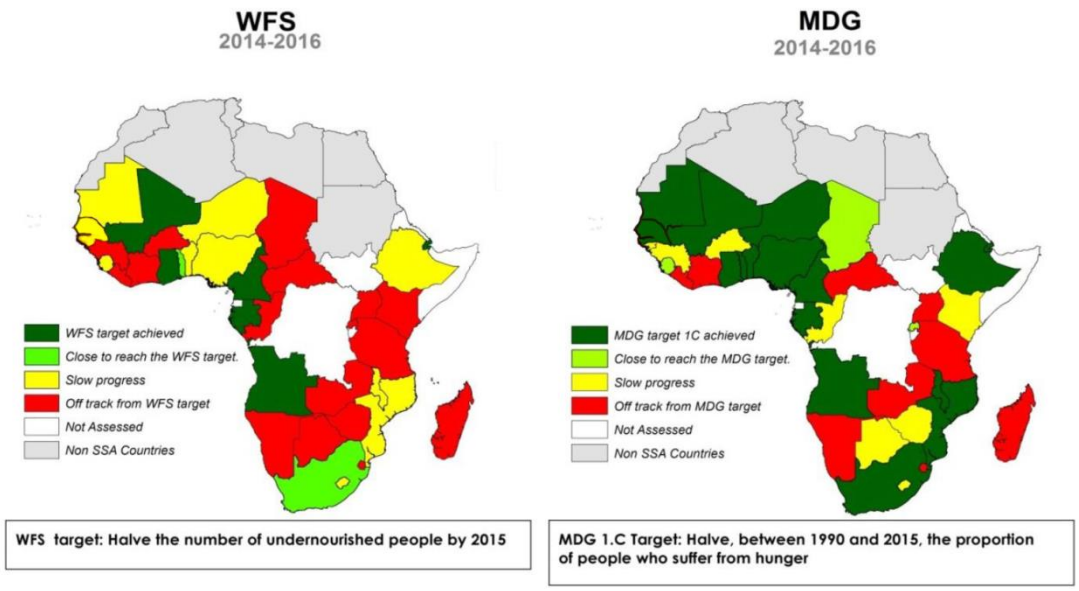
Sub-region	Number of undernourished (millions)		Change so far (%)
	1990-92	2014-16	
Eastern Africa	103.9	124.2	19.6
Middle Africa	24.2	58.9	143.7
Southern Africa	3.1	3.2	2.3
Western Africa	44.6	31.5	-29.4
SS-Africa	**175.7**	**217.8**	**23.9**

Source: ***FAO, 2015***



Source: ***FAO, 2015***

Fig. 2/5: Prevalence of anemia in reproductive women and stunting in children under five years in Sub-Saharan Africa, 2014.



Source: ***FAO, 2015***

Fig. 3/5: Progress towards the World Food Summit (WFS) and Millennium Development Goal (MDG) targets in Sub-Saharan Africa (SSA).

CASE STUDY :

The state of food insecurity in a selected country

- ***THIS SECTION IS AN ASSIGNMENT FOR LEARNERS***
  Based on international and national reports and statistics, analyze the state of food insecurity in your country or a selected country of interest.

  The proposed Analysis plan is :

  1. Context of the Country
  2. Agricultural production and food availability
  3. Market structure and food accessibility
  4. Food insecurity, malnutrition and health
  5. Challenges and prospects for food security

AFRICAN FOOD SECURITY PROSPECTS

The 2015 FAO report on "Food Insecurity Africa concluded that "Africa's success in achieving food and nutrition goals depends on several key national and regional drivers: effectiveness of political leadership and governance, the quality of the policies and strategies in the food and agricultural sector, the soundness of the macro-economic environment, the inclusiveness of economic growth, and the degree of economic integration or interconnectedness, among others".

Therefore, key issues facing African agriculture in the coming decade include: the challenge for the agri-food system to provide for the changing food and nutrition requirements of the evolving population, economic inequality and poverty in rural areas, high population growth without foreseeable demographic transition, maintaining control over coveted natural resources, and the impacts of globalization on Africa agriculture, such as climate change, globalization of markets and the search for new sources of green energy (FAO 2015).

Accelerate sustainable agricultural growth

Sub-Saharan Africa has recorded more than 10 years of steady economic growth. Many countries have experienced high growth for several years, with about a third growing 6 percent or more annually according to a recent report of the World Bank. Overall, the region registered a 48 percent increase in GDP per capita between 2000-02 and 2010-12. However, most of the fastest growing economies are centered on extractive production of natural resources: oil and /or minerals, with a reduced contribution of the agricultural sector over time. Thus, economic growth is increasingly taking place outside the agricultural sector on which paradoxically most of the population live and derive their livelihoods

To achieve the most direct reduction of hunger, priority must be given to economic growth in the agricultural sector which hosts the majority of the poor, and has proved to be more effective in reducing poverty than either the manufacturing or service sector.

Promote structural transformation

Economic transformation has been the consensus paradigm for Africa's development. The UN's High Level Panel on the global development agenda after 2015 sets out the priorities for transforming African's economies for jobs and inclusive growth. The African Union's Vision 2063 calls for integrating the continent's economies so that they partake more in the global economy and in regional opportunities. The African Development Bank's long-term strategy "At the Center of Africa's Transformation" has the goal of establishing Africa as the next global emerging market. Furthermore, the Economic Commission for Africa's 2013 economic report "Making the most of Africa's commodities: Industrializing for growth, jobs, and economic transformation" details what is needed to promote competitiveness, reduce dependence on primary commodity exports, and emerge as a new global growth pole

A key challenge consists of modernizing the agri-food system in order to compete in increasingly competitive national, regional and global markets, while providing livelihood,

employment and entrepreneurship opportunities to a diverse and young population. Modernization of smallholder agriculture and its integration into the fast-growing agribusiness chains, which can produce quality products that meet the rapidly evolving urban demand (food quality, convenience, safety…).

Address livelihood risks and uncertainties

African farmers face harsh agroecologies and erratic weather, characterized by low soil fertility, recurrent droughts and/or floods. The region is also affected by extreme climate events such as unusual rainfall and temperature patterns. Plant and animal diseases are also a growing threat in Africa… Agricultural risk management strategies, social protection programs, integrated adaptation and mitigation approaches are required to ensure resilient livelihoods and achieve food and nutrition security.

Other keys issues are the "***Foster public-private partnerships***" and "***Enhance trade and regional integration***".

See more on these issues at: http://www.fao.org/3/a-i4635e.pdf

CONCLUSION

- ***This unit will conclude with a group discussion on the following question:***

  "**What may be the role of biotechnology in ensuring food security and sustainable agriculture in Africa**?"

To support the discussion, learners are invited to read the following documents (and other related documents):

1. Food security in Africa : challenges and prospects
   http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.524.7116&rep=rep1&type=pdf
2. GM Crops for Food Security in Africa – The Path Not Yet Taken
   http://sakikofukudaparr.net/wp-content/uploads/2013/01/GMCropsFoodSecAfrica2012.pdf
3. Modern Biotechnology for Food and Agriculture: Risks and Opportunities for the Poor
   http://www.bio-nica.info/biblioteca/PinstrupAndersenxxxModernBiotechnology.pdf
4. Agricultural biotechnology, poverty reduction, and food security
   http://ilsina.org/wp-content/uploads/sites/6/2016/07/AsiaDevelBank2001.pdf
5. Biotechnology and food security in developing countries
   http://www.academicjournals.org/article/article1380106339_Tonukari and Omotor.pdf

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