

*Editorial*

# Applications of Biotechnology in Agricultural Productivity in Ethiopia

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## EDITORIAL NOTE

Ethiopia is an agrarian country that may significantly benefit from biotechnology applications to increase agricultural output. The country is in the early phases of agricultural biotechnology research and development, with activities distributed among numerous public institutes. Plant tissue culture, bio-fertilizers and bio-pesticides, molecular markers for disease diagnostics, and genetic diversity are all examples of crop research and uses. Artificial insemination, molecular diagnostics, vaccine manufacture, and molecular genetic analysis are all examples of livestock-related uses. Recombinant DNA infrastructure and capabilities, as well as other cutting-edge technologies like proteomics and bioinformatics, are still lacking and must be improved. Using modern biotechnology tools/products, such as genetically modified organisms, a variety of crop production restrictions may be overcome.

The barriers to advancement in agricultural biotechnology are varied, ranging from a lack of technical and regulatory capability to a lack of public and decision-maker comprehension of the benefits given by agro-biotechnology. In the past, the application of technology developed through traditional research has considerably enhanced the country's agricultural productivity. technologies, biotechnology can help to complement these efforts by speeding up processes and/or delivering new answers to old or developing issues in a more accurate and cost-effective manner. Biotechnology has enormous promise for increasing crop and livestock output, and fast progress is being made in its application across the world. Ethiopia has put up favorable regulations to enable the use of contemporary biotechnology, recognizing the benefits it provides for its agricultural growth. However, given present levels of resources, knowledge, skills, infrastructure, and awareness, using such tools to solve critical agricultural restrictions remains difficult. The current state of agricultural biotechnology R&D efforts in the country is presented in this

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report, along with recent advancements in national capacity Building.

### **Plant tissue culture**

In recent years, the advantages of tissue culture for quick and large-scale plant multiplication have been widely acknowledged in the country, and research efforts are now being expanded to other universities as well. Regional agricultural research institutes, such as the Amhara Agricultural Research Institute and the Southern Agricultural Research Institute, as well as some higher learning institutions, have recently expanded their capacity and begun tissue culture work for micropropagation of important crops in their respective geographic areas.

### **Molecular markers**

Molecular markers such as Restriction Fragment Length Polymorphisms (RFLPs), Random Amplified Polymorphic DNA (RAPD), Amplified Fragment Length Polymorphism (AFLP), and Single Sequence Repeats (SSR) have been used to study genetic diversity of various agricultural species in recent years. The experiments were not focused towards more essential practical applications such as Marker Assisted Selection (MAS), which is a significant gap in the country's genetic marker research. This is due in part to a lack of interaction between research operations and current conventional breeding research initiatives.

### **Diagnostics and characterization of crop diseases**

One of the areas where biotechnological technologies are commonly employed, particularly with viruses, is crop disease diagnoses and characterisation. A variety of viruses from

various crops have been identified to species or strain level using the Enzyme-linked Immunosorbent Assay (ELISA).

### **Animal production and health**

Artificial insemination has been the most widely utilised reproductive biotechnology method in Ethiopia for over three decades. The National Artificial Insemination Center (NAIC) in Kaliti, established in 1981, is a national centre for the production, preservation, and distribution of cow sperm, mostly from alien (Holstein Friesian) sires (NAIC, 1995). At the EIAR, efforts are presently ongoing to use indigenous breeds to use multiple ovulation and embryo transfer techniques. Vaccines and disease diagnosis tools are the key biotechnological advancements in the field of animal illnesses in Ethiopia. The following steps should be taken to strengthen the country's biotechnology capacity and reap its benefits. In particular, for the introduction, research, and release of GMOs, effective biotechnology policy directives and biosafety systems, as well as regulatory and monitoring mechanisms, is required; current applications such as plant tissue culture, microbial product development, vaccine production, and diagnostics should be expanded. It is necessary to develop a strong national capacity in recombinant DNA research such as GMOs, including containment greenhouse facilities, to make wise use of the country's biodiversity through in vitro conservation, molecular characterization, and introduction of marker assisted breeding and isolation of potentially useful genes.