Issue 1:
Monthly Newsletter

GMASSURE

Assuring Agricultural and Food Safety of Genetically Modified Organisms (GMOs) in Southern Africa

In this issue:

Letter from the Editor

Welcome to the first edition of our monthly newsletter, in which we introduce you to this action of the ACP Science and Technology Programme, funded mainly by the European Union, with project centres in South Africa, Namibia and Zimbabwe. Two biosafety capacity-building workshops have been held in Namibia and Zimbabwe, and we are pleased to report on the highlights of these exciting events. We also introduce you to the Project Leader, and focus on some interesting facts about biotechnology and food security. Finally, we present the findings of research conducted by the University of California, Davis, which reveals that GE crops have no negative effect on livestock health and productivity.

Ella Nyakunu
Editor

It's all about food security

The Southern African Development Community (SADC) region urgently needs to maximise food production, while simultaneously safeguarding the environment through sustainable agricultural practices. The region's policy makers also need urgent support to strengthen the capacity of scientists and government regulators in biosafety and biotechnology. This challenge was the primary reason for the establishment of GMASSURE.

What is GMASSURE?

GMASSURE is an action of the African, Caribbean and Pacific (ACP) Group of States' Science and Technology Programme, funded mainly by the European Union (EU), with the support of the Department of Science and the Technology (DST) in South Africa, as well as partner institutions in South Africa (the Agricultural Research Council, the Council for Scientific and Industrial Research and the University of Johannesburg), Namibia (the University of Namibia), Zimbabwe (the University of Zimbabwe) and Denmark (the Technical University of Denmark).

Its objective is to assist in increasing agricultural productivity in SADC by improving knowledge about and increasing capacity in agricultural biosafety and biotechnology, and the safe use of genetically modified (GM) agricultural crops. GMASSURE works closely with scientists, government officials and policy makers, small- and large-scale farming communities, other relevant interest groups and the public across the SADC, to promote sustainable agricultural practices and enhance food security across the region.

Ensuring future food secuity through biotechnology.

What does GMASSURE do?

GMASSURE conducts training workshops and awareness campaigns, and provides relevant literature, research material and guidelines to stakeholders, ensuring that people across the region can gain access to sufficient and safe food. It also tackles misinformation in the public domain by providing concrete, research-based facts and objective information about genetically modified organisms (GMOs) and biotechnology. It hopes to promote public awareness of modern biotechnologies.

How GMASSURE makes a difference?

It hopes to develop expertise within scientific institutions, as well as among government regulators and policy makers in biosafety and biotechnology in SADC, to support decision-making on the relevance and applicability of new biotechnologies, particularly GM crops. It provides scientists with the knowledge and capacity to embed sustainable training programmes on biotechnology and biosafety in their institutions. This will also support policy makers and decision makers in the individual countries and in SADC as a whole. In turn, stakeholders will be able to provide role-players in the agricultural value chain with information and advice. Small-scale farmers, in particular, need support to facilitate decision-making regarding appropriate agricultural technologies.

ACP S&T PROGRAMME

Building capacity in SADC countries

Environmental safety and biodiversity conservation are significant features of GMASSURE's training workshops, which incorporate discussions of the Precautionary Principle and Cartagena Protocol, and how best to incorporate these into risk assessment, risk management and decision-making in SADC.

Delegates at the Biosafety Capacity-building Workshop in Harare learnt about the implications of biotechnology for developing countries.

Inaugural symposium

An inaugural symposium was hosted at the Orion Velmore Hotel in Centurion, South Africa, on 2 and 3 July 2014 to introduce the project's aims and activities to delegates. The symposium was attended by project partners, stakeholders and beneficiaries from various backgrounds. The majority of SADC countries were represented by one or more delegates, leading to representation by 11 member states.

A wide range of stakeholders involved in biosafety training and regulation delivered presentations on the importance of genetically modified crops and their commercialisation in Southern Africa.

The symposium included a discussion about regional cooperation and what would be expected of member states to advance the debate on biotechnology. SADC country representatives were given the opportunity to update delegates on the status of biotechnology and biosafety in each of their respective countries.

Capacity-building workshops

GMASSURE has hosted two biosafety capacity-building workshops, which were attended by delegates from the various SADC countries. The first was held in Windhoek, Namibia, from 17 to 21 November 2014, and the second in Harare, Zimbabwe, from 16 to 20 March 2015.

These workshops focused on building the capacity of scientists, policy makers, regulators, farmers and other key stakeholders. Participants were introduced to biosafety and biotechnology, as well as the implications of the technology for developing countries, and had the opportunity to present the status of biotechnology and biosafety developments in their respective countries. The relevant regulatory systems that are in place in the different countries, as well as international frameworks were discussed at length.

A number of further workshops are being planned for the near future, as well as interactive workshops between partners from Namibia, South Africa and Zimbabwe.

Upcoming events

A Food Safety training workshop, with particular application to GMOs, will be held in South Africa from 23 to 25 November 2015.

The workshop will focus on the following:

- The four steps of food safety risk assessment, and special food safety issues for GMOs
- Compositional analysis
- The need for toxicological testing
- Toxicity testing of introduced gene products
- Safety testing of the whole GM crop
- Tests for the allergenicity of introduced gene products
- How to compare health risk and benefits of GMOs
- Animal feeding trials to ensure the safety of GMOs

Successful applicants will be provided with travel and accommodation.

For more information on the selection and application process, please contact Ella Nyakunu at ella.nyakunu@up.ac.za or info@gmassure.org.

Biotechnology and food security

The Food and Agricultural Organisation (FAO) defines biotechnology as "any technological application that uses biological systems, living organisms or derivatives thereof, to make or modify products or processes for specific use".

Agricultural technologies are used for different purposes, such as the genetic improvement of plant varieties and animal populations to increase their yields or efficiency, the characterisation and conservation of genetic resources for food and agriculture, plant or animal disease diagnosis and vaccine development. Agricultural biotechnology encompasses a range of tools, including traditional breeding techniques, which alter living organisms or parts of organisms to make or modify products, improve plants or animals, or develop microorganisms for specific agricultural uses. Modern biotechnology includes the tools of genetic engineering.

The history of biotechnology

Listening to some of the debate going on around genetically modified organisms (GMOs), one would think that biotechnology is a new science. Perhaps it would be pertinent to first define what is meant by biotechnology.

Biotechnology was originally defined by Karl Ereky, a Hungarian, to mean the use of biological systems to provide goods and services. Biotechnology can be classified as traditional biotechnology and modern biotechnology. Most people are familiar with traditional biotechnology. There are ample examples in our daily diets, including dairy products, such as yoghurt and cheese, beverages, such as beer and wine, and the use of yeast in bread-making. These have been around for the past 10 000 years.

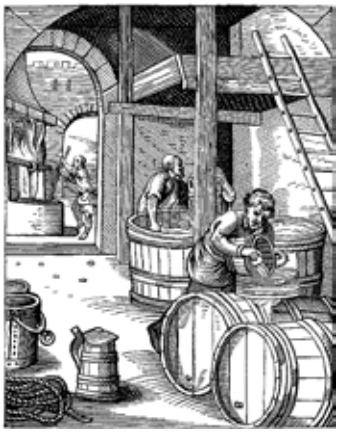
Modern biotechnology can be defined as genetic modification, genetic engineering, genetic manipulation and transgenesis. Genetic modification is much broader as it includes organisms that will have been derived from mutation breeding (by using chemicals or radiation to induce the genetic changes) to organisms that have been created through the introduction of genes derived from other sources (hence crossing the species and indeed the taxonomic boundary). These genes are referred to as transgenes and hence transgenesis. Genetic engineering is more precise in that it refers to the introduction of the transgene (a foreign gene). Similarly, genetic manipulation is understood in the same way.

Collectively, these techniques are referred to as recombinant DNA (rDNA). This technology is possible because every organism on this biosphere has its genetic material in the form of DNA made up of a simple alphabet of A, C, G and T.

Something similar to a pair of molecular scissors exists in the form of restriction enzymes that cuts the DNA precisely to give compatible ends that can easily be recombined. A combination of the elucidation of the structure of DNA, the discovery of restriction enzymes and the easy handling of microbes in a test tube culminated in the advent of rDNA technology and its products.

These products (recombinant proteins) include insulin for the treatment of diabetes, rennin for cheese-making, growth hormones for the treatment of dwarfism, and vaccines against diseases such as measles. For the most part, the use of recombinant proteins in medicine did not elicit as much controversy as the use of genetically modified (GM) crops.

Similarly, crops with tolerance to biotic and abiotic stresses have been developed for better weed, disease and pest control, as well as climate resilience. Crops that have been nutritionally enhanced to combat micronutrient deficiencies, including childhood blindness, have also been developed.



Brewing was an early example of biotechnology.

With the advent of genomics, certain genes are being tweaked within the genome of that organism, resulting in organisms with enhanced characteristics, but not necessarily carrying foreign genes.

Prof Idah Sithole-Niang
University of Zimbabwe

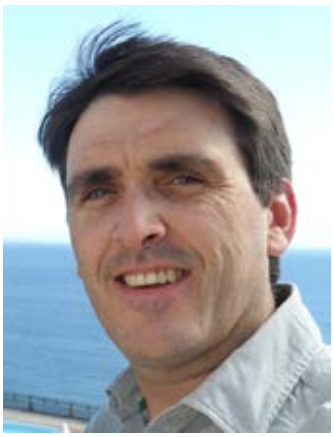
Meet the Project Leader

Dr John Becker, is Project Leader of the GMASSURE action. He holds an undergraduate degree in Biological Sciences and an honours, master's and doctorate in Biotechnology from the University of Stellenbosch, South Africa.

As a senior researcher at the Council for Scientific and Industrial Research (CSIR) in Pretoria, South Africa, he studied plant-pathogen interactions, yeast metabolic engineering, functional genomics and anti-malarial drug discovery. He was also exposed to, and performed research on, genetically modified organisms during this time.

In January 2011, he was appointed Centre Manager of the African Centre for Gene Technologies (ACGT), a joint initiative between the Agricultural Research Council (ARC), the CSIR and the universities of Johannesburg, Pretoria and the Witwatersrand.

As manager of the ACGT, he is expected to manage an institutional network of excellence in biotechnology, which includes the GMASSURE action.



Research reveals that GE crops have no negative effect on livestock health and productivity

Globally, food-producing animals consume 70 to 90% genetically engineered (GE) crop biomass. In the USA, animal agriculture produces over nine billion food-producing animals annually. More than 95% of these animals consume feed containing GE ingredients.

A study conducted in 2014 by researchers from the University of California, Davis (Dr Alison van Eenennaam and Amy Young) found that the health and productivity of livestock populations that had been fed genetically engineered (GE) crops over an extended period was not negatively affected.

The objective of this study was to review the literature on livestock GE feeding studies and the composition of animal products derived from animals fed a GE diet. Data on livestock productivity and health was collated from public sources between 1983 (before the introduction of GE crops in 1996) and 2011 (a period with high levels of predominantly GE animal feed). These field data sets, which represent over 100 billion animals following the introduction of GE crops, did not reveal unfavourable or perturbed trends in livestock health and productivity.

Studies have been conducted with a variety of food-producing animals, including sheep, goats, pigs, chickens, quail, cattle, water buffalo, rabbits and fish fed different GE crop varieties. The results have consistently revealed that the performance and health of GE-fed animals were comparable with those fed near-isogenic non-GE lines and commercial varieties.

Many authors came to the same conclusion a decade ago, which suggests that little contradictory data has emerged over the past 10 years, despite the increased global prevalence of GE feed.

Because DNA and protein are normal, digested components of the diet, there are no detectable or reliably quantifiable traces of GE components in milk, meat and eggs following the consumption of GE feed. Internationally, countries that cultivate GE corn and soy are the major livestock feed exporters.

Cultivation approvals of GE varieties in exporting countries occurring before food and feed approvals in importing countries have resulted in trade disruptions. This is likely to be increasingly problematic in the future, as many "second-generation" GE crops with altered output traits for improved livestock feed are in the developmental and regulatory pipelines.

Advanced techniques to affect targeted genome modifications are emerging. It is not clear whether these will be encompassed by the current GE process-based trigger for regulatory oversight.

There is a pressing need for international harmonisation of both regulatory frameworks for GE crops and the governance of advanced breeding techniques to prevent widespread disruptions in the international trade of livestock feedstuffs in the future.

Source

Van Eenennaam, AL and Young, AE. 2014. The prevalence and impacts of genetically engineered feedstuffs on livestock populations. *Journal of Animal Science* 2014: 92, 4255–4278.