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FOR ANIMAL RESOURCES

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Perspectives on the need for access to genome editing and animal biotechnologies in Africa

Session V: Delivering the Promise of Genome Editing

5th November 2020


GENE EDITING
POVERTY
FOOD SECURITY

Introduction

Africa's needs to boost production and productivity, enhance nutrition

Gene editing provides an opportunity;

- ❑African scientists to develop homegrown solutions to food security and climate change
- ❑Tap into the ecologically important traits such as disease resistance, worm resistance , drought resistance
- ❑Focus on a sound, diverse nutritional base

Do we need this Shift?

Developing Countries	annual per capita consumption		total consumption	
	meat (kg)	**Milk(kg)**	**meat (Mt)**	**milk (Mt)**
1980	14	34	47	114
1990	18	38	73	152
2002	28	44	137	222
2015	*32*	55	184	323
2030	*38*	67	252	452
2050	*44*	78	326	585

Past and projected trends in consumption of meat and milk in developing countries. Data for 1980–2015 adapted from Steinfeld et al. (2006) and for 2030–2050 from FAO (2006)

Do we need this shift?

Increased demand for livestock products;

- **Population trends** by 2050
  - Population in sub-Saharan Africa (SSA) at 1.2 per cent per year
- **Urbanization** – move from rural areas to urban areas by 30% in Africa
- **Income growth** – Expansion of middle class

Situational analysis

- African governments do not actively invest in increasing agricultural production – adoption on novel technologies
- Limited of technical capacity – National Research and extension services
- Few functional research labs - equipment
- Limited knowledge by farmers
- Reliance imported products and genetic materials (breeds)
- Limited of infrastructure

Action across member states

- Kenya - begun drafting guidelines to regulate gene-edited products
- Nigeria, South Africa have already amended their biosafety laws to incorporate these new breeding techniques
- Researchers especially in the universities – disease resistance, increase shelf life, nutrition content
- National research organizations - CRISPR-Cas9 technology to improve maize germplasm so it becomes resistant to maize lethal necrosis (MLN)
- International organizations partnering with National ROs

Action across member states

ISAAA- organized Africa Biennial Biosciences Communication Symposium (ABBC2019)

- Declaration to Establish African Coalition on Genome Editing Communication “Genome editing and other modern biotechnologies, while not being the only solution to these challenges, offer great potential in addressing specific concerns in food production, nutrition, health interventions and environmental restoration and conservation

Action across member states

BUT the aspect of animal biotechnology still remains wanting

AFRICAN UNION's ROLE

- Developed continental frameworks and strategies such as ;
  - STISA 2024
  - Agenda 2063
- The call to action to use science, technology and innovation as tools of change
- The shift towards knowledge and technology driven economies in the new normal

AFRICAN UNION's ROLE

- Through Technical offices of the AUC, various actions have been undertaken to support MS to embrace animal biotechnologies

- AU-IBAR played an active role through the Genetics project (2013-2018)
  - Main Objective "**To strengthen the capacity of countries & RECs to sustainably use & conserve African animal genetic resources through institutionalising national and regional policy, legal and technical instruments**"

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TIME FOR AFRICA TO TELL HER STORY

What does Africa really want from BIOTECHNOLOGY?”

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Identification of gaps

- **Limited technical capacity in Laboratory techniques and equipment**
- **Minimal or complete lack of skills in large-scale data handling, large-scale genomic data analysis, bio-informatics, use of novel programming languages**
- **Inadequate training infrastructure (institutions and/or curricula)**
- **Lack of/scarcity of available budgetary funds**
- **Lack of enabling policy environment**

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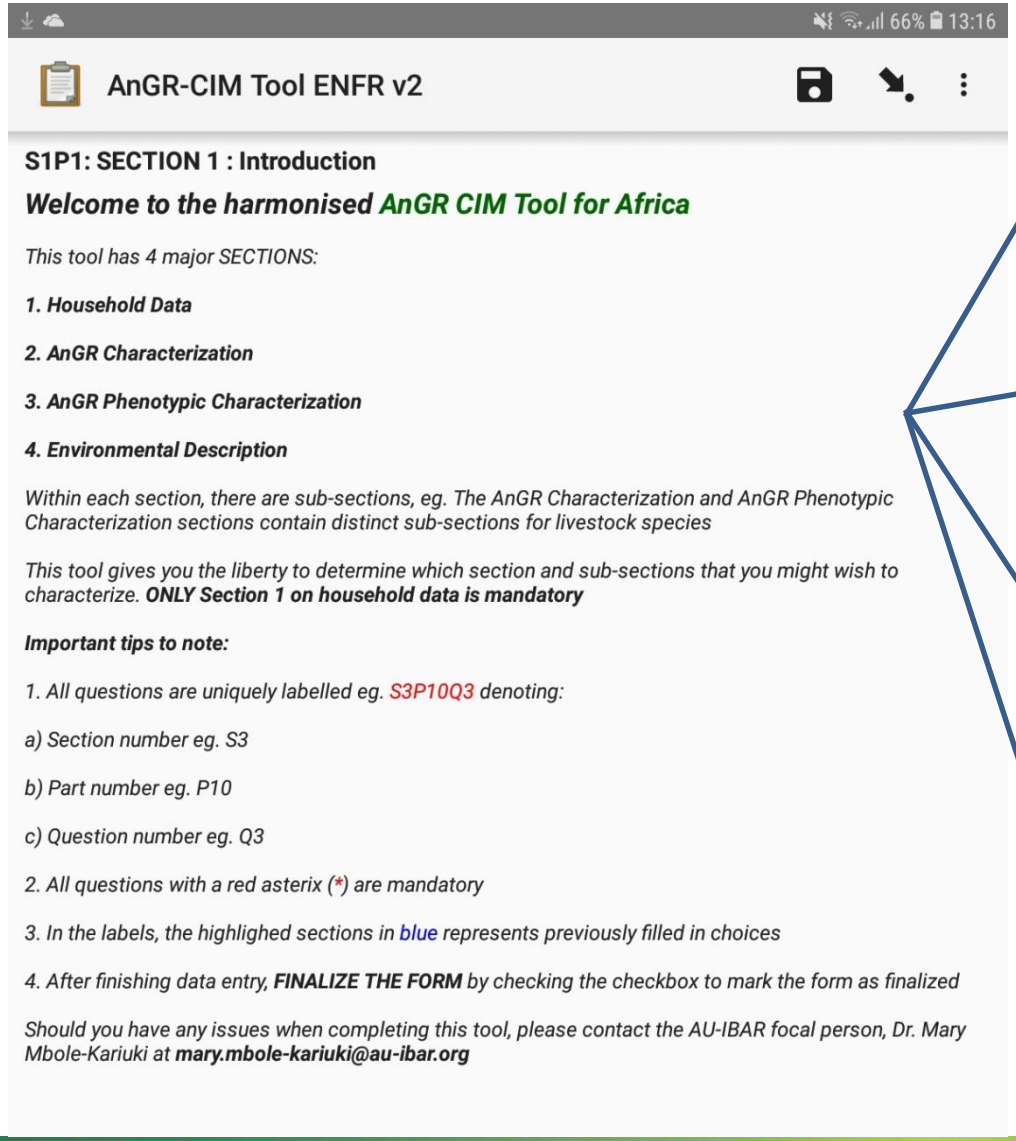
COURSE OF ACTION

AU-IBAR developed harmonized Animal Genetic Resources Characterization, inventory and Monitoring (AnGR-CIM) tool

- **Supports harmonized;**
  - **Phenotypic Characterization**
  - **Molecular Characterization**

Harmonized AnGR-CIM tool for Africa
Vr 2
(English-French)



Section 1
Household data (socio-economic and household descriptions)

Section 2
AnGR Characterization
(production and reproduction, adaptive traits , indigenous knowledge)

Section 3:
AnGR phenotypic characterization
(morphometric, descriptive, biological samples)

Section 4:
Environmental description
Day temperature, Solar intensity, precipitation, Humidity, soil type etc,

Data Visualization system

- One-stop-shop for all data collected with AnGR-CIM tool and simple analysis

Partnerships

AU-IBAR – considers partners mandate, comparative advantage and on the principle of subsidiarity

ILRI and the Centre of Tropical Livestock Genetics and Health (CTLGH)

- **Genomics Reference Resource for African Cattle**
  - **This resource will comprise a set of sequence an / or genomic information on African cattle breeds, that is publically accessible, and that is intended to benefit the African research community in livestock genetics and ultimately African livestock keepers**
  - **Identification of ecologically important genomic regions**

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Partnerships

AU-IBAR's actions;

- **Facilitated collection and submission of data – available from the AnGR-CIM tool**
- **Facilitated collection of blood samples or DNA samples**
- **Developed the harmonized Material transfer agreement for movement of genetic materials**

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Partnerships

ILRI's actions ;

- **Support sequencing and genotyping**
- **Submit resultant sequence / genotype information to member states through AAGRIS**
- **Also as agreed with MS, place into select public databases**

ILRI
INTERNATIONAL
LIVESTOCK RESEARCH
INSTITUTE

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Outcomes

Country	Contact institution	Cattle	Cattle breed	Number of samples per breed	Type of sample (blood, hair, DNA)
DRC	Ministère de l'Elevage	Cattle	Ndama	9	Whole Blood
Egypt	Animal Production Research Institute (APRI)	Cattle	Egyptian	19	Whole Blood
Ethiopia	Ethiopian Biodiversity Institute	Cattle	Highland Zebu Cattle	50	Whole Blood
Ghana	Ministry of Food and Agriculture	Cattle	Ghana Shorthorn cattle	30	Whole Blood

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Outcomes

Country	Contact institution	Cattle	Cattle breed	Number of samples per breed	Type of sample (blood, hair, DNA)
Kenya	Ministry of Agriculture, Livestock & Fisheries	Cattle	Northern Frontier District Zebu	50	Whole Blood
Madagascar	Ministère de l'Elevage	Cattle	Zébu malgache	50	Whole Blood
Sudan	Ministry of Food and Agriculture	Cattle	Butana	51	Whole Blood
Togo	Ministère de l'Elevage	Cattle	Bovins de race somba	28	Whole Blood
Benin	Ministère de l'Elevage	Cattle	Bovins de race Borgou	20	Whole Blood

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RECOMMENDATIONS

- Promote use of ecologically important traits in indigenous breeds – disease resistance (ECF, Trypanosomiasis, worm resistance, drought tolerance etc)
- Encourage governments to allocate budgets for research and uptake of biotechnologies
- Foster PPPPs to enable informed investments
- Revise curricula to promote animal biotechnologies

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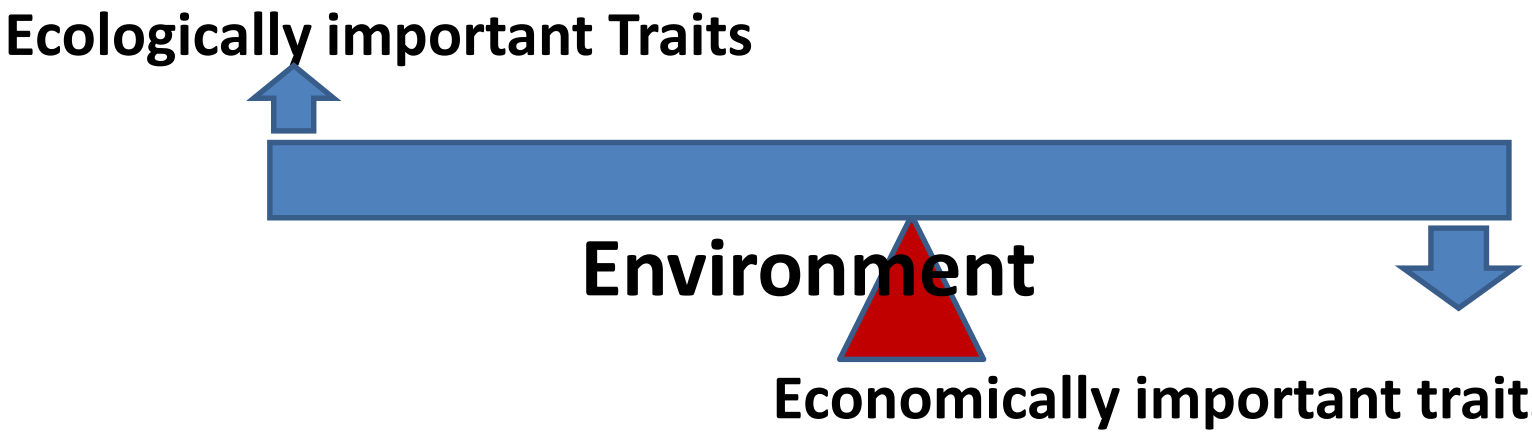
RECOMMENDATIONS

- Awareness creation among policy and decision makers on gene editing and associated technologies
- Promote public participation in research direction and policy formulation on genome editing and genomics
- Operationalization of African Coalition for Communicating about genome editing

Parting shot

Embrace indigenous resources



- Foster acceptance by the end user - FARMERS

Thank You Merci شكرا