

# HIGH LEVEL AFRICAN PANEL FOR EMERGING TECHNOLOGIES (APET)

## Gene drive for control and elimination of malaria vectors



Presented by Prof. GASSAMA Y. K.  
Chair of APET



# APET MISSION

The African Union Commission (AUC) and governments recognize the need to accelerate the use of new and emerging technologies by capturing, adopting and disseminating relevant, new or emerging technologies.

The AUC commissioned through the African Panel on Emerging Technologies (APET), the advice of independent and autonomous scientists, to provide the necessary lighting for decision making on emerging technologies.

The AUC recommend adopting a **co-evolutionary approach** between technology and regulation, a regulation that must be **efficient and responsible**, without imposing an undue burden on the adoption of technology.

**APET** Gene Drive for control and elimination of  
malaria disease vectors

# APET MISSION CONTEXT

The context of this mission entrusted by the African Union to the Panel and facilitated by Nepad STI, is that of an Africa rich in natural resources, but which still struggles to value them, while STI offer new and groundbreaking opportunities for structural transformation of our economies.

This is particularly true for new biotechnologies, which offer major breakthroughs in the fields of agriculture, human and animal health, more specifically diagnosis and control of diseases, including malaria.



**APET** Gene Drive for control and elimination of malaria disease vectors

# STRATEGY FOR CONTROL AND ELIMINATION OF MALARIA VECTORS

- The APET proposes to AUC the genetic approach of **Gene drive** as a complementary tool to the chemical strategy to control and eradicate malaria in Africa by 2030, which is the goal set by African Union and the WHO.
- ***African Union publishes a Decision EX . CL/Dec. 986-1007 (XXXII), the Executive Council of the African Union (AU), requests the AU and Member States to harness drones for agriculture, **gene drive for malaria control** and micro grids for access to energy, as three emerging technologies of relevance for African development.***

# MALARIA DISEASE / A PROBLEM OF AFRICA

Africa most affected by malaria, up to 90% in sub-Saharan Africa.

Significant progress, due to scale-up of interventions, cutting down malaria mortality for 45%

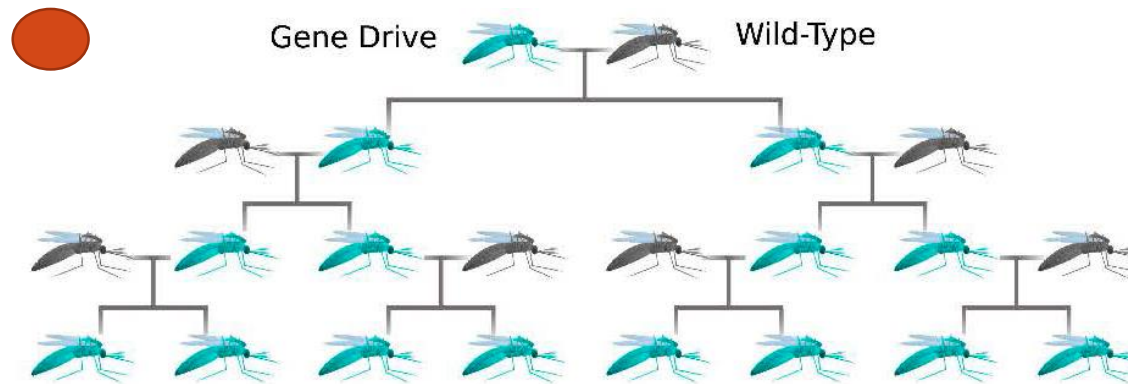
But still residual levels of malaria transmission

The African Union target for malaria elimination by 2030 not attainable without specific interventions

**Gene drive as complementary intervention to attain this target.**



# GENE DRIVE FOR CONTROL AND ELIMINATION OF MALARIA DISEASE VECTORS



Systems of biased inheritance  
Any desired traits can be  
**transmitted to the progeny at  
far higher frequencies** than in  
normal sexual reproduction, in  
spite of any selective  
disadvantages.

Tremendous potential for  
controlling insects that carry  
disease or destroy crops,

Altering genes in ways that reduce  
population size or prevent the  
insect from spreading a parasite.

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# STRATEGIES FOR CONTROL AND ELIMINATION MALARIA DISEASE VECTORS



## ■ POPULATION SUPPRESSION

Introduction of artificial gene to  
Distort sex chromosome inheritance

most progenies are males

or by knocking out female fertility  
genes : female no lay eggs

Insect populations dwindle

**Constructs are not expected to  
persist in the environment**

## • POPULATION ALTERATION

Introduction of artificial gene to  
reduce organisms' ability to transmit  
specific pathogens.

Progeny incapable of carrying  
malaria pathogens

Constructs intended to spread  
throughout the vector population  
and **persist in the environment**

Many concerns raised about the safety of ecosystems and species and  
the ethics of such manipulations.

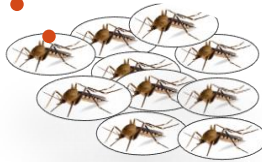


# GENE DRIVE GREAT POTENTIAL FOR CONTROLLING INSECTS



High impact  
10% release

Large scale



Short duration

Total elimination



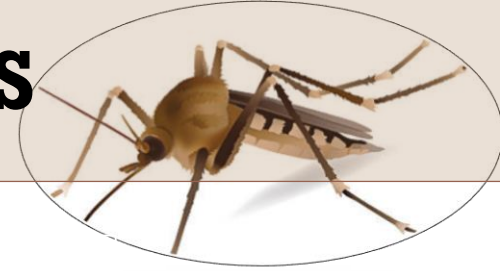
Gene drive the most effective for reducing insect vector of malaria.

Tremendous potential,

but additional research is needed to improve the tool.



# RECOMMENDATIONS



## Research Training

The field of research to develop technology in Africa is still very open and offer perspectives of research on:

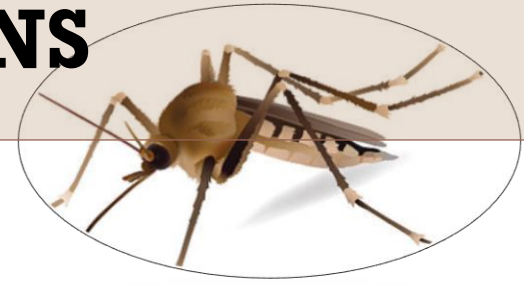
- stability of the construction in different environments,
- spontaneous resistances,
- dynamics of the receiving ecosystem, among others.

The panel strongly recommended training programs of African scientists and their involvement from the beginning, in research and deployment initiatives, essential for joint ownership of the technology.

Target Malaria program, conducted in Mali, Burkina Faso and Uganda. Deployments of GE mosquitos should be effective in 2024

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# RECOMMENDATIONS



## Regulation

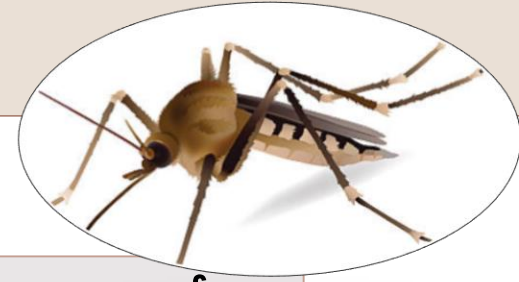
Operational approach is proposed at African level, taking into account both traditional (transgenesis) and new (gene editing) technologies.

Given the rapid evolution of technology, risk assessment conducted on a case-by-case basis could be dynamic and scalable, focusing on the product rather than the method used to generate it.

Dichotomy between **exemptions** proposed for the regulation of new gene editing methods, recognized as highly effective, but whose risks are still unknown, and **heavy regulatory** burden imposed on transgenesis, with more maturity and fully characterized.

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# CONCLUSIONS



- Including local communities that may benefit from the use of gene drive technology before any planned release of a product, is essential to facilitate acceptance of the technology.
- The APET have adopted the strategic objective of effective implementation of technology at the country and REC levels, through the development of regulatory, training and research strategies that must precede any deployment.
- Malaria is one of the greatest threats to public health for Africa.
- We have the power to end it by combining our efforts, in a supportive way, through successful leadership.

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Thanks

Nepad Agency  
African Union Commission  
Experts