
Brazil – Recent Experiences and Lessons
Learned about SIT application

**Application of the Sterile Insect Technique
as a tool for the Integrated Management
Vector (*Aedes aegypti*)**



*Jair Virginio, PhD
Moscamed Brazil*

”Social Organization Moscamed Brasil”



Non-profit institution;



Recognized as “ Social Organization” by Ministry of Agriculture, Livestock and Supply-MAPA and the Government of the State of Bahia.



✓ Biotechnology applied to Agriculture and Public Health



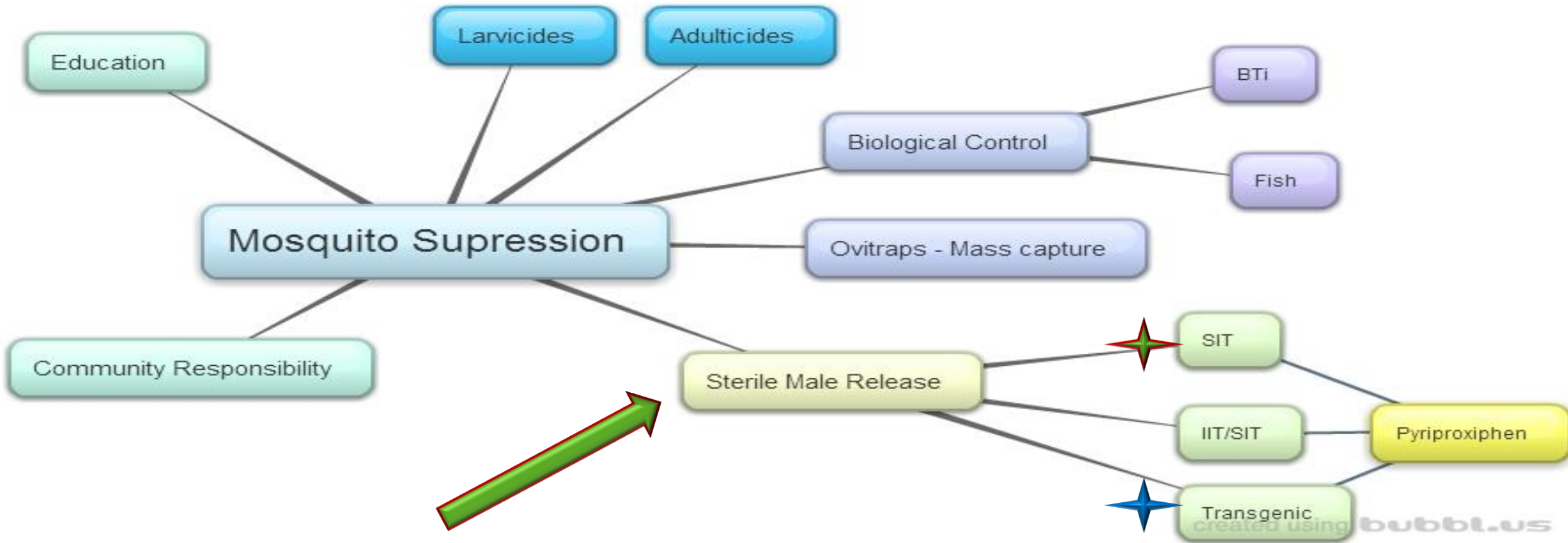
"Social Organization Moscamed Brasil"



Recognized as Collaborating Centre of the
International Atomic Energy Agency-IAEA



Integrated Control



★ 2017/19

★ 2010/13

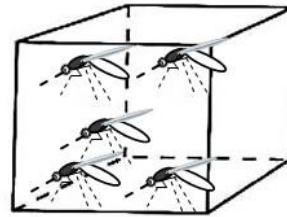
Integrated Vector Management - Mosquitoes

The **Sterile Insect Technique** can be used as a potential tool for the control of *Aedes aegypti*;

There are many challenges to be faced;

For implementation of SIT, It is necessary:

- ✓ To develop;
- ✓ To validate;
- ✓ To optimized different methodologies (Mass-rearing, insect sterilization, packaging, chilling, transport and release methods, etc.).



Pilot Project



RLA5074- Strengthening Regional Capacity in Latin America and the Caribbean for Integrated Vector Management Approaches with a Sterile Insect Technique Component, to Control Aedes Mosquitoes as Vectors of Human Pathogens, particularly Zika Virus



20 countries Latin America and the Caribbean

Brazil and Mexico - Development of Pilot Projects

Brazil - 2 pilot projects: Recife and SFV

Overview of local situation

1.2. Work with end user institution, status



1. Federal / National level

✓ Submitted a counterpart project to the **Ministry of Health** to obtain financial support.

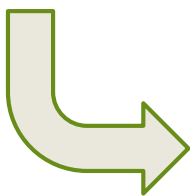
2. State and municipal level

- ✓ Signed agreement between the **Secretary of Health** of Recife and Moscamed Brazil for the development of the pilot in Recife;
- ✓ Technical meetings with the Secretary's team to present the project and coordinate the activities;
- ✓ Technical training of professionals involved in the pilots (vector control)





Overview of local situation

1.3 Permits needed/obtained/requested: Status




✓ Submitted project for approval with the Human Ethics Committee (monitoring activities, sterile insect release, MRR trials)

The screenshot displays the 'plataformabrasil.saude.gov.br' website interface. It features a search bar at the top right and a navigation menu. The main content area is divided into two sections: 'LISTA DE APRECIÇÕES DO PROJETO' and 'HISTÓRICO DE TRÂMITES'. The 'LISTA DE APRECIÇÕES DO PROJETO' table shows a project with the status 'Em apreciação Ética'. The 'HISTÓRICO DE TRÂMITES' table provides a detailed timeline of the project's progress, including submission, approval, and rejection.

Apreciação	Pesquisador Responsável	Versão	Submissão	Modificação	Situação	Exclusiva do Centro Coord.	Ações
PO	JAIR FERNANDES VIRGINIO	1	17/04/2018	25/04/2018	Em Apreciação Ética	Não	 

Apreciação	Data/Hora	Tipo Trâmite	Versão	Perfil	Origem	Destino	Informações
PO	25/04/2018 14:51:49	Submetido para avaliação do CEP	1	Coordenador	Instituto de Medicina Integral Professor Fernando Figueira - IMIP/PE	CONEP	
PO	25/04/2018 14:51:48	Parecer liberado	1	Coordenador	Instituto de Medicina Integral Professor Fernando Figueira - IMIP/PE	CONEP	
	25/04/2018 10:46:57	Parecer do colegiado emitido	1	Coordenador	Instituto de Medicina Integral Professor Fernando Figueira - IMIP/PE	Instituto de Medicina Integral Professor Fernando Figueira - IMIP/PE	
	24/04/2018 07:28:07	Parecer do relator emitido	1	Coordenador	Instituto de Medicina Integral Professor Fernando Figueira - IMIP/PE	Instituto de Medicina Integral Professor Fernando Figueira - IMIP/PE	
	24/04/2018 07:23:20	Aceitação de Elaboração de Relatoria	1	Coordenador	Instituto de Medicina Integral Professor Fernando Figueira - IMIP/PE	Instituto de Medicina Integral Professor Fernando Figueira - IMIP/PE	
	19/04/2018 15:45:22	Confirmação de Indicação de Relatoria	1	Coordenador	Instituto de Medicina Integral Professor Fernando Figueira - IMIP/PE	Instituto de Medicina Integral Professor Fernando Figueira - IMIP/PE	
	19/04/2018 10:51:27	Indicação de Relatoria	1	Secretária	Instituto de Medicina Integral Professor Fernando Figueira - IMIP/PE	Instituto de Medicina Integral Professor Fernando Figueira - IMIP/PE	
	19/04/2018 10:50:30	Aceitação do PP	1	Secretária	Instituto de Medicina Integral Professor Fernando Figueira - IMIP/PE	Instituto de Medicina Integral Professor Fernando Figueira - IMIP/PE	
	17/04/2018 19:53:13	Submetido para avaliação do CEP	1	Pesquisador Principal	PESQUISADOR	Instituto de Medicina Integral Professor Fernando Figueira - IMIP/PE	
	13/04/2018 11:03:05	Rejeição do PP	1	Secretária	Instituto de Medicina Integral Professor Fernando Figueira - IMIP/PE	PESQUISADOR	Prezado pesquisador, O projeto de pesquisa intitulado Ver mais >>

plataformabrasil.saude.gov.br/visao/pesquisador/gerirPesquisa/gerirPesquisaAg 80%   

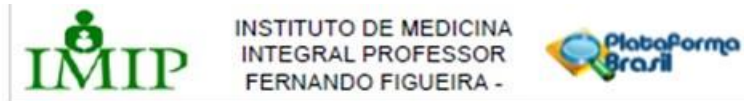
LISTA DE APRECIÇÕES DO PROJETO							
Apreciação	Pesquisador Responsável	Versão	Submissão	Modificação	Situação	Exclusiva do Centro Coord.	Ações
PO	JAIR FERNANDES VIRGINIO	1	17/04/2018	25/04/2018	Em Apreciação Ética	Não	 

HISTÓRICO DE TRÂMITES							
Apreciação	Data/Hora	Tipo Trâmite	Versão	Perfil	Origem	Destino	Informações
PO	11/04/2018 15:20:43	Submetido pela CONEP para avaliação do CEP	1	Secretária	CONEP	Instituto de Medicina Integral Professor Fernando Figueira - IMIP/PE	
PO	09/04/2018 18:59:08	Submetido para avaliação do CEP	1	Pesquisador Principal	PESQUISADOR	CONEP	

«« « Ocorrência 11 a 12 de 12 registro(s) » »»

Overview of local situation

1.3 Permits needed/obtained/requested: Status



PARECER CONSUBSTANCIADO DO CEP

DADOS DO PROJETO DE PESQUISA

Título da Pesquisa: PESQUISA E INOVAÇÃO PARA APLICAÇÃO DA TÉCNICA DO INSETO ESTÉRIL, ASSOCIADA A TÉCNICA DO INSETO INCOMPATÍVEL NO CONTROLE DO VETOR Aedes Aegypti (DIPTERA: CULICIDAE)

Pesquisador: JAIR FERNANDES VIRGINIO

Área Temática: Pesquisas com coordenação e/ou patrocínio originados fora do Brasil, excetuadas aquelas com copatrocínio do Governo Brasileiro;

Versão: 1

CAAE: 67963318.6.0000.5201

Instituição Proponente: BIOFABRICA MOSCAMED BRASIL - BIOMOSCAMED

Patrocinador Principal: FUNDO MUNICIPAL DE SAÚDE
Agência Internacional de Energia Atômica

DADOS DO PARECER

Número do Parecer: 2.620.647

Apresentação do Projeto:

PESQUISA E INOVAÇÃO PARA APLICAÇÃO DA TÉCNICA DO INSETO ESTÉRIL, ASSOCIADA A TÉCNICA DO INSETO INCOMPATÍVEL NO CONTROLE DO VETOR Aedes Aegypti (DIPTERA: CULICIDAE)

a parte humana é permissão para entrada de pesquisadores no domicílio e colocação de armadilhas para

Objetivo da Pesquisa:

O objetivo da técnica é promover a cópula de machos estéreis com as fêmeas selvagens, para inviabilizar suas progênes e desta forma, reduzir o crescimento populacional do mosquito, através do controle da natalidade.

Avaliação dos Riscos e Benefícios:

Adequados.

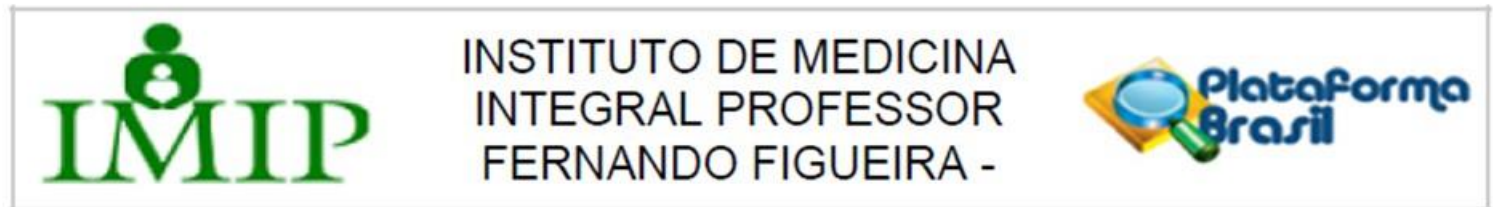
Comentários e Considerações sobre a Pesquisa:

Pesquisa muito relevante

Considerações sobre os Termos de apresentação obrigatória:

Adequados

Endereço: Rua dos Coelhos, 300
Bairro: Boa Vista CEP: 50.070-550
UF: PE Município: RECIFE
Telefone: (81)2122-4756 Fax: (81)2122-4782 E-mail: comitadedecp@imip.org.br



Continuação do Parecer: 2.620.647

Recomendações:

Incluir no TCLE marca para impressão digital no caso de morador analfabeto.

Conclusões ou Pendências e Lista de Inadequações:

Aprovado com recomendação.

Considerações Finais a critério do CEP:

O presente projeto, seguiu nesta data para análise da CONEP e só tem o seu início autorizado após a aprovação pela mesma.

Pilot Project



Phases

1. Pré-realese

Baseline

2. Supression

Vector control AW-IVM

3. Pós-realese

Evaluation

About Mass rearing of *Aedes aegypti*



Mass-rearing Unit
4 million sterile males/week

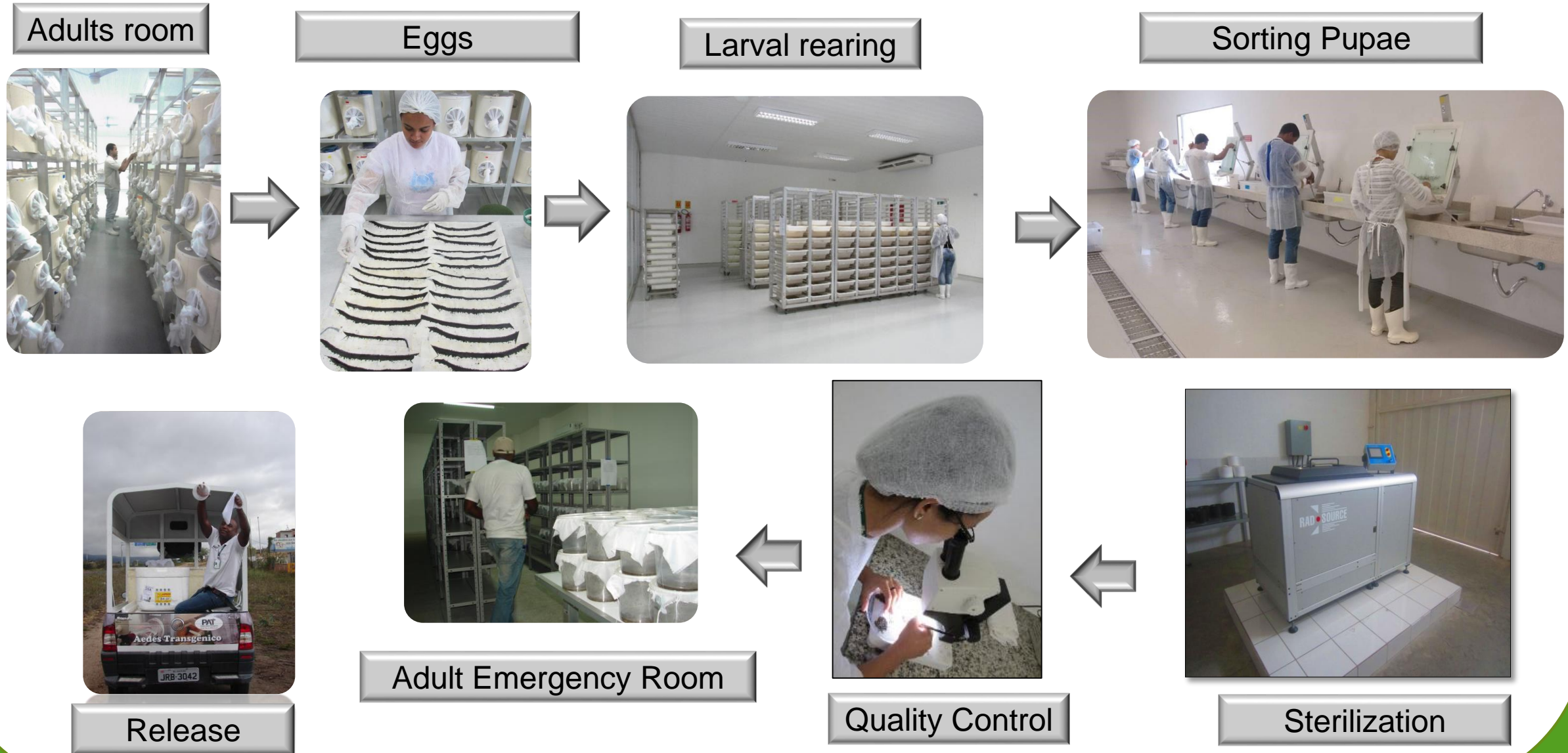
- ✓ Strains: MBR-001
- ✓ Local genetic background;
- ✓ Origin: eggs collected in the district of Carnaíba, municipality of Juazeiro.





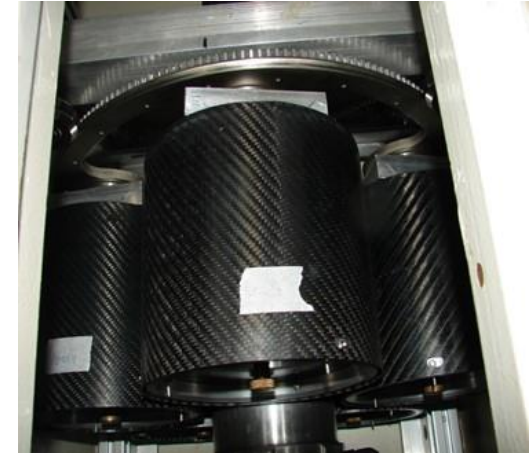
Rearing mosquitoes

Protocols for mass-rearing of *Ae. aegypti*



✓ Mass rearing protocols described by Carvalho et al., (2014), some adaptations

Irradiator used in our facility - X Rays Machine RS-2400

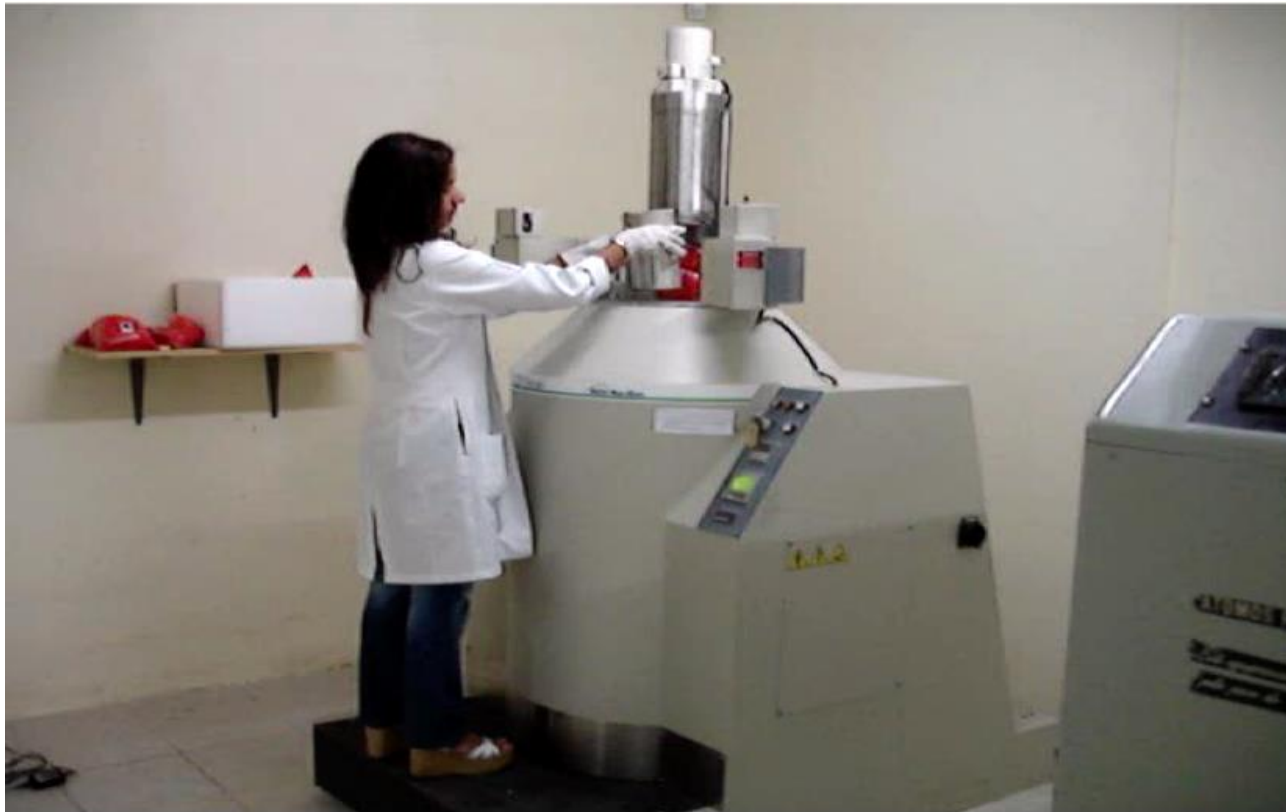


✓ positioned horizontally inside the X Ray Machine chamber



✓ Control panel (define irradiation conditions)

Irradiation with Gammacell 220 (Co 60)



DEN/UFPE

X-Rays or Gamma Rays?

- ✓ There is no difference in the results obtained in the insect sterilization process;
- ✓ Gamma Ray equipment is expensive, more stable, requires less maintenance, but licensing for operation is more complicated and time-consuming;
- ✓ X-Rays equipments are cheaper, easier licensing but require more maintenance and suffer from overheating.

Sterilizing Insects with Ionizing Radiation

Authors [Authors and affiliations](#)

A. Bakri, K. Mehta, D. R. Lance

Chapter

20

44

2.2k

Citations Readers Downloads

Summary

Exposure to ionizing radiation is currently the method of choice for rendering insects reproductively sterile for area-wide integrated pest management (AW-IPM) programmes that integrate the sterile insect technique (SIT). Gamma radiation from isotopic sources (cobalt-60 or caesium-137) is most often used, but high-energy electrons and X-rays are other practical options. Insect irradiation is safe and reliable when established safety and quality-assurance

A New Generation of X Ray Irradiators for Insect Sterilization

T. Mastrangelo ✉, A. G. Parker, A. Jessup, R. Pereira, D. Orozco-Dávila, A. Islam, T. Dammalage, J.M.M. Walder

Journal of Economic Entomology, Volume 103, Issue 1, 1 February 2010, Pages 85–94, <https://doi.org/10.1603/EC09139>

Published: 01 February 2010 [Article history](#) ▼

Abstract

Recent fears of terrorism have provoked an increase in delays and denials of transboundary shipments of radioisotopes. This represents a serious constraint to sterile insect technique (SIT) programs around the world as they rely on the use of ionizing radiation from radioisotopes for insect sterilization. To validate a novel X ray irradiator, a series of studies on *Ceratitidis capitata* (Wiedemann) and *Anastrepha fraterculus* (Wiedemann) (Diptera: Tephritidae) were carried out, comparing the relative biological effectiveness (RBE)

Authorities from Madeira Island donate irradiator to Brazil

S.  R.
REGIÃO AUTÓNOMA DA MADEIRA
GOVERNO REGIONAL
SECRETARIA REGIONAL DE AGRICULTURA E PESCAS
DIREÇÃO REGIONAL DE AGRICULTURA



TERMO DE DOAÇÃO

Pelo presente instrumento de doação, a REGIÃO AUTÓNOMA DA MADEIRA, proprietária da BIOFÁBRICA ILHA DA MADEIRA/Programa Madeira Med, representada pelo respetivo GOVERNO REGIONAL, através da SECRETARIA REGIONAL DE AGRICULTURA E PESCAS, com endereço à Avenida Arriaga, n.º 21-A, 5.º andar, na cidade do Funchal, Ilha da

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2018-04-27

TO WHOM IT MAY CONCERN

Purchase Order Number: 201803931
Supplier: FOSS THERAPY SERVICES, INC.
Material description: REQ66750-Refrurbishment of GC220
Institute: BioFábrica MOSCAMED Brazil
Av. CI. 992 - Quadra D 13, Lote 15
Distrito Industrial do São Francisco
48.900-000 Junzeiro
Brazil
Attn: Jair Virginio
vsirinos@cnen.gov.br; cchia@cnen.gov.br; jair@moscamed.org.br; valenca@moscamed.org.br
IAEA Project: RLA5074

This is to certify that the equipment and materials mentioned above are free of import taxes, fees and dues from which the International Atomic Energy Agency (IAEA) is exempted by virtue of the privileges and immunities accorded to it by its Member States.

In accordance with the provisions of the Revised Supplementary Agreement (RSA) concerning the Provisions of Technical Assistance by the IAEA, signed by the IAEA and the Government of Brazil, title and risk of the equipment and/or materials shall pass to the Government of Brazil upon customs clearance. The use of the equipment and materials is subject to the provision of the said RSA signed by the IAEA and the Government of Brazil.

The IAEA hereby certifies that the equipment and/or materials are provided free of charge as a contribution to the Government of Brazil for the implementation of Technical Cooperation Project No. RLA5074.

The Government of Brazil has designated BioFábrica MOSCAMED Brazil as its duly authorized representative to claim the equipment and/or materials on its behalf.



Dissanayake, Dineth
Procurement Officer
Office of Procurement Services
Department of Management

Import permit for Gamma Ray Machine donated

- ✓ Tripartite agreement between donor, recipient and IAEA;
- ✓ Hiring of company to transport the source;
- ✓ Issuance of Invoice by the donor;
- ✓ Obtain Import Permit by the recipient;
- ✓ Transport and installation of the source.

Insectary activities

Facilities to rearing *Aedes aegypti* at Moscamed Brasil



MBR-001 strain

Capacity: ~4 millions males per week



Capacity: ~0,5 millions males
per week

Update on insectary set up

- Production of equipments:



PVC cages and trolley for cages



Larval rearing trolley



Support trolley (hospital type)



Mass rearing cage and trolley for cages (evaluation in progress)



- Elaboration of floor plan design of the Rearing Center in Recife city

Technical Challenges

- Improve methodology to evaluate flight ability (current method was adapted from the fruit fly)
- Bioassays for adult sterilization
- New larval diet (more economical, ingredients available in local markets)
- Better synchronization pupae for irradiation
- Strain with higher recovery males and better fecundity.



Field activities: surveillance

Any releases? Where/how/data?



✓During the MRR trial 03 releases of sterile males were carried out in the pilot area of Juazeiro (Training course; March/2018).

Release	Date	N° of sterile males
1	03/21/2018	79500
2	03/24/2018	70600
3	03/27/2018	65700
Total		215800



✓So far the releases of sterile males have not started (Awaiting approval of local financial resources; baseline collection).

3.2 Selected sites for carry out the pilot projects in Brazil

Pilot Project in Recife city - Pernambuco State



Macaxeira Neighborhood, Recife, PE - Control área, size= 30 hectare; Inhabitants ~7.647

- ✓ The monitoring activities are being carried out by the staff of the Secretary of Health, Recife.



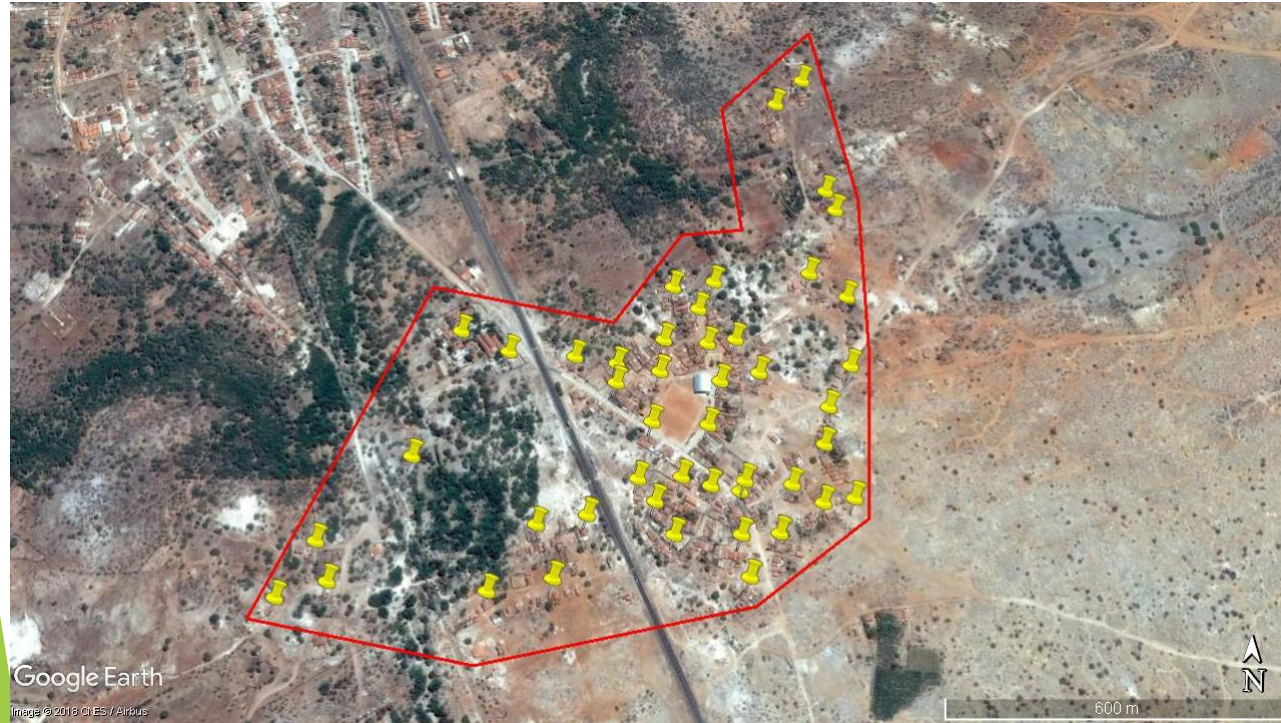
Mangabeira Neighborhood, Recife, PE - Target área, size = 28 hectare; Inhabitants ~7.104



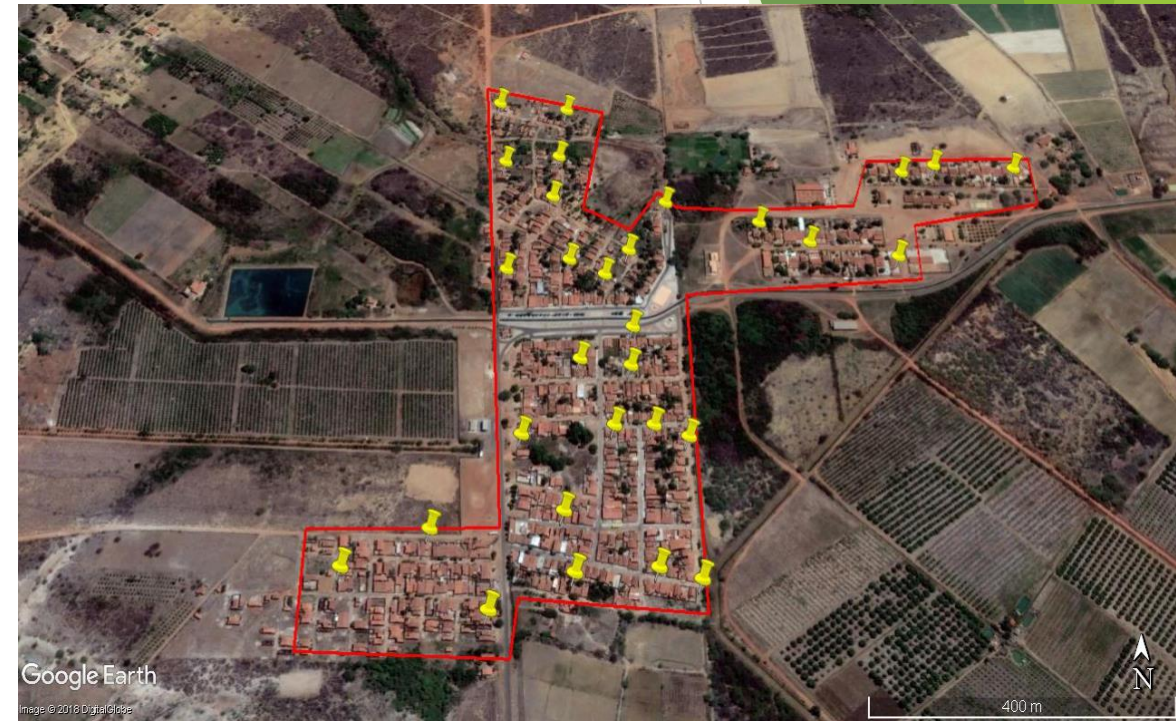
Morro da Conceição Neighborhood, Recife, PE - Target área, size = 31 hectare; Inhabitants ~10.142

Selected sites for carry out the pilot projects in Brazil

✓ Pilot Project in Juazeiro city - Bahia State

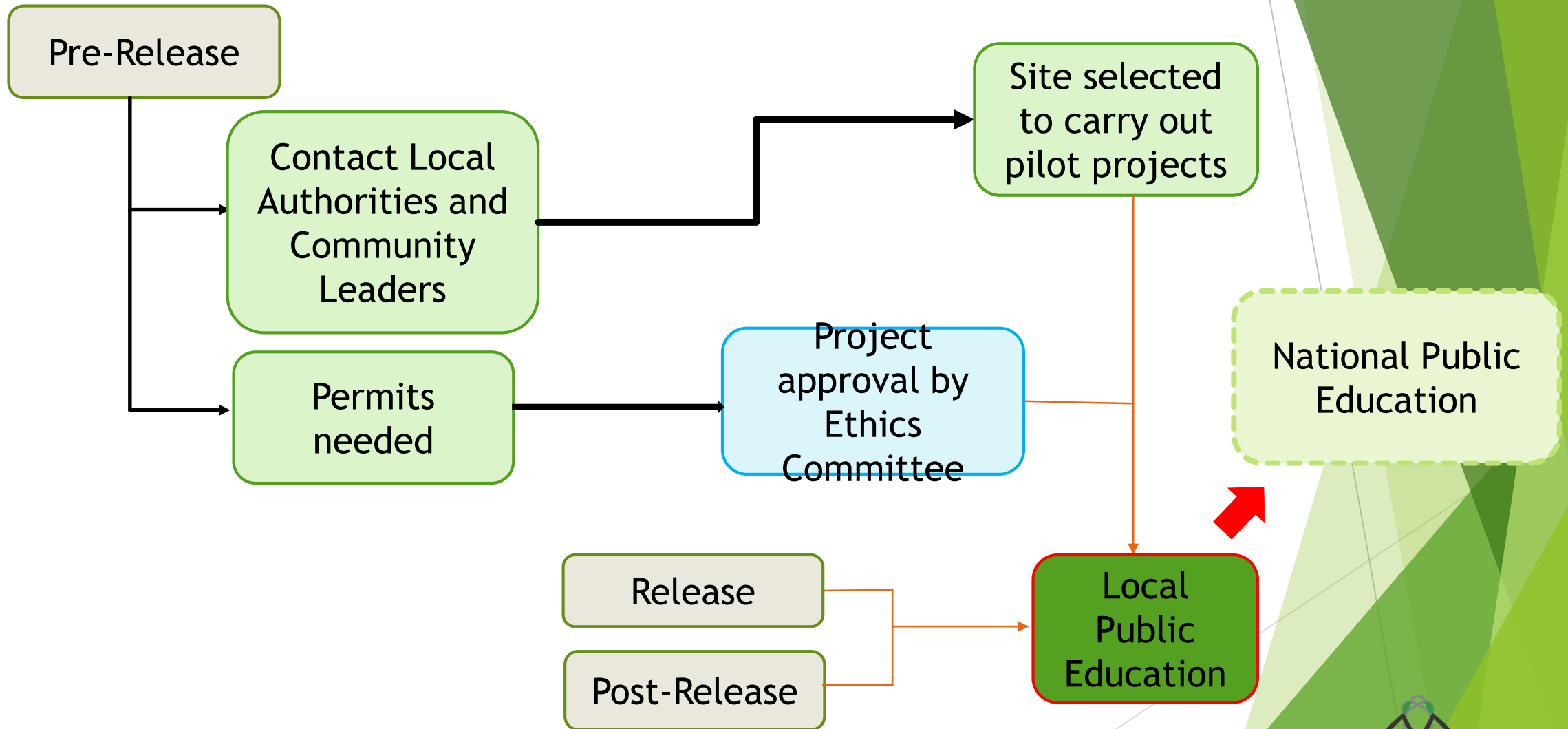


Carnaíba Neighborhood, Juazeiro, BA - Target area, size = 45 hectare.



Carnaíba Neighborhood, Juazeiro, BA - Control area, size = 37 hectare.

Community Engagement Activities



Community Engagement Activities: Pre-releases.



4. Stakeholder engagement

- ✓ **Ministry of Health:** financial agent; end-user of the evaluated technology;
Status: approved the national counterpart project, awaiting the release of resources to start the pilots projects.
- ✓ **Municipal health secretaries - subordinate to the Ministry of Health:** end-user of the evaluated technology.
Status: Signed agreement between the **Secretary of Health** of Recife and Mosamed Brazil for the development of the pilot in Recife;
Project presented to the Secretary of Juazeiro.
- ✓ **Department of Nuclear Energy / Federal University of Pernambuco State**
Status: Technical cooperation agreement signed. Supporting the dose definition tests, dose map and dosimetry.
- ✓ **Federal University of São Francisco Valley (UNIVASF)**
Status: Term of technical-cooperation under construction. Support with fellows

Recomendations

- ✓ Identify irradiators with idle capacity or with low radioactive activity;
- ✓ Concentrate the production of eggs and create release centers spread throughout the national territory (near irradiators);
- ✓ To promote the integration of the Sterile Insect Technique with the other control methods of the *Aedes aegypti* vector;



IAEA

International Atomic Energy Agency



Thanks !

