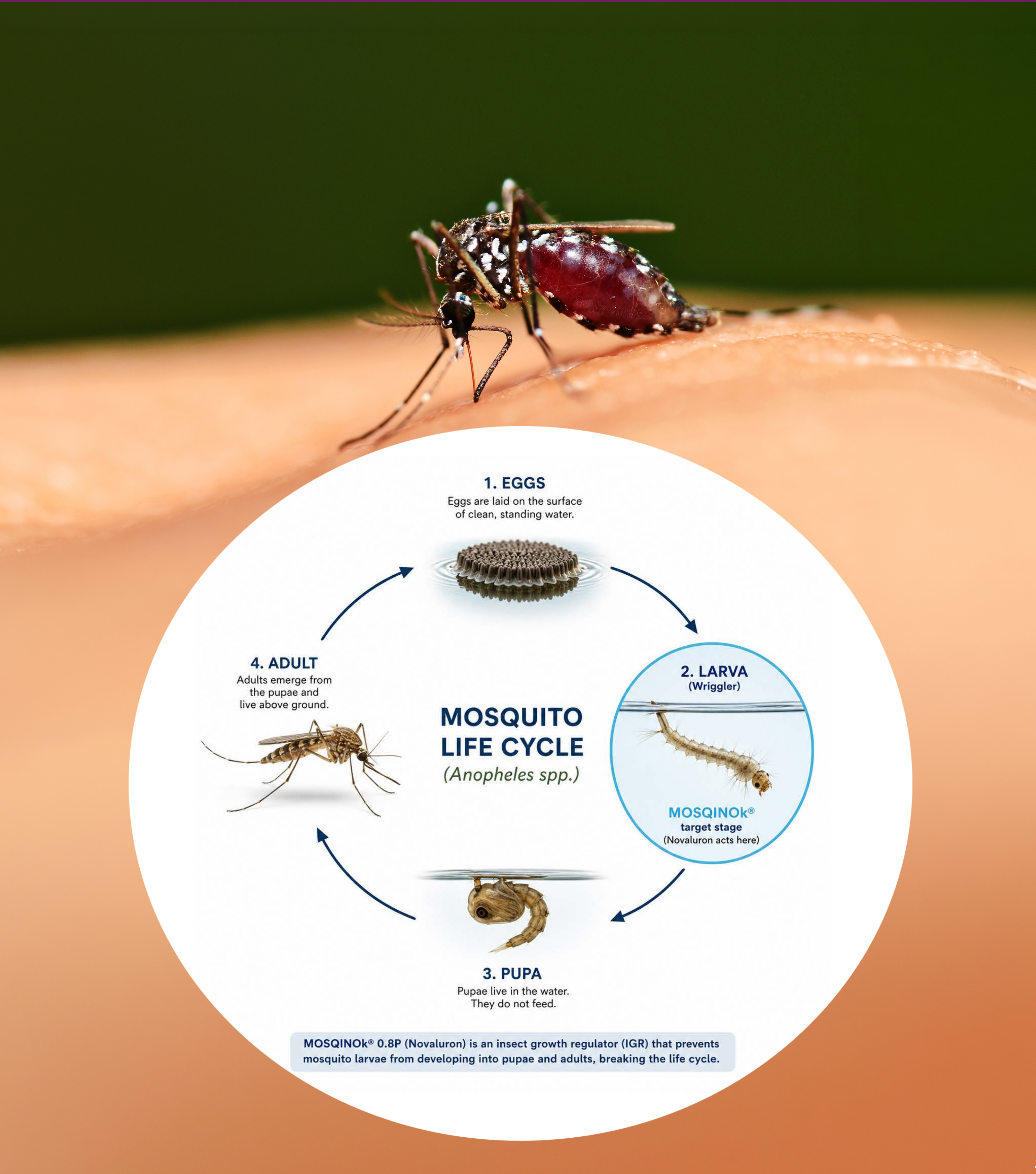
Appropriate Technology

Communicating new practical technologies, policies and ideas addressing the elimination of poverty and hunger



Evaluation of MOSQINOk® larvicide in irrigated rice ecosystems

Flooded irrigated rice fields in Janjangbureh, Central River Region, The Gambia, providing extensive and productive breeding habitats for *Anopheles* mosquitoes.

Credit: Ebrima A Jawara / RUSSELL IPM field team

Malaria vector control in sub-Saharan Africa has historically relied on core interventions such as long-lasting insecticidal nets (LLINs) and indoor residual spraying (IRS). While these tools have contributed substantially to reductions in malaria burden, residual transmission persists, particularly in settings where mosquito breeding habitats are abundant and closely linked to agricultural systems. This is especially relevant in irrigated agricultural landscapes, where aquatic habitats are persistent and highly productive.

In The Gambia, irrigated rice cultivation creates extensive breeding habitats that support *Anopheles* mosquito populations. These environments are difficult to manage using adult-focused interventions alone. As a result, larval source management (LSM) is increasingly being reconsidered as a complementary strategy, particularly where breeding sites are few, fixed and findable.

This article presents operational evidence from a field evaluation of MOSQINOk® 0.8P, a novaluron-based larvicide, in irrigated rice ecosystems in the Central River Region of The Gambia.

Routine larval surveillance using standard dipping techniques to monitor mosquito breeding in rice field habitats.

Credit: Ebrima A Jawara / RUSSELL IPM field team

Reprinted with permission from Appropriate Technology, Vol 53, No 2. www.appropriate-technology.com

Study setting and design

The evaluation was conducted in Janjangbureh (intervention) and Sankuli Kunda (control), two hydrologically independent communities located 8–12 km apart in the River Gambia floodplain. These sites are ecologically comparable and representative of irrigated rice systems in The Gambia.

A quasi-experimental design was used, with one-week baseline monitoring followed by larvicide application in the intervention arm and weekly post-intervention surveillance.

Forty fixed larval monitoring sites were selected (20 per arm), covering rice fields, irrigation canals, puddles, tyre tracks, pump intake ditches and marshy habitats. Larval sampling was conducted weekly using standard dipping techniques, with larvae classified by instar stage and pupae recorded separately.

Adult mosquito monitoring was conducted using CDC light traps at five sentinel households per study arm, with collections performed at regular intervals (approximately every two weeks) throughout the study period.

Intervention and application strategy

MOSQINOk® 0.8P contains novaluron, an insect growth regulator that inhibits chitin synthesis and disrupts successful moulting. The product was applied at approximately one tablet per 200 litres of water, with dosage adjusted according to habitat surface area and mean depth.

Breeding habitats were identified and mapped during baseline surveys, and treatment was conducted weekly by trained field teams. The tablet formulation allowed rapid and practical application across diverse habitat types, including rice paddies, irrigation canals and small transient water bodies.

The first application was carried out on 29 September 2025, with treatment covering all accessible aquatic habitats in the intervention community.

CDC light trap set up for adult mosquito collection at sentinel households as part of routine surveillance.

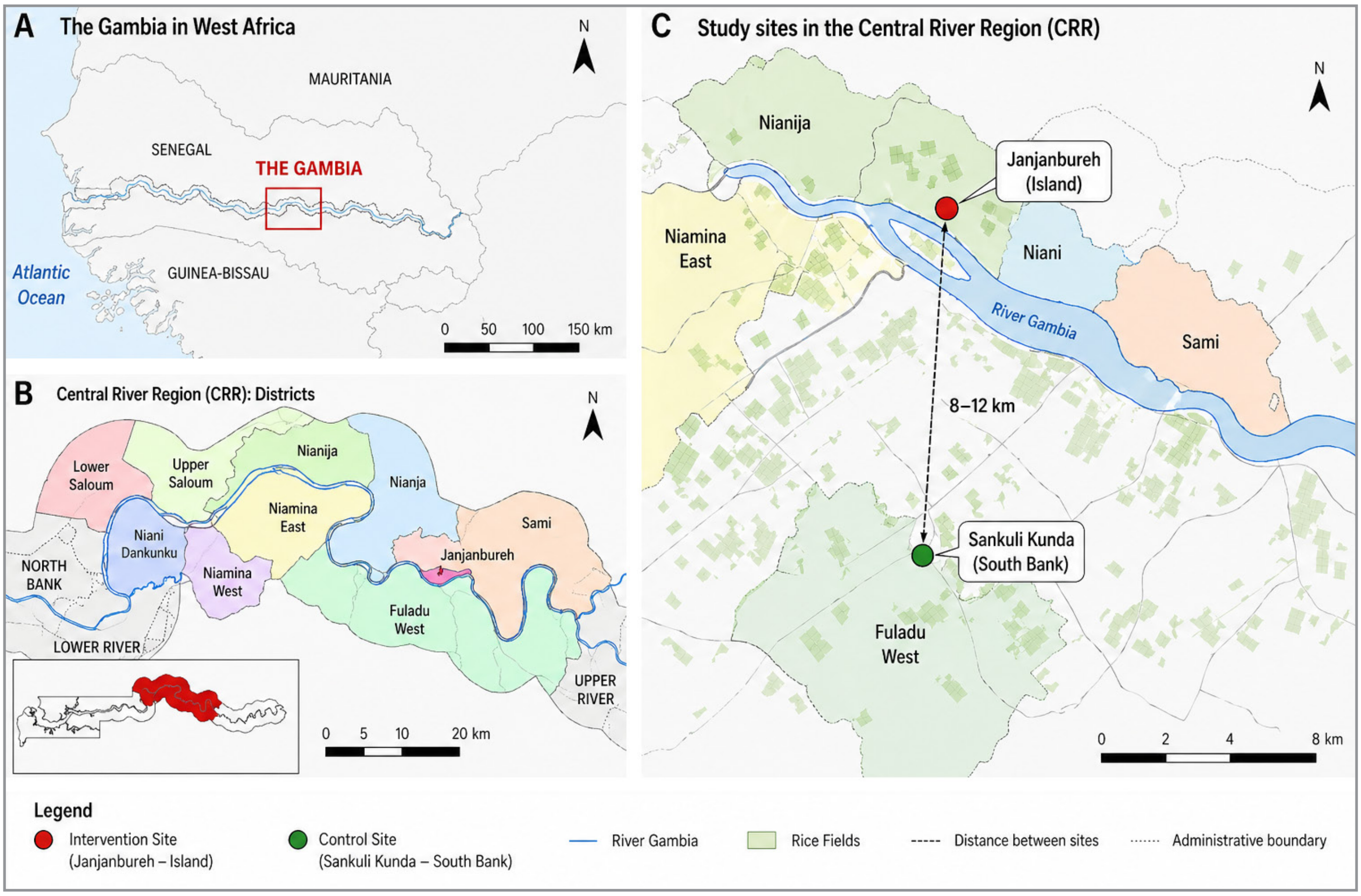
Credit: Ebrima A Jawara / RUSSELL IPM field team

Key findings

Larval suppression: The intervention resulted in a marked reduction in larval density compared with the untreated control. Difference-in-differences analysis showed an estimated 54.1% reduction in larval density attributable to the intervention. Weekly monitoring showed a clear divergence in larval trends after application, with sustained suppression across treated habitats.

Pupal suppression and mode of action: A striking operational observation was the near absence of pupae in treated habitats after intervention. This is consistent with novaluron's mode of action, which prevents larvae from completing development and emerging as adults. This is operationally important because preventing larvae from reaching the pupal stage directly reduces adult mosquito emergence and subsequent transmission risk.

Adult mosquito trends: Adult *Anopheles* densities also declined in the intervention arm, although reductions were more modest than larval effects. This reflects the influence of ecological variability, adult mosquito dispersal and the limited number of trap-nights in this operational study. Across the study period, adult species composition was dominated by other *Anopheles* species (57.0%), followed by *Anopheles funestus* (27.5%) and *Anopheles gambiae s.l.* (15.5%). Adult mosquito collections were conducted at discrete intervals rather than weekly, reflecting operational field constraints and standard surveillance practice. Despite interval-



Map showing the study locations in the Central River Region of The Gambia, including Janjangbureh (intervention) and Sankuli Kunda (control) communities.
Credit: Ebrima A Jawara / RUSSELL IPM field team

based sampling, adult mosquito densities showed a consistent downward trend in the intervention arm.

*Habitat productivity insights***:** Rice fields contributed the largest number of breeding habitats overall. However, smaller habitats such as tyre tracks, pump intake ditches and shallow pools often recorded high larval densities, highlighting the importance of targeting productive microhabitats.

Operational lessons

This study demonstrated that larval source management can be operationally feasible in irrigated agricultural settings when breeding sites are systematically mapped and treated.

Successful implementation depended on structured weekly field routines, accurate habitat identification and consistent treatment coverage. The tablet formulation proved practical for field use, requiring minimal equipment and allowing rapid deployment.

In practice, smaller but highly productive habitats such as tyre tracks, pump ditches and shallow pools should not be overlooked, as they can contribute disproportionately to mosquito production. Prioritising such habitats may improve efficiency during scale-up.

Practical relevance for malaria programmes

The findings provide field-based evidence that larval source management can play a practical role in national malaria control programmes, particularly in settings where breeding habitats are identifiable and manageable.

For countries facing persistent transmission despite high LLIN coverage, targeted larviciding in productive aquatic habitats offers an important complementary tool. Programmes may improve cost-effectiveness by prioritising high-productivity habitats and integrating larval control into existing surveillance systems.

Limitations

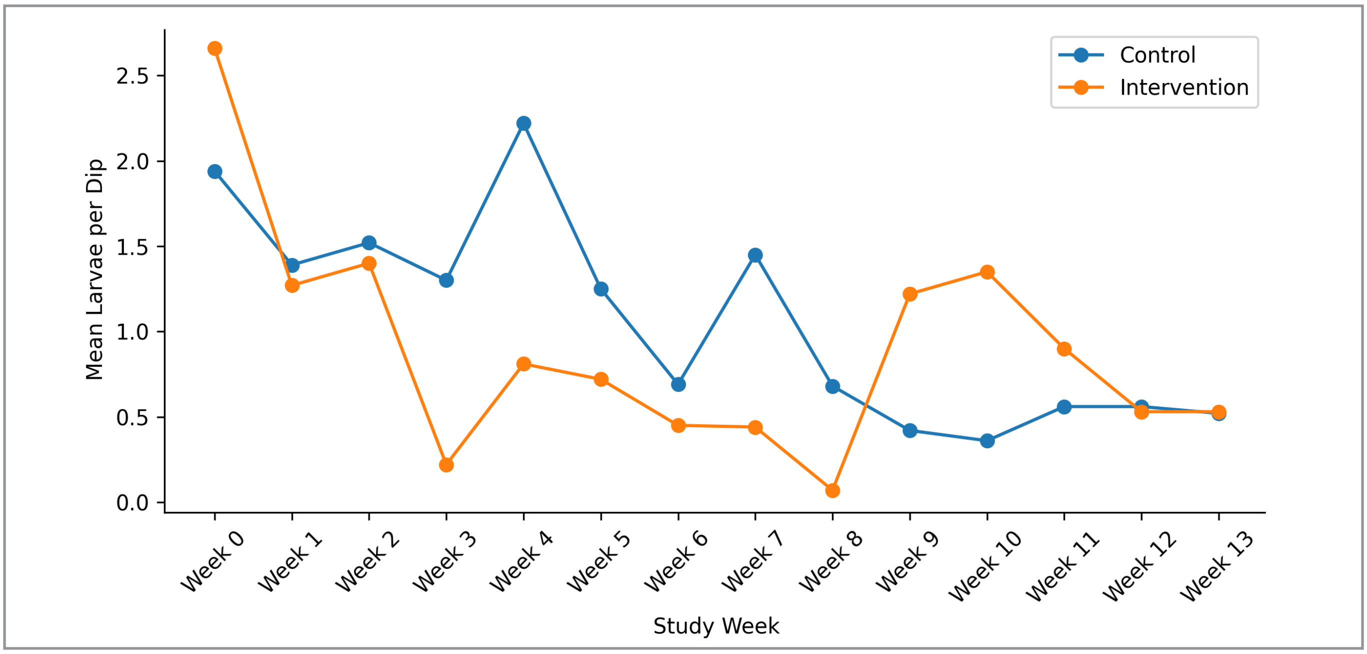
The evaluation involved one intervention and one control site, a short baseline period and limited adult mosquito sampling. Despite these constraints, the consistency of larval and pupal suppression provides strong operational confidence in the intervention.

Conclusion

This field evaluation shows that MOSQINOk® larvicide can substantially suppress mosquito larval populations in irrigated rice ecosystems.

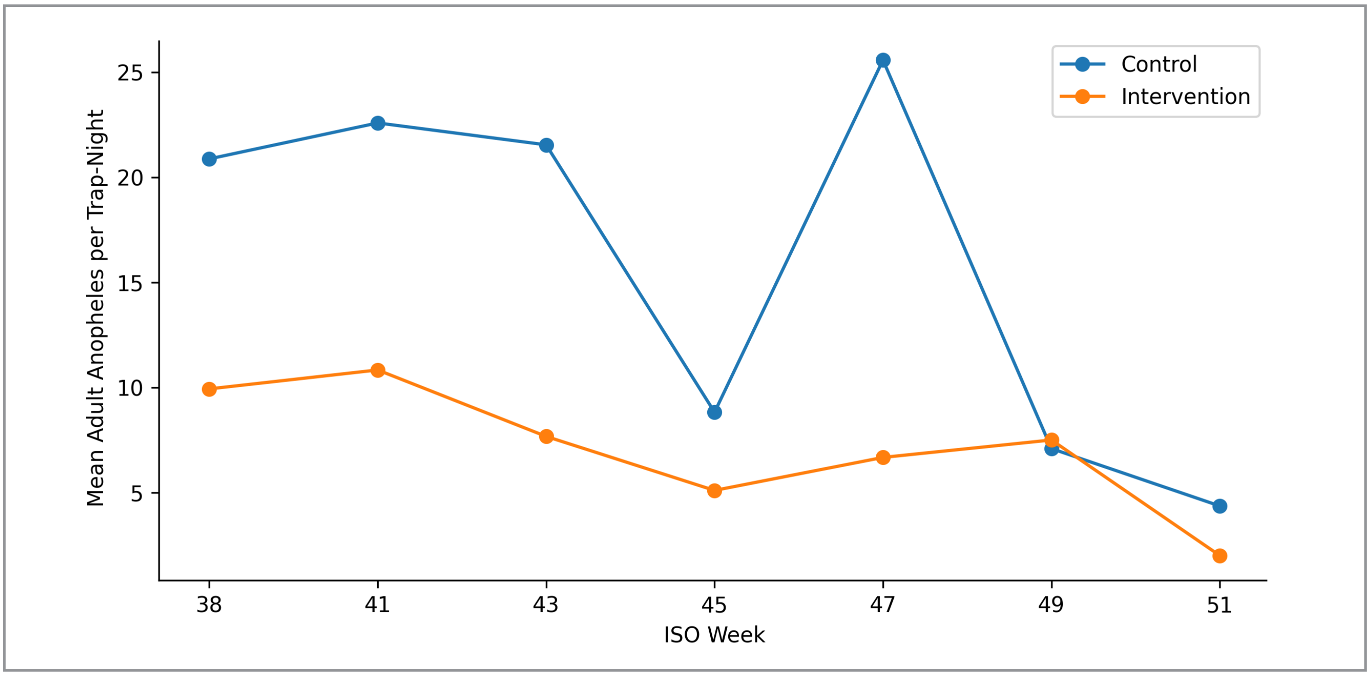
The near elimination of pupae in treated habitats provides strong biological and operational evidence that larval control can interrupt mosquito development at source.

As malaria programmes seek solutions for residual transmission, larval source management represents a practical and scalable complement to existing vector control tools. Further multi-site operational evaluations are recommended to support broader programme adoption and policy integration.



Weekly Larval Density

Credit: Ebrima A Jawara / RUSSELL IPM field team



Biweekly Adult Density

Credit: Ebrima A Jawara / RUSSELL IPM field team

Acknowledgements

The authors acknowledge the support of Blue Sands Foundation for funding the field implementation of this study, and RUSSELL IVM for providing the MOSQINOk® larvicide used in the evaluation.

A version of this article was first printed in International Pest Control MayJune 26 issue.

Ebrima A. Jawara[1], Momodou T. Nyassi[2], Sainey Sanneh[3], Wandifa Samateh[4], Balla Gibba[4], Samuel S. Gomez[4], Harouna M. Soumare[5], Abu Imroz Ali[1], Shakir Al Zaidi[1]

[1] *RUSSELL IPM Ltd, United Kingdom*
[2] *Directorate of Health Services, Ministry of Health, The Gambia*
[3] *Directorate of Health Research, Ministry of Health, The Gambia*
[4] *National Malaria Control Programme, The Gambia*
[5] *MRC Unit The Gambia at LSHTM*


Russell IPM
INTEGRATED PEST MANAGEMENT
MOSQINOK
Effective against Dengue, Zika, Chikungunya and Malaria Carrying Mosquitoes
NOT FOR HUMAN CONSUMPTION
MOSQINOK
Novaluron based slow-release mosquito larvicide
Effective for a minimum of 90 days
Dengue
Malaria
Zika
Chikungunya
Russell IPM Ltd
Unit 45, First Avenue, Deeside Ind. Park Flintshire CH5 2NU, UK
Phone: +44 (0) 1244 281 333, Email: info@russellipm.com
www.russellipm.com


SilMax
LIQUID MOSQUITO FILM
Russell IPM
MADE IN THE UK
Russell IPM
INTEGRATED PEST MANAGEMENT
SilMax
LIQUID MOSQUITO FILM
A silicone-based non toxic mosquito larvicide with residual efficacy of up to 60 days
Russell IPM Ltd:
Unit 45 First Avenue, Deeside Industrial Park, Deeside, Flintshire, CH5 2NU, United Kingdom
t.: +44 (0)1244 281 333, info@russellipm.com,