

Bunds and Bugs in West Africa

Does Rice Irrigation Threaten Farmers' Health?

Health Consortium
WARDA
WHO-PEEM
IDRC
DANIDA
Government of Norway

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Background

Wetland water management and irrigation schemes are thought to make vector-borne disease endemicity worse in West Africa. The development and promotion of wetland / irrigated rice cultivation has been restrained because of such health concerns. However, with the rapidly growing consumer demand for rice in the region (5.6% annual growth rate) and the limited options for intensification of upland areas, wetland rice developments becomes a major focus for agricultural policymakers and farmers. Inland valley bottoms in West Africa represent approximately 50% of the agriculturally available wetland area (375,000 to 842,910 km²).

The *WARDA / WHO-PEEM¹ / IDRC / DANIDA / Government of Norway Health Research Consortium*, brings together six multidisciplinary West African research institutions to evaluate health and social impact of various degrees of wetland water

management / irrigation in the humid rain forest, savanna and Sahel within a planning and policy relevant framework. Results will be used to develop environmental management strategies minimizing health risks related to land use.

¹PEEM = WHO/FAO/UNEP/UNCHS Panel of Experts on Environmental Management for Vector Control

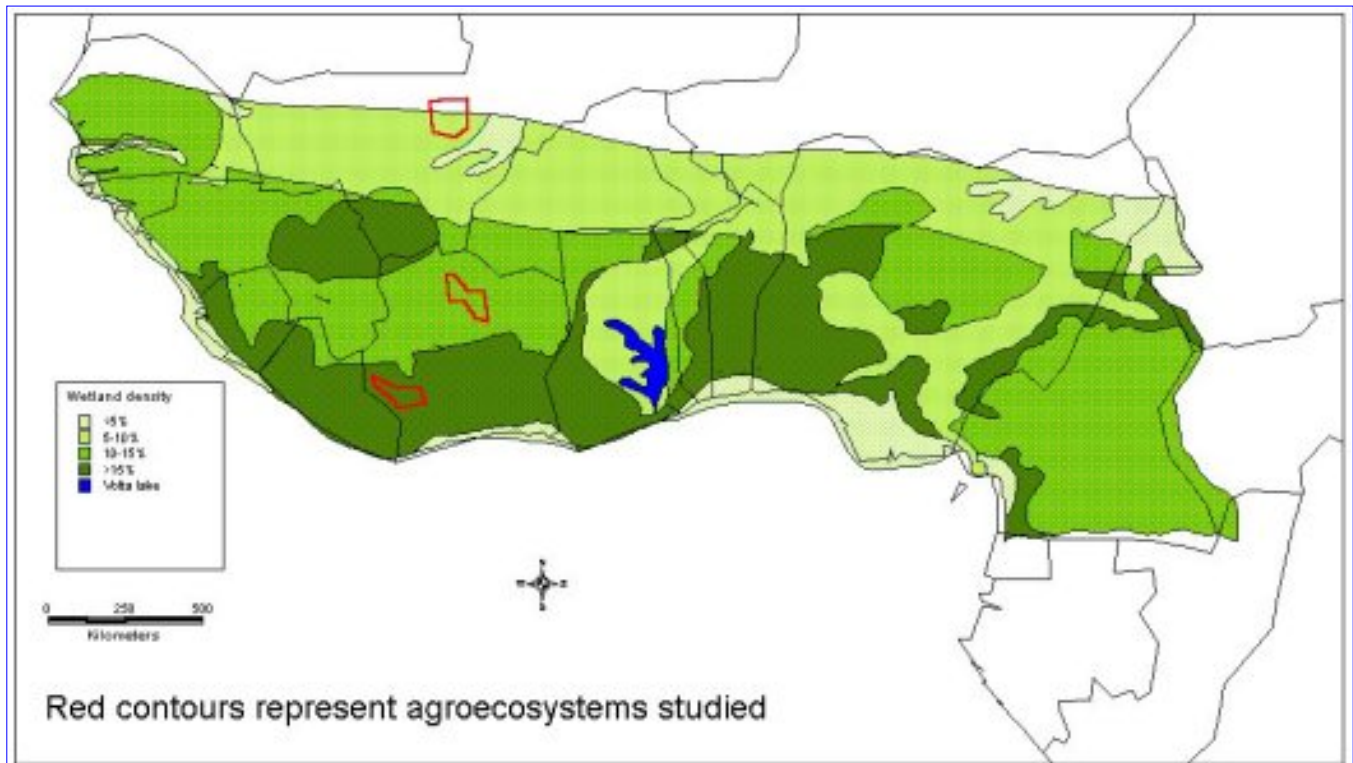


Hypothesis

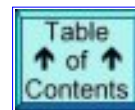
Increasing degrees of water management / irrigation will increase malaria transmission and burden of disease in the major ecosystems of West Africa.



Wetland density in West Africa



From: Andriessse W., N. van Duivenbooden, L.O. Fresco & P.N. Windmeijer, 1994.
Multiscale approach to characterize inland valley agroecosystems in West Africa.
Netherlands Journal of Agricultural Science 42 : 159-179.



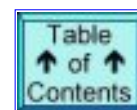
Research Results

Population perception and behavior

Qualitative socio-cultural studies in the savanna indicate that rice double-cropping:

- **Attracts mainly young families**
- **Improves women's income**
- **Transfers financial responsibility for health care and education from men to women**
- **Affects treatment-seeking behavior by shortening the delay between disease onset and initiation of treatment.**

A quantitative rapid assessment of household socioeconomic status suggests that female-headed or wealthier households increase expenditure for prophylactic measures and drug treatments.



Exposure and disease impact of wetland rice farming

Sahel	No irrigated rice cultivation	Irrigated rice cultivation
EIR (ib/p/y)	56	18
Parasite ratio (%)	49	37
High parasitaemia (%)	2.9	2.4

EIR = entomological inoculation rate

ib/p/y = infective bites per person per year

High parasitaemia $\geq 15,000/\mu\text{L}$

Data adapted from: Dolo, G., M.S. Sissoko, A. Dao, I. Sagara, S.F. Traoré, M. Sissoko, M. Bouaré, A. Dicko, N. Sogoba, Dembélé, O. Niar & M. Bagayoko, 1997. Impact of irrigated rice cultivation on malaria transmission in Niono, Mali. A245 Abstracts, 46th Meeting of the American Society of Tropical Medicine and Hygiene, Lake Buena Vista, 7-11 December 1997.

Savanna	No wetland rice cultivation	Rainfed wetland rice cultivation	Irrigated rice cultivation
EIR (ib/p/y)	87	64	84
Median fever episodes per child year	2,2	2,7	2,8
25th - 75th percentile	(1.5 - 2.7)	(1.5 - 3.2)	(1.8 - 3.7)
Median malaria episodes per child year	0.75	0.47	1.28
25th - 75th percentile	(0.35 - 1.21)	(0.22 - 0.61)	(0.78 - 1.36)
Malaria attributable fraction	0.37	0.21	0.38

EIR = entomological inoculation rate

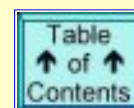
ib/p/y = infective bites per person per year

Malaria episodes: Axillary body temperature ≥ 37.5 and parasitaemia $\geq 10.000/\mu\text{L}$

Data adapted from: Henry, M.C., J. Dossou Yovo, I. Nzeyimana, S. Diarassouba, E. Akodo, T. Teuscher & P. Carnevale, 1998. Impact of rice cultivation systems on malaria incidence in the savanna of northern Côte d' Ivoire. Poster 67, Abstracts, 2nd European Congress on Tropical Medicine, Liverpool, 14-18 September 1998.

Forest zone

data being processed



Preliminary Conclusions

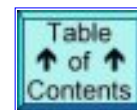
For agricultural development planners:

- In the Sahel, irrigation does not increase malaria transmission and possibly maintains endemicity at a reduced level.
- Reduced vector population density results in prolonged life of each mosquito and, therefore, increases both the chances of transmission and the disease rates. Therefore, alternative intensified rice cultivation strategies (dry seeding and improved pest management), through a shortening of flooding, may decrease overall vector population density in the Sahel and thus increase malaria transmission and disease rates.
- In the savanna, wetland water management for rice double-cropping does not increase malaria transmission and does not impact on malaria-related burden of disease.
- A strategy to improve access to rapid, appropriate fever treatment needs to be included in wetland development plans in order to develop the full socioeconomic potential of intensified rice production systems at household level.



For health planners:

- In the Sahel, measures to reduce dry season human-vector contact could further reduce the incidence of malaria.
- Insecticide treatment of already highly utilized bednets during the rainy season has the potential to substantially reduce the malaria-related burden of disease.
- In savanna areas, increases in women's disposable income accelerate treatment-seeking behavior irrespective of nature of treatment provider (household, market, formal health sector).
- In savanna areas with seasonal, intermediate malaria endemicity, IEC messages need to consider the low nuisance perception leading to very low bednet utilization rates.
- Contrary to the case of malaria fevers, the frequency of non-malarial fever episodes (arbovirus, etc.) is associated with specific agroecologies.
- Rice cultivation improves household food security and improves access to/ utilization of "Bamako Initiative" based health interventions by population.



Consortium members

Mali: Faculté de médecine, de pharmacie et d' odonto-stomatologie, Centre de recherche et de formation sur le paludisme, DEAP, Bamako; Institut d' économie rurale, Niono/Bamako; Institut national de recherche en santé publique, Bamako

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