Title: Co-managing the Agriculture-Biodiversity-Health nexus in LMI countries: can a (renewed) One Health approach help?

Authors : Michel de Garine-Wichatitsky[a], Muriel Figuié[b,c], Clémentine Allinne[d], Leila Bagny Beilhe[e], Ludovic Temple[f]

[a] *ASTRE, Univ Montpellier, CIRAD, Montpellier, France*
[b] *MoiSA, Univ Montpellier, CIRAD, Montpellier, France*
[c] *E. Mondlane University, Maputo, Mozambique*
[d] *GECO, Univ Montpellier, CIRAD, Montpellier, France*
[e] *PHIM, Univ Montpellier, CIRAD, Montpellier, France*
[f] *INNOVATION, Univ Montpellier, CIRAD, Montpellier, France*

Abstract: (442 words/450 ma

The future of societies and ecosystems worldwide depends on the adaptive management of complex interactions between biodiversity, climate and human activities and their impacts on human, animal and environmental health. We focus on agricultural activities which have a direct impact on food systems and living conditions, particularly in developing tropical or subtropical countries, due to high socio-economic dependency on agriculture, often deficient public health infrastructures, and high vulnerabilities to climate change and biodiversity erosion.

The scope of One Health (OH) has been gradually broadened, from an initial focus on public health and zoonotic diseases affecting humans, domestic and wild animals, to include plants and ecosystem health. This expansion was endorsed by the United Nations Quadripartite Alliance of United Nations organizations on health[1] and the associated OH Joint Plan of Action[2]. However, the operational application of this updated OH approach to address health and agricultural issues in tropical low-income countries is both promising and concerning.

We analysed four recent and ongoing interdisciplinary action-research projects addressing health issues in various agro-ecosystems in Africa and SE Asia: i) AfriCam project[3] aims at strengthening local collective capacities for action to prevent and manage the emergence of health risks. In a context of land transformation by agriculture in Cameroon, the approach adopted the concept of integrated health[4] to generate and share common knowledge on agrobiodiversity to mobilise collective action and public policies to prevent zoonoses; ii) MozARH[5] project investigated the evolution of the relations between humans and rodents in areas adjacent to the Limpopo National Park in Mozambique. It illustrates how a changing socioecological landscape can create new viral routes, including in areas apparently little affected by anthropogenic transformation[6], questioning the idea of “natural” equilibrium; iii) Santés-Territoire project[7] addresses agroecological transitions and OH issues in six sites in West Africa and SE Asia, adopting placed-based participatory framing of local health issues and co-designing actions to address them[8,9]. The main focus was often on reducing environmental pollution and mitigating its impacts on crops, soiland people, whereas infectious diseases and biodiversity loss were usually not prioritized; iv) PlantHealth project[10] develops new paradigms for integrative approaches of plant health in Ivory Coast and Cambodia, building innovative indicators, along with understanding the diversity and dynamic of agricultural practices to adapt to o the various and changing sanitary conditions of cultivated plots. This requires renewing the link between researchers with various competences and farmers as primary stakeholders in plant health management.

Each project case study explores a different facet of the Agriculture-Biodiversity-Health nexus, at various scales and in different LMI countries. We summarize the lessons learnt and put them in perspective with the OHHLEP definition[1] and the OH Joint Plan of Action[2].

Figure 1: Agroecosystem of Romsay Sok Living-Lab (Battambang, Cambodia), established with farmers, local stakeholders and researchers to co-design and implement agroecological practises for One Health benefits (Santés-Territoire project[7]; Cassava field on the left forefront of the picture, bat cave and community forest at the background; photo @Michel de Garine-Wichatitsky).

Table: Bibliographic references and web sites of projects cited.

Ref. Number	Bibliographical reference/Project web site
1	Adisasmito, W.K. et al. 2022. “One Health: A new definition for a sustainable and healthy future”. PLoS Pathogens, 18(6): e1010537.
2	FAO, UNEP, WHO, and WOAH. 2022. “One Health Joint Plan of Action (2022-2026). Working together for the health of humans, animals, plants and the environment”. Rome. doi.org/10.4060/cc2289en
3	AfriCam project. https://www.cirad.fr/dans-le-monde/cirad-dans-le-monde/projets/projet-africam
4	Rüegg, S. R., Buttigieg, S. C., Goutard, F. L., Binot, A., Morand, S., Thys, S., Keune, H., eds. (2019). Integrated Approaches to Health: Concepts and Experiences in Framing, Integration and Evaluation of One Health and EcoHealth. *Lausanne: Frontiers Media*. doi: 10.3389/978-2-88963-086-8
5	MozArh project. https://www.rp-pcp.org/projects/on-going/muse-mozarh
6	Figuié, M. et al. "Structural drivers of vulnerability at the human-rodent interface in the Limpopo National Park, Mozambique." *CABI One Health* 2023 (2023): ohcs20230007.
7	Santés-Territoire project. https://www.santes-territoires.org/
8	Sachet, E. et al 2023. Place-based evaluation in Living Labs: designing tools for collective learning. *International Forum on Agroecosystem Living Labs.* October 4 to 6, 2023. Montréal, Québec, Canada
9	De Garine-Wichatitsky, M. et al. 2021. “Health in” and “Health of” social-ecological systems: A practical framework for the management of healthy and resilient agricultural and natural ecosystems. *Frontiers in Public Health*, 8, 616328.
10	PlantHealth project. https://www.agropolis-fondation.fr/Plant-Health?lang=fr"