

**Key knowledge gaps concerning biodiversity loss in a Malagasy priority conservation area
focusing on agriculture and social inequality as major drivers**



Dear Expert,

You receive this questionnaire as we would value your input as an expert for the slash-and-burn problematic in Madagascar in an ecological, socio-economic and / or political context.

Our team aims to identify key knowledge gaps that need to be addressed most urgently to better achieve the Sustainable Development Goals, the Biodiversity Aichi Targets and the 2°C-target of the Paris Climate Agreement. We focus on three Sustainable Development Goals: SDG 2 (Zero Hunger), SDG 10 (Reduced Inequalities) and SDG 15 (Life on Land). To identify key knowledge gaps, we first reviewed the literature for knowledge gaps at global scale. Then, we listed those knowledge gaps relevant to the slash-and-burn problematic in Madagascar, selecting the Dry Forest of Menabe Central as a local case study. To pinpoint key knowledge gaps, we would like to use the help of experts who have personal experience with the slash-and-burn problematic in Madagascar. This way we strive to create a more comprehensive and representative shortlist of key knowledge gaps involving experts from as many institutions and organizations as possible.

Your participation in this questionnaire is completely voluntary and your answers remain anonymous. Your answers will be coded and any identifying information removed. Neither your name nor your organization will be reported in any output linked to this study. If you agree to participate in this questionnaire, please answer the questions to the best of your knowledge. The survey will take about 20-25 minutes and is confidential.

I have read and understood the above terms and am willing to participate (see also *Declaration of consent and Ethics Approval* at the end of questionnaire). ☐ Yes ☐ No

Part I: Information about your background and Madagascar experience

Position / occupation: _____

Name of institution / organization: _____

Nationality: _____

Age:

< 25 26 – 35 36 – 45 46 – 65 > 65

Gender: male female

Approximate amount of time spent in Madagascar:

< 1 year 1-5 years 6-10 years > 10 years

Field(s) of expertise, including years worked in this / these field(s) (please list a maximum of 5 fields):

Have you worked with local people? ☐ Yes ☐ No

If so, in which context?

If you like, you can provide any comments on your background and Madagascar experience here:

Part II: Ranking of knowledge gaps

In this section, we ask you to rank the knowledge gaps collected from the literature by importance.

It is regarded a major challenge to protect natural habitats while simultaneously requiring land for agriculture for a growing world population (Crist et al. 2017, Garibaldi et al. 2017), and because poor people rarely have alternatives to using resources from natural habitats for their survival (Pimm et al. 2001). Therefore, our study focusses on the trade-offs between the following three Sustainable Development Goals:

SDG 2 (Zero Hunger – which is directly connected to food security through agricultural land use),

SDG 10 (Reduced Inequalities) and

SDG 15 (protection of Life on Land)¹.

We grouped the knowledge gaps into four categories:

- ecological knowledge gaps,
- socio-economic knowledge gaps,
- political knowledge gaps and
- general knowledge gaps.

Please note: For each category of knowledge gaps, you can list further essential knowledge gaps you consider equally or more important than the ones you rated at the highest ranking score, i.e. ‘3 – definitely a high priority’.

¹

SDG 2 (Zero Hunger): End hunger, achieve food security and improved nutrition and promote sustainable agriculture.

SDG 10 (Reduced Inequalities): Reduce inequality within and among countries.

SDG 15 (Life on Land): Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

Ecological knowledge gaps:

Prioritizing ecological knowledge gaps is essential for an improved achievement of SDG 15 (Protection of Life on Land). Since SDG 2 (Zero Hunger) is directly connected to food security through agricultural land use, knowledge gaps which address interactions between SDG 2 and SDG 15 (i.e. ecological effects of land-use practices on biodiversity as well as effects of biodiversity on land use productivity), are also addressed here.

Scoring categories:

0	1	2	3
no priority	potentially a priority	definitely a priority	definitely a high priority

Appropriate forest restoration methods in conjunction with biodiversity and sustainable use	
Appropriate livestock management practices and fire regimes	
Best place for which type (multiple-use vs strictly protected) of protected area	
Biomass data	
Carbon stock data	
Ecosystem services (ES) at risk from slash-and-burn as well as associated extractive activities	
Effective buffer zone and corridor dimensions	
Effectiveness of different types of biodiversity protection (ranging from strict to multiple use conservation areas)	
(Spill-over) effects of increased agricultural productivity through intensification on remaining areas of native vegetation	
Effectiveness of payment for ecosystem services and other certification schemes on biodiversity protection	
Effects of remaining forest vegetation (high biodiversity) adjacent to crops on crop yields	
Effects of climate change on biodiversity including lag effects	
Functional / phylogenetic data	
Genetic diversity data	
Impacts of slash-and-burn farming on climate and hydrological cycles	
Interacting effects of climate change on biodiversity and food production	
Long-term degradation effects from slash-burn farming and associated activities on biodiversity	
Multi-trophic interactions	
Nutrient cycling	
Reaction of plant and animal species to anthropogenic as well as natural types of disturbance	
Role of introduced species (including diseases) on ecosystem functioning	
Spatial ecology data for the investigation of species dynamics	
Species behavioral data	
Sustainable quotas for species harvesting in multiple-use protected areas	
Taxonomic data (particularly for groups other than higher plants and vertebrates)	
Time required for regeneration of dry forests, including functional aspects and ES	

If you think there are essential ecological knowledge gap questions that should be listed with a higher priority than those you have given the highest ranking, please list them here:

Socio-economic knowledge gaps:

The socio-economic knowledge gaps address aspects particularly relevant for achieving SDG 10 (Reduced Inequalities). However, socio-economic knowledge gaps listed here may also relate to SDG 2 (Zero Hunger) and SDG 15 (Protection of Life on Land).

Scoring categories:

0	1	2	3
no priority	potentially a priority	definitely a priority	definitely a high priority

Alternative sources of protein for bushmeat	
Better science communication with local people, including managers (what are the best ways to build trust and respect between outside advisers and the local community?)	
Cultural aspects that hinder or could improve conservation efforts	
Data on capacity building	
Data on illegal activities and corruption	
Data on inequality	
Data on international land deals	
Data on material footprint	
Drivers of societal dynamics	
Effectiveness of education and awareness raising on biodiversity conservation	
Effectiveness of payment for ecosystem services (PES), carbon offset schemes and other programs aiming to improve the well-being of small-holder farmers	
Economic benefits for the local small-holder farmers from biodiversity: e.g. potential of ecotourism, PES and other offset schemes on their well-being	
Health risks of traditional slash-and-burn farming vs more technologically and chemically improved farming in attempts to increase food production	
Impact of mining operations on small-holder farmers	
Impact of plantation farming on small-holder farmers	
Most economically efficient land use of already converted land	
Potential of psychological research on motivational values of biodiversity conservation	
Potential of women empowerment concerning income diversification	
Role of biodiversity protection in inequality and poverty reduction	
Role of tele-coupling / international trade in well-being of poor people	
Short- / medium- / long-term costs and benefits of avoiding increasing land degradation	
Short- / medium- / long-term costs and benefits of protecting biodiversity	
(Affordable) technologies which lower the impact of agriculture on biodiversity and improve yield	
Traditional knowledge about sustainable natural resource use	

If you think there are essential socio-economic knowledge gap questions that should be listed with a higher priority than those you have given the highest ranking, please list them here:

Political knowledge gaps:

Political knowledge gaps address all three focal SDGs at political level. The overall question would be how governance can be improved to better protect biodiversity and human well-being, particularly of poor people who need to engage in slash-and-burn practices for their survival.

Scoring categories:

0	1	2	3
no priority	potentially a priority	definitely a priority	definitely a high priority

Effects of conservation activities and sustainable use of biodiversity on political achievements (e.g. 2°C-target of the Paris Climate Agreement)	
Effectiveness of payments for ecosystem services and certification schemes on political decisions	
Influence of mining companies and large plantation farmers / owners on politics	
Research on what social safety-nets are needed to protect people from chronic poverty (and future threats linked to climate change)	
Research on how polycentric governance (multi-stakeholder, including indigenous people) can improve conservation	
Role of corruption in illegal activities (also beyond logging) and ways to reduce corruption	
Roles of World Bank, philanthropists and philanthropic foundations, as well as NGOs in mitigating poverty	
Strategies to improve long-term funding	
Strategies on how to avoid / minimize future political crises	
Strategies on how to improve justice / fairness / enforcement of laws / rules	
Strategies on how to improve security from violence / theft / corruption	
Strategies on how accountability of institutions / governments can be strengthened	
Strategies on how competing (land / property) rights issues can be most fairly addressed	
Strategies to improve local conservation managers' access to scientific publications	

If you think there are essential political knowledge gap questions that should be listed with a higher priority than those you have given the highest ranking, please list them here:

General knowledge gaps:

General knowledge gaps are those relevant for all three knowledge gap categories above.

Scoring categories:

0	1	2	3
no priority	potentially a priority	definitely a priority	definitely a high priority

Better data quality / reliability (through meaningful baselines, long-term data and better spatial resolution and coverage, as well as ground-truthed data)	
Data and meta-data availability (through digitalization)	
Data for more (appropriate) indicators to measure achievement of goals	
Frequent and regular scenario updates based on long-term monitoring	
Interdisciplinary work to generate more comprehensive data sets	
Landscape context data	
Time-lag effects analyses and simulations	

If you think there are essential general knowledge gap questions that should be listed with a higher priority than those you have given the highest ranking, please list them here:

Any comments?

If you would like to be updated on the progress of this work, please provide your email address here:

Thank you very much for your participation!

We really appreciate your time and wish you and your team / organization all the best,

Dr. Anke Frank and Dr. Livia Schäffler

References

- Crist, E., C. Mora, and R. Engelman. 2017. The interaction of human population, food production, and biodiversity protection. *Science* 356:260-264.
- Garibaldi, L. A., B. Gemmill-Herren, R. D'Annolfo, B. E. Graeb, S. A. Cunningham, and T. D. Breeze. 2017. Farming Approaches for Greater Biodiversity, Livelihoods, and Food Security. *Trends in Ecology & Evolution* 32:68-80.
- Pimm, S. L., M. Ayres, A. Balmford, G. Branch, K. Brandon, T. Brooks, R. Bustamante, R. Costanza, R. Cowling, L. M. Curran, A. Dobson, S. Farber, G. A. B. da Fonseca, C. Gascon, R. Kitching, J. McNeely, T. Lovejoy, R. A. Mittermeier, N. Myers, J. A. Patz, B. Raffle, D. Rapport, P. Raven, C. Roberts, J. P. Rodríguez, A. B. Rylands, C. Tucker, C. Safina, C. Samper, M. L. J. Stiassny, J. Supriatna, D. H. Wall, and D. Wilcove. 2001. Can we defy nature's end? *Science* 293:2207-2208.

Declaration of consent

You will be invited to participate in the research study on Key knowledge gaps concerning biodiversity loss in a Malagasy priority conservation area focusing on agriculture and social inequality as major drivers. Before you decide to participate, it is important that you understand why the research is being conducted and what it will involve. Please take the time to read the above and following information carefully and then decide whether you would like to participate or not. If you have any further questions, please contact Dr Anke Frank. You will find her full contact details below:

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Ethics Approval:

This questionnaire follows the DFG White Paper "Safeguarding Good Scientific Practice" and the recommendations of the Leibniz Association on Safeguarding Good Scientific Practice and Handling Complaints of Scientific Misconduct.