



CAMEROON BIOSECURITY PROJECT

Development and Institution of a National Monitoring and Control System (Framework) for Living Modified Organisms (LMOs) and Invasive Alien Species (IAS)

THE QUANTIFICATION OF THE SOCIAL, CULTURAL, ECONOMIC, ENVIRONMENTAL AND BIOLOGICAL IMPACT OF PRIORITY INVASIVE SPECIES IN CAMEROON

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Under the Supervision of:

Project Component Four Taskforce (MINRESI)

&

The Biosecurity Project Coordination Unit (MINEPDED)



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EXECUTIVE SUMMARY

The work documented in this report has two principal objectives: 1) to produce a review of the social, cultural, economic, environmental and biological impacts of biological invasions in Cameroon across a range of sectors, (e.g. agriculture, and conservation) and to document the management responses undertaken to address these impacts, and; 2) to outline methods that could be used to quantify the social, cultural, economic, environmental and biological impact of priority invasive species in Cameroon, with a focus on work in project pilot sites.

The first objective was achieved through a survey of key informants representing a wide range of landuse types representative of the landuse in Cameroon as a whole. The discussions took the form of a semi-structured interview based on a questionnaire sent to the key informants in advance. The questionnaire covered topics such as the main biological invasion concerns in particular landuse systems, the types of impacts caused, the main management methods used and the overall trend of biological invasion impacts over the previous decade.

Because of resource constraints the survey could not be exhaustive. In total 24 interviews were undertaken with 56 stakeholders in 17 locations over a 16 day period straddling November and December 2012. The interview results were supplemented by additional information from the literature and the Project Training of Trainers (ToT) workshop on biological invasions held in May 2012. Future project activities that build upon this one will be used to fill some of the gaps identified in this study such as the lack of information on invasive fish species and on parasites such as ticks, helminths, mites, lice, fungi and other classes of livestock endo- and ecto-parasites. The second objective was achieved by derivation of simple survey instruments from the literature.

The findings of this study have led to a greater understanding of the impacts of many of the invasive species that are thought to be the most important in different landuse types, measures undertaken to manage the impacts of these species, knowledge gaps and other issues that relate to knowledge, perception and understanding. This information will help to focus the biosecurity communications and awareness plan (communication strategy) on some priority communication objectives and provide vital inputs into subsequent project activities notably the following: 4.3.1. Up to date lists of invasive species in Cameroon produced; 4.3.4. Black and white lists of priority invasive species and management approaches formulated; 4.3.5 Biological invasions monitoring network designed [and implemented], and; 4.4.1. Interoperable database of introduced species that conforms to international data management standards established.

Numbers of species listed as invasive

The interviewees mentioned 126 species as being invasive in their landuse systems of interest. Sixteen of these were also listed by the ToT participants while another 31 were listed in the ToT but not in the interviews. This makes an overall total of 157 named species. The largest group were plants (52 species), followed by insects (36 species), plant diseases (29 species) and livestock diseases (20 species) with other groups being much less prominent.

The species that were listed as invasive by interviewees and in the ToT were listed by 36 landuse types in which these species were considered to be problematic. This does not constitute a comprehensive pest list for each landuse type but gives us an idea of what species are considered to constitute the most serious biological invasion issues in these landuse types. The lists for non-agricultural landscapes were dominated by plants and the animal lists were dominated by diseases. For crops the numbers were relatively even between invertebrates, plants, diseases and vertebrates. Vertebrates did not figure prominently in the lists apart from in cereals (maize and rice), in honey production and in stored products.

Origin of species listed as invasive

Although it is not always possible to precisely state the origin of each of the species identified the information given allows us to roughly divide the species by origin. Thirty two percent of species were of uncertain origin. Diseases were very prominent in this category. Although "African" origin is the

second largest category this does not mean that all of these species are native to Cameroon. Africa is a very large continent with natural barriers between vegetation and climatic zones so it is likely that a substantial proportion of those species of African origin are not native to Cameroon. Unsurprisingly most species are native to tropical and sub-tropical locations.

Thirty three of the species listed (21% of the total) were not included in the calculations as scientific names were not given. It was, therefore, not possible to be sure of the species in question so its origin could not be deduced. Although the data is not precise it is a reasonable assumption to make that a large majority of the species considered to be problematic originated outside Cameroon.

Trajectory of biological invasion impacts

Information on biological invasion trends was quite patchy and subjective but what we received appeared to indicate that impacts were going down. This was mainly attributed to improved management methods, the dissemination of good practices and increasing adoption of such practices by an increasingly better educated populace. In one case, perceived decreasing impacts were attributed to climate change. The inherently unpredictable consequences of climate change is illustrated by the fact that in another case it was believed that increasing negative impacts of biological invasions on honey bees was caused by rising temperatures. Rangeland and honey production were two prominent landuse types in which interviewees felt that biological invasion impacts were increasing.

Although the impact of biological invasions in agro-ecosystems is huge it was clear that pest managers were working on strategies to limit their impacts and we were given examples of promising management practices. We did not hear of any similar efforts being undertaken in areas set aside for the conservation of ecosystem services. This may mean that while impacts in man-made landscapes are in many cases stabilising, those in natural landscapes are accumulating in the absence of systematic management efforts.

Other observations from interviews

Other relevant observations included the following:

Effective biosecurity approaches exist and can serve as good practice models that can be disseminated, replicated and built upon and customised to different settings in Cameroon. These include:

- The effective implementation of strict biosecurity measures to ensure that South American Leaf blight does not establish in Cameroon.
- HEIFFER INTERNATIONAL-led efforts to help reduce and break the cycle of pest and disease infestations on crops by, for example, the production of clean biogas from pig slurry.
- The programme of livestock and rangeland improvement being spearheaded by the Tadu Dairy Cooperative.

Good practices have high replication/adaptation potential because it was clear from the interviewees that many in the community are interested in and willing to adopt new practices if they are seen to be effective and the means are available.

There are many win-win opportunities for the CBP: These involve working with existing national and international initiatives. National initiatives include the annual vaccination campaigns against major animal diseases carried out by the Ministry of Livestock, Fisheries and animal Industries, MINEPIA/FAO/WTO project for the elaboration of national Strategic Plans for the Control of Transboundary Animal Diseases, rangeland restoration measures pioneered by the Tadu Dairy Cooperative, efforts to control eucalyptus to help secure water supplies and the work of MINADER to produce pest lists to facilitate safe trade under the WTO SPS agreement International information-related initiatives that could support the activities that relate to invasive species listing, databasing and monitoring include the Global Invasive Alien Species Information Partnership (GIASIP) which has come together to assist CBD Parties and others in the implementation of CBD Articles 8 (g,h,m) and 9 of the CBD, Aichi Biodiversity Target 9 and CABI's Plantwise initiative which helps countries establish community-based plant clinics which deliver practical advice to farmers when their crops have a problem.

People know about specific biological invasions but not invasives as a whole: Everybody we met was familiar with terms such as pests, diseases and weeds but very few knew the term invasive species and if they did they tended to apply it in a narrow sense to species that affected biodiversity but did not directly impact upon productive landscapes. Understanding that sectoral pest, weed and disease problems are examples of biological invasions provides a unified conceptual framework that will help people to conceive of generic solutions to specific problems in terms of the invasive pathway - from prevention to control/mitigation. This paradigm will also help those from different sectors to see that management efforts in one sector are naturally synergistic with those in another. For example a specific plant invader may cause problems in agriculture and in protected areas and also harbour animal disease vectors.

There is no clear consensus on what the term biosecurity means: Biosecurity encompasses the prevention, eradication, control and other management activities for all types of invasive species (pests, diseases, weeds, invasive animals and other organisms) as well as the control of LMOs, traditionally termed biosafety. The term biosecurity is not well known in Cameroon and there appears to be no consensus definition among those who are aware of the term. Biosecurity was not always understood in such a holistic sense by the interviewees. Some thought that the term was synonymous with biosafety (an understandable error as biosecurity and biosafety are both termed biosecrité in French). Some thought that biosecurity only applies to prevention; some felt that the term was synonymous with bioterrorism and others felt that its main focus was food safety. Clearly it is imperative that those implementing the CBP have a shared understanding of the term biosecurity and that this definition is clearly communicated with stakeholders.

Collaboration needs to be improved: Collaboration needs to be improved within organisations, between stakeholders at the national level and with international organisations. A lot of information exists but it is scattered in the various institutions and not always easily accessible. At the international level, it is very important that collaborating institutions understand the biosecurity implications of their actions. For example, it is likely the Varroa bee mite was introduced into Cameroon in used tools or equipment sent from Europe. Aid and trade constitute very important invasion pathways that need to be better addressed.

There is insufficient capacity to identify biological invaders in Cameroon: Of the 126 "species" listed as being invasive by interviewees, a quarter could not be named with any degree of precision. Without a good understanding of what is present it is very difficult to protect the country from new arrivals. In some cases pests are likely to be present but they are not managed simply because people are unaware of their existence or impact. It is also possible that misidentification could lead to non-optimal management.

Key baseline data is lacking: As mentioned a national pest list has yet to be drawn up. Consolidated information in an easily searchable format could help in targeting biosecurity measures to specific locations and species. The outputs of the CBP can help support efforts to consolidate information and improve access to this information.

There is a need for improved extension support: An integrated pest management (IPM) approach was being encouraged by several interviewees but this approach needs extension support which was felt to be lacking in Cameroon by many interviewees.

There are site-specific area-wide, national and regional issues: Biological invasions can be a concern at different spatial scales. It is important to understand which approaches need to be taken in which circumstances. Some issues are site-specific, possibly for historical reasons. Other invaders require solutions beyond the individual site level for effective management. Such area-wide solutions are needed but not always implemented for mobile invaders such as fruit flies. A lack of organisation of some small holder farmers is likely to impede area-wide management. Larger scale issues include the need to elaborate and implement control programmes for major livestock diseases, reinforce the epidemiosurveillance network, and to develop early warning systems so that invasions can be managed more effectively within the country. National issues include the need for effective prevention at border points and regional issues include a coordinated response to biological invaders of regional concern. This could be monitoring and managing the spread of a new species such as

Pseudocercospora angolensis and coordinating a regional approach to management such as a biological control or plant breeding programme.

There are issues regarding the cost, availability and quality of agricultural inputs: Several of the interviewees recounted the difficulties of acquiring adequate inputs such as fertilisers and pesticides. Cost was cited as a problem with small loans being difficult to obtain. There is also the problem of availability of suitable products which in some incidents means that farmers will use whatever is available. There is also the issue of fake products which are commonplace.

There is a need to validate indigenous practices: Several interviewees pointed to the role that indigenous knowledge and practice could play in an IPM approach. There are initiatives to document and validate such practices in agriculture. These efforts could help expand the IPM toolkit and complement non-indigenous-inspired approaches.

There must be systematic conservation of local genetic resources: Linked to the above is the identified need to protect local genetic resources for intrinsic reasons and as a valuable source for genetic improvement of plants and animals. For example, options for breeding for pest resistance are heightened if local germplasm is systematically conserved.

The biological invasions picture in Cameroon is complex and dynamic: A complex and changing situation with regard to biological invasions is the norm so is not unique to Cameroon. A “baseline” therefore, can only be a snapshot of a dynamic situation. Information, therefore, must be constantly updated both to refine our understanding and to document the inevitable changes – new species arrivals, increasing and decreasing impacts of existing species, changing landuse patterns, etc. The encouraging thing is that this dynamic picture does not necessarily mean that the overall effects of biological invasions have to become worse over time. However, what it does mean is that constant surveillance is needed to ensure that new and emerging threats are effectively managed.

Climate change adds another layer of complexity: Many of the interviewees brought up the issue of climate change. In different situations both increased and reduced biological invasion impacts have been attributed to climate change. Clearly the changes are difficult to predict and again regular monitoring is very important in informing land managers of trends and possible management actions to take in response to these trends.

GMO-related issues provoke a great deal of passion: There is a very strong level of concern about the use of GM technology in Cameroon and it is important that this concern is noted by those implementing the CBP. This supports the results of the survey of baseline knowledge and attitudes concerning biological invasions in Cameroon (MINEPDED, 2012) that found that there is quite a degree of polarisation of opinion on the issue of LMOs/GMOs. The controversy of the issue has implications for CBP which aims to help facilitate a risk-based approach to assessing the suitability of any planned species introduction into Cameroon (LMO or non-LMO). The project must work to communicate the rationale for this approach which is preferable to an alternative of clandestine introductions under which there is no regulation.

Other issues: One cannot advocate an integrated cross-sectoral approach to biosecurity that is divorced from the context within which this biosecurity operates. These contextual factors provide opportunities and threats to the implementation of effective biosecurity measures. The following are some of the main contextual issues brought up by the interviewees:

- Limited land availability and land tenure which has implications for the management of biological invasions.
- Climate change (see above).
- Marketing issues – a lack of markets, an inability to get produce to markets and price instabilities and uncertainties were major concerns. Again there are management implications.

Impact assessment approaches for priority invasives

The focus was on invasive plants as invasive species chosen for pilot site work in the project are likely to be plants (see the Project Document – [UNEP/GEF 2010](#)). Although the exact techniques outlined

here cannot be used to assess the impact of other groups of invasive species (insects, pathogens, etc.), the principles are applicable to these groups.

These tools need to be simple and easy-to-use, so that they can be implemented in situations with resource constraints without difficulties. Another important point is that the tools can be used in all ecosystems with a few adaptations.

Approaches for assessing biological impact begin with preparation: the selection of target invasive plant species, at-risk ecosystems and study site locations, followed by site visits to understand the local situation. It is then possible to choose the most suitable methods for the actual assessment. Impact assessment tools were outlined for terrestrial and aquatic ecosystems.

For terrestrial sites, four general tools to assess the impact of invasive plant species on plant communities were selected: Three are based on a comparison of the affected plant biodiversity between plots with and without the invader. The fourth tool examines the variance in density of native species in relation to the cover of the invasive species. These four tools can be used to assess the numbers and vigour of the affected plant community. The requirements for the implementation of each method and their advantages and disadvantages are outlined.

The task of assessing the biological impact of invasive plants in aquatic system is more challenging and only a single tool has been selected: the comparison of plant diversity in ponds with and without weed infestation. Some ways of overcoming inevitable challenges of working in an aquatic system are outlined.

A simple questionnaire approach to assessing the socio-economic impact of biological invaders is outlined as complex studies would be labour-intensive, tedious and time-consuming. The questionnaire can be administered either directly in the chosen site or outside the area to concerned stakeholders (e.g. National Parks staff or officials of interested ministries). Those administering the questionnaire can be sent to pilot site local communities to interview representatives of local authorities and inhabitants according to the questionnaire. The surveyed communities should be assigned to three distinct categories, as far as possible, i.e. a) invasive of concern not (yet) present; b) invasive of concern established, and; c) invasive of concern in high abundance. This approach will allow comparison of results from infested areas with areas not yet infested, which will serve as a control.

It is recommended that the questionnaire is piloted in a representative village to explore whether it will produce interpretable results. The interviewed people could be asked an additional question about what questions they would have expected in the questionnaire reflecting their specific situation. The result of that pilot could be used to change the questions accordingly prior to the main investigation.

Discussion and next steps

This study does not constitute the definitive statement on the impact of biological invasions in Cameroon. Even if this study produced precise figures in the manner of Pimentel et al. (2000) it could not be the last word as the situation is dynamic. However, it is the most comprehensive study of its kind yet to be conducted in the country. As such it offers a valuable point of departure for others to use; firstly to improve understanding of the impacts of biological invasions in Cameroon and, secondly; to use the findings to build upon current good practice examples in a systematic way to reduce the levels of losses caused by biological invasions in a diverse range of sectors.

Improved impact studies both in pilot sites and elsewhere will provide more precise estimates of the impacts of biological invaders in different type of landuse in Cameroon. This information must be regularly updated so that trends can be observed timely and responsive solutions implemented. This information can be used and built upon in the project activities that relate to invasive species listing, databasing and monitoring (see above).

Information from above activities in turn can be used to improve the quality of the impact estimates. It is therefore proposed that the results of this study are built upon as follows:

- Undertake the studies referred to above as an integrated process to minimise duplication and to ensure that data gaps are addressed where possible.
- Ensure that those conducting similar work(e.g. implementation of the NBSAP) in Cameroon are brought into the process to minimise duplication and maximise synergies
- Continue the correspondence/discussions with the interviewees for this study. This will allow them to further evaluate their contributions to this study and provide additional information which will strengthen the documentation of the impacts of biological invasions in Cameroon.

Conclusion

This survey represents the most thorough investigation into the impact of biological invasions across a range of landuse types undertaken in Central Africa to date. It is, therefore, a valuable resource for the Cameroon Biosecurity Project (CBP), the country, the sub-region and the continent as a whole. It is very likely, given the range of ecosystems covered; that the findings of this study are representative of the situation in much of Africa. It provides some extremely useful inputs in terms of information on species identity, impacts and management practices in different landuse systems.

It is vital, therefore, to disseminate the findings of this study widely so they can be put to good use for similar studies undertaken in other countries. This report will be posted on the project website, and also uploaded to information hubs such as the International Phytosanitary Portal, CBD CHM and the National BCH. This will help increase the quality of information coming from Cameroon and establish the country as a leader in biosecurity information in the region so that its findings can be available to the outside world and as a means of raising the profile of the Cameroon Biosecurity Project.

**THE MINISTER OF ENVIRONMENT,
PROTECTION OF NATURE AND
SUSTAINABLE DEVELOPMENT**