

**A REVIEW OF TRADITIONAL KNOWLEDGE
ASSOCIATED WITH ENVIRONMENT
CONSERVATION IN RWANDA**

(Pilot area: Muhanga and Ruhango Districts, Southern Province)

April 2017

TABLE OF CONTENTS

TABLE OF CONTENTS..... 1
LIST OF ACRONYMS AND ABBREVIATIONS..... 3

I. INTRODUCTION	4
1.1 The Owner of the study.....	4
1.1. Context of the study	4
II. APPROACH AND METHODOLOGY	5
2.1. Assessment of TK associated with crop production	5
2.2. Assessment of TK associated with livestock development.....	6
2.3. Assessment of TK in medicine	6
2.4. Assessment of TK associated with fauna and flora protection	6
2.5. Assessment of TCEs associated with biodiversity conservation	6
2.6. Assessment of TK associated with climate change mitigation	7
II. RESULTS ANALYSIS	7
2.1. TK in Agriculture.....	7
2.1.1. Local crop species and varieties threatened of extinction.....	7
2.1.2. TK in Cultivation techniques, Soils fertilisation and Pest control	8
2.1.3. Local races of livestock.....	10
2.1.4. Traditional medicine	11
2.1.5. TK associate with Fauna and Flora protection.....	11
2.1.6. Other type of TK associated with biodiversity conservation	12
2.1.7. TK associated with Climate forecast.....	17
2.2. Challenges.....	19
2.3. Opportunities.....	20
2.3.1. In environment	20
2.3.2. In Agriculture.....	21
2.3.3. In Traditional Medicine	21
III. CONCLUSION AND RECOMMENDATIONS.....	22

LIST OF ACRONYMS AND ABBREVIATIONS

CO ₂	: Carbon dioxide
TK	: Traditional Knowledge
RAB	: Rwanda Agriculture Board
TCE	: Traditional Cultural Expressions
NGO	: Non-Governmental Organization
MINIRENA	: Ministry of Natural Resources
MINEDUC	: Ministry of Education
REMA	: Rwanda Environment Management Authority
MINALOC	: Ministry of Local Government
GER	: Global Ecovillage – Rwanda
GEI	: Global Ecovillage International
GRA	: Global Ecovillage Africa
ABN	: African Biodiversity Network
CFOR	: Force for Change
UK	: United Kingdom
ARCOS	: Albertine Rift Conservation Society
CBD	: Convention of Biological Diversity
IUCN	: International Union for Conservation of Nature
GEF	: Global Environment Facility
UNEP	: United Nations Environment Programme
NIRDA	: National Industrial Research and Development Agency
GHG	: Green House Gases
VNP	: Volcanoes National Park

I. INTRODUCTION

1.1 The Owner of the study

This study has been conducted by Global Ecovillage-Rwanda (GER) which is a Non-Governmental Organization (NGO) legally registered in Rwanda under No 66/RGB/NGO/2016. GER embraces a holistic intervention approach that encompasses social, cultural, ecological and economic dimensions. It operates in partnership and collaboration with national institutions and international organisations. At national level GER's partners are the Ministry of Natural Resources (MINIRENA), Ministry of Education (MINEDUC), Rwanda Environment Management Authority (REMA) and the Ministry of Local Government (MINALOC). African Biodiversity Network and Community Force for Change (CFOR).

1.1. Context of the study

During the pre-colonial time, the Rwandan society was inherently linked to natural resources and ecosystems which contain great lessons concerning rites, ancestral customs, taboos, values, arts, crafts, totems, music, dance and many more. All these were contributing to environment protection and the conservation of biological resources in order to sustainably utilise natural resources through generations. However, to date there is very few documented information about traditional knowledge associated with environment and biodiversity conservation. It is on basis of this very need of capitalising on such knowledge that this study has been conducted as a pilot initiative with a view to highlighting the current status of TK in agriculture (for agro-biodiversity conservation), in traditional medicine, in wildlife conservation as well as in climate change.

The process of reviewing and documenting such knowledge started in Muhanga and Ruhango Districts, Southern Province, as well as in Bugesera in Eastern Province, as a pilot study. But it will be continued in other geographical locations within the country to assess the importance of such knowledge in conservation of both natural and converted ecosystems in Rwanda.

The results of this study will serve as input for the development of a project that will work to increase current awareness regarding traditional ecological knowledge and integrate it to the youth learning programs through the process of interaction with elders to sustainably revive the biophysical environment in Rwanda and strengthen the community resilience. Also, to document

and develop comprehensive and useful tools and strategies for public awareness and for influencing policy at different levels while deepening peoples' sense of belonging to a cultural legacy and the restoration of their marginalized knowledge worn over years. Therefore, elders' knowledge regarding biodiversity management will be shared with the younger generation. The project will also solve the issue of disconnection between people, nature and culture as well as disintegration of young people from their cultural and environmental heritages to support home grown solutions in Rwanda.

The goal of this study is:

- to revive indigenous knowledge in order to bridge the knowledge gap between elders and the youth
- Revive and protect indigenous seeds under extinction
- Use TK for food security & sovereignty

The overall objective of this study is to review and appropriately document the valuable traditional knowledge regarding biodiversity conservation and sustainable management of biological resources in different sectors of their utilisation. This is in accordance with one of the objectives of the organisation that promotes better and sustainable livelihoods.

II. APPROACH AND METHODOLOGY

The assessment has been conducted mostly through interview with elders and other key informants known for possessing accurate information on TK. More than 150 people were interviewed on TK in agriculture, in traditional medicine, in wildlife management and in climate change forecasting. The youngest respondent was 40 years old and the oldest was 83 years old and 36% of respondents were female. In interview, a questionnaire has been developed and used to facilitate data and information collection. In addition to interviews, literature review and field visits for direct observations were also conducted to complement and ascertain the interview results.

The interview was conducted by considering sector by sector and using specific questions for each one as indicated in the paragraphs below.

2.1. Assessment of TK associated with Crop production.

For crop production, a series of eight questions were successively asked to respondents and intended to firstly know if there is (are) native crop species or varieties that have been abandoned.

If the answer to the first question is Yes, what is (are) those abandoned crops or varieties, the causes of their abandonment, the importance of abandoned crops, and what could be the measures to safeguard abandoned crops. The second series of questions was to know if there were traditional techniques that contributed to increase crop production and some examples if any. The third group of questions was to know if there were traditional practices in crop protection and some examples if any; and the last group of questions on agriculture, was to know constraints facing traditional knowledge in crop production and how to address such constraints.

2.2. Assessment of TK associated with livestock development.

Similar questions were asked to respondents to know if there is (are) local livestock races that have been abandoned, causes of abandonment, importance of abandoned races, safeguard measures, TK in diseases treatments, constraints, and the best way to address such constraints.

2.3. Assessment of TK in medicine

Same approach was adopted in assessing existing TK in diseases treatment and also a series of questions was asked to know what are the treated diseases, the value and importance of traditional medicine to date, cause of less consideration towards traditional medicine, extinct medicinal plants or those threatened of extinction, causes or threat of extinction, loss undergone due to extinction of traditional medicinal plants, measures for improving the value of traditional medicine and safeguarding threatened medicinal plants, importance of biodiversity in Rwandan cultural ceremonies, and measures for effective use of traditional medicine.

2.4. Assessment of TK associated with fauna and flora protection

TK associated with fauna and flora protection was also assessed through similar questions intending to know what such knowledge is, what are extinct species or species under extinction, causes of extinction and safeguard measures.

2.5. Assessment of TCEs associated with biodiversity conservation.

Interview was also conducted to know if there are Traditional Cultural Expressions (TCEs) associated with wildlife protection and to what extent they were effective in biodiversity conservation.

2.6. Assessment of TK associated with climate change mitigation.

On this aspect, the study has been mostly inspired by the assessment conducted by REMA in 2012, in Northern Province, Southern Province, Western Province, Eastern Province and Kigali City.

II. RESULTS OF ANALYSIS

As indicated above, the review highlighted the current status of TK in different areas, notably in agriculture (crop and livestock production), in traditional medicine, in fauna and flora protection and in TCEs. In addition, existing advantages, challenges and opportunities specific for each sector were also indicated during the exercise.

2.1. TK in Agriculture

2.1.1. Local crop species and varieties threatened of extinction.

All respondents indicated that there is number of crops that are no longer or poorly cultivated such as local varieties of Cassava (“*Gacyacyari*”, “*Gitaminsi*”, ...), Sweet potatoes, Sorghum, Colocasia (amateke), “Uburow”, “Ibikoro” (yam), local varieties of banana (“Kivuvu”, “Intuntu”, “amatente”), Aubergine, Raspberries (Inkeri), Ncongeye, Tobacco, “Isogi”, squash and their leaves (Ibisusa”), Imyungu, local variety of wheat, “Incakara”, etc.

It is clear that Rwandan traditional agriculture was endowed with a very rich variety of crops which unfortunately are abandoned or under abandonment, leading thus to their disappearing and consequently to the loss of biodiversity, especially the agro-biodiversity.

The reason of abandonment of such local crop species and varieties were many. Responses given to that question were: land scarcity, low productivity, low resistance to pests, monoculture, need of ensuring food security, soil infertility, development, government policy on agriculture, insufficient seeds, insufficient fertilisers, wetlands are no longer in use, and climate change/variety.

In fact, the main reason behind the abandonment of local varieties is that they are less productive while there is challenge of ensuring food security to the fast-increasing population. Therefore, priority has been given to more improved crop species and varieties, to be cultivated on available land. It is in the same logic that the government has promoted crop intensification programme

where improved seeds are cultivated supported by an important package of technology and inputs in order to increase crop production and thus ensure food security.

Concerning the importance of those local crop varieties under extinction, respondents indicated that they offered some advantages compared to improved varieties, such as being more sweet, more resistant to climate stresses and less demanding in terms of inputs (fertilisers).

Respondents have been asked what should be done to stop the loss of native species and local varieties and even maintain them sustainably. Most of the responses proposed a number of strategies and actions to be undertaken, including search and find seeds for those species and varieties; sensitizing farmers and partners on the importance of such varieties and their effective involvement in them; put in place means and spaces for their conservation both *in situ* and *ex situ* and training farmers on how to properly conserve those species and varieties. Furthermore, native species and local varieties are the most reliable gene bank of materials to be continuously researched on and further obtaining more productive and adapted varieties.

2.1.2. TK in Cultivation techniques, Soils fertilisation and Pest control

Rwanda traditional agriculture was characterised by diversified practices including very useful techniques in cultivation, soil fertilisation, and pest control. Traditional knowledge in relation to plants and animals' diseases control, appropriate traditional agricultural methods, long-term agriculture products conservation, traditional integrated pest management, biological diversity preservation, etc. are not assessed and utilized. Currently, some of traditional practices have been neglected or abandoned, others have been partially adopted and others starting to attract researchers. Some examples of those traditional practices are described in the following paragraphs, based on information received from both elders from Muhanga and Ruhango and confirmed by researchers from Rwanda Agriculture Board (RAB).

2.1.2.1. Cultivation in mounds (ridge tillage)

Ridge tillage is a traditional cultivation technique that contributes efficiently to increase crop production due to the following advantages:

- Improves mechanical weed control
- Soil temperature is higher in the ridge

- Allows better drainage while maintaining moisture by capillarity
- Reduces water and wind erosion
- Improves soil structure (reduces compaction)
- Increases soil fertility
- Increases efficiency and reduces costs
- Promotes the complete reduction or abandonment of herbicides, thus facilitating the transition to biological control
- Reduces the amount of fertilizers
- Has substantial environmental benefits in terms of water, soil, and air preservation
- It is thus particularly suitable for organic cultivation.

This traditional cultivation technique has attracted researchers across centuries and researchers from RAB use the technique for some crops, especially for tubers, but can apply efficiently for other crops like cereals and legumes.

2.1.2.2 Soil fertilisation

According to respondents, traditionally they used to fertilise their crops using very simple things such as cow urine mixed with that from men to fertilise banana crops. RAB helped to determine appropriate concentration by diluting the urine. Organic fertilisers have been used traditionally for long time and from this research the combination of organic and mineral fertilisers is advised. Other people use ash to fertilise crops. Organic fertilizer is preferred from modern fertilizer which, in addition to being at low cost, has harmful effects on both humans and animals, plants and land.

2.1.2.3 Pest control

Respondents indicated that they were using different things and practices and it was perfectly working to ensure crop production and food security to people. These practices include inter alia the following:

- Pest control using ash
- Harvest conservation using “Umuravumba”
- Banana plantations protected from “Ikigoma” which is a fungi species that attacks banana, by binding with a rope around the regime of banana before its opening until the critical period of contamination is over.

- Cows' urine is also used to control the banana decimating disease known as "Kirabiranya".
- Harvest conservation using ash.
- Termites control using ash;
- Cut weeds on ridges and place them between the rows of bushes during stripping, while those in the row are automatically destroyed or buried. This has the effect of delaying their growth and this gap in weed germination allows the main crop to take its place. In addition, the presence of residues in the inter-row forms mulch, thus delaying the germination of weeds.

2.1.3. Local races of livestock

Local races of livestock are also threatened of extinction because they are less productive compared to the improved ones. Among cited extinct races are local races of cows, sheep, hogs, ducks, chicken, dogs, etc.

Regarding the importance of local races, respondents indicated that local races of cows produce meat and milk with a good and better taste compared to milk from improved races, but, also they were more resistant to diseases and to drought. In addition, it was easy to domesticate local races of cows, sheep, ducks, and others, and they were providing manures for the fertilisation of arable lands, with less investment. Other domesticated animals like dogs were good for the guarding of homesteads.

To cure diseases that were affecting livestock, local medicinal plants were used. For instance, some plants like Vernonia ("Umubirizi") were used, associated with salt and water to cure or to protect the livestock against diseases. Some of the respondents even attested that there are many diseases which can't be treated by modern medicines, but which are treated traditionally, using local medicinal plants.

Concerning the conservation of local races of livestock, respondents said that it is advisable to encourage and support people to raise such races though currently focus is on improved and more productive races, for food security. Policy and decision makers should also promote the maintenance of local races for continuous research and sustainably renewing more improved genetic materials and races.

2.1.4. Traditional medicine

It has been highlighted during the interview that traditional medicine has been neglected and replaced by modern medicine, though it was more effective in curing diseases that modern medicine could not cure, such as hepatitis, breast cancer, gastritis, poisoning, madness, and many other diseases currently treated using modern medicines. For instance, one species of Euphorbia was used to cure cough, while Vernonia was used to cure intestinal worms. Other medicinal plants are known in Kinyarwanda, such as “Igucuncu” “Wambuba” used to treat malaria; etc.

The photos below are for some plant species used in Rwanda traditional medicine.



Some plants used in Rwanda traditional medicine

On health basis, the importance of traditional medicine is mostly interesting when it helps to treat diseases that classic or modern medicine can't treat. So, modern and traditional medicine should complement each other to increase the effectiveness in diseases treatments. Furthermore, traditional medicine can inspire new opportunities of research in medicine and pharmacy. Environmentally, the valorisation of traditional medicine contributes to the conservation of medicinal plants and the overall biodiversity.

2.1.5. TK associate with Fauna and Flora protection

Respondents to the interview attested that there are number wild animal and plants species that have disappeared or became rare in the country. Animal species cited as threatened of extinction include Hyena, Hare, some species of Antelopes cited in Kinyarwanda (ifumberi, impongo), Leopards, Lions, the monkey, the Perdix, Plant species threatened of extinction have also been indicated but, most of them in Kinyarwanda language, such as “wambuba”, “igicuncu”, umuravumba, umunyinya, umubirizi, umuko, umuvumo, imiko, ingongo, intagarasoryo, iminyinya, imigenge, etc.

The causes of disappearance of wild animal species and tree species are mostly due to the conversion of natural habitats to arable lands or inhabitation lands.

2.1.6. Other type of TK associated with biodiversity conservation

There are many beliefs and practices that were directly or indirectly contributing to the conservation of the biodiversity, while others were negative and could not favor biodiversity conservation.

2.1.6.1 Some of positive beliefs and practices are:

- In the marriage ceremonies, tobacco was of great value and always available in the ceremonies and this was an additional motivation for cultivating tobacco and making it permanently cultivated.



Photo 1. Dry Tobacco ready for smoking

- Some tree species like “Umukerenke” were used to fabricate “Ibyansi-Inkongoro” which were used as proper tools for milk keeping; “Umurinzi” was used to fabricate traditional

chars, and because of the great importance of such tools in Rwandan culture, those tree species were kept and managed sustainably.

- A kind of big calabash in Kinyarwanda called “Igisabo”, also has a great consideration in any Rwandan marriage ceremonies, so that any married women must bring a “Igisabo” kept in special conditions. This also could make the plant from which this tool is produced being conserved sustainably
- Rwandan culture gives the highest value to cows for many reasons: cows were used in dowry, give milk for the whole family, the more number cows is increasing the more the owner has great respect in the society, and because of this, a number of songs were dedicated to cows. There was a permanent kind of competition for having as many cows as possible, and this contributed to the sustainable survival and improvement of this species.
- Every woman who gave birth was supposed to drink Sorghum porridge. Sorghum was also very useful in producing local beer associated or not with ripe banana. These uses could contribute to sustainably cultivate the Sorghum crop, which is currently neglected and under cultivated. Drinks such as inturire and rituals associated with sorghum (guterekera, kuragura, kubandwa) also run the risk of extinction.
- Some tree species such as “Umuvumu” (Albisia), “Umuko”, Umwishwa, etc were used in many cultural ceremonies so that nobody was allowed to cut such trees. Their disappearance will have harmful consequences on traditional beliefs of Rwandans (kwororoka k’umuryango, kurindwa kwa roho y’uwatabarutse, etc)



Photo 2. “Umuko”, one of the trees used in cultural ceremonies

- Traditionally, each Rwandan clan has its “Totem Animal” that was respected and protected by members of the clan, because it was considered as one of the member of the clan. So, if nowadays this culture were taken into account by each clan, at least there would be a number of protected species corresponding to the number of Rwandan clans. But, as is said in a modern proverb “*Kiriziya yakuye kirazira*”. Which means that nothing is anymore

sacred and therefore respected; including such animal species that used to be protected by the tradition.

2.1.6.2 Negative beliefs for instance are:

- There were misconceptions around some species, and people used to believe that they could bring curses. For instances: (i) people used to believe that if somebody plants “Umusave” (Markhamia) it makes him die prematurely. With this kind of mindset, such tree species was vowed to disappear, because of this misconception around it. So, people need to be sensitized to prove that this was totally wrong.
- People could not eat mushrooms (ibihumyo) and drink milk, in order to avoid damaging cow breasts and consequently damaging milk production. With this wrong belief, mushroom was a very bad thing and could be destroyed in any way; thus, survival of mushroom species was compromised.

2.1.6.3. Role of having Totemic animals in Biodiversity Conservation

- In the context of preserving biodiversity and living in harmony with mother nature, King Ndobu (1213-1246) told Rwandans that all living creatures, plants, animals including human beings, are to be respected because they have values to learn from. His goal was to show his people how all creatures are all connected with nature, and how people should learn from other creatures, with the responsibility to respect and protect each other. Thus, he assigned to each clan of Rwanda its totem to respect and learn from its values and virtues. As an example, the jackal is a totem for the Abasita and Abashingo clans. The latter learn from it the values of resilience and should respect it. The Abega clan are entitled to respect a toad and learn from its foresight and hygiene. The following table shows values and virtues that each clan of Rwanda has to learn from its respective totem.
- What is very interesting is how Rwandans knew the values and virtues to learn from other animals to live in harmony with nature and in a conflict-free society. But the irony is that Rwanda traditional culture was lost due to colonization and the western culture was privileged, thus abandoning African values and virtues based on communalism, and embracing western values based on individualism, made possible the execution of the genocide against Tutsi in the 20th Century!

- The following chart indicates the totem of each clan, its symbolic meaning and its values and virtues to learn from.

UBWOKO (Clan)	TOTEM (animal)	Icyo ihagarariye (Its symbolic meaning)	Imico-mbonera bayigiraho (Its values & virtues to learn from)
<i>Abanyiginya/Abasindi n'Abatsobe*</i>	Umusambi (Crested crane); n'intama (ku Batsobe = sheep)	Imitegekere myiza, gutanga amahoro, imihango, imishyikirano (forethought, peace giving, rites, dialogue)	Gugira ibanga n'umutima, kugira ubuntu no kurangaza imbere, gutekerereza igihugu (sense of secrecy and integrity, generosity and forethought, anticipation)
<i>Abasinga/Abarenge</i>	Sakabaka (Eagle/black kite)	Umutware w'ikirere n'uw'ibiguruka byose (King of airspace and birds)	intsinzi y'ibihe byose n'ubutware bw'isi (victory and guidance on earth)
<i>Abazigaba/Abenengwe</i>	Ingwe (Leopard)	Umutware w'ishyamba, Kudakorwamo (King of woodland, own security)	Kurema ibyiza no kudakorwaho, kwigirira ikizere (providing security and having self-confidence)
<i>Abagesera</i>	Inyamanza (Le Bergeronnette)	Imigisha no gutunganirwa	Uburumbuke (blessings and prosperity).
<i>Abega/Abakono/Abaha*</i>	Igikeri (Toad); n'Uruvu ku Baha (Le Cameleon)	Umwami w'amazi n'ibishanga, kuramba (King of waters and wetland, longlife)	Kureba kure, kutaba umunyamusozi, ubudahangarwa, kuba indangamirwa (foresight, sense of sovereignty, of integrity)
<i>Abacyaba /Ababanda*</i>	Impyisi (Hyena); n'igikona (ku Babanda) Le corbeau	Kutarambirwa, kuba abaragwa mubano (persistence, sense of humor)	Gusetsa, kwidagadura, gutarama, kunamba ku mugambi. Gupfira ibyo wiyemeje (sense of humor, entertainment, never

			giving up, dying for a noble cause)
<i>Abungura</i>	Inyombya (le Mésange) n'Ifundi	Amahoro no kuramba (peace and long life)	Kugira ubumwe (sense of unity)
<i>Abashambo</i>	Intare (Lion)	Umwami w'Ishyamba n'ubutware bw'isi yose (King of animals and their overall leader)	Kuba abanyambaraga n'abanyamahoro (being strong and peaceful)
<i>Abasita</i>	Umuhari/Imbwebwe (Jackal)	Kuba maso no gukenga (sense of own security, and not trusting everybody)	Kutagamburuzwa n'amakuba (not giving up)
<i>Abongera</i>	Isha (Gazelle)	Kuba maso no gukenga	Gukora byinshi kandi vuba. (Doing a lot and quickly)
<i>Abahondogo</i>	Ishwima (Pic-boeuf)	Guhirimbana muri byose (sticking to your goals)	Kuba inkubana rusibana, kurwana inkundura. Gukubana ntuye ku izima (never giving up, working hard, perseverance)

NB: *Abasigi*, *Abasigari* n' *Indara* nta Totem bagira kuko bavutse nyuma y'Ingoma y'Umwami Ndobu (There was no totem for Abasigi, Abasigari and Indara clans/sub-clans because they appeared after the reign of King Ndobu).

2.1.7. TK associated with Climate forecast

Local people have a diversified knowledge in predicting weather for a day, season, or years. In 2012, REMA conducted an assessment on Traditional Knowledge with respect to preparedness vis-à-vis abnormal climate change effects. The assessment has been conducted in the four provinces of Rwanda (Eastern, Western, Northern, Southern, and Kigali City) and came up with among others the following information on TK associated with weather forecast:

- **Moon appearance:** when the moon appears dark the first day, this was an indication that there will be much rain, when it appears clear and reflecting, it was an indication that there will be no rain.
- **Red ants' movements:** when red ants come out from the swamps or marshlands towards land side, people knew that it is about to rain, and when the ants go in the opposite direction, people knew that the weather will be dry, because normally ants prefer a place which is not very dry and not very wet.
- **Termites' activity:** when people observe that termites are not digging, they knew that it is about to rain.
- **Wetlands flooding:** when wetlands started flooding, people knew that in few days it will be raining.
- **A very sunny time during the rainy season:** this was an indication that very short time it might rain.
- **Emigration of some bird species:** when some birds' species start to disappear from local place, people knew that the land will be dry in coming days.
- **Too much wind** was an indication that there will be too heavy rain.
- **Dew that burns the grass:** this was an indication that in coming days there will be a very dry season.
- **Very calm cows:** an indication there is no rain in coming days.
- **Flowering of a tree species called "Irango":** an indication that the coming days will be sunny.
- **Nesting of swallows:** an indication that the rain is about to stop.
- **Rainbow:** an indication that, it will not rain or the rain is about to stop.
- **Cold wind on the ground:** an indication that, in coming days it will be raining.
- **Etc.**

The above are some examples of TK associated with weather forecasts, are proof that Rwandan people were well equipped with very useful knowledge that could serve as preparedness or early warning package in face of changing climate effects. However, as indicated for other sectors, it is important to conduct a deep and detailed review and documentation of all related knowledge, and

starting applying such knowledge in preparedness measures and early warning system to complement modern system.

2.2. Challenges

a. Lack of information/awareness towards Rwandan TK

The first and most important challenges is that people, especially young generation are not aware of the importance of traditional knowledge in many sectors described above and that could contribute to sustainably improving citizens' livelihoods, once capitalized on. Elders possess traditional knowledge in different sectors, but, there is no proper framework or programme for the transmission of such knowledge to the younger generation.

This study was a pilot project, but, a more detailed study with wider coverage at national level would be useful in order to provide data and information that will help to build an exhaustive database for Traditional knowledge towards biodiversity conservation and climate change (mitigation and adaptation) and that should be capitalized on and contribute effectively to socioeconomic development.

b. Lack of clear policy and regulatory framework

The second challenge is the need of a clear policy and regulatory framework, especially in agriculture and in medicine sectors, to institutionalizing traditional knowledge as a tool and opportunity for improving citizens' livelihood and sustainable development. Therefore, agriculture sector, medical sector, conservation sector, and climate programme should review their respective policies to include and provide clear guidance for documentation and utilizing such knowledge.

c. High population density and land scarcity

High and increasing population has contributed to overexploiting the yet existing scare land, but also led to convert portions of natural ecosystems into arable lands in order to ensure food security. This has therefore led to the encroachment of critical ecosystems such as wetlands, savannah and forests, and consequently to biodiversity loss and indirectly reducing the ecosystems' capacity of storing and sequestration of CO₂ and other GHG that deplete the ozone layer. Projects such as Nyandungu Urban Wetland Eco-Tourism Park and the like should be emulated/replicated.

d. Specific challenges towards TK valorization in agriculture

As indicated above, priority has been given to more improved crop species and varieties to ensure food security, while neglecting native crop species and varieties due to their low productivity. In addition, traditional knowledge in relation to plants and animals' diseases control, appropriate traditional agricultural methods, long term agriculture products conservation, traditional integrated pest management, biological diversity (agro biodiversity) preservation, ..., are not assessed and utilized. Unfortunately, old persons considered as scientific traditional libraries are disappearing day by day without leaving their knowledge to younger generations.

2.3. Opportunities

Opportunities are so many in all sectors discussed in the previous chapters of this report.

2.3.1. In environment

In environment, Rwanda has ratified a number of international conventions and protocols for which it has the obligations of implementing their recommendations, especially the Convention of Biological diversity, specifically the Aichi Target 13, stating that by 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity; and Target 18 stating that, by 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels. The Nagoya Protocol that has also been ratified by Rwanda, talks about Traditional Knowledge associated with biodiversity conservation as one of the resource to be equitably shared taking into account the right of the providers of such knowledge.

At national level, there are number of policies and regulatory instruments including the Environment Policy, Biodiversity Policy, Wildlife Policy, Environment Organic Law, etc. All these instruments are guiding and supporting environment and biodiversity conservation. The problem is to ensure that there are enough provisions that promote Traditional Knowledge associated with environment and biodiversity conservation.

Regarding institutional framework, there also a good number of institutions and organisations from public and civil society, which are key stakeholders involved in environment and biodiversity conservation and with whom initiatives that promote traditional knowledge might be shared and supported. Internationally, there are also organisations such as the CBD Secretariat, IUCN, GEF, UNEP, Global Ecovillage international, Global Ecovillage Africa, African Biodiversity Network CFOR/UK, ... with which reliable partnership can be established.

Furthermore, Global Ecovillage-Rwanda is working in partnership with ABN's to promote Youth Cultural Biodiversity in Rwanda to address disruption of inter-generational knowledge transfer. The project will also contribute to the process of building climate resilience, through reviving traditional seed diversity by involving youth and promoting ecological agriculture as the most effective and ethical way to feed the growing population and cope with climate change in sustainable way increase awareness of the links between traditional, indigenous and local knowledge and sustainable development through community involvement and the process of influencing policies related to the environment.

2.3.2. In Agriculture

Initiatives relating to traditional knowledge in agriculture are not much developed compared to the environment sector. However, Rwanda Agriculture Board (RAB) has a gene bank where seeds of some indigenous species (for crops and trees) are kept. It also supports Community seed banks in the districts of Bugesera (Kambuye Sector), Rusizi, Gicumbi and Nyamasheke. RAB has also the possibility of undertaking *in situ* conservation of native species and local varieties of crops, because it has number of research centers across the country with enough spaces.

2.3.3. In Traditional Medicine

Local communities, especially elders, detain rich traditional knowledge relating to utilization of medicinal plants. NIRDA has signed with traditional healers confidential agreements necessary for boosting their small businesses and get profit. Unfortunately, old persons considered as scientific traditional libraries are disappearing every day without leaving their knowledge to the next generations.



Photo. Traditional Healer from “Ibyiwacu” cultural village, nearby VNP

The Rwanda health Policy 2015 recognizes the role of traditional medicine referred to as Traditional health care sector. A national intersectoral council for traditional medicine has been created, registered and group together traditional health practitioners which could advocate for the valorization of the traditional medicine. However, Rwanda does not have official legislative/regulatory texts governing the practice of traditional medicine, a licensing process for traditional health practitioners, or procedures for the official approval of traditional medical practices and remedies.

III. CONCLUSION AND RECOMMENDATIONS

This pilot study of reviewing existing traditional knowledge associated with environment conservation has been successfully conducted in Muhanga, Bugesera and Ruhango districts and focused on assessing existing TK in agriculture, in wildlife conservation, in traditional medicine and in climate change. The study clearly proved that there is a very rich and useful traditional knowledge to be capitalised on and that might sustainably contribute to improve citizens' livelihoods and economic development. Thus, the following recommendations were made:

- ❖ Conduct a deep and detailed review and documentation of traditional knowledge at country level, because this was just a pilot study.
- ❖ Put in place a programme of transferring such knowledge from elders to young people across the country.
- ❖ Sensitization of all stakeholders from different sectors on the importance of traditional knowledge and its utilisation.
- ❖ Avail land at districts level for *in situ* conservation of native crop species and local varieties for medicinal plants.
- ❖ Protect and restore degraded natural forests, especially those out of protected areas and savannahs.

GER-RWANDA 2017