

**UNESCO BIOSPHERE EXCURSION:
A LEARNING EXPERIENCE FOR YOUNG ENVIRONMENTALISTS
FROM ETHIOPIA AND THE UAE**

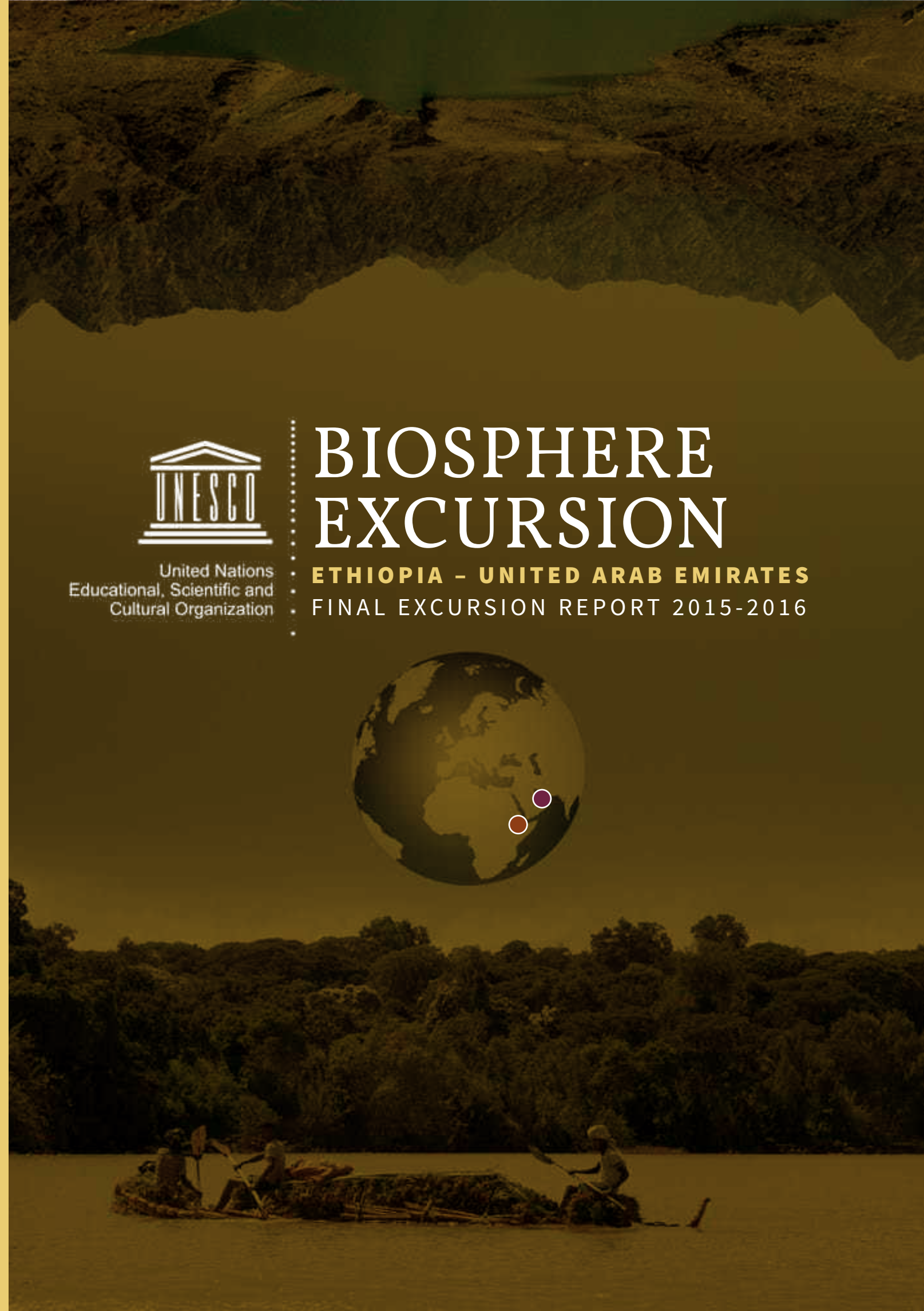
**MULTIPLIER PROJECTS
EXCURSION IN ETHIOPIA
EXCURSION IN THE UAE**



United Nations
Educational, Scientific and
Cultural Organization

BIOSPHERE EXCURSION

ETHIOPIA - UNITED ARAB EMIRATES
FINAL EXCURSION REPORT 2015-2016



IMPRINT

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FOREWORD

More than 40 years ago, the United Nations Conference on the Human Environment was held in Stockholm, Sweden from June 5–16 in 1972. The Stockholm Declaration contains 26 principles, and all of them are still valid and reflected in the new UN Sustainable Development Goals.

1. Human rights must be asserted, apartheid and colonialism condemned
2. Natural resources must be safeguarded
3. The Earth's capacity to produce renewable resources must be maintained
4. Wildlife must be safeguarded
5. Non-renewable resources must be shared and not exhausted
6. Pollution must not exceed the environment's capacity to clean itself
7. Damaging oceanic pollution must be prevented

8. Development is needed to improve the environment
9. Developing countries therefore need assistance
10. Developing countries need reasonable prices for exports to carry out environmental management
11. Environment policy must not hamper development
12. Developing countries need money to develop environmental safeguards
13. Integrated development planning is needed
14. Rational planning should resolve conflicts between environment and development
15. Human settlements must be planned to eliminate environmental problems
16. Governments should plan their own appropriate population policies
17. National institutions must plan development of states' natural resources
18. Science and technology must be used to improve the environment
19. Environmental education is essential
20. Environmental research must be promoted, particularly in developing countries
21. States may exploit their resources as they wish but must not endanger others
22. Compensation is due to states thus endangered

23. Each nation must establish its own standards
24. There must be cooperation on international issues
25. International organizations should help to improve the environment
26. Weapons of mass destruction must be eliminated

The new set of United Nations Sustainable Development Goals (SDGs) 1-17 were launched in October 2015. It is interesting to notice that many of the concerns of the international community documented almost 45 years ago, when the world's human population stood at 3,8 billion, being half of today's population, are so extremely similar to the new UN SDGs and the targets within them.

Considering the fact that world's human population has nowadays exceeded 7,5 billion people globally, and our common need for clean air, water, food, education, health, shelter and jobs, and considering that our common natural resources are limited, it is highly important to take the SDGs very seriously, and try to achieve them in time. The SDGs are interconnected and it should be avoided to look at them as stand-alone goals.

One of the oldest and best platforms in the UN system in support of all UN SDGs is the World Network of Biosphere Reserves of UNESCO, which exists since 1971.

The World Congress of Biosphere Reserves, in Lima, Peru, March 2016, attracted more than 1,000 visitors from around the world, a clear sign of renewed international trust and interest in this highly important trend-setting system for the development of models for nature conservation in reconciliation with sustainable development.

Two major and explicit aspects of sustainable development have emerged since 1972:

1. The massive scale of displaced people and international migration exceeding 65 million people globally.
2. The real and present situation of global climate change.

A new way of environmental thinking, philosophy and ethics needs to be developed in all compartments of the world. We need to stop thinking-in-the-box, including at UNESCO and including at the UN, including all agencies, programs and funds. It is with this in mind that we invite the youth and sister UN agencies to participate our activities in support of Biosphere Reserves, of which we believe, are the best options to develop sustainable human living.

The involvement of the youth is crucial for the achievements of the UN SDGs. The youth has to understand that Governments cannot achieve the goals by themselves. The support and involvement of all of us is absolutely essential, as well as the support of IGOs, NGOs, and the private sector.

We have therefore developed a set of practical activities involving the youth:

- An annual conference 'QUEST 4 Africa'

(aiming to turn from rhetoric to action on biodiversity, climate and water issues)

- An environmental film-series highlighting issues and management options
- UNESCO Green Academies for environmental action and peace training
- An exchange program for young professional men and women from different countries, visiting Biosphere Reserves and learn about environmental and socio-economic issues in the real world (not only on paper).

The first leg of the excursion took place in Ethiopia. Two Biosphere Reserves were visited, namely the Afro-Alpine Cloud Forests of Kafa and one of Africa's great lakes and source of the Blue Nile, Lake Tana, as well as Africa's capital city, Addis Abeba. The second leg took place in the United Arab Emirates, visiting the coastal and marine Marawah Biosphere Reserve in the Gulf, with its salt-desert ecosystems (sabkhat), salt-marshes, mangroves, and coral reefs, as well as Wadi Al Wurayah, a planned BR consisting of mountainous freshwater ecosystems, coastal alluvial plains, and marine systems in the Indian Ocean.

I wish to thank the project manager, Ms. Maria Hänsel, her assistant, Ms. Makeda Yohannes, as well as all participants, lecturers and sponsors that allowed this activity to take place, and for implementing it at the highest possible professional level.

It is now up to the participants to realize and utilize what they have learned, above all the environmental teachings as well as the aspects of rapprochement-of-cultures.

Dr. Benno Böer

Ecological Sciences Advisor – Africa
Sciences Advisor Ethiopia



**GLOBAL CITIZEN
FOUNDATION**

ACKNOWLEDGMENTS

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United Arab Emirates
Embassy of the United Arab Emirates in
Addis Ababa - Ethiopia



Embassy of the Federal Democratic
Republic of Ethiopia Abu Dhabi - UAE



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INTRODUCTION



BY MARIA HÄNSEL

‘COMMUNITY-BASED FOREST MANAGEMENT IN KAFA ZONE, AS PRACTICED BY THE MENJA ETHNIC GROUP VISITED, HAS SHOWN US EXACTLY WHY ENGAGING LOCAL COMMUNITIES IS THE BEST WAY FOR BOTH LIVELIHOOD IMPROVEMENT AND ENVIRONMENTAL SUSTAINABILITY.’

TESFAU BEKELE,
PARTICIPANT FROM ETHIOPIA

‘PLANTING COFFEE NEEDS THE SHADE OF THE FOREST WHICH MAKES IT A GOOD ENVIRONMENTAL PRACTICE THAT DECREASES DEFORESTATION. FARMERS GAVE US A GOOD EXPLANATION DURING THE VISIT AND THE TOUR IN THE PLANTED AREAS.’

ZULFA RASHEED,
PARTICIPANT FROM THE UAE

NOVEMBER 2015 marked the first round of the UNESCO Biosphere Excursion. A total of 17 young participants from Ethiopia and the United Arab Emirates (UAE), were selected to join this excursion to UNESCO Biosphere Reserves in the two countries. In Ethiopia, the group visited Kafa Biosphere Reserve and Lake Tana Biosphere Reserve. In addition training sessions were held in the capital, Addis Ababa. Those were supported by the Horn of Africa Regional Environmental Center and Network and the Hope College of Business, Science and Technology. The goal of the UNESCO Biosphere Excursion Program is to offer an in-depth understanding of the challenges and solutions of environmental management through first-hand experiences. Participants had the chance to visit project sites with environmental NGOs and government representatives, and to discuss possible solutions to deforestation and promoting tourism. Small research assignments in groups covering topics such as wetland management and tourism development enabled close interaction with the concerned local communities in each Biosphere Reserve. Additionally, training sessions with local and national experts were held to ensure a more detailed understanding of efforts towards environmental protection and options for livelihood improvement in Ethiopia.

UNESCO Biosphere Reserves have been established to serve as model sites for sustainable human living. Their principal idea is to reconcile environmental protection and socio-economic development. Biosphere Reserves can therefore act as ideal platforms for education for sustainable development. During the program, participants could increase their understanding of how ecological and social systems are closely interlinked. The diverse educational and cultural backgrounds of participants and lecturers, resulted in inspiring discussions on the possibilities of a successful initiation of changes with long-term positive impacts. In the Ethiopian context it is especially crucial to find economically viable solutions to environmental problems, making inter-disciplinary approaches indispensable.

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IN APRIL 2016 the same group of participants met again in the United Arab Emirates. Protected areas in Abu Dhabi, Dubai, Fujairah and Sharjah were visited as part of the program. Experts from the Environment Agency Abu Dhabi, EWS-WWF, Fujairah municipality and Zayed University shared their expertise with the group, including different on-site sessions. The visit of Bu Tinah Island, one of the core zones of the UNESCO Biosphere Reserve Marawah (Abu Dhabi) and thus only accessible for research and monitoring activities, was one of the highlights of the trip. In Wadi Wurayah National Park (Fujairah) the group checked on camera traps for wildlife monitoring as a real-life exercise. In addition to the training sessions participants had the chance to meet with different local stakeholders during research assignments, carried out in both above-mentioned places. On 21 April 2016, the UAE National Commission for UNESCO in cooperation with the Ministry of Education coordinated an experience-sharing session with outstanding secondary school students in Fujairah to discuss the importance of environmental protection.

Multiplier projects were carried out by participants between the two parts of the excursion, to share lessons learned with their own communities. These projects covered a wide range of activities and proved the enthusiasm of participants to actively address environmental problems. In a number of cases participants managed to independently acquire funds to successfully carry out their projects. Almost all projects integrated the support of individuals and institutions to a certain extent. Thanks to the multiplier projects a larger number of individuals could directly and indirectly benefit from the UNESCO Biosphere Excursion Program. In addition it was a good possibility for participants to further develop their project management skills.

INTRODUCTION - UNESCO BIOSPHERE EXCURSION

The diverse cultural and professional backgrounds of participants made the UNESCO Biosphere Excursion program a special experience for everyone involved. During the two trips through Ethiopia and the UAE respectively, the participants worked together closely, jointly developing new ideas and shared unforgettable experiences.





PART I

MULTIPLIER PROJECTS

As part of the UNESCO Biosphere Excursion Program, participants carried out individual multiplier projects in between Part One in Ethiopia and Part Two in the United Arab Emirates. Participants developed their own ideas to address one environmental challenge they were concerned about in their community. They were responsible for the acquisition of potentially needed funds as well as institutional and individual support. The commitment of the participants greatly enlarged the number of beneficiaries from the program and demonstrates their willingness to promote a greener future.

MULTIPLIER PROJECT SUMMARY

AWARENESS CREATING ACTIVITIES ON FOREST PROTECTION WITH LOCAL COMMUNITY MEMBERS, SNNPR, ETHIOPIA



BY BIRUK EMIRU

In the recent past a trend of deforestation has been observed in Gezha forest, resulting in the decline of biodiversity in the remaining parts. The main reason for this is the strong forest dependency of the community living around the forest. Gezha forest is located in the Southern Nations, Nationalities and Peoples Region (SNN-PR), Ethiopia, around 50 km south-west of Arba Minch. Zaziaie Kebele, with a population of over 3000 people, was selected for this project.

There is an urgent need of awareness creating activities among community members to protect the forest from further deforestation. In this project, different techniques to create awareness among students were used, including practical tree planting sessions, interviews and group discussions with elders and youth, and artistic approaches to convey environmental teachings. Stickers with inspirational thoughts about forests were provided to public transportation vehicle owners for free. These posted stickers are a good way to reach the local youth.

PROJECT WAS SUPPORTED BY

Woreda Agricultural office (tree seedlings), Zaziaie Primary school and the director (tools), Mina Printing Enterprise (printing discount), Arba Minch University (media coverage) and friends.

TARGET GROUPS

School children (grade 7), youth in town and elders of the community

NO. OF DIRECT BENEFITERS

40 students, 12 elders participated in interviews and group discussions and 500 passengers in public transportation vehicles per day.

PLANNED FOLLOW-UP?

Checking the growth progress of each student's tree and continuing the tree planting activity with grade 7 school students every year.

TEACHING STUDENTS ABOUT FORESTS AND ITS IMPORTANCE ...



... AND SHOWING THEM HOW TO PLANT A TREE



PLATES WITH STUDENTS' NAMES INSTALLED NEXT TO THE PLANTED TREES



DISTRIBUTING STICKERS WITH INSPIRATIONAL THOUGHTS ABOUT FORESTS ...



... IN DIFFERENT PUBLIC TRANSPORTATION VEHICLES



MULTIPLIER PROJECT SUMMARY

ARTISTIC APPROACH TO CREATE ENVIRONMENTAL AWARENESS WITH BEACH SCULPTURES



BY ZULFA ABDULLA RASHEED

The aim behind this beach sculpture project was to engage the community in different positive environmental practices using art. A study by the University of Pennsylvania demonstrated that a vibrant art scene and more social cohesion enhances environmental awareness.

The event was held in Fujairah at Umbrella Beach, an area that is normally crowded during weekends. It started by cleaning the area. Unfortunately, people pollute the area by leaving their harmful plastic wastes. The municipality is making an effort in keeping the beach usable, but it is continuously polluted, countering the cleaning efforts. The community should cooperate to keep the beach clean.

By making a sand sculpture on the part of the cleaned area of the beach, the power and talents of youth was used to educate their peers and parents. The event was covered in the social media by Mubadarat Al Fujairah, in Alittihad Newspaper and on the Fujairah News website.

PROJECT WAS SUPPORTED BY:

Mubadarat Al Fujairah (community service group), Fujairah College, Kalba Art Center

TARGET GROUP

Citizens of Fujairah City

NO. OF DIRECT BENEFITERS:

6 participants in cleaning activities and preparing the sculptures,
Walkers and visitors of the Umbrella Beach

PLANNED FOLLOW-UP?

Mubadarat Al Fujairah is considering continuing with a similar annual event and environmental activities in Fujairah with the help of other organizations and institutions.

POLLUTION AT UMBRELLA BEACH, FUJAIRAH



WHILE PREPARING THE SCULPTURES, OTHER PEOPLE START TO BECOME ATTRACTED...



VISITORS RECEIVE AN EXPLANATION ABOUT THE EVENT AND ITS BACKGROUND



MESSAGE LEFT AT THE BEACH





MULTIPLIER PROJECT SUMMARY
ECO-FASHION SHOW WITH SELF-MADE CLOTHES AND JEWELRIES USING RECYCLED MATERIALS



BY RAHEL BEKELE

This project took place in the Hope College of Business, Science and Technology in Addis Ababa. This university atmosphere offers ideal conditions for university students to simultaneously observe, learn and enjoy. The organized event gave participants the opportunity to learn something about the environment in an entertaining way. An eco-fashion show was organized to demonstrate how everyone can have a green and sustainable life while cleaning our environment. During the day of the show, the students worked on clothes, shoes, bags and jewelries all made from waste materials like plastic bags, plastic bottles and old magazines. This was a practical demonstration of how precious our resources are. It showed how it is possible to make beautiful things out of things that would usually have been thrown away.

PROJECT WAS SUPPORTED BY
 Hope College of Business, Science and Technology and the Omar's PLC

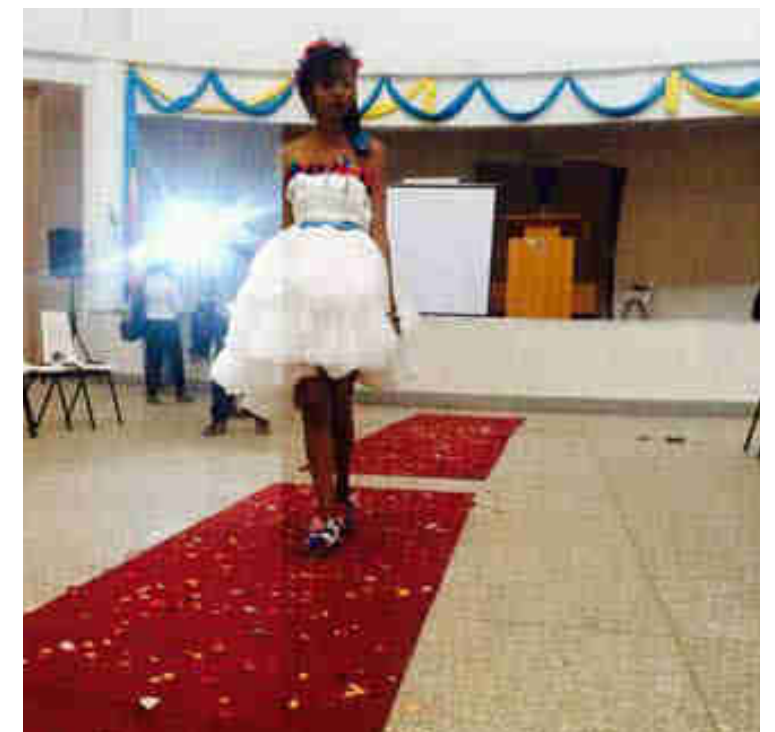
TARGET GROUP
 Students of Hope College of Business, Science and Technology

NO. OF DIRECT BENEFITERS
 50-60 students from Hope College attending the show

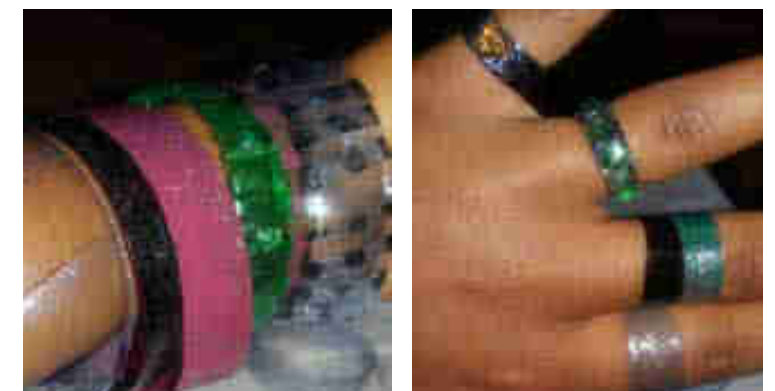
PLANNED FOLLOW-UP?
 To organize a bigger eco-fashion show that will draw a wider audience



USING THE EVENT TO EXPLAIN TO PARTICIPATING STUDENTS WHY IT IS IMPORTANT TO HAVE A SUSTAINABLE LIFESTYLE



DRESS MADE OUT OF USED PLASTIC BAGS, MADE BY A STUDENT FROM HOPE COLLEGE



JEWELRIES MADE OUT OF USED PLASTIC BOTTLES, MADE BY A STUDENT FROM HOPE COLLEGE



CLOTHES MADE FROM WASTE MATERIALS BY STUDENTS FROM HOPE COLLEGE AND OTHER UNIVERSITIES



MULTIPLIER PROJECT SUMMARY
TRAINING ON SOLID WASTE MANAGEMENT AT DELCHIBO FULL CYCLE ELEMENTARY SCHOOL, BAHIR DAR TOWN



BY FIKIRTE DEMISSIE AND SELAMAWIT DAMTEW

Bahir Dar, which is the capital of Amhara region, has been grappled with increasingly growing urban waste management problems. The main risks of poor solid waste management to health are indirect and related to poor water, land, and air quality. Hence to overcome the above mentioned problems creating awareness among Bahir Dar town students (through training) have paramount importance. This is because through the students it is possible to reach the whole community (their families and friends). Hence, we have decided to give training for the Sanitation and Environment club of Delchibo Full Cycle Elementary School. The training was conducted through briefing by the trainers (Fikirte and Selamawit) followed by students group discussion. After the discussion they wrote on the flip chart by marker and present to the class.

PROJECT WAS SUPPORTED BY
 Organization for Rehabilitation and Development in Amhara (ORDA), Bahir Dar Education Office and Director, Supervisor of Delchibo Full cycle Elementary School, Ato Yonas and Ato Amsalu

TARGET GROUP
 Grade 5- 8 Students

NO. OF DIRECT BENEFITERS
 53 students

PLANNED FOLLOW-UP?
 Continue training to create awareness for all the students and do some practical activities



LISTENING THE BRIEFING BY THE TRAINEES



STUDENTS LISTENING THE BRIEFING BY THE TRAINEES



STUDENTS DISCUSSION WITH THEIR GROUP



STUDENT PRESENTING GROUP RESULT



TRAINED STUDENTS

HOW MUCH DO YOU KNOW ABOUT WATER?

HOW CONFIDENT ARE YOU SPEAK ABOUT WATER?

MULTIPLIER PROJECT SUMMARY

TOWARDS SUSTAINABLE WATER USE: TACKLING WATER ISSUES BY TEACHING PEOPLE THE WATER FOOTPRINT CONCEPT



BY SAMAR GAMALELDIN ABDELSATTAR GEWILY

UAE has the second largest ecological footprint globally. The biggest share, 74%, of this footprint comes from using fossil fuels to generate energy. A large proportion of this energy is used for the preparation and processing of drinking water. Water is scarce in the region, due to low rainfall and a high evaporation rate. Thus, the country depends on desalination, which is a very energy demanding process. A 'Play n Learn' event was held at one of Dubai Public Libraries, for kids and their families, to learn about the water challenge in UAE and how to face it. To spark kids' interest, a number of games and activities were used. Activities included a water footprint calculator, passing on facts about water consumption in an interactive way. 'Aqua Republica' is a game with teaching elements about challenges of water consumption and alternative, more sustainable options. Participating children also designed posters and displayed on a 'Temperature check' board their level of knowledge and willingness to talk to people about water issues.

- PROJECT WAS SUPPORTED BY:**
Emirates Wildlife Society-WWF, Dubai Culture and Arts Authority
- TARGET GROUP**
Public community (mainly mothers and kids)
- NO. OF DIRECT BENEFITERS:**
12 kids and their families
- PLANNED FOLLOW-UP?**
Initiate a competition on actions taken to reduce participants' water footprint

WATER FOOTPRINT CALCULATOR TO ESTIMATE THE INDIVIDUAL DAILY USE OF WATER ...

What Is Your Water Footprint?

Take a water tour with us through your home, yard, diet, energy, and consumer choices! Then, pledge to cut your water footprint and help return your water to rivers, lakes, wetlands, underground aquifers, and freshwater species.

Know this: The average American lifestyle is kept afloat by about 2,000 gallons of H₂O a day—twice the global average.

The bright side: By pledging to cut your water footprint, you can help restore freshwater ecosystems.

Ready for the challenge? Let's get started...

Your water footprint: 63 (100) 732 (1,000) 51 (700) 368 (250) 1,214 (2,000)

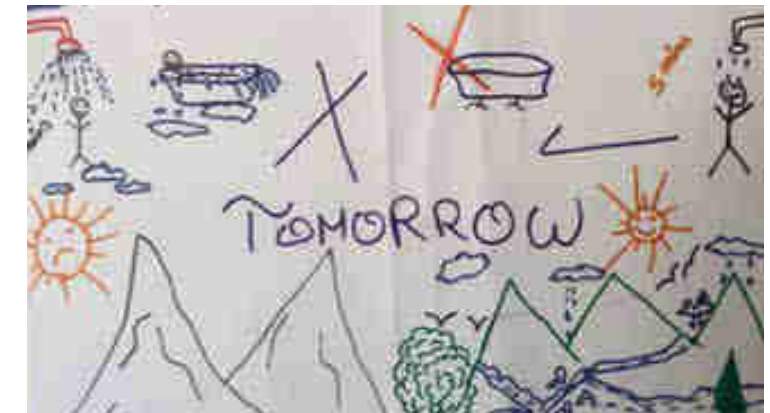
You currently use more water than average for your stuff. To help reduce your impact, pledge to use even less water in one or more areas of your daily life. When you agree to do so, our partners will pay to support restoration work that puts water back into the struggling Colorado River on your behalf. Help us Change the Course by pledging now.

Click on the areas below to take action to reduce your levels of consumption:

Water used in your home and yard	63
Water used for your diet	732
Water used for your transportation and energy	51

... AND COMPARE IT TO THE GLOBAL AVERAGE

POSTERS CREATED BY PARTICIPANTS ...



... TO RAISE AWARENESS ABOUT WATER ISSUES DURING THE SESSION



MULTIPLIER PROJECT SUMMARY

HOME GARDENS FOR SUSTAINABLE INCOME GENERATION FOR THE MENJA COMMUNITY IN SHEKA BIOSPHERE RESERVE



BY GETNET REGASSA

The Menja community in Sheka Biosphere Reserve has been living in the dense forest and borders in order to avoid contact with the dominant ethnic group, due to discrimination and stereotypical racism. They practice forest beekeeping, usually in far distance from homesteads, as their main income source. This project was designed with the overall goal of building sustainable livelihoods for poor and disadvantaged Menja women. As part of the project, 15 Menja community members and local agricultural extension workers have been trained. It is expected that those trained will pass on their knowledge to the remaining community. The main components of the training for the Menja community were the benefits of home gardens, for example, in beekeeping. With the agricultural extension workers, the focus was set on the communication of the principal Biosphere Reserve concept. Such activities will enable them to better incorporate these ideas into their regular plan of actions in the future, especially in measures related to the Menja community.

TARGET GROUP

Menja Women

NO. OF DIRECT BENEFITERS

20 people participated in a training

PLANNED FOLLOW-UP?

With the help of acquired funds to further support the project: Increasing the knowledge within the Menja community of the production and processing of potential home garden products. Making product marketing more successful through community-based organizations and micro-enterprises



TRAINING SESSION WITH MEMBERS OF THE MENJA COMMUNITY IN SHEKA BIOSPHERE RESERVE



CAPACITY BUILDING WITH THE MENJA COMMUNITY ...



... AROUND THEIR HOME GARDENS



GROUP DISCUSSION WITH SOME MENJA COMMUNITY MEMBERS



MULTIPLIER PROJECT SUMMARY
PROMOTING WASTE SEGREGATION
AT ZAYED UNIVERSITY



BY ABRAR HUSAIN MADDI, FATIN NASER ALBREIKI
AND KHULOOD SALEM BIN MAHFOODH

Recycle bins are provided all over the compound at Zayed University. However, they are either used improperly or not used at all. As a result, the company responsible for recycling the waste spends extra money and effort to recycle the waste again. This project was initiated to motivate female university students to segregate waste. It involved designing posters with common potential waste objects used by students in the university. Those were attached above each respective recycle bin. In addition, flyers were posted in the busiest places in the university, such as the elevators. Finally, a small education session with the employed cleaners was held, conveying the importance of waste segregation and its proper application.

PROJECT WAS SUPPORTED BY:

Zayed University Student Life Office

TARGET GROUP

All students in Zayed University Abu Dhabi Female Campus

PLANNED FOLLOW-UP?

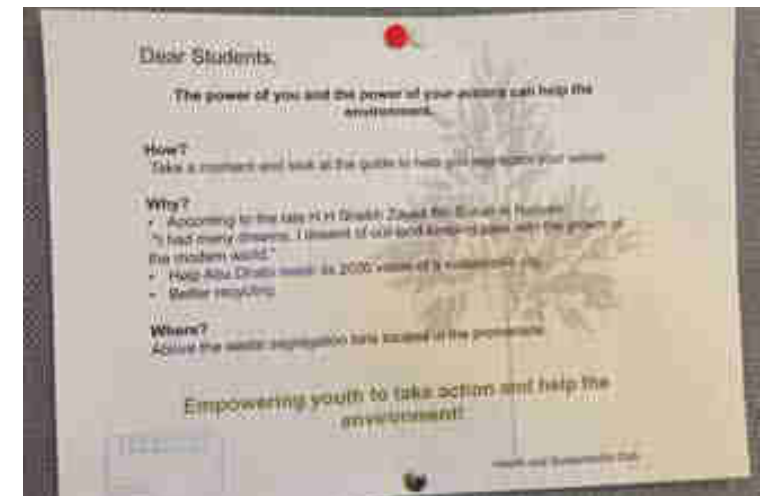
None by group members, since all have graduated already. However, the office of student life took in consideration to increase the number of activities that are environmentally related with the aim to raise awareness among students.



POSTING THE POSTERS ABOVE EACH WASTE SEGREGATION BIN



THE THREE TYPES OF POSTERS THAT WERE PLACED ABOVE THE SEGREGATION BINS



POSTED FLYERS NEXT TO AN ELEVATOR TO INVITE REFLECTIONS OF FELLOW STUDENTS



A TRAINING SESSION FOR EMPLOYED CLEANERS AT ZAYED UNIVERSITY

MULTIPLIER PROJECT SUMMARY

TRAINING ON SIMPLE WATER PURIFICATION TECHNIQUE FOR THE KOKA COMMUNITY



BY ZAHRA MOHAMMED

The project took place in Koka, around 100 km south-west of Addis Ababa. In Koka, 15,000 people are directly using lake water for all household uses like drinking, cooking and washing. As a consequence, the communities face various communicable diseases and other health problems. To improve this, a water purification method using a vertical core, for example a water bottle, and crushed stones, sand and cotton, as purification materials, were used. Practical demonstrations of how water is purified in a simple way help to make its implementation more widespread.

To achieve this, I organized an event with 10 households which play a special role in the community. Before trainings were given, the effectiveness of the purification method was positively evaluated in a laboratory. These household members act as multipliers in their communities, helping to spread their newly acquired knowledge and skills through the organizations in which they operate as highly respected members.

PROJECT WAS SUPPORTED BY

Addis Ababa University, Department of Zoological science Fisheries and Aquatic Science Stream

TARGET GROUP

People of Koka communities

NO. OF DIRECT BENEFITERS

Community representatives from 10 households were directly involved in the training.

PLANNED FOLLOW-UP?

Further test the effectiveness of the purification method, analyzing physical and chemical water parameters

PEOPLE IN KOKA ARE USING LAKE WATER DIRECTLY FOR DRINKING ...



... AND WASHING



DEMONSTRATING THE EFFECTIVENESS OF THE PURIFICATION METHOD



GIVING TRAINING ON WATER PURIFICATION TO COMMUNITY REPRESENTATIVES





MULTIPLIER PROJECT SUMMARY
MULTIPLIER AWARENESS PROJECT
OF AN INVASIVE MESQUITE SPECIES IN
THE UAE



BY HATEM AHMED MAHMOUD SHABANA

In UAE, an invasive mesquite species, *Prosopis Juliflora (Sw.) DC.* causes many damages to man, animal and the surrounding plant, so it is a real threat that needs real control, this project aims to make awareness of its dangerous and right control mechanisms and it had to target the most related category (agriculture workers), it took many stages of preparation: field trips, capturing live photos, pods and seeds collection, mapping to compare the fast reproduction of it and germinating seeds then meeting with agriculture workers with a translator attendance. First introduced pre-questionnaire questions to measure their background about that subject then used all the collected data to introduce our idea. Most of the workers did not know the P. Juliflora as an invasive species (dangerous plant); on the contrary they knew it as a useful plant, so this project was effective and well-targeted as workers will help in manual management through their daily work in addition to the other chemical and biological methods.

PROJECT WAS SUPPORTED BY:

Sharjah Research Academy

TARGET GROUP

Agriculture Worker

NO. DIRECT BENEFITERS:

40 workers

PLANNED FOLLOW-UP?

Continue in these awareness projects in the coming future and make it a part of my work activity.

BEFORE ...



... AND AFTER P. JULIFLORA INVASION



P. JULIFLORA OUTCOMPETING NATIVE SPECIES (MOST COMMON EXAMPLE, ACACIA SP.)



GERMINATION OF P. JULIFLORA SEEDS

MULTIPLIER PROJECT SUMMARY
**AWARENESS CREATION ON
 ZERO GRAZING AS A MANAGEMENT OPTION
 FOR FARMERS IN TIGRAY**



BY HAFTOM HAGOS

The aim of the project was to inform farmers about the options and advantages of practicing zero grazing in areas with different land-use, such as farmlands and area closures. The selected site for this purpose was found in Enderta District within the Tigray Region in Ethiopia. Farmers in this area allow their livestock to graze freely in the farmland and areas that are supposed to be protected from grazing. Even though there are community by-laws restricting free grazing, the farmers do not follow them due to low awareness on the benefits of zero grazing. This project aimed at filling the gap in awareness in collaboration with district experts.

More than 30 farmers participated in the awareness creation program, but if these measures were effective in changing the behavior of farmers, it will only be evident over the course of time. The trainings were conducted orally and were supported by pictures to inspire the farmers to try new techniques. The pictures showed different degraded sites and zero grazing sites with enriched vegetation as a result.

TARGET GROUP

Farmers in Tigray Region

NO. OF DIRECT BENEFITERS

32 farmers

FREE GRAZING LEFT NO VEGETATION IN FARMLANDS



DISCUSSIONS HELD WITH FARMERS IN ENDERTA DISTRICT



TIED CATTLE AROUND FARM HOUSE



PICTURES USED TO INSPIRE FARMERS TO PRACTICE ZERO GRAZING ...



... SHOWING POSITIVE IMPACTS OF CHANGES IN ANIMAL FEEDING HABITS ON THE VEGETATION



MULTIPLIER PROJECT SUMMARY
PUBLIC AWARENESS ON THE IMPORTANCE OF NATIONAL PARKS



BY SAMI ULLAH MAJEED AND SWAMITI KAKEMBO

The purpose of the project was to raise awareness about environmental issues, particularly about the importance of environmental conservation in the form of National Parks. All stakeholders, including local institutions, must play a role to ensure success. To make the public the guardians of the environment and to make the public aware of the importance of protecting fragile ecosystems, they must gain knowledge about the impact their actions have.

Tucked away in the Hajar Mountains, Wadi Wurayah is a precious natural area of over 200 km², maintaining one of the last freshwater sources in the Middle East. This fragile and unique ecosystem is home to numerous rare, endangered and endemic species. Fujairah municipality has been working closely with its partners since 2006 to ensure its conservation. This project included working with different stakeholders in raising the awareness level by doing different joint activities within Wadi Wurayah National Park. This will encourage them to support protected areas in their capacity.

PROJECT WAS SUPPORTED BY

Fujairah Municipality in particular the staff of Wadi Wurayah National Park

TARGET GROUPS

Institutions operating in United Arab Emirates

NO. OF DIRECT BENEFITERS

More than 200 employees of Gulf Rock Engineering, 12 employees of Material Recycle Facility (MRF) The science faculty of the American University of Sharjah.

PLANNED FOLLOW-UP?

To increase our outreach and expand the number of stakeholders involved



THE WATERFALL IN WADI WURAYAH NATIONAL PARK



AWARENESS SESSION WITH EMPLOYEES OF GULF ROCK ENGINEERING AT THE PARK HEADQUARTERS



FIELD EXCURSION WITH EMPLOYEES OF MATERIAL RECYCLE FACILITY (MRF)



WATER QUALITY TESTING IN THE FIELDS WITH STAFF FROM THE AMERICAN UNIVERSITY OF SHARJAH

MULTIPLIER PROJECT SUMMARY**COMMUNICATION AND PUBLIC AWARE-
NESS CREATION TO PROMOTE WISE USE
OF WETLANDS AROUND LAKE ZIWAY****BY TESFAU BEKELE**

This project initiated a dialogue with communities living in the vicinity of wetlands around Lake Ziway. Often people are not fully aware about the value of wetlands. Therefore, wetlands are being converted into other land use forms, such as crop land and grazing land in an unsustainable way. This multiplier project focused on communication and public awareness creation to promote wise use of wetlands of Lake Ziway's shore areas, specifically on Bochesa wetland. Constructive discussions and experience sharing was made possible by the deliberate selection of representatives from the community (religious leaders, administration bodies, fishermen, school teachers, and honored people). In small gatherings with these targeted stake holders of the community, it was discussed in detail why wetlands are so important to the environment, how to rehabilitate and conserve them and how landholders near to wetlands can adopt private conservation measures.

TARGET GROUP

Local communities near Lake Ziway

NO. OF DIRECT BENEFITERS:

15 direct participants and a total of 530 households (approximately 2500 people)

PLANNED FOLLOW-UP?

Awareness creation and experience sharing between different wetland user communities to enable knowledge transfer of lessons learned between communities with different levels of sustainability for the management of their wetlands.

DISCUSSION WITH KEY INFORMANTS
ON WHOM TO INVOLVE IN THE TRAINING
SESSIONS



EXPERIENCE SHARING SESSION WITH
ONE OF THE KEY GROUPS



ON-SITE DISCUSSION ON KEY ISSUES
WITH COMMUNITY REPRESENTATIVES



DISCUSSION WITH FURTHER IMPORTANT
STAKEHOLDERS





PART II
EXCURSION IN ETHIOPIA

A SHORT INTRODUCTION TO BIOSPHERE RESERVES IN ETHIOPIA

BY MARIA HÄNSEL

Presently, Ethiopia has registered four UNESCO Biosphere Reserves in the World Network of Biosphere Reserves, currently composed of a total of 669 Biosphere Reserves in 120 countries. Those are namely Kafa Biosphere Reserves and Yayu Biosphere Reserve, registered in 2010, as well as Sheka Forest Biosphere Reserve and Lake Tana Biosphere Reserve, registered in 2012 and 2015 respectively [1]. These Biosphere Reserves are all part of the Eastern Afromontane Biodiversity Hotspot. Worthy of protection are not only their natural ecosystems but also their function as gene pools for diverse agricultural crops. All of them show unique ecological and cultural characteristics. As part of the UNESCO Biosphere Excursion Program two out of the four Biosphere Reserves were visited by the group of participants.

Lake Tana Biosphere Reserve is found in Northern Ethiopia in the Amhara Regional State. It comprises Lake Tana itself as well as part of the catchment area of the lake. The total surface area sums up to around 700,000 ha, including the lake [1]. Lake Tana is the largest lake of Ethiopia and the main source of the Blue Nile. With its surrounding wetlands it is a hotspot for biodiversity. Especially its importance for migratory and residential bird species is internationally recognized [1]. The area is also of great cultural and historical significance. For example, on 20 out of the 37 islands of Lake Tana, Ethiopian Orthodox churches and monasteries can be found, partly dating back to the 14th century [2]. Around many of those, church forests have been established, serving as living seed banks for a high number of indigenous woody species [2]. Next to agriculture, being key for the economy in the region,

revenues from tourism have started to play a significant role. The area is visited by a large share of international and domestic tourists and offers high potentials for community-based and environmentally friendly tourism development [2].

Kafa Biosphere Reserve is located in South-West Ethiopia and its total surface area amounts to around 540,000 ha [1]. The dominating natural vegetation of the highlands is evergreen moist Afromontane forest [3]. In Kafa, similarly to Yayu and Sheka forest, human activities are centered around coffee cultivation as well as other agricultural activities [1]. In parts of the Afromontane forest, wild coffee plants (*Coffea arabica* L.) can still be found, being endemic to Ethiopia. In the late 1990s Participatory Forest Management, a program aiming at the joint management of forest resources in a sustainable way by community members, has been introduced in the region, like elsewhere in the country [3].

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KAFA BIOSPHERE RESERVE & LAKE TANA BIOSPHERE RESERVE**TWO SHOWCASES
OF SUSTAINABLE WETLAND
MANAGEMENT OPTIONS IN
BIOSPHERE RESERVES****BY FATIN NASER ALBREIKI, KHULOOD SALEM BIN MAHFOODH,
TESFAU BEKELE AND SELAMAWIT DAMTEW****INTRODUCTION**

An international meeting held in Iran, Ramsar in 1971, has developed broadest and most international definition of wetlands. Wetlands are: “Areas of marsh, fen, and peat land, or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters”. It is estimated that wetlands in Ethiopia cover an area of 13,699 km² or 1.14% of the country’s land surface [1]. Due to improper extraction, usage, and misconceptions regarding wetlands, the condition and state of the wetlands is continuously decreasing over time that threatened their existence in the near future. Agriculture growth and development, ongoing land degradation, urbanization and industrialization, absence of institutional arrangements and policies, poor capacities, biological and ecological problems are the major challenging aspects of wetlands in the country of Ethiopia [2]. As Ethiopia is prone to desertification and recurrent drought, the effects of wetland loss could complicate and worsen the situation locally. In order to reverse these emerging problems and conserve these fragile but crucial wetlands, integrated problem solving approach through realizing the collaboration of relevant stakeholders from policy level down to grassroots community is indispensable opportunity for Ethiopian wetlands [2]. In general the purpose of this report is to assess the effect of human pressure on ecological aspects of Debremariam wetland, around Lake Tana, and Alem Gono wetland, a wetland located in Kafa Biosphere Reserve in the area of Bonga. This report aims to understand the status and trend of the wetlands over the past years, identify the anthropogenic activities that are affecting the wetlands, assess the impact of wetland degradation on different ecological aspects of the wetlands, and finally to understand the local community’s awareness on sustainable management options of wetlands. ■

ABSTRACT

This study assesses the effects of human pressure on ecological aspects of Alem Gono and Debremariam wetlands. It aims to understand the status and trend of the wetland over the past years, identify the anthropogenic activities affecting the wetlands, assess the impact of wetland degradation on different ecological aspects and finally to understand local community’s awareness on sustainable management of wetlands. Two simple methods guided the research. Interviews were held with local experts and residents in the vicinity of the two wetland areas as well as other wetland users. The results of this research indicated that Alem Gono wetland is currently at a stable stage. Whereas Debremariam wetland is under threat due to anthropogenic activities. The major reasons behind these trends are the population growth and lack of government efforts as mentioned by interviewees. The main suggestion raised while visiting both wetlands that would contribute to a better management was ecotourism. Establishing ecotourism could help maintaining the wetlands while contributing to the economy thus helping the local community to lead a better life. ■

MATERIAL & METHODS

Questions concerning Alem Gono wetland were discussed with officials in Bonga to understand its previous and current situations. Also officials were asked to give some specific information that would help answer the research question addressed. The group also went into the field to observe, and interact with the locals living in the vicinity of Alem Gono wetland. Through informal interviews some important and valuable information were obtained. Interviews were conducted in Kafa (local language of the area) and Amharic and then translated to English. The approach for the Debremariam wetland was similar. In addition an interview was done with an instructor at Bahir Dar University. Again, the group went into the field to observe, and interact with the locals living close to the wetland. ■

RESULTS

STATUS AND RECENT CHANGES

Alem Gono wetland was found to be surrounded by cultivated lands mostly. Large areas of it are converted into cultivated lands while deforestation practices are happening in areas surrounding the wetland. The intensification of cultivated lands surrounding wetlands is contributing to erosion and sedimentation. According to the observation of local people mud comes and settles, affecting the land by converting it to grass land and replacing the natural vegetation. This affects the biodiversity of the wetland and the flow of water, as the soil is no longer able to absorb that much of water. Although the negative effects of cultivated lands are observed in the wetland, agriculture department states that people are still converting large areas of wetlands into agricultural lands where local people plant crops that would contribute to their economic status such as *Eucalyptus globulus*. According to the respondents deforestation around wetland has a direct effect of erosion on Alem Gono wetland, however, local community did not confirm ground elevation due to erosion. Population growth is an important factor in converting wetland to a productive land due to the increased demand for food; however, it is not mainly the threat. The most obvious threat to Alem Gono was over grazing.

Debremariam wetland was almost entirely covered by papyrus species 13 years before. But now the coverage of papyrus and other wetland vegetation is only found in a very limited area. According to the respondents, the wetland area is being affected adversely by both change in climatic conditions as well as anthropogenic pressure. The respondents stated that, population growth is the main reason behind the huge loss of wetlands in the area. Population number is highly increasing and consequently shortage of farming as well as grazing land occurred in the area. So, this results in converting and draining wetlands so as to get enough arable land as well as grazing area so as to meet their need in food security. The other reason that forced farmers to convert wetlands according to the view of the respondents is the way governmental bodies deal with land policy. Those people who were living permanently in the vicinity of Debremari-

am wetland were previously displaced from their farming areas as reported by all respondents. Their farm land was taken by the government for infrastructural activities like the expansion of settlements, without giving enough compensation and alternatives to the local community. This was a major reason for the surrounding community to convert wetlands into agricultural lands. The introduction of new farm animals like horses in recent times was also considered as a big threat to the wetlands by the people that were interviewed. Horses differ in their grazing habits in comparison with other domestic animals because they have a wider range of vegetation they feed on and additionally graze to a lower level. This has an impact on both the composition and abundance of the wetland vegetation. Respondents were also asked whether climate change is affecting the wetlands or not, and they recognized that it has affected the wetlands especially in the last decade. According to them, shortage of rainfall is highly reducing the level of the Lake Tana water. The decrease in the water level of the Lake dried the wetlands allowing the community to cultivate these lands. The respondents also detected that, there is an increase in temperature over time that may affect or stimulate evaporation and evapotranspiration in the wetland, resulting in drying up of the wetland. As observed the wetland is almost dried up so that farmers were simply cultivating the wetland with different vegetables like cabbage, lettuce, onion and like that. The major reason that was stated by the respondents is that rainfall shortage (as briefly discussed above), and next to rainfall shortage, the construction of a dam (Checher dam), about 5 km away, was made responsible for having affected the water level of the wetland. Since the source of water for the wetland is the lake, any disconnection with the lake affects the nature of the wetland. Similarly, this dam has blocked the water that comes from the lake to the wetland especially in the dry months, and consequently the wetland dried out and the community will start cultivating on it.

FAUNA AND FLORA

As it was observed in Alem Gono, the vegetation cover in the wetland consisted of *Eucalyptus globulus*, *Cyprus papyrus*, *Typha* spp and *Zea* may. Of the animal species found in the wetland, birds and cattle were the most obvious ob-

served fauna of the area. Bird counting has been done, but there is no continuous monitoring in place. However, there is one record of the yellow fronted parrot, endemic to Ethiopia, along with many other species identified there. One major threat to the parrot is the cutting of dried wood where they would preferentially nest. According to the most recent observation by biodiversity scientists, 7 endemic birds and 3 migratory were found in the wetland. The number of birds species found now are less compared to previous observations. Scientists studying biodiversity of the ecosystem found no fish species but it might be due to insufficient assessment. There are inlets and outlets in a wetland. Inlet areas do not have rivers, as the water is 10-15 cm below soil, which is insufficient for the existence of fish. The water body that is suitable for fish to live (rivers) is found in the outlet. However, the outlets still has not been studied because this area is protected because of religious reasons were people are not allowed to get in.

In Debremariam the natural flora and fauna of the wetland is slowly disappearing. Wetland emergent plants like *Cyperus papyrus* and *Typha* spp, and other indigenous trees are being cleared from the area and now the area is being covered by the exotic plant species *Eucalyptus*. So according to the respondents view, even though this eucalyptus tree is providing a lot of economic advantages to the local community like for house construction, fuel wood, and as a source of income by selling to other neighboring community, it is also highly affecting the nature of the wetland by drying up the water.

AWARENESS OF THE LOCAL COMMUNITY ON WETLAND CONSERVATION

As far as the awareness among people is concerned, locals do realize more the importance of wetland nowadays. However, according to interviews done with local people benefiting from the wetland ecosystem, they would not mind to continue exploiting it as long as it provides them economic value. Therefore, government regulations on the wetland are the only barrier to people's activities in the area.

In Debremariam wetland the community is fully aware about the ecological as well as socio-economic and cultural values of the wetland. They know how much benefits could be obtained from

conserving wetlands from the experiences of their near-by community. Rather some external reasons are pushing the people to convert and degrade wetlands in to other land use types like grazing sites by stocking a high density of animals, cultivating (Agricultural lands), eucalyptus plantations etc. Some of the reasons that are pointed out by the community are; Scarcity of land; according to the respondents, the community residing around the wetland area have a scarcity of both grazing and cultivated land while the population is dramatically growing So the people have no alternative than converting wetlands so as to sustain their livelihood.

The second reason that was stated by the respondents is the lack of government policy on the management of wetlands. According to them, the government is not giving special attentions to the sustainable use of wetlands. Government cooperation could help in optimizing the utilization of wetlands currently there aren't any restrictions and other activities from the government side, so the community are exploiting the resources of the wetland. One of the examples given by the respondents was the conflict between different user groups of the wetland. People having high number of cattle release their cattle to the wetland unwisely, whereas on the other side people having insufficient land intend to use the wetlands for cultivation purposes. Such difference of interests needs the attention of the government and its cooperation for the sustainability of wetlands. ■



DISCUSSION

Even though there are no monitoring activities carried out in the wetlands to assess ecological changes and no published research by other researchers was found for Alem Gono and Debremariam wetlands, we tried to compare our survey data with other studies done on Lake Tana basin wetlands and other Ethiopian wetlands as these all are facing almost similar challenges [3]. Generally Ethiopian wetlands are being degraded in recent history [1]. This has led to huge loss of social, economic, and ecological services. Similarly, the status of the two wetland sites visited was found to support this idea. Both wetlands are under pressure by anthropogenic activities. From the view of the respondents, it was understood that wetlands are still being considered as wastelands and are converted in to other land use types. Despite this, during our survey, it was observed that there are some encouraging initiatives in limited areas so as to sustainably manage wetlands.

In the last two decades, human population pressure associated with climate change and merging development schemes, lake Tana

have shown a decline in its wetland system's ecological functions and self-restoration ability [4]. The same trend is also happening in the specific areas of both Alem Gono and Debremariam wetlands according to the respondents view. Population growth is high and is adversely affecting wetlands. According to studies conducted, approximately three million people are living in the Lake Tana watershed, and many recent development activities at the catchment areas have negatively affected the water of the lake, wetlands and the climate of the region [5]. Not only developmental activities but also traditional farming activities are affecting the visited wetlands. The wetlands are being drained for cultivating for temporary gains. Wetlands in the visited area can provide huge values if these ecosystems can be sustainably conserved even though draining of wetlands for agricultural purpose is a century-old practice in some parts of the country [6]. The visited wetland sites were good source of fish species in the past years, but now no fish species are found due to the drainage of the wetland. Lake Tana wetland areas are major sources of fish like the African catfish,



Tilapia, and Barbs [7].

However, disturbance of the wetlands can lead to complete loss of the biodiversity that already inhabit the wetland. In addition to birds, one can find some mammals (hippos, foxes, highlander hyenas, rabbits and other rodents) on the Fogera plains [7]. According to most of the respondents, the wetland was an important area for different bird species. But nowadays, the respondents' have perceived that these birds are reducing in number and some migratory birds have totally disappeared from the wetland. This could be due to the modification of the wetland vegetation with eucalyptus tree, cultivation of crops, drainage of the water and over exploitation of vegetation. Papyrus vegetation and Typha plants on the shores of the Lake Tana are described as important feeding, nesting and breeding sites for wetland birds [8]. Wetlands are important breeding and roosting sites, especially for migratory birds like Black Crown Crane [9].

Wetland vegetation are also overexploited by humans for house construction, making handicrafts, replacing by other plants like eucalyptus for the purpose of fire wood and marketing, and over grazing by their animals. And this will have also an impact on both the hydrology as well as

on the biodiversity of the wetland.

Degradation of wetlands can also affect the local climate. In our survey; temperature increase, rainfall shortage, and drought are some of the detected local climatic changes observed in the area in which the respondents have predicted it is because of wetland degradation. Another study conducted from 1973 to 2008 in the southern part of Lake Tana also indicated the same trend, with declining rainfall and increasing temperature [5].

It is obvious that, these above mentioned results are due to the effect of the highly growing population near the wetlands. There are a lot of human pressures as some of them are identified in the respondents of this survey like farming of wetlands (Land use change), overexploitation of vegetation, sedimentation, damming, lack of wetland policy and lack of cooperation among different stakeholders of the community. All these threats identified in our survey were also supported by other studies on Lake Tana wetlands. For instance, in a study on Shesher and Welela wetlands it was stated that these wetlands were shrinking at an alarming rate, mainly because of unsustainable farming practices and a huge irrigation project on Ribb River which is

was under construction at that time [10]. Another study in Gilgel Abay watershed in the southern part of Lake Tana, has also proved how much population growth is modifying wetlands [11]. The study has shown the continuous expansion of arable land in order to meet the increasing food demands of the growing population, where as in contrast, grass and wetland cover are declining. According to this study also, 47.16% of wetlands were converted in to other land uses from the year 1973-2008. This indicates that conversion and degradation of wetlands through land use modifications is becoming the major driver for the loss of wetlands.

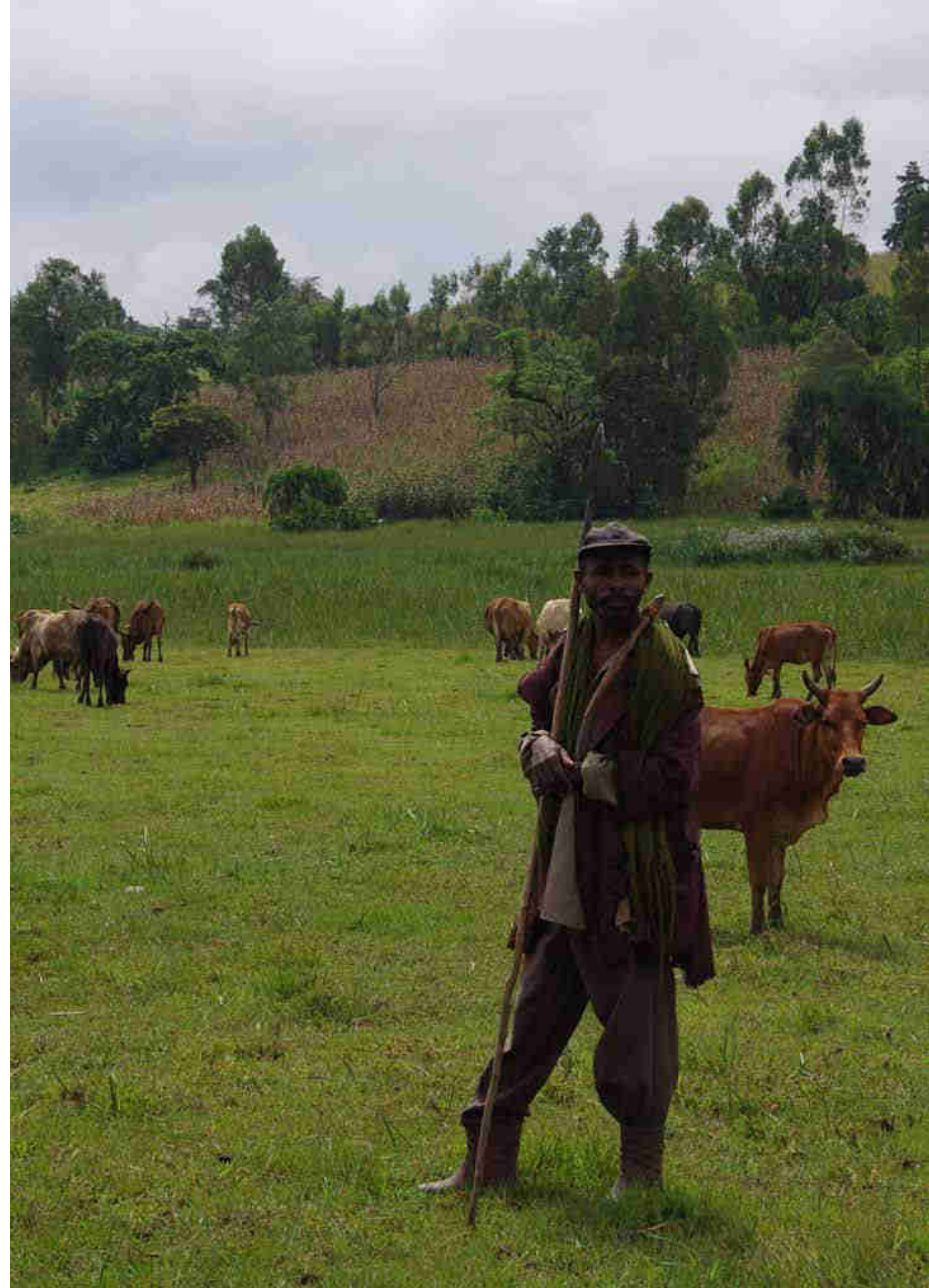
This encroachment of wetlands could be due to the lack of wetland policy and due to the priority given by the government to other activities like agriculture. This was also raised by the respondents of Debremariam wetland and other related studies in the basin. It was reported that low priority and attention was given by local governors and extension agents to the management of the lake and shore area vegetation in the past [4]. In many cases it has been reported local administrators have distributed the buffer zone and grazing areas to landless young people. Even though the lack of wetlands governing policy was mentioned as a triggering factor for the loss of both Alem Gono and Debremariam wetlands in specific and Ethiopian wetlands in general. Lack of cooperation among different stakeholders of the community was also one of the big issues raised by the respondents. Differences in interests are leading to over-using wetlands without any compromise. A study in Dibanko bahir wetlands in the Tana basin came to the same conclusion [9]. In this study it was reported that there are conflicting activities among stake holders in the use of the wetland. Those farmers having little or no land holding from the terrestrial land and require to drain the wetland and obtain farm land support drainage whereas those that use the wetland for grazing their cattle and women do not accept its drainage. Women feared that over-drainage can lead to the drying up of springs and they need to walk further to fetch spring water for drinking and have no other alternatives. ■

CONCLUSION

From this survey, it can be concluded that, both Alem Gono and Debremariam wetlands can provide a lot of ecosystem services. Despite the benefits gained, those wetlands are under serious threat from anthropogenic pressure. Damaging activities include conversion in to agriculture, eucalyptus plantation, dam construction, over-exploitation of resources, lack of wetland policy, and lack of cooperation among different community members. These and other associated factors are affecting the ecosystem services that can be supported by the wetland like biodiversity, regulation services of the hydrology and local climate. Appropriate consideration should take place so as to restore the ecological values that are being lost. Although the local communities are fully aware about sustainable conservation of wetlands it was also understood that there were no local mechanisms in place to conserve the natural resources in general and the wetlands in particular in the area visited. This is an indication that conservation strategies of natural resources has not been given due emphasis. However, it was understood from the survey that all of the respondents had not seen or heard about any of the government effort to manage the wetland and the natural resources as a whole in their respective localities. According to one interviewed expert, no satisfactory result was observed on the status of wetlands yet, although there were some initiatives on sustainable wetland management by different governmental organizations and non-governmental organizations. Therefore, an immediate initiative is necessary to be taken in order to conserve the remaining wetland resources. ■

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KAFA BIOSPHERE RESERVE

CHALLENGES OF PARTICIPATORY FOREST MANAGEMENT PROJECTS IN KAFA BIOSPHERE RESERVE

**BY ABRAR HUSAIN MADDI, RAHEL BEKELE,
SAMAR GAMALELDIN ABDELSATTAR GEWILY AND ZAHRA MOHAMMED**

ABSTRACT

Kafa Biosphere Reserve is one of the still persisting areas of Ethiopia with more than 50% of it covered with natural forests. Yet the threat of deforestation is increasing too. One of the conservation projects taking place in the area is Participatory Forest Management. We tried to assess the effectiveness of the project based on socio-economic surveys of Kafa forest community and other studies that assessed the achievement of the project there. We found that the monitoring of the area has fallen behind over time, awareness was restricted to few practices of trees cutting. The pressure of community needs is high, especially if support from government and NGOs is lacking. This forms a persisting challenge for the program to achieve its target. Other studies have additionally stated that ecologically the project achievement is not satisfactory. ■

INTRODUCTION

Deforestation is one of the most detrimental human activities to nature. Consequences of deforestation include changes in soil, loss of biodiversity, and climate change. Forests are sources of livelihood, by providing soils highly rich in nutrients -formed from understory vegetation decomposition, and continuing to protect it from aspects of erosion -wind and water, with the physical structure of the forest. On the other side, when it comes to biodiversity, many plants and animals are especially adapted to forest habitat and cannot thrive and grow elsewhere. Reducing the size of their habitat creates pressure on many species and leads to their extinction. Furthermore, if deforestation reaches a global scale, an alternation in climate will be the consequence. Trees sequester carbon dioxide -one of the main greenhouse gases that contribute to global warming [1].

Deforestation and the resulting environmental degradation is a major problem in the Federal Democratic Republic of Ethiopia because of its negative impact on food security, community livelihood and sustainable development.

The Ministry of Agriculture (1999) calculated that the high forests that used to cover 16% of the land area in the early 1950s were reduced to 3.6% in the early 1980s, which counts to over 75% clearance, and further declined to 2.7% in the early 1990s. The identified main triggers of deforestation was population growth, poor economic growth and the state of the environment [2]. Clearing of land in Ethiopia occurs for agricultural use and the logging of trees for fuel. It is practiced in both forests and woodlands. Kafa Biosphere Reserve, located 460km southwest of Addis Ababa, is one of the least impacted areas by deforestation in Ethiopia. More than 50% of this zone is still covered by natural mountain forests and it is the center of origin and genetic diversity of wild coffee (*Coffea arabica* L.). The area is home to approximately 600,000 people. Main economic activities in the area are dominated by agriculture. The main other reasons for deforestation are daily household needs such as fuel (for sell or direct use) and house building [3].

Multiple conservation initiatives started in the past decade aiming to reduce the rate and impact of trees clearing by the community. One of these is the Participatory Forest Management Program, introduced by Farm Africa in mid 1990s and currently managed by NABU (Nature And Biodiversity Conservation Union) since 2010. The program is special in recognizing local communities as the protecting and caring factor rather than destructive beings that require foreign management. PFM try to align environmental protection with economic development. That is achieved first by involving the community in monitoring forests and educating them to become more aware of the value of conserving the forest together with techniques to sustainably satisfy their social and economical needs [4]. In this study, our aim was to assess the effectiveness of PFM program work implemented to restrict the rate and impact of deforestation, in the Kafa Biosphere Reserve in Bonga. A number of studies looked at the effectiveness of the project from what it achieved in terms of rate of deforestation and area of forest. We looked at these data together with community view of the project through literature reviewing and interviewing both parties of the project NABU and forest community. ■

MATERIAL & METHODS

The study was conducted in Kafa Biosphere Reserve (BR), situated in Southern Nations and Nationalities and Peoples' Republic, Ethiopia. Data collection took place over 3 days on November 4-6, 2015. Due to the nature and period of the study, data collection was restricted to interviews with the two main stakeholders the forest community and the organizations implementing conservation work. Collected data was summarized and compared to reported results in previous literature to assess the impact of the currently implemented project and determine key challenges and limitations they face.

To understand conservation and management work implemented in the area, we met two workers from NABU and had an interview with their representative in the area asking him specifically about PFM program achievements, response from community and future vision of the progression of the project. In addition we met staff from the Agriculture Department as representatives of the local government.

Both parties presented information on their work dealing with increasing deforestation practices and the support they provide to local community to assist in promoting sustainable living.

To look at forest management from the public point of view, we prepared a survey for the community with questions focusing on family size, sources of income, tree cutting practices, education and/or support received from either government or NGOs, their perceived impact of forest management, and finally their willingness to change their ways of living. A local guide from the area took us to PFM site and a community forest - not part of PFM but next to it, where community members own the land and regulations on trees cutting don't apply. Four families were surveyed from PFM site and six families from the community forest. In addition, information about wood selling from observations at the local market was integrated. ■

RESULTS & DISCUSSION

After meeting with the residents of Kafa private community forest, it was found that their major source of income is farming crops, with 71% of the community depending on it (Figure 1), which involve practices that require clear land. However, results of interviews with the community showed that most crop farming practices take place in family owned property that has long been established as farmland. The second common source of income was found to be cattle farming which accounted for 43% of the community followed by fuel wood cutting. Based on the fact that planting crops occur on already cleared land, it can be said that deforestation occur mainly for cattle grazing and cutting fuel wood. Mainly, all families except for one (average 6 people/household) cut an average rate of one tree per day for personal use including cooking, warming their houses, or building houses and tools. About 90% of the population have been found to rely on wood-based and other biomass fuels for its household energy supply [5]. The one exceptional family stated to cut around 40-50 trees per week and sell them in market. The information was further emphasized, as it was found that around 30-40 trees are sold in the town weekly from asking the community in the area. The majority of interviewees (71%) claimed to cut only dry trees, and many of them seemed to plant other trees in place of what they cut, or they cut from a point where the tree can easily regrow as taught by the NGO specialists. However, Eucalyptus species (*E. globulus* and *E. camaldulensis*) are the major species planted in the highlands of Ethiopia due to its fast growth rate that would provide wood more quickly. Eucalyptus is non-native and can out compete native species, demands high amounts of water unlike native rainforest trees [6]. Yet, even with Eucalyptus trees, the rate of growth is way behind the rate of cutting.

In general, the locals practice trees cutting since the intact forest is not a source of income as it is when compared to agriculture or wood selling, and forest produce takes long time and the locals don't have alternative sources of income. From the interviews conducted in Bonga, Kafa region, it is clear that sustainable use of the forest is made unattractive by the long period of time that trees take to re-grow. It's hard for them to wait



FIGURE 1: SOURCES OF INCOME OF INTERVIEWED MEMBERS IN A COMMUNITY FOREST IN KAFA

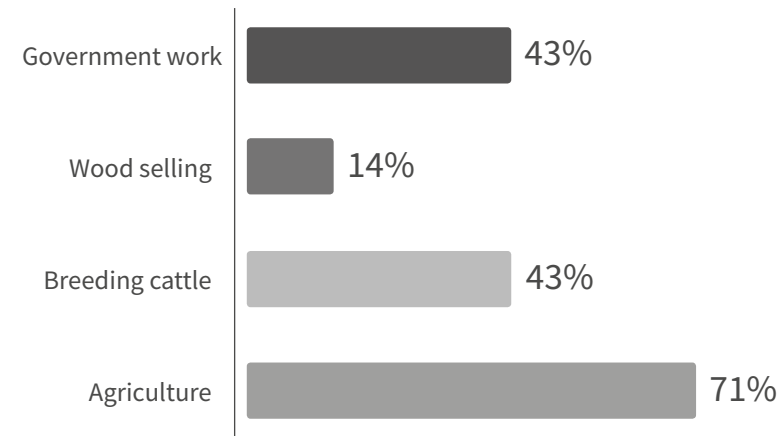


FIGURE 2: STATED AREA OF TREE CUTTING BY INTERVIEWEES OF THE LOCAL COMMUNITY IN KAFA

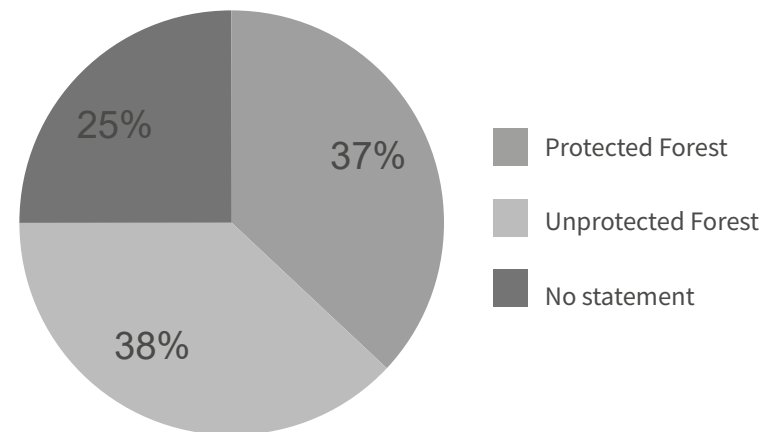
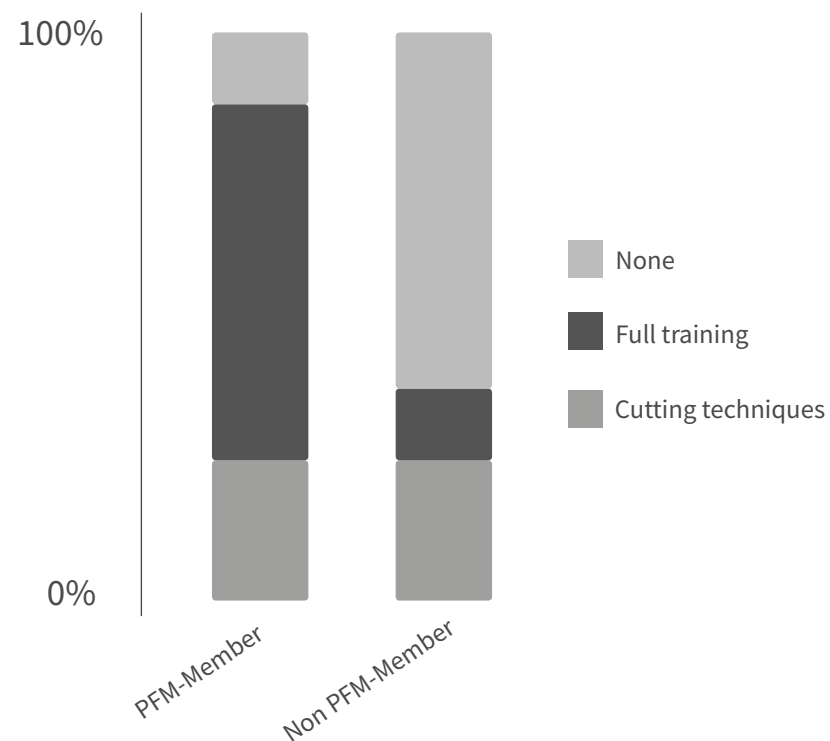


FIGURE 3: RECEIVED TRAINING ON SUSTAINABLE FOREST MANAGEMENT AND ENVIRONMENTAL EDUCATION BY MEMBERS AND NON-MEMBERS OF PARTICIPATORY FOREST MANAGEMENT (PFM) SITES.



for the growth of forests' native trees for long-time without having another sources of income, and sustainable techniques practiced currently are not effective enough in facing the fast rate of deforestation.

NABU's Participatory Forest Management (PFM) program seemed to be a promising strategy that addresses both biodiversity conservation and human economical needs. In addition, encouraging the community to participate in the monitoring of the forest by convincing them on how deforestation is a risk to their own survival is the best way to protect a land - no one would protect the land more than its own people. However, it was found in this study that the implementation was lacking in terms of knowledge spread and strength of enforcement.

The first problem recognized in the implementation is the lack of enforcement in monitoring. All interviewed members of the community mentioned that security was much stronger at the beginning of the NABU project and gradually weakened. It was additionally noted that security is only strong in some areas at some times. Most individuals interviewed from the community outside the PFM area stated that they cut from secured and unsecured areas of the forest almost on daily bases (Figure 2).

The second problem was lacking education and awareness in the local community about environmental and socio-economic importance of the forest. Since monitoring can only take place on government owned land, reforestation efforts needed to be promoted via education to convince owners of privately held forests of the importance of their practices. The reach of awareness regarding environmental conservation practices in the are was highly variable. It was found that from PFM site around 60% attended or knew about weekly meetings arranged by NABU (to demonstrate work plans and raise awareness among members of the community) while the remaining 40% had never heard of these meetings and awareness was restricted to teaching sustainable size of trees to cut, and only one family from the area outside PFM knew about the meetings but never attended (Figure 3). Even with monitoring, many locals saw the guards sometimes but still didn't know why they are there. According to these results, NABU's education is clearly reaching most of the community within the PFM but falling behind outside it.

Education seemed to have focused only on few sustainable practices such as how to cut trees in a more sustainable way and giving ideas on how to improve income (like agriculture tips), while many people didn't even know anything about the real benefit of protection of the forest.

Another issue with NABU's PFM program is its inability to convince locals of the program's effectiveness. NABU's Local Project Coordinator believes that this, in part, is due to the community's lack of trust to outsiders. Furthermore, the strong agricultural traditions of the local community also contribute to its lack of willingness to change. However, results from the interviews suggest something different: More than half the people interviewed (57%) showed an interest in changing their current tree-cutting practices and a number of them believed in change if support is provided. There was 100% agreement from community that they did not receive any sort of help from any entity and that they had to depend on their own ways to support their needs. It was found that the relative forest dependency of non-PFM members is comparable and sometimes greater than PFM members, in a study which involved 141 household surveys collecting socio-economic information [7].

The same study involved conducting a combination of forest inventory from over 50 plots in the managed forest to collect vegetation data, it found that since external support of the project was taken out in 2010 there were no improvement to the ecological system, the level of regeneration of ecologically and economically important species was not satisfactory. The same concern was expressed in an earlier study. In an assessment of PFM during its first phase (before 2010) it had shown to have positive impacts both on the state of the forest and living condition of participant households at least within the project life time [8]. They expressed their concern about the sustainability of the PFM program in Ethiopia with the weak government support for the scheme. The conclusion questions the project sustainability in the long run. ■



CONCLUSION

The sample size of surveying only eight families is way too small to represent a population of over 600,000. This was brought due to the short period of time to conduct study and lack of knowledge of the area and places of target participants relevant to the research question.

Agriculture was found to be really important to the community. All interviewees stated that their life has improved a lot after they started practicing agriculture. This suggests that it is probably better for conservation work to focus on sustainable agriculture practices like agroforestry. This target seems to be more likely to convince the community bringing visible evidence of effectiveness, better income and improve the status of the land. This would then in turn need less monitoring.

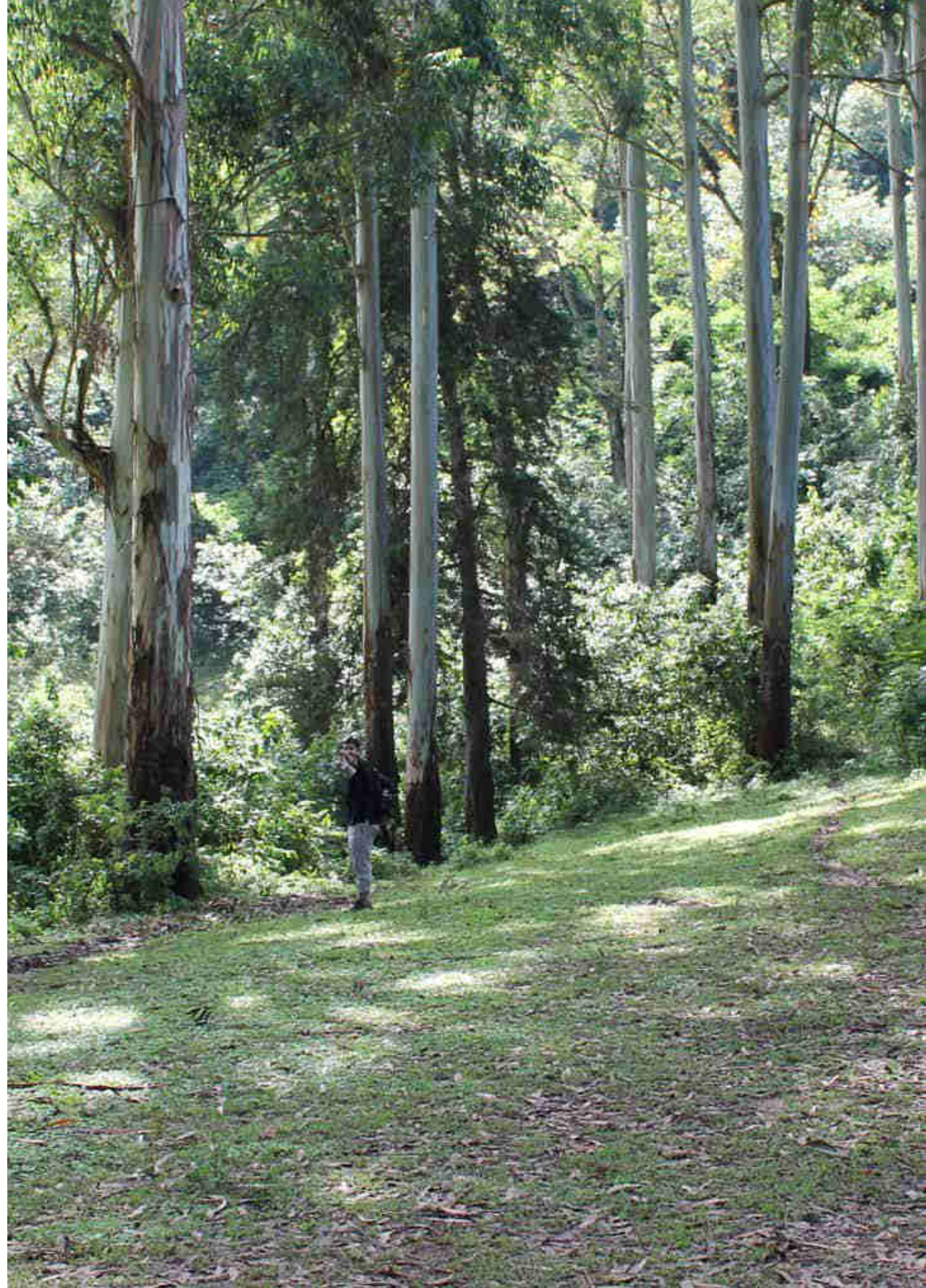
At the end, it could be said that PFM project did not provide satisfactory improvement to the environment so far, but this does not prove that the project itself is a failure. It has only started and has been implemented for a short period of time (5 years) that is not enough to bring changes to ecosystem. Definitely stronger reach to the community and continuous, long term effort need to be invested to start harvesting results.

After speaking with members of the Kafa, Bonga community, it was clear that they had a deep appreciation for the land. As this is a major idea in the conservation effort, this idea should be used in the effort to make the people of Kafa understand the need to protect the environment and change towards more sustainable practices. ■



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LAKE TANA BIOSPHERE RESERVE

TOURISM FOR SUSTAINABLE INCOME GENERATION: THE CASE OF THE BLUE NILE FALL AREA COMMUNITY

**BY BIRUK EMIRU, GETNET REGASSA,
HAFTOM HAGOS AND SWAMITI KAKEMBO**

ABSTRACT

Tourism is believed to have great potential for contribution towards sustainable local community development. Owning a huge number of natural as well as man-made tourist attractions, Ethiopia strongly supports the development of tourism business. This study was conducted in Lake Tana Biosphere Reserve of Amhara regional state with the objective of assessing and identifying potential tourism opportunities and available income generating activities for the local residents. Data were collected through interviews and group discussions. From natural and cultural aspects tourism potentials in the Lake Tana Biosphere Reserve area are high, providing many different potential sources of income from tourism. Various types of agricultural products

and activities, which are attractive in relation to tourism exist. Even though there are varieties of tourism potentials and alternative sources of income for community around Blue Nile Falls, accommodation and other types of tourist facilities and services such as trekking ways and special recreational chances like kayaking are limited. To increase the income from tourism activities and to improve the people's livelihood at a sustainable base, it is very important to work together with the stakeholders through participatory tourism activities. This cooperation should give emphasis on promoting the tourism capacity of the area, upgrading the infrastructure of the Biosphere Reserve and conserving the sustainable natural resources of the area. ■

INTRODUCTION

The importance of tourism has been recognized in the economy of many countries due to the income generated. International tourist arrivals of the world have increased from 25.3 million in 1950 to 803 million in 2005 and the World Tourism Organization (WTO) forecasts that international tourism will continue growing at an average annual rate of 4%. Ethiopia strongly supports the development of tourism business and has huge natural and man-made tourist attractions. The presence of immense tourism potential on the one hand and the very low level of tourism development in the country on the other has prompted the Ethiopian Tourism Commission to hold the vision that Ethiopia could by 2020 be one of the top ten tourism destinations in Africa. Historically the focus of marketing tourism by the Ethiopian Tourism Commission (ETC) has been the globally important cultural and historical sites within the country. The link to nature tourism has been relatively tenuous so far. In contrast, and arguably a better indicator of its value, private tour operators spend a considerable portion of their marketing budget focusing on nature tourism. Ecotourism is tourism that involves traveling to relatively undisturbed natural areas with the specific objective of studying, admiring and enjoying the scenery and its wild plants and animals, as well as any existing cultural aspects

(both past and present) found in these areas. Ecotourism is rooted in the concept of sustainable development, as defined by the World Commission on Environment and Development's Brundtland report (1987). In many view ecotourism as a viable way to protect the natural environment and create social and economic benefits for local communities. Poverty alleviation through tourism is defined as tourism that generates net benefits to the poor, not only economic benefits, but also creating positive socio-cultural and environmental benefits to the poor. There is an argument on the role of tourism in poverty reduction at local level and it has been the question about the centrality of beneficiaries in the tourism development process [1]. Active community participation in ecotourism is claimed to be good for business and good for conservation [2]. Alternative forms of tourism such as ecotourism and community-based tourism have better outcomes because they are smaller in scale, which is typically associated with more limited environmental and social impacts and greater opportunities for local businesses to get involved [3]. Therefore this research assesses the potential tourism opportunities with the aim of identifying available possible income generation options through tourism for local residents around the Blue Nile Falls. ■

MATERIAL & METHODS

Lake Tana basin is found in the Amhara regional state of Ethiopia. The Lake Tana is critical for the national economy, as it has great potentials for irrigation, hydroelectric power, water supply, high value crops and livestock production, transportation, (eco-)tourism attractions and others [4]. The livelihood of people is mainly based on agriculture production.

The data was collected through primary data sources by various mechanisms such as interview and group discussion with concerned bodies as well as field observations. In addition some information was also collected through phone interviews with related bodies such as Bureau of Culture, Tourism and Parks Development (BoCTPD) and Nature and Biodiversity Conservation Union (NABU). Tourist facilities and services as well as natural and cultural heritages and landscapes in Bahir Dar, especially focusing on the Blue Nile Falls, were visited for interviews and discussions. Generally, the questions focused on sources of livelihood available; delivery of products; community benefit from tourism; successes and challenges of tourism in the past and current trend; land use activities such as agriculture and deforestation; and plan and recommendations from different bodies. From Tis Abay (Blue Nile Fall's) community interviews and group discussion were held with 6 local community members, 2 governmental offices and 1 NGO representative. The local community members who were interviewed live within five kilometer perimeter of Blue Nile Falls. The group consisted in one old and five young members of the community. In addition to this, a supervisor of the Tourist Information and Supervisor Office (TISO), a project coordinator of a local NGO from NABU and one representative from BoCTPD was interviewed. The data collected was analyzed in a qualitative approach. The Blue Nile Fall is found in Dasra Kebele (lowest administrative level) located in Bahir Dar Zone (administrative level below the Region). According to the community members' interviewed, the population of Dasra Kebele is 400 households with an average family size of 6-7 members. The major source of their livelihood is agriculture. The community members collect their firewood from the forest found in the area. TISO representative stated that the community's culture is strongly related to the Gondar culture in Northern Ethiopia. ■





RESULTS

The Tourist Information and Supervisor Office (TISO) is located at a distance of 3 km from Tis-Abay. It gives services for travelers by giving tourist related information, facilitating guide and boat services as well as reception services. According to the representative of TISO, their office was established in 1995 with 10 local guides. Before that time the area was accessible without any charge. Currently, 19 persons are working as a local guide. The community is not benefiting from the direct income of entrance fees since all of it goes to government. However, they get benefit from giving services such as guiding and selling items.

According to the interviewed TISO representative, there are some attraction places, in the vicinity of Tis-Abay, other than Lake Tana, that make it an ideal tourist destination. The following Table 1 shows a number of attraction places with their respective distance from Tis-Abay area.

The TISO representative explained that the tourist flow in the area is about 3000 person per month with a peak tourist flow period between September and December in addition to holidays. However, due to development activities like hydroelectric, the amount of water flow in the fall has been generally decreasing. He also explained that their office has no special future plan regarding tourism activity. Regarding tourism development and income generation in Tis-Abay, there are a number of challenges observed by different bodies. Generally, representatives of the different organizations agreed that missing infrastructure and community awareness as challenges of tourism and income generation was a problem (Table 2).

To make Tis-Abay effective in tourism and income generation, NABU recommended that community based tourist services should be established. The area should deeply be assessed to facilitate services that can attract tourists in addition to the natural resources. For instance, if a bird watching site is established in the area, it may not be effective for there are no wetland birds except some limited number of forest birds. So, the services to be established in the area need deep assessment of their impact before rendering them. BoCTPD also recommended that boat service should be improved. The community's cultural arts, music, food and drink should be promoted and ways, in which agricultural products such as milk, fruit and others can be selling to tourists, should be facilitated.

From the direct field observation by the research group, different potential tourist attraction places of Lake Tana are recorded. Zege Peninsula, wetland bird watching sites, recreational areas and walkways along the shore of Lake Tana, boat trips on the lake, unique culture and belief of the people around and the rich aquatic life of Lake Tana are the most tourist attractive places observed. Additionally, the group also carried of some information regarding the current status and challenges of tourism activity around Blue Nile Falls. These challenges are absence of infrastructures such as quality road from Bahir Dar to Blue Nile Falls, standard hotel, restaurant, bank and safe boat service (no safety clothes) and community based lodge and toilet services near to the water fall. The amount of the water fall is not expected as known in promotion of Blue Nile Falls. The crowdedness of the area by the local kids when they see tourists to sell their staff is also another challenge for tourism activity. ■

TABLE 1: DISTANCES TO DIFFERENT POTENTIAL TOURISTIC ATTRACTIONS IN THE VICINITY OF THE BLUE NILE FALL AREA

Tourist Attractions	Distance
Dingay Debelo Rock-Hewn Church	7 km
Two monasteries 1 st	15 minutes
2 nd	90 minutes
Meshebel protected forest	5 km
Aba Gureza Washa (Cave)	7 km
Alata Hot Springs	20 km
Natural spring water (not hot)	10 km

TABLE 2: DIFFERENT CHALLENGES FOR TOURISM AND INCOME GENERATION FOR THE BLUE NILE FALL AREA, OBSERVED BY REPRESENTATIVE OF THREE DIFFERENT ORGANIZATIONS, NAMELY THE TOURIST INFORMATION AND SUPERVISOR OFFICE (TISO), THE NATURE AND BIODIVERSITY CONSERVATION UNION (NABU) AND THE BUREAU OF CULTURE, TOURISM AND PARK DEVELOPMENT (BOCTPD)

Type of challenge	TISO	NABU	BoCTPD
Low quality of access road	Yes	Yes	Yes
No formal walkways	Yes	Yes	Yes
No facilities like hotels and banks	Yes	No	Yes
Low community awareness	Yes	Yes	Yes
Decrease of water volume	Yes	No	Yes
Unfair pricing of some individual	Yes	No	No
Lacking sanitation facilities	No	Yes	No

DISCUSSION

From natural and cultural aspects, tourism potentials in the Lake Tana Biosphere Reserve area at the excursion sites are high. There are different types of potential income from tourism in the Lake Tana Biosphere Reserve. For instance: Guiding, boat service, gift shops, coffee drinking, producing traditional instruments (flutes), marketing gift and cultural jewelries, which came from other places, are attractive in relation to tourism. Various types of agricultural products can also play a great role in this regard. This observation is similar to the thematic group tourism assessment by Amhara national regional state, bureau of industry and urban development that found tourism demand can surely be increased and tourism has the possibility to generate alternative incomes for local community [5]. Traditional ways of food preparation, different production cycles (honey, coffee, traditional beer), crafts (papyrus boat construction, painting) or participation in an Ethiopian coffee ceremony are just some examples for tourism potentials from local livelihoods in the area.

The existence of a tour guide association at Lake Tana BR helps to guide tourists during their visit inside the BR. This is a good thing because with the many tourists who come to the BR, if there was no organized tour guide association, tourists would face a big challenge in exploring the BR and the surrounding touristic sites. Some of the tour guides operating in Lake Tana BR have limited knowledge on some aspects of the BR. They mainly focus on giving tourists site guide inside the BR but with less important scientific and historical information related to the BR. This thus reduces tourist satisfaction and hence a bad impression to BR in general. This issue should be handled by joint efforts between the government and NGOs to train tour guides so as they become professional and provide quality services to tourists who visit Lake Tana Biosphere Reserve. At present, the region is predominantly visited, because of the waterfalls and the monasteries but its various potentials might appeal a wider range of tourists. The nature lover as well as the cultural tourist, the adventurous or more serious such as the old or young budget or high-class customer could feel attracted by the Lake Tana region. In Lake Tana there are different strong



side situations which may be an opportunities for further planning of community livelihood improvement through tourism. Different observers and researchers support that service providers create employment opportunities to a number of people and also generate substantial income directly or indirectly from tourism sector. Service providers also contribute to regional development through tax payment and linkages with other economic activities. Improving the competitiveness of the service providers greatly influences the profitability and sustainability of the business and also national image building. There is involvement of women in tourism activities. In all our visits at Lake Tana BR, it was evident that women were actively involved in tourism related income generating activities mainly sell of craft items (souvenir goods). This has promoted women empowerment and economic stability which is a one of the goals of man and Biosphere Reserves. The land ownership system is common in the area. According to information given to us by the officials we interviewed, the forested land in Lake Tana BR is owned by the community. And they said the fact that the land is owned by the community has enhanced the community to have a big responsibility and love of protecting it.

Despite these potentials in the area; local people's inexperience with tourism will challenge

a demand oriented development. Nowadays, tourism revenues are not an important means of income except for some relatively small beneficiary groups like the local guides. In general, all other local tourism actors like souvenir vendors or coffee/tea shop owners can hardly earn money with their businesses. Almost no money flows back to the community.

In the area 75% of the income is generated from crop and livestock production. The availability of forest, shrubs and field flowers are suitable for honey production. As a result, some households are using traditional and modern beehives producing honey and honey wine called tej. However, such kinds of products are mainly for own consumption or are prepared for festivals and holy days.

In the little town of Tis Abay some farmers opened small shops, restaurants and hotels mainly to cover local demands for food and accommodation. The town has a relatively dense settlement pattern and is an important market place for the surrounding villages as well as the starting point for the tourist circuit around the waterfalls. Next to the Tourist Information Center and along the trek some vendors offer souvenirs (scarves, handicrafts) to the visitors, but supply isn't really diversified and the generated income remains low. The promotion of the artistic products and their cultures such as cultural tradition-

al music (Azmari), cultural foods and drinks in the area are the potential source of incomes for communities from the tourism. Even though there are varieties of tourism potentials and alternative sources of income for community in Blue Nile Falls, accommodation and other types of tourist facilities and services are limited and are a challenge in the area. Tourist facilities and services are important factors that influence the length of stay of tourists in the destination area. In Blue Nile Fall area there is lack of proper accommodation and services for tourists' stay and this decreases the amount of income gained from tourism in the area. In addition to accommodation, other travel services and facilities should be further developed. ■

CONCLUSION

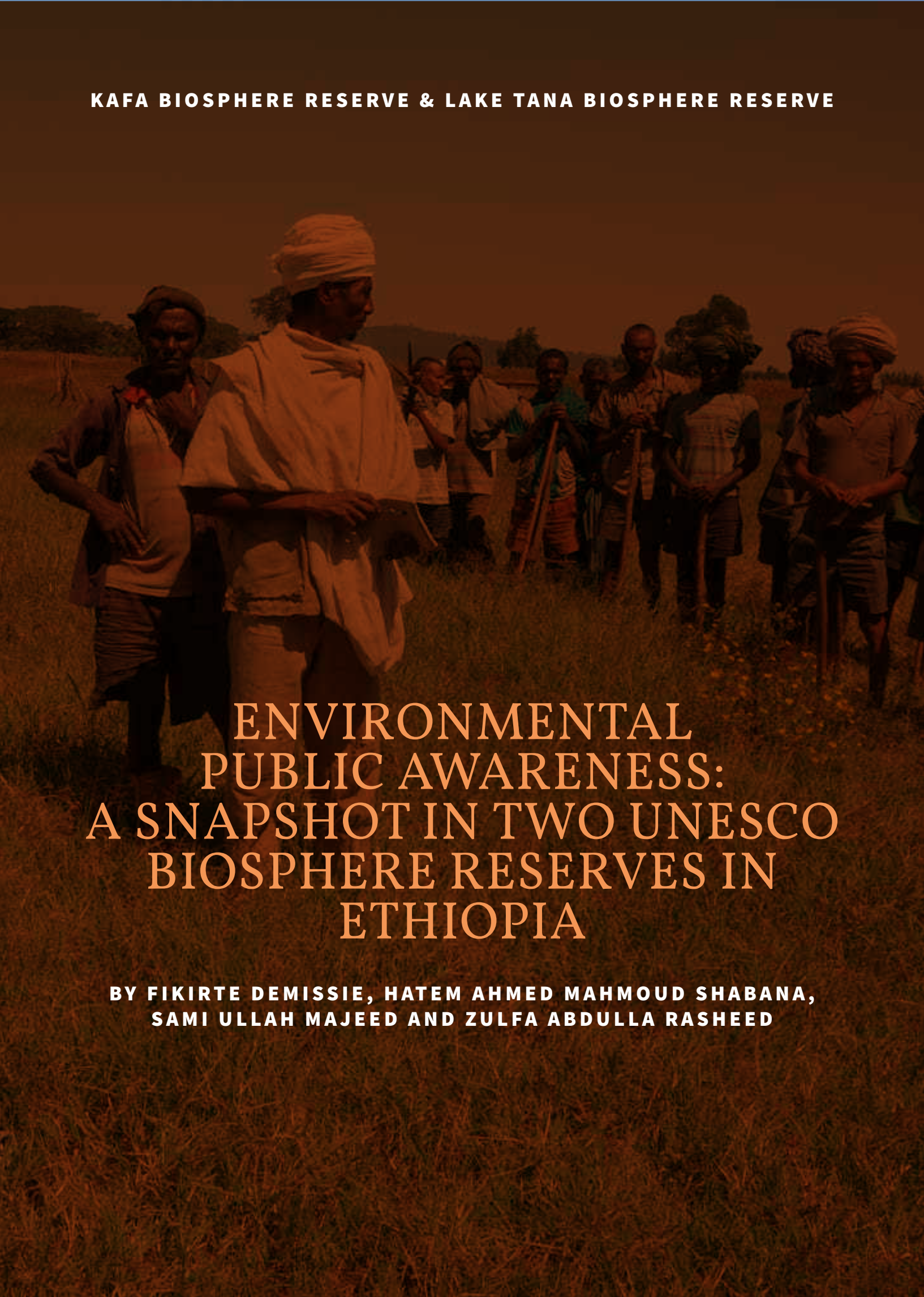
Lake Tana BR has a great potential for tourism. There are different types of income generating tourism opportunities for local residents in the Tana Biosphere Reserve. For instance: Guiding, boat service, gift shops, coffee drinking, producing traditional instruments (flutes, Masinko), marketing gift and cultural jewelries which came from other places and various types of agricultural products activates which are attractive in relation to tourism. But the management is not fully utilizing this vast potential. For instance, tourism activities like providing walk ways, are not properly designed to attract more tourists. Concerned bodies like governmental and non-governmental organizations should facilitate suitable infrastructures in the area. To increase the income from tourism activities and to improve the people's livelihood at a sustainable base, it is very important to work together with the stakeholders through participatory tourism activities. In other words, by initiating the local communities and other relevant bodies to discuss and work together. This cooperation should give emphasis on promoting the tourism capacity of the area, upgrading the infrastructure of the Biosphere Reserve and conserving the sustainable natural resources of the area. Community participation and benefit sharing offers both an opportunity and a threat to communities. If the participation of government in management and improvement of local communities' livelihood are not going together, opportunities will be lost. Therefore, the government should give a chance for the local people to participate in different tourism activities. ■



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KAFA BIOSPHERE RESERVE & LAKE TANA BIOSPHERE RESERVE


ENVIRONMENTAL PUBLIC AWARENESS: A SNAPSHOT IN TWO UNESCO BIOSPHERE RESERVES IN ETHIOPIA

**BY FIKIRTE DEMISSIE, HATEM AHMED MAHMOUD SHABANA,
SAMI ULLAH MAJEED AND ZULFA ABDULLA RASHEED**

ABSTRACT

Environmental public awareness is the strongest way to build public support for the implementation of environmental action plans. There is no doubt that public awareness issues and concerns about the quality of the environment have triggered several forms of public participation in the efforts to protect the environment. Perhaps the most important and common form of participation is through the activities of environmental groups. There is a range of tools for raising public awareness, such as environmental educational programs and public communication.

Interviews were conducted with residents in Kafa and Lake Tana Biosphere Reserve with a special view on lake and wetland management. The effectiveness of public participation depends on the behavior of different individuals. The role of public participation, as well as the means of screening and selecting stakeholders and the role of public members, committees, commissions, and non-governmental organizations (NGOs) are discussed. We conclude with recommendations stating what could be done to have better community engagement. The recommendations include suggestions to the governments and decision-makers in the long term. ■

INTRODUCTION

Ethiopia has been cited as one of the most important biodiversity hotspots of the world, but also one of the most degraded [1]. This will make some drastic changes regarding environmental management necessary in the future. Public awareness is essential whenever a change is sought in the behavior of community or its members. Public awareness of the environment

includes the ability to understand the surrounding world, including the laws of the natural environment, sensitivity to all the changes occurring in the environment, understanding of cause-and-effect relationships between the quality of the environment and human behavior, an understanding of how the environment works as a system, and a sense of responsibility for the common heritage of the Earth, such as natural resources. Awareness shapes a hierarchy of values, and influences the public decision making process by creating a sense of responsibility and negatively incentivizing undesirable behaviors. Governmental and non-governmental institutions that have an impact on the environment and environmental resources also play a role in engaging the community. Not only because of their perceived authority, but because they have a better understanding of what the environment due to their comparatively large amount of resources which allows them to conduct scientific research. But we also affirm these institutions cannot operate in isolation from the population where they are the first affected by any decisions concerning the environment in which they live. This report will measure the extent of both relevant practical sides which are the people's awareness and the role of institutions. Public participation in the environmental activities is concerned with involving, informing, and consulting the public in planning, management, and other decision-making activities which can be considered a part of the political process. This part of the process provides opportunities and encouragement for the public to express their views.

Development programs on environmental protection risk failure if they do not take into account the experience of the people they are designed to benefit. It is necessary to listen to the inhabitants to understand their behavior towards natural resources and to involve them in the decision-making process. A similar case appointed by Nathan James Bennett and Philip Dearden in a paper studying "Why local people do not support conservation: Community perceptions of marine protected area livelihood impacts, governance and management in Thailand" [2]. "The results presented in this paper point to a problematic relationship between National Marine

Parks (NMPs) and local communities that is likely to undermine the success of marine conservation initiatives in Thailand” where 17 NMPs have been studied. The paper found that the communities in Thailand should be more fully included in the management and initiatives that related to the NMP.

To know and understand what is good and what is better, and at the same time commit a wrongdoing, is socially more injurious than committing a wrongdoing in ignorance. Therefore, building, in a society, a new system of values with the aim of creating environmental public awareness, should include systematic training activities aimed at increasing the basic knowledge of ecology and environmental protection, and, at the same time, heighten the sensitivity of individuals to nature.

THE SPECIFIC OBJECTIVES OF THE STUDY ARE TO:

- Assess the public awareness of sustainable use and management of environment in the UNESCO Biosphere Reserves.
- Examine the role of institutions in the sustainable use and management of environment in the UNESCO Biosphere Reserves in Ethiopia.
- Investigate public participation in the sustainable use and management of the environment in Lake Tana and Kafa UNESCO Biosphere Reserves.

The follow two research questions were guiding this work: What is the level of public awareness about the state of sustainable use and management of environment in the UNESCO Biosphere Reserves? To what extent does the community participate in the sustainable use and management of environment in the UNESCO Biosphere Reserves?

“Environmental public awareness is shaped throughout the whole life of particular people living in a given local community, performing specific work and having definite personal characteristics which have a deciding effect on their sense of responsibility and ability to emotionally perceive the environment as having value in itself” [3]. The knowledge acquired during school education and then systematically improved in adulthood is an essential factor in heightening the environmental awareness of an individual and an indispensable condition for the development of a pro-ecological lifestyle. ■



MATERIAL & METHODS

The major stakeholders were interviewed in the visited Biosphere Reserves (Government departments, NGOs and local inhabitants) to know the extent of the awareness the public has and also to gain a better understating of the steps the government and NGOs are taking for maintaining the environment and providing livelihood options to the local population of the Biosphere Reserves. Data for this study was collected mainly from primary sources. The primary sources included both interviews and observations. The data was collected from 3-14 November 2015. Interviews were conducted within 17 local communities who reside in and near the Kafa and Lake Tana Biosphere Reserves. For the interviews, the group prepared questions in English and then translated them into Amharic. In Kafa, a local guide was used to translate the question from Amharic to Kafecho (the most common local language spoken in Kafa Zone). The majority of respondents were male (77%) and fell into the age categories of 26-40 and 41-65 years respectively (41%). The majority of interviewees owned land below one hectare (83%) and depended on more than one

source of income generation activity for their livelihood (94%). Most interviewees were practicing animal husbandry (94%). Of those, about 70% depend on grazing land other than their private land, including lake shore and wetland areas. Moreover, observations were also done to collect data from both sites. The data from the secondary sources were collected from official documents and internet sources. In Kafa zone, there are 112 PFM (Participatory Forest Management) of these we collected data from one of the PFM site called Matapa PFM site. In addition, data was also collected using interviews from Agriculture bureau and NABU. ■

RESULTS

The local communities of both Biosphere Reserves were asked about their awareness regarding their respective Biosphere Reserves. 65% of the total respondents were not aware about the existence of their respective Biosphere Reserve. When interviewees were asked about their awareness regarding environmental protection activities more than half of the respondents were not aware about any ongoing activities. Local residents were also asked about their involvement in environmental protection activities. The survey illustrates that more than half of the respondents are not involved in environmental protection activities. A little more than half of the respondents indicated that they receive some form of support from various institutions.

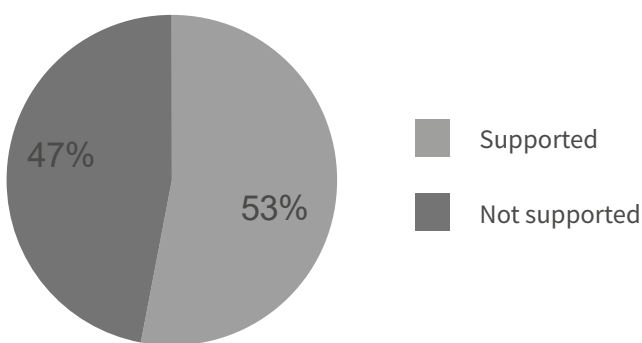


FIGURE 1: RECEIVED SUPPORT FROM INSTITUTIONS

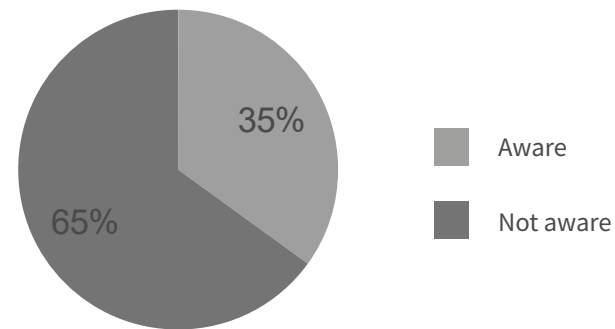


FIGURE 2: COMMUNITY AWARENESS ON THE EXISTENCE OF A BIOSPHERE RESERVE

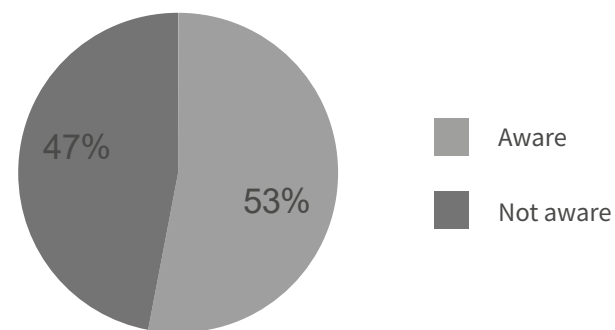


FIGURE 3: COMMUNITY AWARENESS ON ENVIRONMENTAL PROTECTION ACTIVITIES

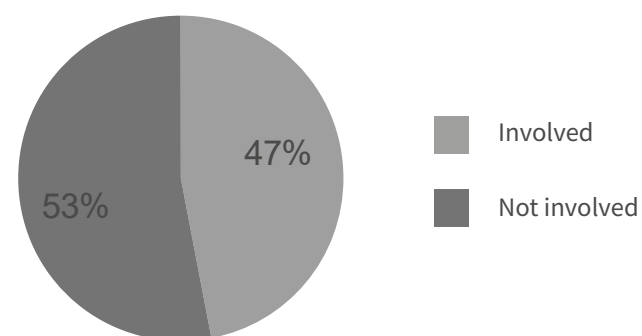


FIGURE 4: COMMUNITY INVOLVEMENT IN ENVIRONMENTAL PROTECTION ACTIVITIES

DISCUSSION

PUBLIC PARTICIPATION IS A KEY PART OF ANY ENVIRONMENT PROJECT:

A high degree of public involvement and commitment is key for the success of any environmental program. To achieve active public involvement the decision-makers must consider environmental education and community participation as a priority in the national and local environmental policies. Public participation should be a part of any environmental project activity starting with the identification of problems, through planning and implementation. The public should be informed of the results, progress, and effectiveness of programs. A higher degree of awareness will increase the proportion of people following the right or safe environmental practices. Thus, high cost to the environment due to lack of awareness can be avoided.

LOCAL SHOULD FIRST ACCEPT THE NATIONAL AND LOCAL PLANS:

National and local development priorities need to be well accepted and understood by government bodies on all administrative levels, and then disseminated through the public appropriately. Especially in rural areas of Ethiopia community bylaws are usually well accepted. New regulations might not be easily accepted, especially if they touch economically important aspects or are in conflict with existing bylaws.

PROVIDING PUBLIC INFORMATION ACCESS:

Effective public participation requires the availability of adequate information. Freedom of public access to information on the environment is one of the basic steps that need to be implemented in order to achieve public participation. Providing access to information will not automatically lead to a significant increase in the degree of public participation in environmental decision-making. Links between information and participation need to be made. This will stimulate the involvement of civil society in decision-making.

ENVIRONMENTAL EDUCATION TO IMPOSE A WAY OF THINKING:

Combining education with environmental awareness is a way to impose an environmental friendly culture based on the new way of people thinking and behaving. For example, simple low-

cost visual aids are effective tools of environmental education including mass communication techniques and teaching and learning approaches. People have to be able to reproduce the environmental knowledge gained and to transfer it in their own words and actions.

ENGAGEMENT OF YOUTH IN ENVIRONMENTAL ISSUES:

The use of youth clubs and associations is a good opportunity to communicate messages. They can be involved in activities related to environmental issues. However, especially youth clubs may need technical support. In addition recognition from adults and project leaders is important to be able to perform ideas. ■

CONCLUSION

Simple materials and approaches are often more effective because they use available resources and can take into account local knowledge and existing communication channels. The traditional ways of communication based on cultural heritage should be taken into account and used, as much as possible. Involving all the partners from the bottom to the top, from the beginning and all through the process, as well as listening and understanding the knowledge and the priorities of the people, is essential to make the public communication process the most effective. The flexibility in working with all stakeholders is very important. Every stakeholder has a different approach to the situation and any program should be able to interpret their needs and suggestion properly to achieve a common ground to work collectively for the betterment of the conservation. The use of pilot "demonstration" projects such as Participatory Forest Management (PFM) should be used by governments and decision-makers to promote ideas and approaches in order to ensure that the policies that come through are manageable and applicable in the long term. This method is suitable for areas that have no access to radio or TV and have few cultural activities. However, it is important to prepare a relevant education program which will be adapted to the local conditions and which will use existing resources, such as people, infrastructure, etc. to increase the awareness in the local community on conservation of the environment. ■

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PART III

EXCURSION IN THE UNITED ARAB EMIRATES

A SHORT INTRODUCTION TO BIOSPHERE RESERVES IN THE UAE

BY MARIA HÄNSEL

In the United Arab Emirates one UNESCO Biosphere Reserve has been registered until now. Marawah Biosphere Reserve has been included in the World Network of Biosphere Reserves in 2007 [1]. To explore the diverse landscapes and ecology of the United Arab Emirates, the group additionally paid an extended visit to the country's first national park, Wadi Wurayah. This site has the potential to be enlarged to a UNESCO Biosphere Reserve in the future, with the present area of the national park serving as a prospective core zone of the Biosphere Reserve.

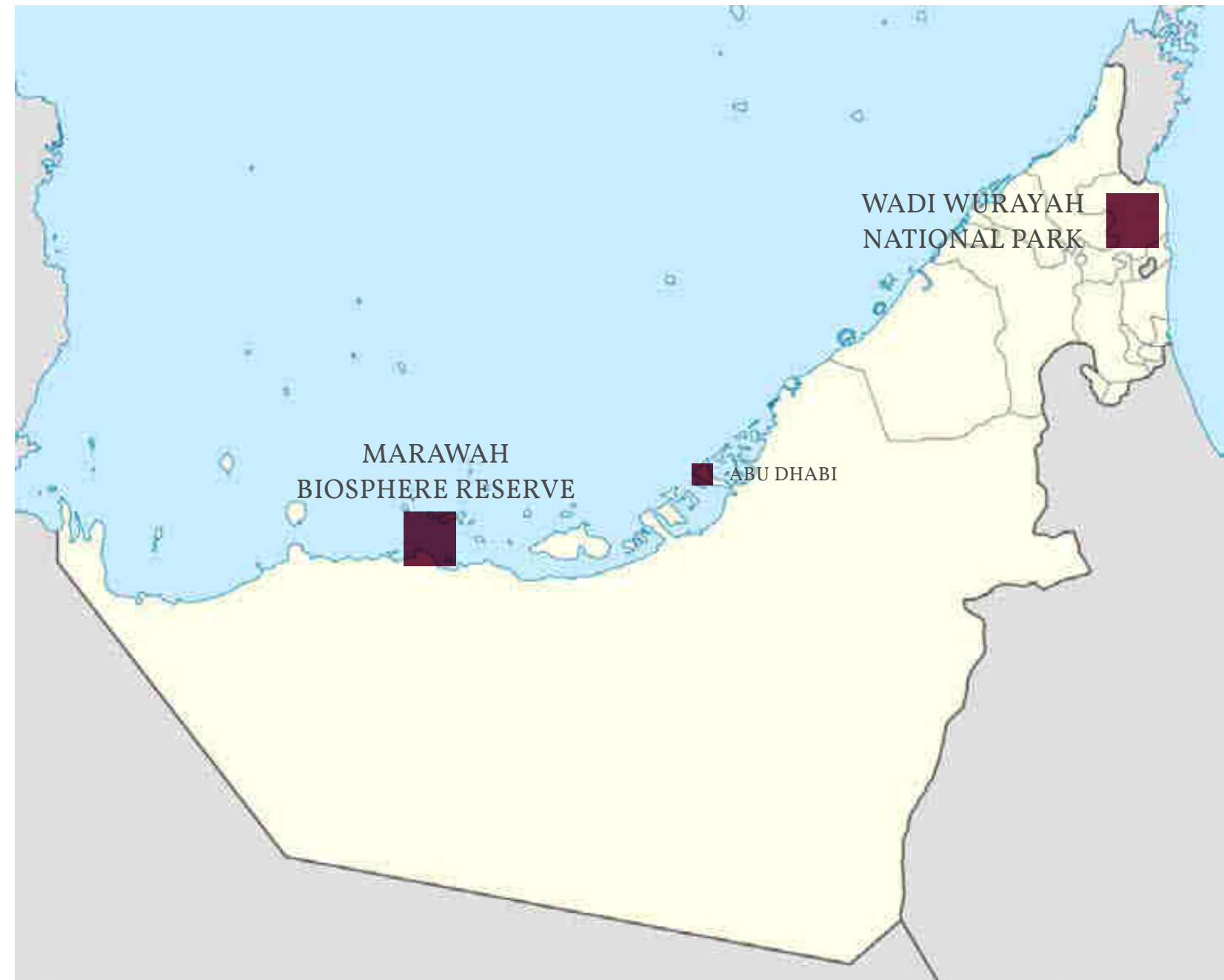
Marawah Biosphere Reserve, situated in Abu Dhabi, is a marine protected area with a total size of around 430,000 ha, including a coastline of over 120 km and a large number of islands [1]. Important habitats include sea grass beds, coral reefs, mangroves and coastal sabkhas (salt planes). It hosts one of the last viable dugong populations, giving conservation efforts in the area international importance. Coral reefs are relatively fragile ecosystems, being very sensitive to environmental changes. The region has seen a notable degradation of coral reefs and coastal ecosystem in general, due to various human pressures including climatic changes [2]. Various archeological sites are present, especially on the islands, with significant findings dating back to Neolithic settlements on Marawah Island [1]. The area serves as important shelter and spawning ground for different fish species and therefore plays an important role for a sustainable local fish supply. Traditional fishing is practiced in designated areas of Marawah Biosphere Reserve. Only modified, traditional gear is allowed to ensure that fishing activities are non-destructive.

The population density within Marawah Biosphere Reserve is generally very low. Most of the islands are not being inhabited at present. The port of Al Mirfa, the biggest city in the area, is one of the important trading centers for fish in the UAE.

Wadi Wurayah National Park has been designated a national park in 2009. It comprises a stretch of the Hajar Mountain Range in Fujairah with a total area of 12,900 ha. Wadi Wurayah is one of the few places in the United Arab Emirates with permanent and intact fresh water resources. It is home to a high number of rare and endangered mountainous and freshwater species [3]. Wildlife is monitored in ongoing surveys, for example using camera traps. Large parts of the national park became Ramsar sites of international importance in 2010 [3]. Traditionally, goat herding was done on the mountain ridges. Signs of early settlements in the area date back to 300 BC [3].

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MARAWAH BIOSPHERE RESERVE

LOCALLY GENERATED INCOME FROM FISHERY AND ITS SUSTAINABLE MANAGEMENT IN MARAWAH MARINE BIOSPHERE RESERVE

BY BIRUK EMIRU, GETNET REGASSA,
HAFTOM HAGOS AND SWAMITI KAKEMBO

ABSTRACT

Fishing is a historical activity practiced globally in bodies of water. It can contribute to the improvement of communities' livelihoods while avoiding the destruction of aquatic life if practiced sustainably. The focus of this study is to provide information on the role of fishing on the socio-economic aspect of local communities inside MMBR. The study area is Al Mirfa, a coastal town inside MMBR which is located 120 km west of Abu Dhabi, UAE. Primary data was generated by interviews and direct field observations of the study team while the secondary data came from written scientific articles and reports. Fishing is a source of employment for many people, both locals and foreigners, in and around Abu Dhabi. Dugongs and turtles are among the protected

species as they are critically endangered. In addition rules apply regarding the extracting of small fish and fish in reproductive stages. These activities are controlled and monitored by government authorities such as the Environment Agency Abu Dhabi and the Abu Dhabi Food Control Authority and Facility Protection Service. There are a limited number of local fish markets because the locals themselves are often fishermen. Due to a large number of fishermen in the area, more patrolling should be done along the coastline to curb illegal fishing. The team size of rangers should be increased to enable easy supervision and patrolling of the fishing areas as well as fish markets. ■



INTRODUCTION

The United Arab Emirates (UAE) is a coastal country extending along both the Arabian Gulf and the Gulf of Oman. The country has numerous islands and lagoons, which provide an ideal environment for an abundant growth of marine resources. Before the discovery of oil, the people living along the coastal regions of UAE depended on the sea for their livelihoods [1]. Maritime trade, boat building, fishing net and trap fabrication, pearl diving and fishing, were the locals' main occupations. Following the discovery of oil in the 1970s, however, the country witnessed great economic and social changes. Although oil is the main source of revenue for the country at present, the government acknowledges agriculture and fisheries as important parts of the economy [1]. Al Mirfa, the team's study area, is a fishing site on the Persian Gulf found in the western region of Abu Dhabi emirate. The study focuses on the fishing activities and their social and economic impact on the people inhabiting Al Mirfa city in Al Marawah Biosphere Reserve.

PRESENT STATUS OF FISHERIES IN UAE

Artisanal boats and fishermen carry out the fishing activities in the UAE. Modern large fishing boats are prohibited within a distance of 24 nautical miles from the coast, thus conserving the marine environment and protecting the fisheries of the country and the interests of artisanal fishermen [1]. The waters of the UAE are characterized by a diversity of species. Pelagic, demersal, and migratory species are available at different periods of the year. The production of fresh fish is considered sufficient to satisfy local demand [1].

The number of fishing boats has also increased, from 1,065 in 1976 to 7,681 in 1998, whereas the number of fishermen engaged in fishing showed an increase from 4,000 to 18,758 during the same period. Fish consumption per capita of UAE nationals (both fresh and frozen fish) was equivalent to about 33 kg. This ratio is considered high compared to other Arab countries as well as the global average per capita consumption [1].

FISHING METHODS ON THE ISLANDS OF ABU DHABI

The fishing grounds used by tarad fishing boats are close to their home ports because of limitations on the range these vessels can travel. Inside the Marawah Marine Biosphere Reserve hadaq fishing (hook and line) is allowed for local fishermen [2]. The total wholesale value of fish landed by tarad fishermen using hadaq in Abu Dhabi Emirate was estimated at 24 million AED in 2008. Kan'aad (*Scomberomorus commerson*), hamour (*Epinephelus coioides*), shaari (*Lethrinus nebulosus*) and jesh (*Carangidae*) were the most valued species, accounting for 30%, 23%, 21%, and 21% of the total wholesale value, respectively. The Abu Dhabi Free Port was the single most important landing site (61%), followed by Al Sadr (19%) and Dalma (9%) of the total wholesale value [2]. Two distinct fishing grounds are identified for lansh (a local word derived from 'launch') boats using gargoors (fish traps) [2]. The fishing ground stretching west from Sir Abu Nu'air is exclusively visited by lansh boats from Free Port in Abu Dhabi. Because of the distance they need to travel, fishermen undertake 3 to 4 trips per month, with each trip lasting on average 3.5 days. They usually deploy the maximum number of 125 gargoors (garagir) each trip. The fishing ground north of Dalma is frequented by the fleet based in Dalma [2]. Due to the relatively short distance they are required to travel, these fishermen take up to 20 daily trips per month, using only 50 gargoors each trip [2]. The total wholesale value of fish landed by lansh boats deploying gargoors in Abu Dhabi Emirate was estimated at 33 million AED in 2008 [2]. Hamour (*Epinephelus coioides*), shaari (*Lethrinus nebulosus*) and jesh (*Carangidae*) comprised the majority, accounting for 52%, 18% and 16% of the total wholesale value, respectively. Abu Dhabi Free Port was the principal landing site, making up 74% of the total wholesale value of fish landed by lansh boats [2]. ■

MATERIAL & METHODS

Marawah Marine Biosphere Reserve (MMBR) comprises several important representative habitats with national and regional significance which include sea grass beds (3 species), coral reef communities (more than 18 species), macro algae outcrops (more than 15 species) and mangrove vegetation (mono stands of *Avicennia marina*). This particular Biosphere Reserve is also of global importance as a shelter and feeding ground for the vulnerable Dugongs (*Dugong dugon*). MMBR lies in the hot desert biome of the Middle East and Western Asia biogeographic region and has combined characteristics from both Arabian Desert and Palearctic bioregions. The local community in the area practices traditional fishing using controlled non-destructive fishing gear. Al Mirfa, a coastal town which is 120km west of Abu Dhabi, is the targeted sample area where interviews were conducted. The town is located at the coordinates of 24°3'56"N and 53°28'26"E and contains many public gardens and the Fisherman's Society.

In Al Mirfa Town, 11 questions were asked of eight respondents of different nationalities. The respondents were first divided into three groups namely fishermen, sellers, and customers which were four, two and two in number respectively. The data is analyzed qualitatively due to the small number of respondents for the prepared questions. The general information gathered from this interview is discussed in statement form in the discussion section. ■



RESULTS & DISCUSSION

Al Mirfa is among the major commercial fishing areas of Abu Dhabi, it's a source of employment and livelihood for many people. This was evident in our interviews with fish sellers as it was clear these people in the fish market relied on fishing and fish selling as their sole source of income. There are different fish species in the market such as: White Jash, Yellow Jash, Hamour, Badha, Gabit, Sheri, Farsh, Safi and King Fish. The fishing of certain species is completely restricted while some fish species are restricted during certain months of the year. Dugongs and Turtles are among the completely prohibited species as they are considered threatened [3]. Additionally, fish in breeding and small fishes are prohibited to extract. This is a good thing because it controls extinction of those species which are highly threatened and also enables reproduction of vulnerable fish species in those specific months of restriction. Different authorities such as the Environment Agency Abu Dhabi, Abu Dhabi Food Control Authority, Facility Protection Service have been doing awareness creation and fish monitoring activities including about the restricted fish species. Al Mirfa Port has been monitored by the Marine Police and the Environment Agency has directly enforced the Marawah marine protected area through its Monitoring, Control and Surveillance Unit (MCS) [4]. There is limited local market for fish because the locals themselves are fishermen so they usually have no need to buy the fish in the market. The market for fish from Al Mirfa is mainly in Abu Dhabi and Dubai to which fish is transported in refrigerated vans to keep them fresh for consumption. The source of fish for Al Mirfa is Al Mirfa itself, Fujairah, Dubai, as well as Sila and Dalma in Abu Dhabi. The establishment of Al Mirfa port has boosted further development of fishing in the area. This helps in facilitating fish exports to neighboring countries like Saudi Arabia and increasing market availability.



Direct government involvement in the management of the BR is a strong point in the proper conservation of Marawah BR resources. EAD is a government agency and is fully in charge of all the activities that take place at the BR. This has reduced bureaucracy in decision making in case of need of implementation of conservation plans and laws and also it helps in proper funding to the BR. There is use of proper modern conversation monitoring tools at Marawah BR. Rangers are equipped with monitoring devices having a specific software developed by EAD which enables them promptly record and report violations happening in the BR. This helps curb violations as violators can be easily reported to authorities as soon as they commit a crime. There is use of modern technology in patrolling as rang-

ers are equipped with patrolling speed boats which help them patrol the marine section of the Reserve easily and efficiently. There are few rangers handling the patrolling and monitoring of the vast area of the BR. This makes work a bit difficult and inefficient and creates room for law violations. The local community has a lot of employment opportunities provided by the BR: jobs like fishing, fish selling, fish transportation, and conservation related jobs like park rangers etc are being availed to the community due to the existence of the BR. Illegal fishing is practiced by some fisher men which poses a threat of reduction of some fish species and possibly eventual extinction of these species if the problem isn't properly solved. ■

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MARAWAH BIOSPHERE RESERVE

الحد الأدنى للأطوال المسموح بصيدها وتسميتها Minimum length at maturity	الاسم العلمي Scientific Name	الاسم المحلي Local Name
25 سم	<i>Carangoides chrysophrys</i>	الجش الصال
25 سم	<i>Carangoides bajad</i>	جش نعيبي
33 سم	<i>Gnathonodon speciosus</i>	الزريدي
24 سم	<i>Argyrops spinifer</i>	الكوفر
25 سم	<i>Rhabdosargus sarba</i>	قابط
36 سم	<i>Lethrinus</i>	الفرش
27 سم	<i>Acanthopagrus</i>	الفسكر
26 سم	<i>Plectorhynchus viridis</i>	ينم
24 سم	<i>Siganus canaliculatus</i>	الصافي
23 سم	<i>Gerres longirostris</i>	البدح
28 سم	<i>Lethrinus nebulosus</i>	الشعري
28 سم	<i>Lethrinus lentjan</i>	الشخيلي

PUBLIC AWARENESS ON THE IMPORTANCE OF FISHING REGULATIONS IN AL MIRFA CITY

BY FIKIRTE DEMISSIE, HATEM AHMED MAHMOUD SHABANA, SAMI ULLAH MAJEED AND ZULFA ABDULLA RASHEED

ABSTRACT

Environmental protection needs to become the first priority in governmental management because mankind's survival requires environmental maintenance and protection. While institutions may try their best alone, they cannot succeed without the cooperation of the communities that they support. The Marawah Marine Biosphere Reserve is like all UNESCO Biosphere Reserves a representative ecological area which aims to achieve conservation, sustainable development, and logistic support for scientific research and education. This study assesses the public awareness of the local community in Al Mirfa City concerning protected and endangered fish species. All fish shops in the city were visited and stakeholders in the fish marketing chain were interviewed. Most of the customers and sellers had no idea that the region is a Biosphere Reserve,

while fishermen knew and appreciated existing fishing restrictions. In their opinion the regulation helped in giving fish the chance for reproduction and secure sustainability in fish stocks. Authorities engaged with fishermen and sellers by giving them instructions and informing them about laws that control fishery of prohibited fish species but without explanation of the benefits of this prohibition to. As for the customers, consumption patterns of fish differs also according to financial ability. Rich customers often buy prohibited fish because they are not aware of the importance of regulations to avoid over-exploitation. Public awareness of the environment in the community, especially among those wealthy enough to afford banned or regulated fish species, might discourage illegal practices due to new awareness of the environmental impact. ■

INTRODUCTION

"Environmental public awareness means, the ability to understand the surrounding world, sensitivity to all the changes occurring in the environment, understanding of cause-and-effect relationships between the quality of the environment and human behavior and a sense of responsibility for the common heritage of the Earth, such as natural resources with the aim of preserving them for future generations" [1]. This philosophy matches the aim of protectorates, specially, Biosphere Reserves. Each Biosphere Reserve promotes solutions reconciling the conservation of biodiversity and its sustainable use [2]. The Biosphere Reserve is a representative ecological area with three mutually reinforcing functions: conservation, sustainable development, and logistic support for scientific research and education [3].

Marawah Marine Biosphere Reserve (MMBR), the largest marine protected area in the Persian Gulf (425,500 hectares), is situated west of Abu Dhabi (UAE), and is home to important marine and coastal ecosystems including sea grass beds, coral reefs and mangroves. The Reserve also hosts 60% of the second largest population of dugongs in the world [4]. It includes numerous islands and has a coastline stretching over 120km. It is divided to three Zones: Bu Tinah and Al Bazm are core areas, where access is prohibited for all except MMBR staff and accompanying researchers. Buffer zones allow limited activities such as diving and traditional fishing by residents of Al Mirfa and the local fishermen. In the transition zone more activities are allowed, yet the Federal law no. 24 of 1999 concerning the protection and development of the environment in the United Arab Emirates applies. In addition all general regulations of the MMBR are apply in this zone [4].

Local communities practice traditional fishing methods using controlled non-destructive fishing gear thereby preserving the local endangered fish species. Fishing is only allowed in designated areas of the MMBR and is limited to traditional fishing methods that include fixed net (locally called Hadhra), shore net (locally called Al Sakkar), and seine nets (locally called Daffara). All of these traditional fishing activities were evaluated and modified to ensure that they are environmentally friendly [2].

To ensure laws regarding fishing regulations are properly enforced, endangered fishes species that require restrictions in some parts of the year are listed for those people who deal with fish (fishermen, traders, sellers and customers). Especially in Al Mirfa the largest city inside MMBR public awareness has utmost importance to ensure the proper management of endangered fish species. The objectives of this study was to Assess the effectiveness of the laws and awareness programs of some institutions on the public awareness of people and their cooperation in sustainable use, management and conservation of rare and endangered fish in Al Mirfa City, Marawah Marine Biosphere Reserve (MMBR), United Arab Emirates (UAE). ■

MATERIAL & METHODS

From April 10-12, 2016 interviews with relevant stakeholders in the fish marketing chain were conducted. The group visited experienced fishermen, three fish shops (all the shops in city), the fishermen's association, the Environment Agency Abu Dhabi (EAD) representative in Al Mirfa as well as the new building that gathers the new fish market and new fishermen's association building. All Individuals (fishermen, sellers, customers and institutions representatives) were asked questions that discussed the targeted issues. A total number of eight individuals participated in the questionnaire, two sellers (workers), two customers, three fishermen and one EAD representative in his office (Fish trap blacksmith). The Age of most of the respondents was between 30 and 40 years old and two were above 60 years old, all of them were male, seven were Emirati and one was from Pakistani. The low number of interviewees allowed only to capture a qualitative impression of the situation and cannot be considered statistically representative. ■



RESULTS

The fishermen (4 individuals) were aware of the protectorate, while the sellers (2 individuals) did not know about it and only one of the two customers was aware of its existence (Figure 1). The fishermen had generally a good attitude towards the existence of the protectorate as they found that it helped in organizing the area between the stakeholders. This would then eventually lead to sustainable fishing behavior. There were however also critical voices stating that regulations would limit their work and benefit fish stocks and not necessarily fisherman. Existing laws protecting fish were known to most individuals (86%). The Environment Agency Abu Dhabi (EAD), Al Mirfa municipality, Facilities Protection Service (Army) and Abu Dhabi Food Control Authority were the authorities known by six individuals to be dealing with awareness and monitoring fishing activities. Most individuals (86%) knew which fish to catch. The 14 most highly consumed types of fish were generally known to be regulated for size and during breeding seasons (Figure 2). Dugongs and turtles were mentioned by only one fisherman to be completely prohibited.

According to the EAD representative the common methods of fishing are Al Salia (fishing net), Al Halaq (encircling net), Al Defara (encircling net), Ghazal (gill net for large pelagic fish). According to two fishermen thread and fishhook are most common.

Al Mirfa is an important trading center for fish in the UAE. Prohibiting certain fishes species might encourage fishermen to catch more of the unregulated fish species (according to three individuals) since the overall demand of fish does not change (according to two individuals). This in turn would also cause a price increase of up to three to five times of the original price (according to three individuals) (Figure 3). The average kilograms (kg) sold per day according to both sellers was between 150-300 kg/day. One of the two sellers agreed that there were fluctuations in the fish prices without explaining why this occurred. Prices of fishes were fair and acceptable for one of the customers (Pakistani), while was expensive for the other one (Emirati). When asked about the willingness to buy prohibited fish, most individuals (5 fishermen) showed that they would not buy it and some of them would report it too, while one customer showed that he would buy it if he needs it. ■

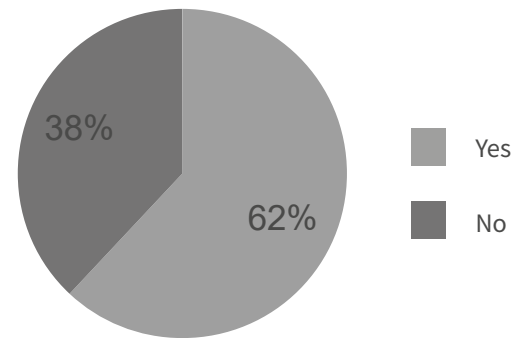


FIGURE 1: SUMMARIZED ANSWERS OF ALL INTERVIEWS REGARDING THE QUESTION: ARE YOU AWARE OF THIS BEING A PROTECTED AREA?

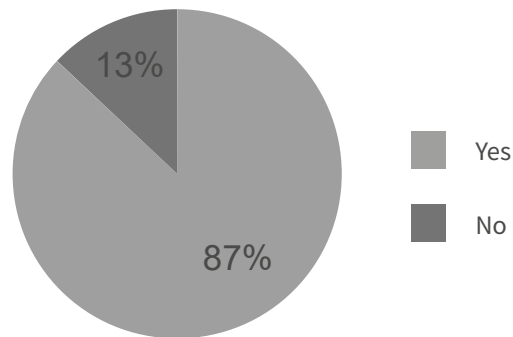


FIGURE 2: SUMMARIZED ANSWERS OF ALL INTERVIEWS REGARDING THE QUESTION: ARE YOU AWARE OF LAWS PROTECTING FISH?

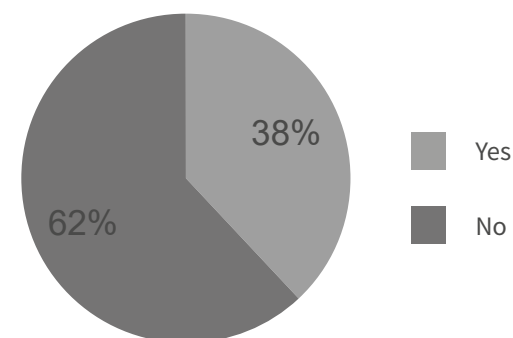


FIGURE 3: SUMMARIZED ANSWERS OF ALL INTERVIEWS REGARDING THE QUESTION: IS OTHER FISH BEING CAUGHT MORE DUE TO THE BAN OF CERTAIN SPECIES?



TABLE 1: SUMMARIZED STATED PRICE DIFFERENCE BY INTERVIEWED FISHERMEN REGARDING THE PRICE THEY WOULD GET PER KILOGRAM OF FISH PER SPECIES IN TIMES OF HIGH SUPPLY VERSUS TIMES OF LOW SUPPLY

Fish species	Price if supply is high	Price if supply is low
Khayat	10 AED/kg	30 AED/kg
Hamour	15-40 AED/kg	60-70 AED/kg
Kan'aad	10 AED/kg	40 AED/kg
Al Jesh	40 AED/kg	70 AED/kg
Shaari	15 AED/kg	70 AED/kg



DISCUSSION

The total whole sale value of fish landed in the Emirate of Abu Dhabi was 105.6 million in AED 2014. In Al Mirfa city (2014), a total catch of 620 tonnes was caught by Lansh and Tarad (fishing vessels) [5]. Al Mirfa city is inhabited by a population of about 29,000 residents causing the area around the islands to be exposed to many threats including additional pressure on fish stocks in addition to commercial fishing. According to both sellers in the questionnaire, the average amount of fish sold per day was between 150-300 kg. The EAD regulate the fisheries of Abu Dhabi in pursuit of achieving sustainable exploitation and in order to maintain control and monitor fishing activity they issued licenses and permits that are required by law [6]. Whilst there are a wide variety of methods, the main fishing gear type used to target demersal species is the Gargoor which is a dome-shaped wire trap, they are licensed to fishermen on lanshes (deep water) only. Hadaq (hand line) is usually operated in combination with the Gargoor fishing method. Demersal fishing methods such as Sakhar, Hadhra and Defara (encircling net) are mainly operated by tarad fishermen as these gears are confined to shallower waters. Other popular fishing gears include Ghazal, and Nesaab [5]. Many methods used in fishing by fisherman but the famous method (Gargoor) mentioned by fishermen and not mentioned by EAD Representative because it used only in deep water so not used in sites inside protectorate but they mentioned that they are used out protectorate and inside the permitted sites.

Although sellers and customers did not know about the protectorate and its laws, they knew which species of fish were prohibited. Sellers receive a list from authorities with the prohibited fish without explanation. The customers only knew about it by going to the shops and then not being able to find specific types of fishes. This also implied that if people found these prohibited types of fishes in any time of the year they would buy it. It is especially important to raise public awareness regarding the negative impact of overfishing. If customers refuse to buy prohibited fish species, fishermen will most likely not try to catch them thereby greatly reducing the amount of environmental harm.

As for the customer, buying fishes differs not just according to the issue of the fish being available or no but also according to financial



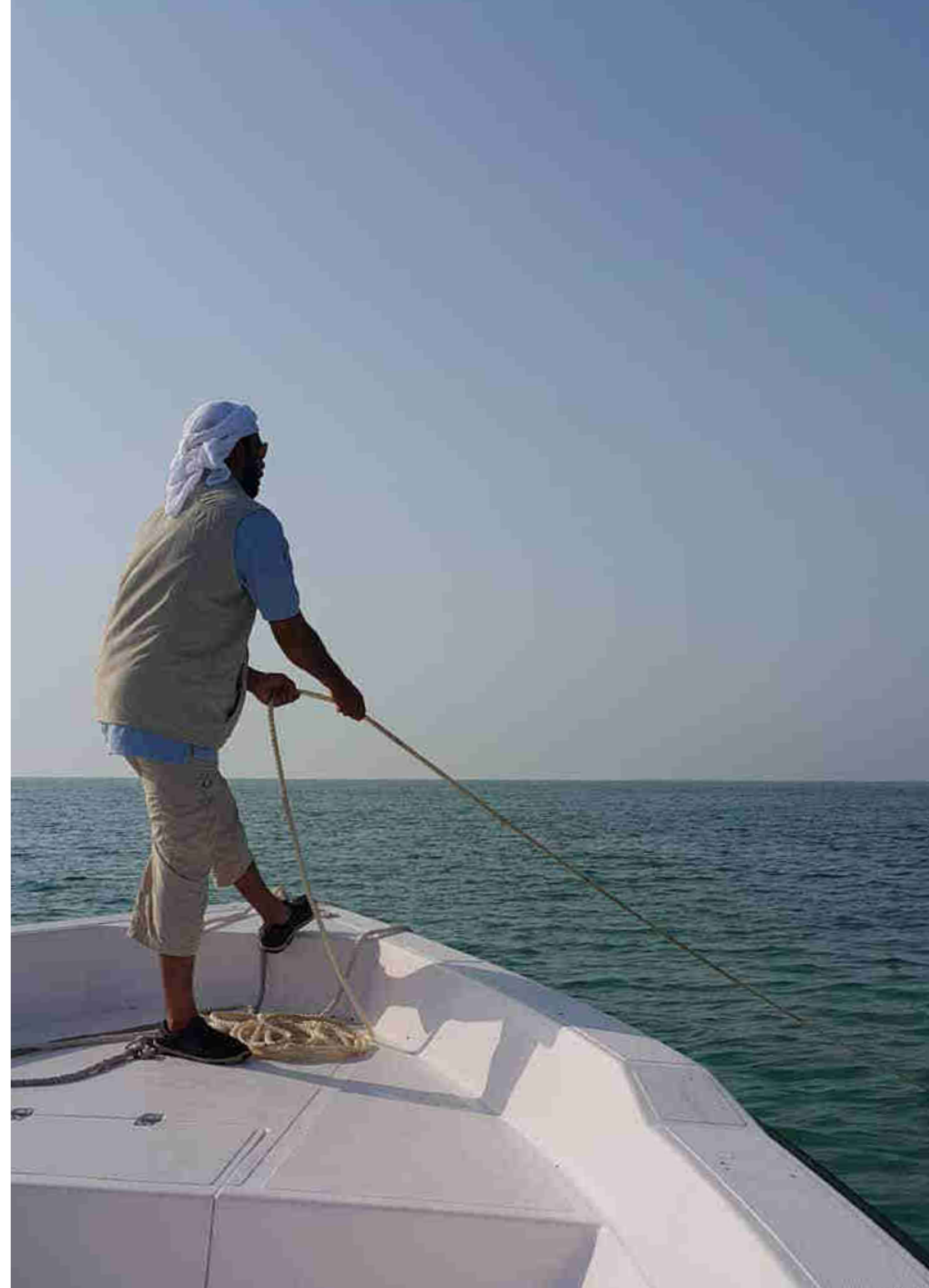
ability and from one nationality to another, for example, we find the Pakistani customer buy the available cheap fish, so he does not have a problem with the price as he always adapt his needs to it, while the Emirati customer find the prices expensive because he may buy specific kinds of fish that he mostly likes even if they are expensive, so the worry is that he may do the same with the prohibited types and buy it if it was found illegally if he is not well aware of the importance of fish sustainability and this assured by the answer of one customer that was ready to buy a type of fish that may be prohibited just because he needs it, so awareness of the customers should increase to help in saving the rare and endangered species as they are mostly desired by them. On the other hand, all fisher men knew about the protectorate and prohibited fishes and they even declared that they would report any illegal fishery activity (catch, sell or buy) and this was logical from them as it would conflict with his benefits. This confirms that the customer and his awareness is a basic side in conservation and protection of prohibited fish. ■

CONCLUSION

Awareness efforts should be increased and expanded, especially among people who buy fish, to stress the importance of resource conservation and the positive effect that sustainable use of resources can have on the community. Fish farms of endangered fish species can decrease the pressure on wild stocks and allow fish existence all the year and avoid any illegal fishing. Gathering all the shops with the fish market in one place would facilitate its monitoring and control. This plan will most likely be implemented in the soon future. This aggregation of customers, sellers and fishermen in one place can also be used for future awareness campaigns. For that purpose, awareness techniques that are convenient and culturally sensitive should be used. Engagement of NGOs in environmental awareness effort could be beneficial to reach a larger audience. ■

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WADI WURAYAH NATIONAL PARK

SHIFTING TO WATER EFFICIENT CROPS IN FARMS AROUND WADI WURAYAH TO REDUCE WATER CONSUMPTION

BY FATIN NASER ALBREIKI, KHULOOD SALEM BIN MAHFOODH,
TESFAU BEKELE AND ZAHRA MOHAMMED

INTRODUCTION

Irrigation agriculture is common in farms around Wadi Wurayah. The farmers' major source of freshwater for irrigation is from digging wells inside their farms and pumping the water. Those wells are fed with water coming from upstream areas of the wadi. Considering the high number of farms around the wadi, and the huge amount of water pumped by each farm, freshwater is over exploited in these areas. Increasing salinity of the ground water is the consequence of over pumping water [1]. The quality of groundwater usually deteriorates downstream because water dissolves salts from the gravel deposits with extended time. However, this process is accelerated when saltwater intrusion from Gulf of Oman into the eastern gravel aquifer because of the intensive pumping activities to meet increasing demand of irrigation and domestic water [2]. Plantation of citrus trees in all farms, which is known to consume a lot of water, is one of the main drivers for high water use.

Shifting to water-efficient crops that only need a lower amount of water could be a solution to over exploitation of ground water. The aims of this study are to understand, the perception of farm owners around Wadi Wurayah on their water consumption and how well they know about the over exploitation of fresh water for irrigation, to discern solutions to encourage them shifting to crops requiring less amount of water, and to determine how the government influences their crop choices and therefore their water usage. This will then allow the evaluation of their willingness to change the structure of the farms to contribute to less pressure on ground water.

OBJECTIVES:

- Evaluate the knowledge of farms owners and workers regarding the effects of over pumping of freshwater
- Identify the connection between the government and the farms and water usage
- Understand what will be the incentive of farm owners to shift into local crops plantation

ABSTRACT

Over pumping of ground water in farms around Wadi Wurayah will be a serious challenge in the near future. Seawater is replacing fresh water, making the groundwater more saline and therefore unusable for irrigation. One of the major drivers behind over pumping of fresh water is the cultivation of water intensive cultures like citrus trees, grown in the majority of farms. To understand the incentives that would make the farmers shift to local crops instead of citrus, a survey was done on 11 farms around Wadi Wurayah. In addition an interview was done with one municipality representative to study the connection between government activities and water usage in farms. Results showed that majority of the farms were for personal only, indicating that the owners do not depend on them as a source of income. In addition, the municipality appeared to have no influence on the farmers' usage of water. Therefore, one of the solutions proposed to reduce the pressure on ground water is to specify the types of crops the farms can plant. A second solution is to initiate a stronger linkage between the municipality and the farms to monitor their water usage and educate them regarding the environmental effects of over pumping water. ■

MATERIAL & METHODS

This study was conducted based on interviews with farm owners and workers and with one municipality representative. The surveys were done on 11 farms around Wadi Wurayah. The survey tried to determine the water consumption of farms and the environmental knowledge of farmers including types of crops planted, the source of water, how often the irrigation is done and on the known effects of over pumping. Further questions were asked to evaluate how much owners depend on their farms for income and to understand what farmers would do differently in the future if they were limited to a specific amount of water for irrigation. While some of the farmers spoke Arabic, many spoke only Urdu. This proved to be only a minor inconvenience because one of the team members was able to communicate in the language.

Questions to the municipality representative involved the connection between the municipality and the farms around the wadi, the monitoring activities and the challenges to these activities. ■

RESULTS

TYPE OF CROPS AND IRRIGATION

All of the farms surrounding Wadi Wurayah use individual wells. The frequency of irrigation according to interviewed farmers is every 2 to 3 days in summer and every 4 days in winter. The types of crops grown in the farms visited were mango, banana, cucumber, papaya, dates, lemon, orange, jujube, lime, and other citrus fruits. Some of these require high amounts of water, citrus crops can consume up to 64 liter of water per day in winter and 511 liter of water per day in summer [3]. This is however also depending on the size of the tree. However there are some other crops found in the farms that do not consume high amounts of water such as dates.

GOVERNMENT EFFORTS

The survey also set out to find if the local government promoted public awareness regarding water use efficiency in the community surrounding Wadi Wurayah. The results of the survey showed that the government did very little in this respect. Only 2 of the 11 surveyed farms stated that officials did visit their farms (see figure 1). Yet only measuring of water levels were done and no attempts to discuss water conservation issues with farmers.

An interview was conducted with an official of Fujairah Municipality from the Environmental Sector. During this interview, the interviewee stated that plans to manage and monitor fresh water in Fujairah were developed in 2014 which mainly pertain to fresh water used for irrigation

in farms. This plan is still under study. Currently, the municipality is unaware of the amount of water used for irrigation and has no records of the number of wells found in the area around Wadi Wurayah. She also stated that the old wells are still in use however to dig a new well permission is needed. According to her, monitoring activity is lacking due to the high number of farms that are surrounding the area.

KNOWLEDGE AMONG FARMERS

The survey showed that the majority of the farmers in the farms have very little or no knowledge regarding the effects of over pumping (Figure 2). On the other hand, farmers were already noticing changes in water quality, namely higher salinity. However, the causes of these changes were not well understood and more wells were dug to meet the problem. Moreover, some farmers believed that if water is left untouched and would not be pumped it would start to rot. The majority of interviewed farmers had no formal agricultural education (Figure 3).

IMPORTANCE OF THE FARMS TO THE OWNERS

The majority of the farms do not contribute to their owners' incomes; they are passed on from generation to generation and therefore they play important cultural and traditional roles. As shown in Figure 4, 10 from the overall 11 farms surveyed did not depend on the income generated from the farms because their produce is used only for personal use and not sold to the market. ■

FIGURE 1: NUMBER OF FARMS THAT HAVE BEEN VISITED BY GOVERNMENT OFFICIAL IN THE PAST

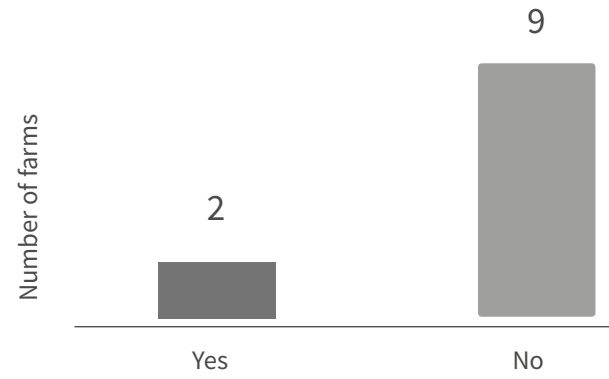


FIGURE 2: KNOWLEDGE LEVEL OF INTERVIEWED FARMERS REGARDING THE EFFECTS OF OVER PUMPING

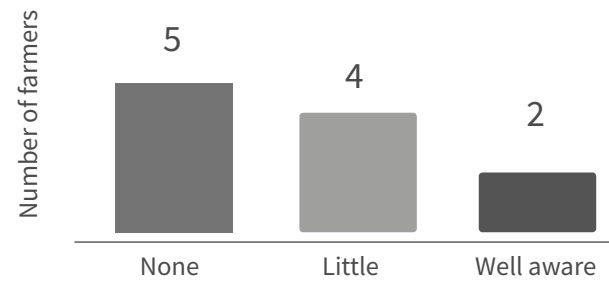


FIGURE 3: NUMBER OF FARMERS THAT TOOK FORMAL, NONE AND INFORMAL AGRICULTURAL TRAINING

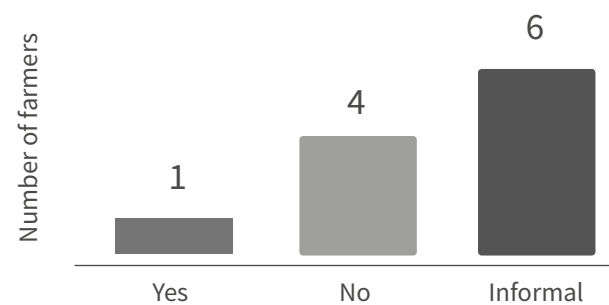
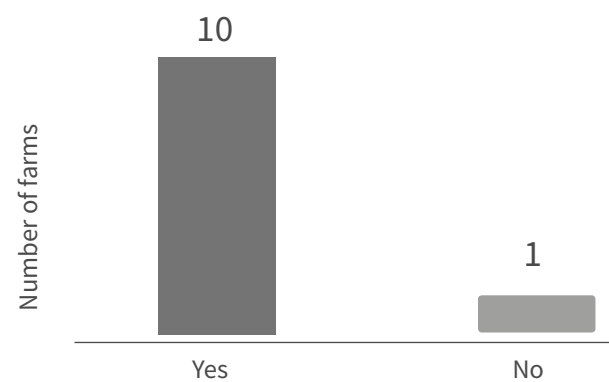


FIGURE 4: NUMBER OF FARMS PRODUCING FOR HOME CONSUMPTION ONLY



DISCUSSION

The results of the survey showed that farmers surrounding Wadi Wurayah do not plant local crops on their farms but instead water-intensive ones such as papaya, citrus, and banana. This is alarming because these crops are not suited to be grown in a water deficient country like the UAE. The land would be better off if farmers farmed local crops such as dates and other crops that do not consume much water or to crops that can tolerate saline water. Officials should put in some effort and provide incentives to the farms to shift into local farming. So far only weak efforts have been done by the municipality of Fujairah in the area around Wadi Wurayah. What is additionally aggravating the situation is that the majority of farm managers have no formal agricultural education and hence they are unaware of the resulting environmental problems of excessive water use.

A good solution to combat the problem of over digging of wells would be to specify the types of crops to be planted. This could for example be dates and other plants that do not consume a high amount of water. Because owners of these farms do not depend on these farms for income there should be relatively low resistance. In return for putting regulations in place regarding the types or quantity of crops farmers can grow, the municipality of Fujairah should provide some sort of compensation. The shift to planting local crops will help the environment by maintaining the quality and quantity of water available as well as maintaining the quality of the soil. ■



CONCLUSION

In conclusion, there is a lack of communication between farmers and officials in the area around Wadi Wurayah. It is essential that these two parties come together in their efforts to find a solution. A solution could be shifting from the current water-intensive crops to local crops that are better adapted to the environment of the Emirate of Fujairah. To ease the transition between the different crops, the government should give incentives to farmers. Also the Fujairah municipality should apply machines in each farm that monitor the amount of water being pumped and used. This will allow the municipality to track the levels of consumption and find well adapted solutions.

A more comprehensive study should cover most farms around Wadi Wurayah. This will give more insights into the possible solutions of the issue of saline water taking the place of fresh water due to over pumping of fresh water. ■

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WADI WURAYAH NATIONAL PARK

PERCEPTION OF GRAZING REGULATIONS AROUND WADI WURAYAH NATIONAL PARK

BY ABRAR HUSAIN MADDI, RAHEL BEKELE,
SAMAR GAMALELDIN ABDELSATTAR GEWILY AND THARINDU KAVINGA

ABSTRACT

Overgrazing by goats around Wadi Wurayah National Park is a major problem facing the park's environment as it contributes to the depletion of natural resources and adversely affects soil. Farmers around Wadi Wurayah often tend to graze their goats outside their farms by allowing them to be released into the mountains. The main reasons behind this habit are due to the health of the goats, natural fodder and its costs. Overgrazing phenomena increased over the past years, making government regulations necessary to ensure ecosystem functions. In order to know more about the overgrazing regulations from the farmers' perspective, a survey was conducted on 22 farms around Bidiyah, near Wadi Wurayah. Results demonstrated that most of the farmers are aware of those overgrazing regulations. However, they lack insight regarding their importance and therefore do not follow them.

Moreover, the majority of the farmers do not favor the regulations as they hinder their ability to practice farming as it has been done traditionally in the area. For improved results, it is recommended that the government sets fines for those goat farmers infringing regulations, while providing incentives for those operating within the bounds of the regulations. Furthermore, enforcing a regulation requiring a microchip in each goat's leg would be effective in keeping goats out of protected areas, as it operates by alarming and notifying the stakeholders whenever the goats pass on specific areas that are prohibited. ■

INTRODUCTION

Wadi Wurayah National Park, located in Fujairah, one of the seven emirates of the United Arab Emirates, is a 22,400 hectare area between the towns of Masafi, Khor Fakkan and Bidiyah on the Oman Gulf Coastline [1]. A large part of it has been designated as a Ramsar wetland of international importance. From 2006 to 2009, the emirates wildlife society in association with World Wildlife Fund (WWF) promoted the conservation of Wadi Wurayah concluding with the official protection of the site by HH Sheikh Hamad Bin Mohammad Al Sharqi, supreme council member and ruler of Fujairah, as the first mountain protected area of United Arab Emirates [1]. Emirates Wildlife Society-World Wide Fund for Nature (EWS-WWF) has been continuing its cooperation with the Fujairah municipality for the conservation management of the wadi [2].

Wadi Wurayah, a home to delicate ecosystems and endangered species, is truly a treasure of the region. It is one of the few areas in the UAE that contains unique biodiversity in flora and fauna, as well as intact freshwater resources. The area also holds significant cultural and historical importance, with archaeological sites discovered dating as far back as 300 B.C. In spite of this decorated history, Wadi Wurayah today faces many threats. Urbanization, overexploitation of water resources, overgrazing of domestic animals like goats, poaching, hunting and habitat degrading through human activities, such as littering and lighting fires all take a toll on this fragile but precious habitat that is home to some of the country's most fascinating species.

One of the greatest ecological problem facing UAE inland desert is excess grazing. Though camels are the main cause for this in Dubai and hors-

es contribute as well, both goats and feral donkeys are considered the main problem in other emirates. Overgrazing is known as the excessive grazing of plants by wildlife or livestock. It occurs when an excessive amount of green material is repeatedly removed from a plant and it does not have sufficient leaf mass to reproduce. Residual plant matter is needed to hold the soil and prevent erosion by water and wind. Overgrazing is also defined as the presence of too many animals on the land for too long, or at inappropriate seasons such that the land becomes degraded. Moreover, overgrazing can lead to several consequences, such as soil erosion, loss of soil depth, reduction in soil fertility and soil organic matter. Most of the UAE is heavily overgrazed, but there is a great reason to hope for the future. The desert ecosystem has an outstanding ability to recover after conditions changed, whether the stress is a long drought or a change in the land management. The roots of most plant species survive several years even when there is almost nothing left of the plant above the ground. Some species can appear as a dead stump for several years before springing to life again. Therefore, most of the desert's rangelands should be able to revert to their former states. Before this can happen the desert needs to be freed from the burden of overgrazing.

This report is targeting the environmental problem of goats overgrazing and its regulations in the area of Wadi Wurayah. The aim of the study is to identify enforcement of biodiversity protection in the national park, and what kind of regulations are applied at the moment and to identify what can be done in the future in terms of better accepted laws by the community. ■

MATERIAL & METHODS

The study was conducted within the farms that are around Wadi Wurayah National Park. The majority of the studied farms are located in Bidiyah. The main reason for choosing to conduct the study in that particular area is because Bidiyah farms are close to Wadi Wurayah hence the farmers often exploit the natural resources of the national park such as the freshwater. Farmers who own livestock lead their goats to graze on the mountains for several reasons. In order to study this environmental issue, a questionnaire which contained multiple questions regarding overgrazing of goats was conducted.

It targeted the local farmers whose farms were close to Wadi Wurayah, so therefore, they may practice overgrazing of goats while depending on Wadi Wurayah for many things. 22 farms in Bidiyah were visited by the group of the four participants in three days in order to meet the local owners of the farms. At the time most of the farms that were visited, foreign laborers were the only people present. Eight different questions were asked to the farmers. Although some of the questions that were directed to the labors were not answered due to lack of awareness, the phone numbers of the farms' owners were provided in order to contact them and get the unknown answers of the skipped questions. ■



RESULTS

■ Question 1 "Do you think goat farming activities have a positive or negative impact on the environment?" The majority have a very positive point of view towards the impacts of goat farming activities. Around 54% of the farmers think it is beneficial for the local environment. Some of them said yes it is, because visitors enjoy to see animals and by encouraging reproduction in plants as they feed on. 18% of the farmers responded that it has no effect or no benefit to the environment. Interviewees stated that because goats are part of nature and could therefore not hurt the environment. 27% of the farmers had no answer to these questions and few were unaware.

■ Question 2 "Why do you rear goats?" We received multiple answers from each farmer. 41% of the farmers had three reasons why they rear goats. 18% farmers had two reasons, 23% had a single reason why they rear goats, 9% had no reason and at last 9% of the farmers left the question unanswered. Farmers who listed more reasons for rearing goats tended to have more goats. Keeping up local tradition, was the most common reason stated. Others mentioned income generation as their main reason.

■ Question 3 "What were your past and what are your present herding techniques?" During the past, 55% of the farmers release their goats outside to feed themselves during summer. 18% released their goats deliberately to the mountains while 9% of the farmer used to feed the animals on the farm. No answer was give by 37% of the farmer. In winter, 55% of the farmers fed their goats outside. A total of 9% of farmers released the goats to the mountains, while it is unknown where the remaining goats go as the farmer releases them to wander freely. 9% farms feed their goats. 37% of the farmers left it unanswered and some refused to answer. This summer, 59% of the farmers feed the goats inside their farms and do not release them. Out of this percentage, some mentioned that they either buy fodder or cut it from the mountains. 14% of farmers release their goats outside to feed. 27% had no answer and some were unwilling to answer the question. At the time of the interview, 27% of farmers released their goats outside. 45% farms fed their goats, and some have mentioned that they either buy fodder or cut it from the mountains. However, the majority responded that their farms are the source of fodder. 27% of respondents had no answer and some were unwilling to answer the question.

■ Question 4 "Why do you prefer mountain herding?" 5% of the farmers had five reasons for why they prefer mountain herding, and another 5% had four reasons for the question, 14% had three reasons, 14% gave two reasons, 18% of the farmers had only a single reason behind herding at the mountains, the remaining 41% of the farmers specified their own reasons, for example, the health of the goat will be better, natural feed and normal way of grazing were some of the answers they gave and some left the question unanswered.

■ Question 5 "Where do you get your goat fodder from?" 18% had three suppliers that they get fodder from, 32% answered that they get it from two sources, while 41% had only one source of fodder. 9% had no response and had no sources for their fodders which is most likely releasing them outside, since this is the only other way to feed them. The majority had only a single source of fodder. This suggests that if this single source fails they may turn to the park's mountains or other sources for feed.

■ Question 6 "What grazing regulations are known to you?" 64% of the farmers questioned responded positive to the regulation but only 9% of the 64% farmers were aware about the mountains grazing regulations, the major percentage only knew that it is not allowed to release them outside their farms. The remaining 37% had no background about any kind of laws, and some were unwilling to answer the question. This illustrates that the majority know that the law is there, but only a small percentage of those are aware of restrictions and other facets of the law, specifically those related to mountain areas.

■ Question 7 "How do you feel about regulating grazing?" 14% of the farmers agreed with regulations, while 27% of the farmers had neutral feeling towards regulating grazing, 5% of the farmer disagreed with the regulations. Furthermore, 41% of the farmers strongly disagreed.

■ Question 8 "What would be your preferred way of regulating grazing?" 45% of the farmers had no answer for this question and some had shown unwillingness, while the rest of the farmers gave one to two suggestions.



DISCUSSION

More than half of the farmers view goat farming in a positive light as they think it has a good impact on the local environment and because it promotes tourism. None of the farmers questioned said it has a negative impact on the environment. This positive attitude towards goat farming among the locals might have increased the number of goat farmers in the recent past. The main stated reason for farmers to keep goats was for the sake of keeping up the tradition. Since goat farming is something the community grows up with, it could be a strong reason to keep the practice in the future.

Over half of the farmers surveyed used to release their goats outside their farm to feed them in the past. The number of farmers who feed their goats on their farms have increased throughout the years while the percentage of farmers who release their goats outside their farms has decreased. They started using fodders and farm feeding as an option rather than releasing them outside.

Releasing the goats on the mountain to feed is the preferred way to feed their animals by the majority of interviewed farmers. Most of them assumed that this would produce healthier and better tasting goats. Furthermore, farmers cited feeding their goats on the mountain as more cost effective than paying for food for their goats. The majority of farmers have one source of fodder for their goats, if the source fails, they would be forced to look for another source of fodder. They may release their goats outside which includes the mountains where they might overgraze because the majority release them without any goat herders. The area is under considerable pressure [3]. Beginning in the 1980s, the exploitation of Wadi Wurayah has been mitigated because of its status as a protected area, but domestic goats and donkeys have escaped, or were released into the wild, and have become feral over time. Overgrazing was previously not identified as the primary threat for Wadi Wurayah ecosystems. Due to the extirpation of the native wildlife, feral goats have now become an essential part of the diet of the few Arabian leopards and caracals in the region, and are the most observed ungulate in the Wadi Wurayah National Park [3,4].

Although over half of the farmers are generally informed about grazing regulations, only few are aware about the mountains regulations, especially not connected to regulations regarding Wadi Wurayah National Park. The awareness of



the farmers about the regulations of grazing in the mountains could help with the decreasing of the number of the goats released there. The majority of farmers are not in favor of regulating grazing, few have neutral feeling about it while the rest agree with it. Since most of the farmers have no interest in grazing regulations, the majority had no interest in discussing means of regulating grazing. As mentioned above, many farmers have a positive point of view regarding goat farming and have no interest in suggesting ways of regulation themselves. ■

CONCLUSION

Many farmers have a lack of knowledge regarding the overgrazing dilemma in the UAE. Although some farmers are aware of overgrazing regulations, they do not participate and follow the laws due reasons related to individual desire and the health of their animals. Based on our findings, it is recommended to provide incentives to the local farmers to encourage grazing goats on their own farms, as well as enforce financial penalties for those not compliant with the government's laws. In addition, microchips planted in the legs of goats in the area that warn stakeholders of goats trespassing in prohibited areas could be a useful tool. ■

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