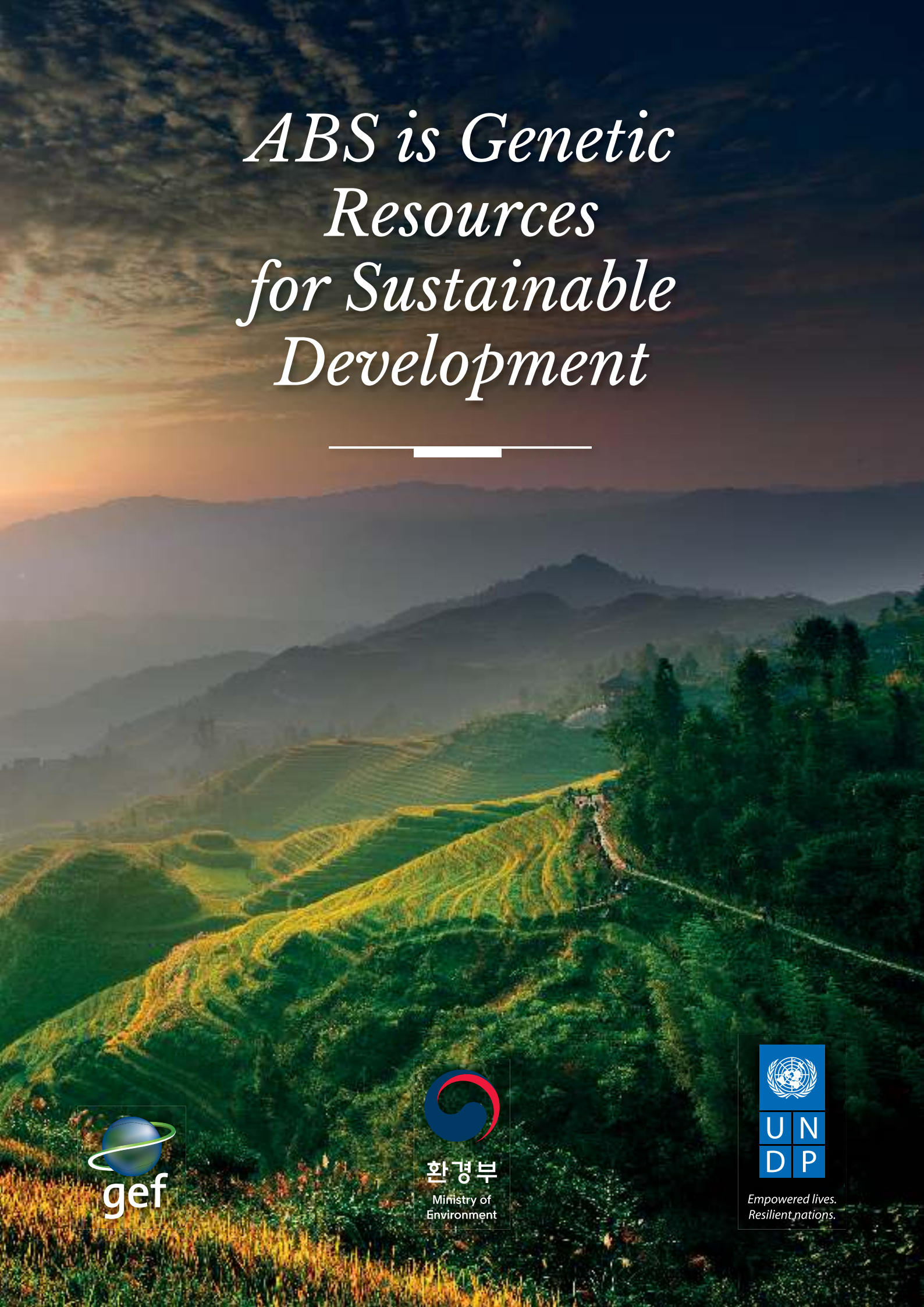
ABS is Genetic Resources for Sustainable Development

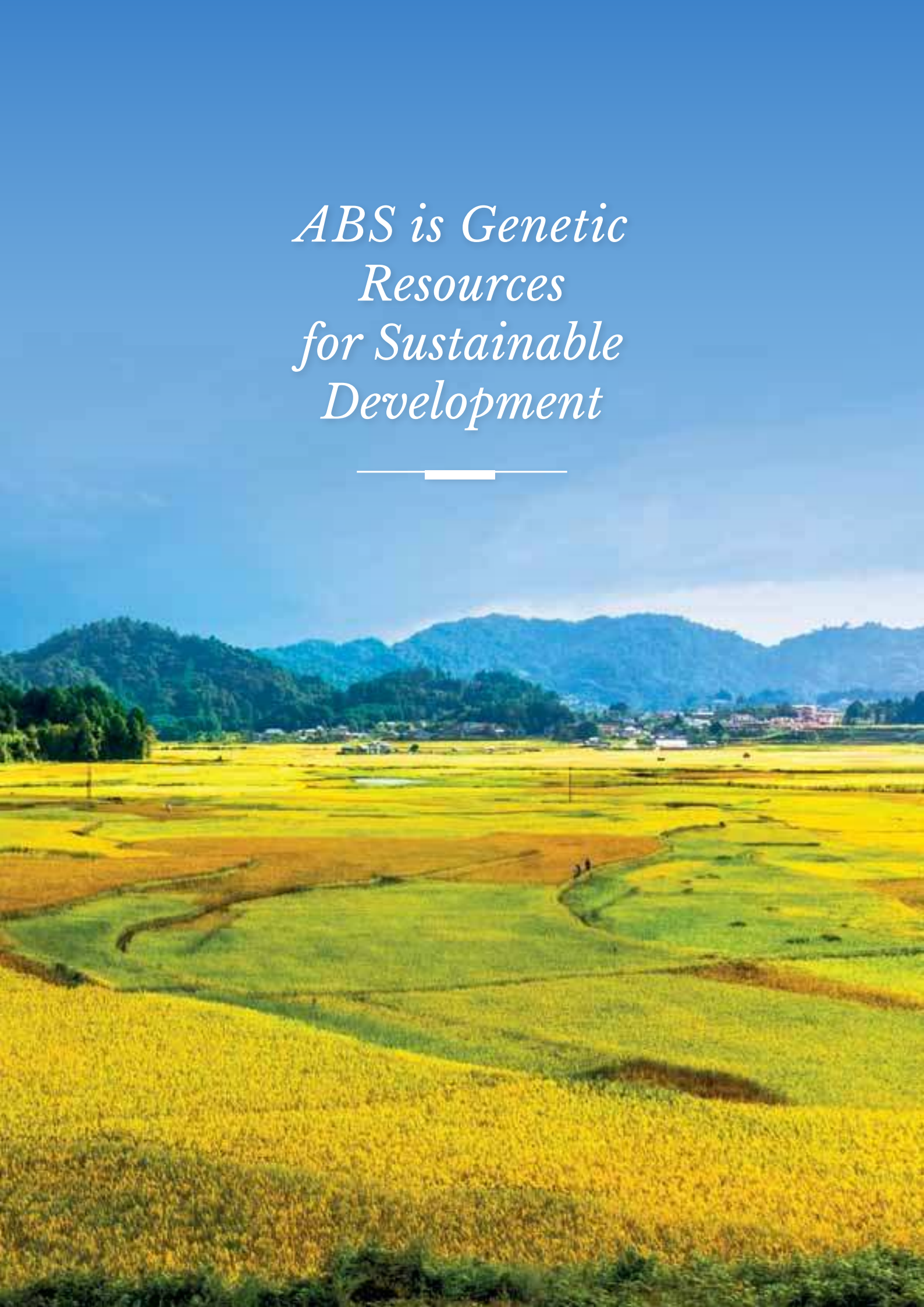


gef

환경부
Ministry of Environment

UNDP
Empowered lives.
Resilient nations.

ABS is Genetic Resources for Sustainable Development



Empowered lives.
Resilient nations.

UNDP partners with people at all levels of society to help build nations that can withstand crisis, and drive and sustain the kind of growth that improves the quality of life for everyone. On the ground in more than 170 countries and territories, we offer global perspective and local insight to help empower lives and build resilient nations. www.undp.org

The Global Environment Facility (GEF) was established on the eve of the 1992 Rio Earth Summit to help tackle our planet's most pressing environmental problems. Since then, the GEF has provided over $17 billion in grants and mobilized an additional $88 billion in financing for more than 4000 projects in 170 countries. Today, the GEF is an international partnership of 183 countries, international institutions, civil society organizations and the private sector that addresses global environmental issues. www.thegef.org

Published by:
UNDP – Global Environmental Finance
Sustainable Development Cluster
Bureau for Policy and Programme Support
United Nations Development Programme
304 East 45th Street, 9th Floor, New York, NY 10017, USA

Executive Producer: Midori Paxton
Project Leader and Managing Editor: Santiago Carrizosa
Project Coordinator: Alejandro Lago
Chapter Editors: Patrick E. McGuire, Santiago Carrizosa, Anja Cedric, and James Oladipo Ayodele
Compilation: Alejandro Lago, Fouad Bergigui, Claudio Chiarolla, and Anthony Foronda
Peer reviewers: Jorge Cabrera, Anthony Foronda, and Vidya Vijayaraghavan
Design: InkDesign Publishing Solutions, Cape Town, South Africa, www.inkdesign.co.za
Printing: Renk Matbaasi A.S., Istanbul, Turkey.

Other photographs: See page 239 for a full list of photographer credits. We would like to thank the many people in UNDP country offices around the world, and in partner institutions, who have assisted with collating information, drafting sections of text, assisting with sourcing or supply of photographs, and reviewing draft material. A full list of acknowledgements is provided on page 239, at the back of the book.

CONTENTS

Foreword 6
Message of support 8
Introduction 9

AFRICA **10**
Botswana 12
Cameroon 20
Ethiopia 28
Kenya 36
Republic of South Africa 44
Rwanda 52

ARAB STATES **60**
Sudan 62
The Hashemite Kingdom of Jordan 70

ASIA **78**
Bhutan 80
China 88
Kazakhstan 96
Mongolia 104
Myanmar 112
Tajikistan 120
Viet Nam 128

CENTRAL & EASTERN EUROPE **136**
Albania 138
Belarus 146

LATIN AMERICA & THE CARIBBEAN **154**
Argentina 156
Colombia 164
Costa Rica 172
Dominican Republic 180
Ecuador 188
Mexico 196
Panama 204
Uruguay 212

PACIFIC ISLANDS **220**
Cook Islands 222
Samoa 230

Acronyms 238
Acknowledgements 239
Photographers 239
Tribute to Dr Edna Molewa 240

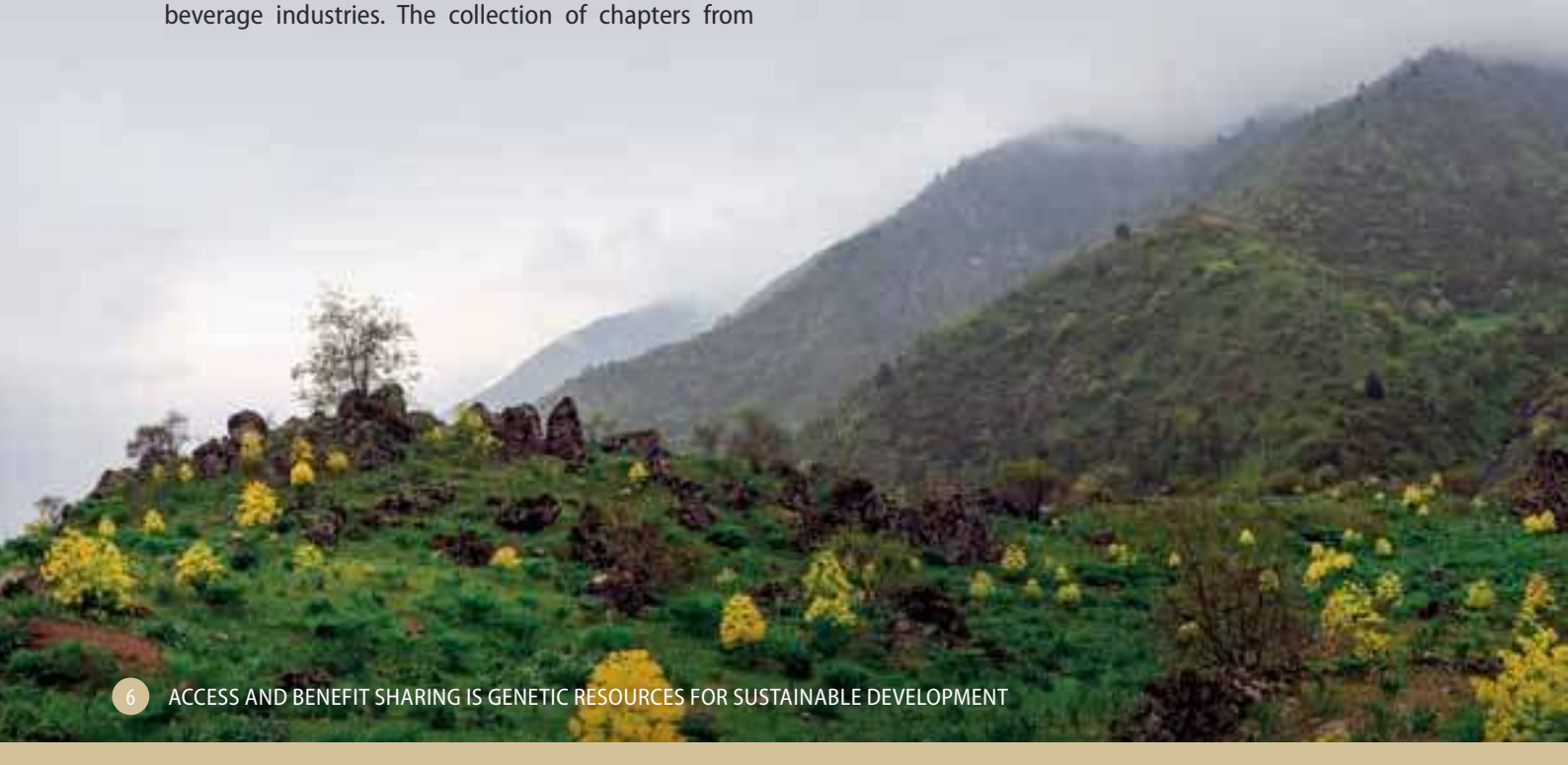
FOREWORD

The power of innovation, derived from traditional knowledge, science and technology, has transformed genetic resources into medicines, food, beverages and many other products which are indispensable for human existence on this planet. In fact, it can be argued that both genetic resources and innovation underpin sustainable development.

For millennia indigenous peoples and local communities have managed genetic resources and today, they continue to be essential to sustain the livelihoods of communities. About 75% of the world's population relies upon – largely plant-based – traditional treatments for primary healthcare. Old and new agricultural varieties that can anticipate the impacts of climate change need to be maintained to sustain a growing population. The biotechnology industry is constantly harnessing living organisms to develop pharmaceuticals, cosmetics, and crop protection agents that can be used as substitutes for harmful chemicals that pollute rivers and oceans. The energy and manufacturing sectors are also using micro-organisms to degrade pollutants and clean up polluted sites, to provide energy, and to help make paper and detergents.

The publication "ABS is Genetic Resources for Sustainable Development" unveils the potential of genetic resources to develop novel products for the agriculture, crop-protection, pharmaceutical, personal care and food/beverage industries. The collection of chapters from 27 countries provides a glimpse into the intricacies of biodiscovery stories, their contribution to the Sustainable Development Goals (SDGs), and the role of local stakeholders in the development of national laws and policies that facilitate access to genetic resources and ensure that benefits are shared between the users and providers of these resources.

This book illustrates efforts supported by the Global Environment Facility and UNDP, carried out by governments, local communities, and the private sector to implement the three objectives of the Convention on Biological Diversity; namely, the conservation of biological diversity, its sustainable use and the equitable sharing of benefits derived from the utilization of genetic resources. While not all the countries showcased in this publication are Parties to the Nagoya Protocol on Access and Benefit-Sharing (ABS), all of them have signed the Protocol and have been inspired by the Protocol to develop or strengthen their ABS policies, laws and institutional capacity at all levels.



This book also shows that genetic resources are strategic for achieving the SDGs. The stories of the eyewitnesses and sustainable development advocates in each chapter demonstrate that genetic resources truly are accelerators of the 2030 Agenda for Sustainable Development. Genetic resources are contributing to poverty alleviation (SDG 1), food security (SDG 2), good health and well-being (SDG 3), gender equality (SDG 5), innovation (SDG 9) and life on land (SDG 15), just to name a few. Furthermore, the biodiscovery stories are excellent examples of national and international partnerships (SDG 17) needed to promote all the SDGs.

Genetic resources are indeed a treasure trove of the planet that need to be harnessed for present and future generations, and there exists a clear link between biodiversity use and economic growth. The Nagoya Protocol provides a platform for the equitable sharing of benefits that facilitates both the sustainable development of indigenous peoples and local communities and the continued conservation of our natural capital for many years to come.

NAOKO ISHII
Chief Executive Officer and Chairperson of the Global Environment Facility

ACHIM STEINER
Administrator, United Nations Development Programme

CRISTIANA PAŞCA PALMER
Executive Secretary, Convention on Biological Diversity

MESSAGE OF SUPPORT

Humankind has always managed genetic resources in daily life selecting seeds, improving varieties through breeding, obtaining secondary products with fermentation processes (i.e. bread or beer) or cultivating or collecting medicinal plants. In the last 40 years, modern biotechnology has broadened the usage and value of genetic resources so that now they can be the raw materials for new processes of innovation and new products with extremely high values.

At the top of the biotechnology market is the pharmaceutical industry, followed by agro-industrial, phytosanitary, food and beverages, and cosmetic sectors. A common unfortunate characteristic of all those sectors was that they did not provide any benefit back to the country where the genetic resources came from. With the international and national implementation of the Nagoya Protocol, the challenge is still to realize the fair and equitable sharing of the benefits derived from the utilization of the genetic resources with the full participation of all the relevant actors (governments, indigenous peoples and local communities, research community and private sector).

South Korea became a Party to the Nagoya Protocol on August 17 2017, reaffirming the commitment that had been expressed with the organization of the 12th Conference of the Parties (COP-12) of the Convention on Biological Diversity and the 1st Meeting of the Parties (MOP-1) of the Nagoya Protocol in Pyeongchang in October 2014. Since then, South Korea has been collaborating with other countries in the region and different international organizations to promote the full implementation of the Protocol.

Drawing on the significant body of work financed by the Global Environment Facility (GEF), and supported by the United Nations Development Programme (UNDP) and its many partners, this publication `ABS is Genetic Resources for Sustainable Development`, showcases a selection of case studies from 27 countries that highlight not only the impact of the Nagoya Protocol into the Sustainable Development Goals (1, 2, 3, 5, 8, 9, 11, 14, 15 or 17) but also how the new biodiscoveries are bringing concrete sustainable development opportunities. This publication demonstrates how the Nagoya Protocol can play a crucial role in bringing new opportunities of development at the local level in particular, for those that are the custodians of biodiversity.

I believe that the examples showcased in the publication will be an important source of inspiration to broaden the implementation of the Nagoya Protocol globally. Biodiversity is the key element in sustaining the global ecosystem and securing the future of the mankind and therefore it is a precious heritage for us to protect and pass down to the next generations.

Only if we properly value our biodiversity and genetic resources, we will be able to secure its conservation and sustainable use. I hope that this publication will accelerate our work for biodiversity conservation and greatly contribute to the global implementation of the Nagoya Protocol.

CHUN-KYOO PARK

Vice Minister, Ministry of Environment, Republic of Korea

INTRODUCTION

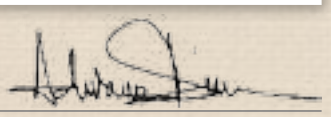
The 2014 Nagoya Protocol on Access to Genetic Resources and Benefit-Sharing (ABS) has brought renewed impetus to the ABS policymaking process by calling upon each nation to establish clear rules and procedures that bring legal certainty and security to both users and providers of genetic resources. Consequently, today more than ever, countries are actively engaged in the development of national policies to regulate ABS. The Protocol has also been brought to the attention of national and international users of genetic resources, who are approaching countries to access their genetic resources, develop products, and make sure that the benefits derived from the utilization and marketing of these products are shared equitably with the providers of these resources. Stakeholders are becoming more aware of the strategic role genetic resources play in fostering the 2030 Agenda for Sustainable Development advanced by the United Nations since 2015, and this is one of the key objectives of this book.

This publication reveals the impact of the Nagoya Protocol and national ABS frameworks in 27 countries from six regions, Africa, the Arab States, Asia, Central & Eastern Europe, Latin America & the Caribbean and the Pacific Islands. The chapters are authored by experts and practitioners from government, research institutions, indigenous peoples and local communities. Each chapter covers one country and is focused primarily on one biodiscovery case, which is basically a story of how traditional knowledge, science, technology and human ingenuity have been used to develop novel products from genetic resources. Eyewitnesses and sustainable development advocates provide a personal account of impacts of the biodiscovery case, including a reflection on key challenges and how they were overcome.

The innovations described in the book target the industries of agriculture, crop-protection, pharmaceutics, food/beverages and cosmetics, and this is a good indicator of the significant local capacities of these 27 countries. In fact, one of the most interesting findings of this publication is that most countries rich in biological and genetic resources have developed local scientific and technological capacities which, together with traditional knowledge, are harnessing the potential of genetic resources. This situation was not common over 25 years ago when the Convention on Biological Diversity came into force. Furthermore, today countries are using the Nagoya Protocol, coupled with national science policies, as a strategy to continue increasing their scientific and technological capacity and ensuring that benefits of biological and genetic resources are shared equitably amongst users and providers of genetic resources.

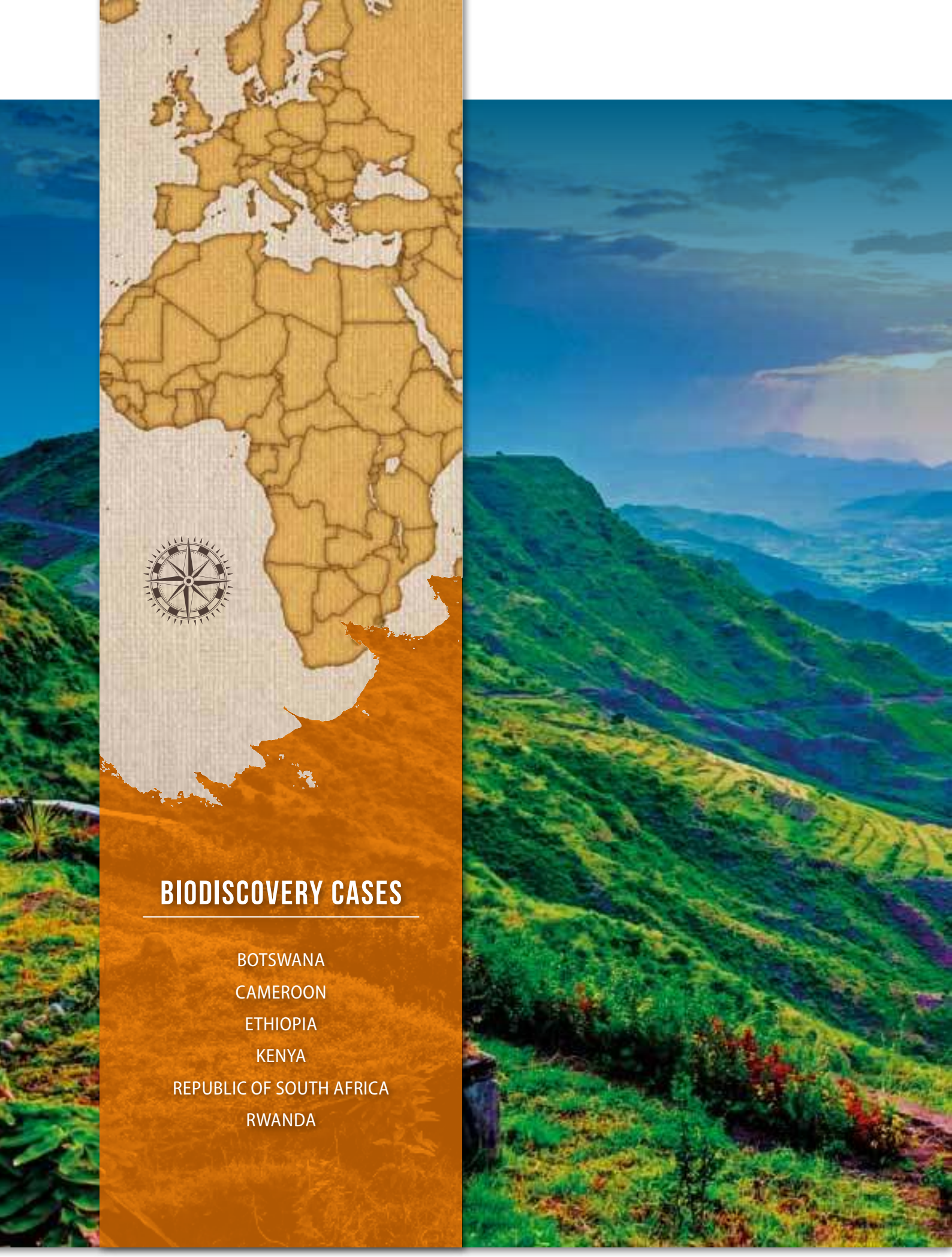
This book is also a visual celebration of our biological, genetic and cultural diversity. The reader will be taken on a journey around the world, visiting different countries and landscapes and meeting indigenous peoples and local communities, scientists and policymakers. Covering different corners of the world, from Jordan within the ancient Fertile Crescent region where genes still contribute to new varieties of lettuce, to the humid jungle of Chocó in Colombia where a dye is being used by the food industry, the stories of this book reveal how trust is being built and how these innovations facilitate implementation of the Sustainable Development Goals of the United Nations.

This book demonstrates that the future for the sustainable use of biological and genetic resources is here. We hope you enjoy the journey through these countries, their biodiscovery cases and peoples, as much as we enjoy working with them.



ADRIANA DINU

Executive Coordinator, Global Environmental Finance
Bureau for Policy and Programme Support
United Nations Development Programme



BIODISCOVERY CASES

BOTSWANA

CAMEROON

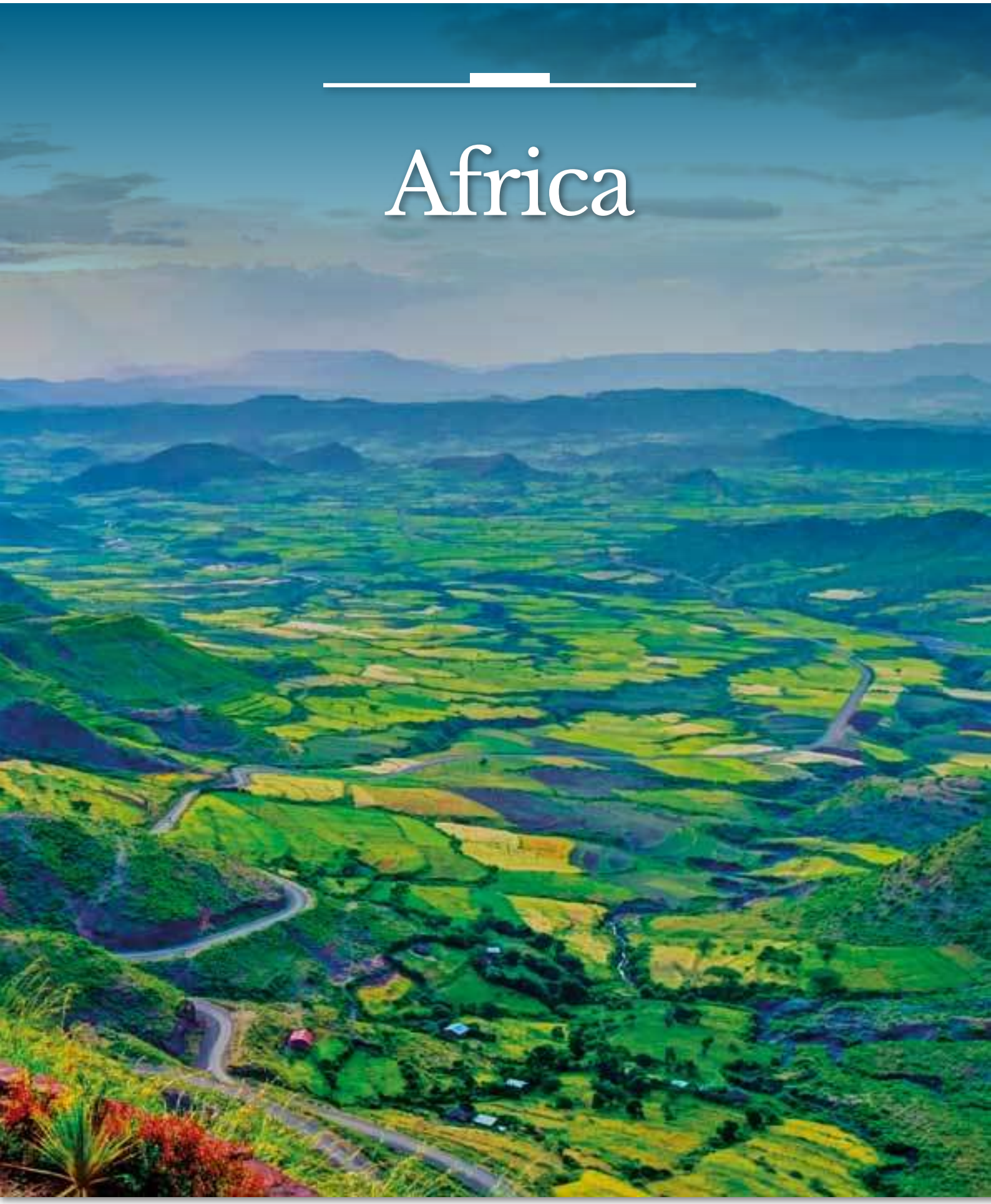
ETHIOPIA

KENYA

REPUBLIC OF SOUTH AFRICA

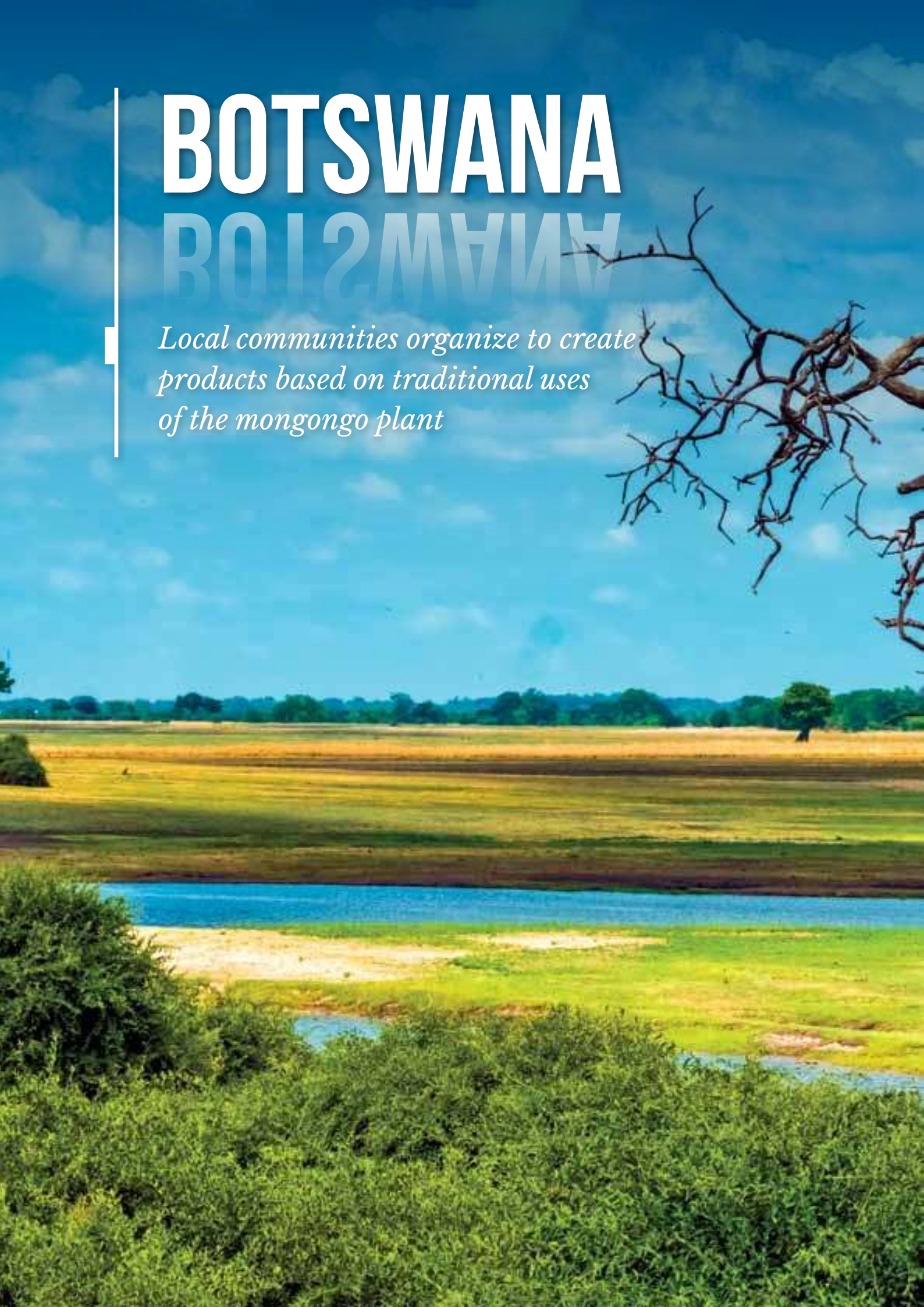
RWANDA

Africa



BOTSWANA

Local communities organize to create products based on traditional uses of the mongongo plant



AUTHORS

DINEO GABOREKWE
Access and Benefit Sharing (ABS) Project Officer, UNDP

INNOCENT MAGOLE
National Project Coordinator, Ngamiland Sustainable Land Management (SLM), UNDP

ODUETSE KOBOTO
Programme Specialist, Environment and Climate Change Specialist, UNDP

KEBAABETSWE KEOAGILE
Principal Natural Resources Officer II, Department of Environmental Affairs (DEA), Ministry of Environment Natural Resources Conservation (MENT)

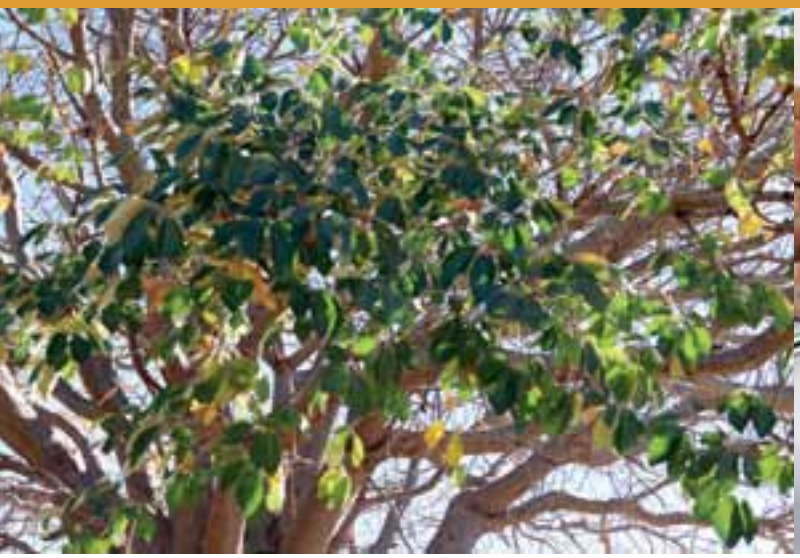
MOSIMANEGAPE NTHAKA
Principal Natural Resources Officer I, Department of Environmental Affairs (DEA), Ministry of Environment and Natural Resources Conservation (MENT)

SETTING THE SCENE

Botswana is a richly endowed country that has 13 endemic species, 10 potentially endemic and 7 near-endemic plant species, while 43 plant species are listed as threatened species. Botswana is habitat to over 157 species of mammalian fauna, 587 species of avifauna, 99 fish species, 131 reptiles, 44 amphibians, 252 invertebrates per the 2016 National Biological Diversity Strategy and Action Plan. This on its own speaks of the diversity and potential of the genetic resources that the country offers. Botswana's population of about 2 024 787 people is spread over the 582 000 km^2 of the vast ecoregions, which also denotes the diversity in the use of biological resources and associated traditional knowledge.

There are several research institutions that provide a backdrop of knowledge on the genetic resources, such as the University of Botswana's science-based departments, Botswana University of Agriculture and Natural Resources (BUAN), Botswana International University of Science and Technology (BIUST) and University of Botswana-Okavango Research Institute (UB-ORI). However, there are not many institutions that are currently working on the valorization of genetic resources. The few that are include the National Food Technology Research Centre (NFTRC), Kgetsi Ya Tsie (KYT), Kalahari Conservation Society (KCS) and the Centre for Scientific Research Indigenous Knowledge and Innovation (CesrIKi). To date, a number of products have been developed for the local market and are being sold in local health shops and by street vendors.

This indicates that there is a good potential for market expansion for natural products and thus there is a critical need to have a fully operational legislative framework that will govern not only the resource harvesting but also protect the knowledge that is associated with the utilization of these resources including its documentation. Therefore, it is also of great importance to ensure that there is a sustainable use of the resource base to avoid its depletion due to its overexploitation.



Biodiscovery case

In the small but vibrant village of Shakawe there is a group of women bound by their will for an improved livelihood. They saw potential in the resources that they have been using as part of their childhood and as taught by their forefathers. Mrs Ndara, one of the funders who participated in the ABS capacity-building workshop in Shakawe in May 2018, emphasized that "*We formed the Matute-a-Mongongo group because we noticed that we can use the resources that we have abundantly to earn a livelihood*". The group originated as women-only, but it has since taken men onboard. This group of women harvest fruits of the mongongo species (*Schinziophyton rautanenii*, Euphorbiaceae) once they have fallen from the tree and use them for developing several products. These products cover food and beverages, cosmetics and agriculture. The fruit part is used to produce juice, the nutty part of the kennel is used to produce oil and the by-products of the oil are used to produce soap.

The above production is undertaken by local women with the support from local authorities such as DiKgosi (village chiefs), government departments, namely the Department of Forestry and Range Resources and the Department of Environmental Affairs, and relevant projects such as the Sustainable Land Management (SLM) Project in Ngamiland and the UNDP-GEF Global ABS Project.

The SLM Project facilitates and finances the establishment of the processing plant, while the Global ABS Project is assisting with the development of the requisite support tools, including the development of a Biocultural Community Protocol and the establishment of procedures concerning the Prior Informed Consent (PIC) and the Mutually Agreed Terms (MAT) or a model material transfer agreement to enable fair and equitable sharing of benefits from bioprospecting of the genetic resources that come from the mongongo tree communities in and around Shakawe. This will enable the valorization of the mongongo genetic resource and assist in developing other products from this resource. The project will also support research and analysis of the mongongo value chain to generate additional socio-economic information with a view to further developing the resource in line with the Nagoya Protocol.

There is an important body of traditional knowledge that is associated with this genetic resource. The oil is believed to have healing characteristics (anti-inflammatory, nutritious, etc.) The egg-shaped, red-brown fruits, which ripen and fall between March and May, contain a thin layer of edible flesh around a hard stone. Inside this stone, there is a tasty and highly nutritious nut similar to an almond that, when pressed, yields the mongongo oil. Mongongo oil is used as a body rub by the !Kung Bushmen of the Kalahari to cleanse and moisturize their skin, and protect it against the harsh desert environment. Both the edible flesh of the fruit and the oil are an important part of the primary diet of the !Kung Bushmen.

The value of the resource and the associated traditional knowledge is increasingly being unearthed. The National Focal Point for the Convention on Biological Diversity and the Nagoya Protocol is in receipt of requests for approval to trade with resources that are being traditionally used by the local communities. These are coming from various other communities and companies from within Botswana that have since appreciated the potential returns or gains in trading with resources.

EYEWITNESS STATEMENT

In Botswana, resources belong to the government and any Motswana may use them for their subsistence. In a workshop held in Gaborone in August 2018, key ABS stakeholders sought to better understand the status of traditional knowledge associated with genetic resources in the country, and how this can be integrated into the legal framework being developed on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization, in accordance to the provisions of the Nagoya Protocol.

They also developed and refined recommendations for the new ABS policy and legal framework being prepared by the country, including documentation, prospecting, access permits, and fair and equitable sharing of benefits.

"Our rich natural resource base and the indigenous knowledge we have built over the years around it can be sustainably used to generate employment and wealth for the country."

MR THABANG LESLIE BOTSHOMA, Deputy Permanent Secretary, Botswana Ministry of Environment Natural Resources Conservation and Tourism

In fine focus: SDGs implemented by the biodiscovery case

The Mongongo biodiscovery case will contribute to the following SDGs:

- SDG 2 (Zero Hunger) – the mongongo communities are considering the propagation of the tree with the view to ensuring the sustainable harvesting of the fruit in the coming years. The enhanced production of the oil will also improve the nutritional composition of the food base of the families that harvest mongongo fruit. The by-product, after pressing the oil, is used as an additive to food as a condiment and this will go a long way to ensuring the eradication of hunger in the communities in and around Shakawe.
- SDG 5 (Gender Equality) – SGD 5a requires "undertaking reforms to give women equal rights to economic resources, as well as access to ownership and control over land and other reforms of property, financial services, inheritance and natural resources in accordance with national laws". The development of the Biocultural Community Protocol will enable the ascertainment of women's right to access and use the Mongongo resources and their effective involvement, including in the various phases of product development.
- SDG 8 (Decent Work and Economic Growth) – Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services. Access and Benefit Sharing is a key mechanism among all multilateral environmental agreements aimed at explicitly harnessing new opportunities for economic and social development. The Mongongo group will be fulfilling this component and facilitate improved livelihood for their community.

Legal and political enabling environment for ABS and the Nagoya Protocol

Botswana signed the CBD in June 1992 and ratified it in October 1995, in order to facilitate the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources. Botswana also ratified the Nagoya Protocol on 12 October 2014. Botswana also developed the National Biological Diversity Strategy and Action Plan (NBSAP) which was recently reviewed in 2016.

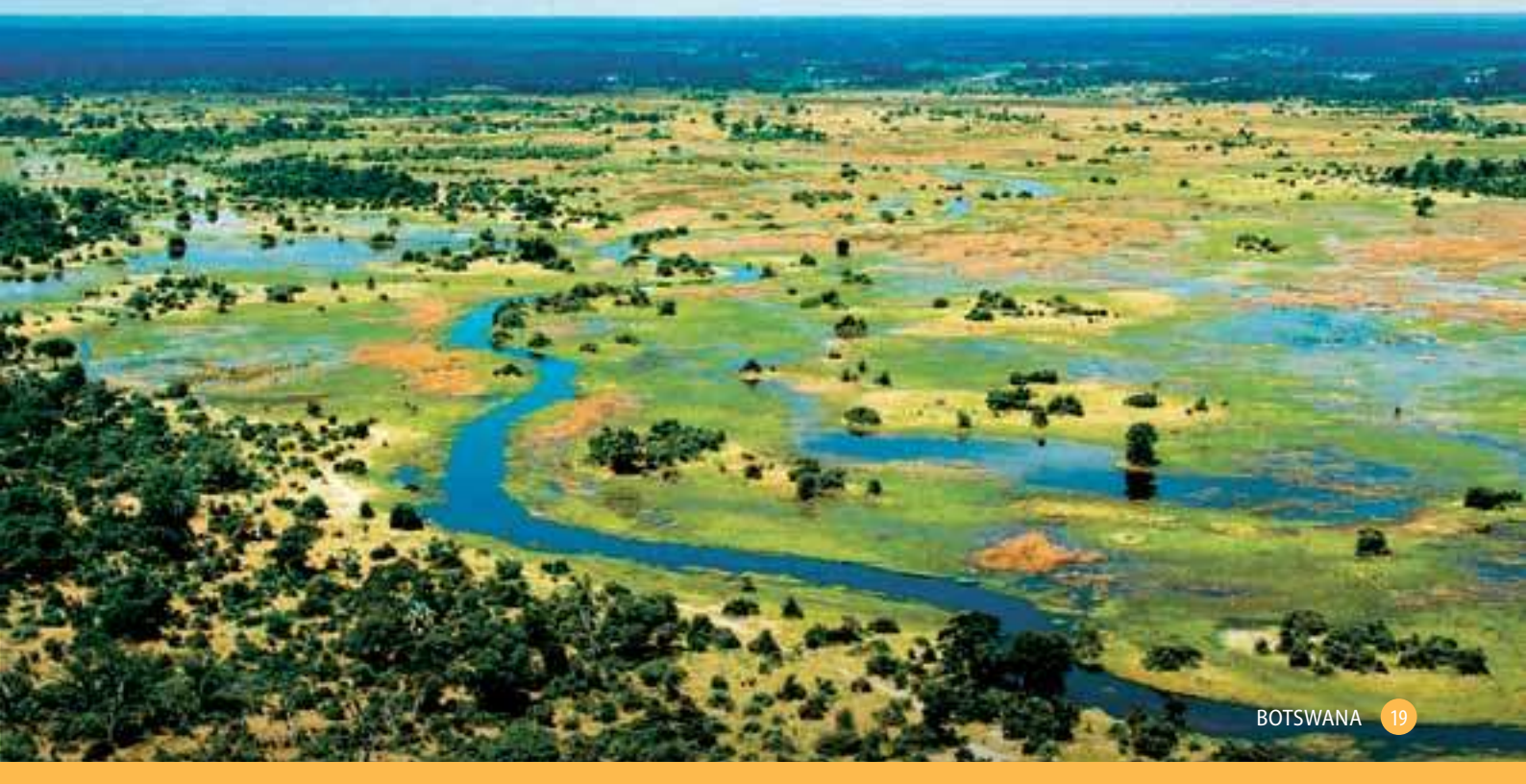
The Forest Act of 1968 allows local communities to harvest resources for a minimal cost and ensures that, if there is harvesting for commercial purposes, it is done at a sustainable pace with due consideration to the resource base. The Conservation of Agricultural Resources Act of 1983 provides for control over the use of the natural agricultural resources. The National Policy on Natural Resources Conservation of 1990 facilitates the protection of natural resources by advocating for the undertaking of Environmental Impact Assessments (EIA) enforced through the Environmental Assessment Act of 2010. Furthermore, the Industrial Property Act of 2010, which is currently being reviewed and updated, allows for the protection of traditional knowledge associated with genetic resources.

Botswana through support of the UNDP-GEF Global ABS Project has established a drafting group to facilitate the development of the ABS legal framework. This is a multi-stakeholder team that is comprised of various departments and organizations. During the drafting process, the group has also availed itself of the expertise and recommendations from ABS consultants with a view to upgrading the ABS legal framework.

MESSAGE FROM AN SDG ADVOCATE

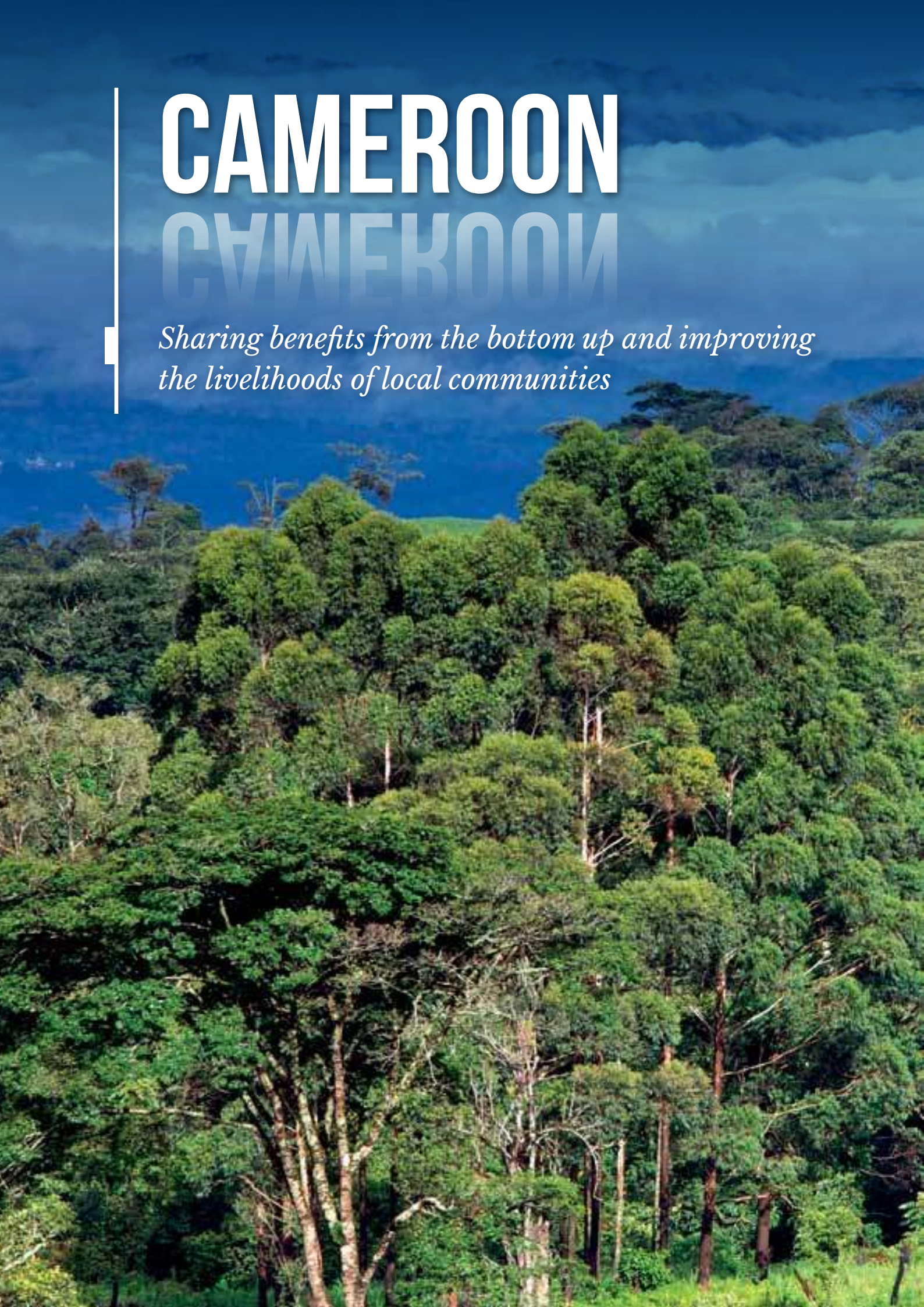
"The Mongongo project carries great hope for community members, especially the women involved. It has a high potential to contribute to livelihood and the local economy. The project, as a whole, is experiencing challenges relating to establishing controls and process such as improving the organizational structures, governance systems and the marketing ability of the "Matute-a-Mongongo" group products. The group needs to be assisted, not only with finance, but also with technical resources to enable it to fully function and realize its sustainable development objectives."

MS DINEO GABOREKWE, ABS Project Officer, following the capacity-building workshop for the Matute-a-Mongongo in Shakawe



CAMEROON

Sharing benefits from the bottom up and improving the livelihoods of local communities



AUTHORS

AURÉLIE TAYLOR PATIENCE DINGOM
National ABS Focal Point

MARTIN ZEH-NLO
Assistant Resident Representative, UNDP Cameroon

PENNY STOCK
Regional Technical Advisor, UNDP

SETTING THE SCENE

Deep in the Congo Basin, which harbours the world's second largest rainforest, Cameroon's rich biodiversity and genetic heritage has earned her the nickname of 'Africa in miniature'. The total country area is almost half a million km^2, 46% of which is covered by forests with more than 9 000 species of plants (with 156 endemics), 927 species of birds (including 24 restricted-range species) and 297 mammals (with 8 endemics). More than 20 000 forest and savannah elephants and mandrills, buffaloes, bongo antelopes and sitatunga roam the landscape. Cameroon is also home to threatened great apes including chimpanzees and two subspecies of gorilla: the Western Lowland gorilla and Africa's rarest ape, the Cross River gorilla.

Cameroon's natural resources provide the vital foundations for food security and health in the country. Many of the 22 million residents live in rural communities and are dependent on forests for firewood, hunting and shifting cultivation or small-scale agriculture for survival.

Cameroon ranks 152 out of 187 countries in the Human Development Index. More than 30% of the population lives on less than one US dollar a day, despite the fact that Cameroon has one of the highest literacy rates in Africa.

Climatic diversity across Cameroon has resulted in five diverse vegetation zones including: tropical forest, coastal and maritime, montane forest, sudano-sahelian and savannah. These zones provide the perfect habitat for a range of species that can potentially be used under the Nagoya Protocol. They include the angiosperm dicotyledonous plants *Mangifera indica* (Anacardiaceae), *Mondia whitei* (Apocynaceae), *Echinops giganteus* (Asteraceae), *Carica papaya* (Caricaceae), *Ricinondendron heudeulottii* (Euphorbiaceae), *Irvingia gabonensis,* (Irvingiaceae), *Cola nitida* (Malvaceae), *Azadirachta india* (Meliaceae), *Moringa oleifera* (Moringaceae), *Psidium guajava* and *Eucalyptus globulus* (Myrtaceae), *Coula edulis* (Olacaceae), *Prunus africana* (Rosaceae), *Citrus limon* and *C. aurantum* (Rutaceae); angiosperm monocotyledonous plants *Annona muricate* (Annonaceae), *Aloe ferox* (Asphodelaceae), *Cymbopogon citratus* (Poaceae) and *Zingiber officinale* (Zingiberaceae) and the gymnosperm *Gnetum africana* (Gnetaceae).

Biodiscovery case

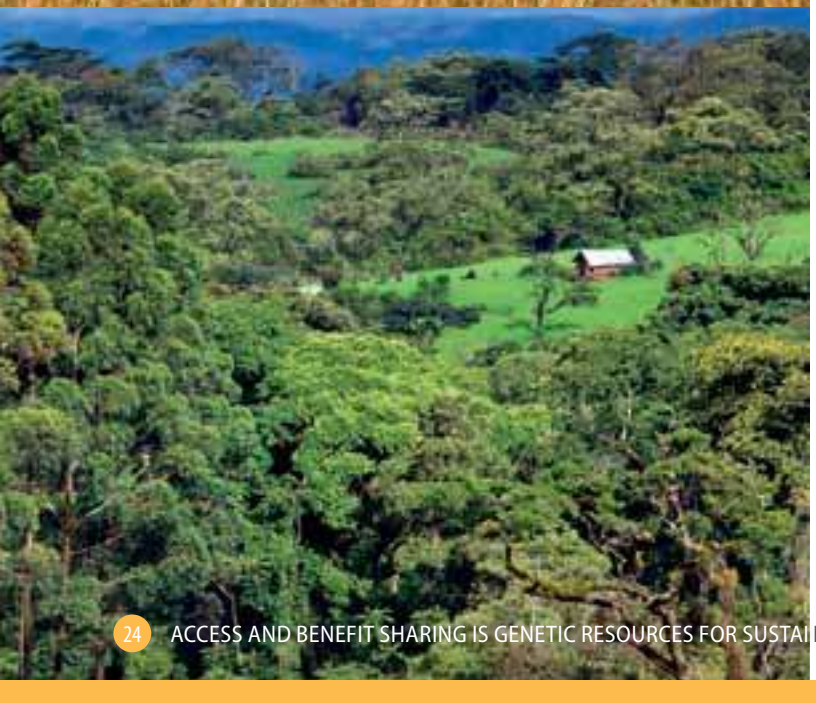
The GEF-financed and UNDP-implemented medium sized project "A bottom-up approach to ABS: Community level capacity development for successful engagement in ABS value chains in Cameroon" together with the ABS Capacity Development Initiative aims to build capacities at the national and local levels to develop specific value chains for *Echinops giganteus* and *Mondia whitei* that are compliant with the ABS principles enshrined in the Nagoya Protocol.

The project is working with local communities on ABS to:

- Reduce biodiversity loss by generating greater local and national economic benefits from genetic resources, providing an important incentive for biodiversity conservation and
- Strengthen the stewardship and rights of indigenous and local communities (ILCs) to their resources and traditional knowledge (TK), contributing to local conservation and sustainable use of biodiversity.

Developing these two value chains will lay the groundwork for establishment of other value chains in the country and region. For example, *Gnetum africana* can be used in the production of whiskey while *Vitellaria paradoxa* (Sapotaceaae) can be exploited in the production of shea butter. The project will also support and inform significant legal changes at the national level.

Long ago, according to local legend, a villager ate a meal of 'yellow soup' that was so tasty and smelled so inviting that he did not rest until he knew which ingredient was used to prepare the dish. He discovered that it was *Echinops giganteus*, which is an herbaceous perennial plant of the Asteraceae family, found in only three regions of Cameroon – the southwest, west and northwest. The genus *Echinops* comprises approximately 120 species, commonly known as globe thistles. These are native to Europe, East-Central Asia and to the mountains of tropical Africa. The defining characteristics of these species are their large spiny leaves and globe thistles or ball-shaped seed heads, which grow at the top of the plants.



In recent years, research has been undertaken to explore the potential of biological resources in Cameroon by the Man and Nature Foundation. In the Mt. Bamboutos area, indigenous peoples in different localities have provided traditional knowledge about *Echinops*, with support from a local NGO – ERUDEF. Research revealed that villagers in each locality have a different vernacular name for the plant, for example, "ayilagwem" in Magha-Bamumbu. Villagers use the roots, flowers and leaves for food and medicine. Recently scientists have found that the roots of the *Echinops* contain essential oils, which potentially make it valuable to the fragrance and flavour sectors. It has also exhibited cytotoxicity and antibacterial properties, thus providing baseline information for use in contemporary medicine.

Mondia whitei is a popular medicinal plant species endemic across Africa. In Cameroon, however, the plant is found in only three regions – the southwest, west and the northwest. Even in these regions, it is found only in some specific areas. For example, in the north-eastern part of the southwest region of Cameroon, mondia is found in the remote area of Lebialem at elevations ranging from 200 to 600 m (Bangang) and 145 to 1 835 m (Lewoh). The plant is known locally as "nkang bongo" and "yang", respectively in these two regions.

The plant is a liana or climbing shrub up to 20 m long. The roots become woody with age and are highly aromatic. In Lebialem, it is used by communities as a medicine. It has a pronounced vanilla-like odour and tastes like a mixture of liquorice and ginger, which make it useful as a food-flavouring agent.

Research is currently under way by a French company 'V. Mane Fils' for extraction of essential oils that can be used by the cosmetics industry. An agreement has been reached between V. Mane Fils and the Ministry of Environment, Nature Protection and Sustainable Development (MINEPDED) with the local communities of Magha-Bamumbu and Lewoh to allow access to local plants. The agreement was mediated by the Man and Nature Foundation and ERUDEF. Although it is not yet known if products can be developed, a follow up and evaluation mission will be held soon to confirm the potential for sale of the roots of *Mondia whitei*, with benefits for local communities according to the negotiated terms.

EYEWITNESS STATEMENT

"The exploitation of Echinops giganteus has improved the livelihoods of the people of Magha-Bamumbu village exponentially. Parents involved in the value chain – production, harvesting and sales – are able to generate secure income that enables them to pay for their children to attend school and provide food for their families. This is not a cumbersome project; people can get involved in plant production while continuing with their daily chores and other income-generating activities. If you grow or harvest Echinops, you can sell it to V. Mane Fils for a fair price. The company has also agreed to improve local health infrastructure and support road maintenance in the area."

HIS MAJESTY FON LEKUNZE, of Magha-Bamumbu village, Mt. Bamboutos

The community of Lewoh in the Lebialem division is highly motivated to support the production of *Mondia whitei*. Controlled planting of *Mondia* reduces the pressure exerted on the species found in the wild. At least four stems are needed to support the climber. This way, fewer large wild trees are felled to harvest the mondia.

In fine focus: SDGs implemented by the biodiscovery case

The implementation of the Nagoya Protocol through the development of value chains for *Echinops giganteus* and *Mondia whitei* have contributed to the achievement of SDG 1 No poverty, SDG 2 Zero hunger, SDG 3 Good health and well-being, SDG 4 Quality education, SDG 5 Gender equality, SDG 8 Decent work and economic growth, SDG 9 Industry, innovation and infrastructure and SDG 15 Life on land.

Representatives from the communities of Magha-Bamumbu and Lewoh who are actively involved in the production, harvesting and transformation of the roots of these species, which are subsequently sold to the V. Mane Fils, have received significant benefits from their involvement in the project. The income that accrues from sales enables the local communities of Magha-Bamumbu and Lewoh to improve their livelihoods (SDGs 1, 2, 3 and 5) and to meet their basic needs. Sales are not only made to the French firm but also to local markets. With improved income, children are able to go to school (SDG 4). Essential oils extracted from the roots of these two-plant species are used in the cosmetic and food industries, thereby contributing to SDG 9.

Legal and political enabling environment for ABS and the Nagoya Protocol

Cameroon is a signatory to the Convention on Biological Diversity (CBD) and the Nagoya Protocol. Although Cameroon did not become a party to the Protocol until 2017, significant measures have already been put in place since its adoption in 2010. This includes the designation of an ABS focal point who coordinates implementation activities assisted by a steering committee headed by MINEPDED. In 2012, Cameroon elaborated a national ABS strategy, which defined five areas of intervention: capacity building, institutional and legal framework, administration, promotion and valuation of genetic resources and traditional knowledge. In 2016, the project supported the development of an ABS action plan to implement the strategy.

With technical support from a team of international consultants through the UNDP GEF ABS project, a specific law on ABS and its regulatory text has now been drafted for review by the national ABS Steering Committee. Under the national ABS framework, the local communities of Magha-Bamumbu signed an MoU with V. Mane Fils in 2015, which included PIC and MAT for research and development of *Echinops giganteus*.

MESSAGE FROM AN SDG ADVOCATE

"The implementation of the ABS process in Cameroon can be characterized as 'learning by doing'. As the project has advanced, we have learned important lessons about promoting value chains that benefit the poorest and leave no-one behind.

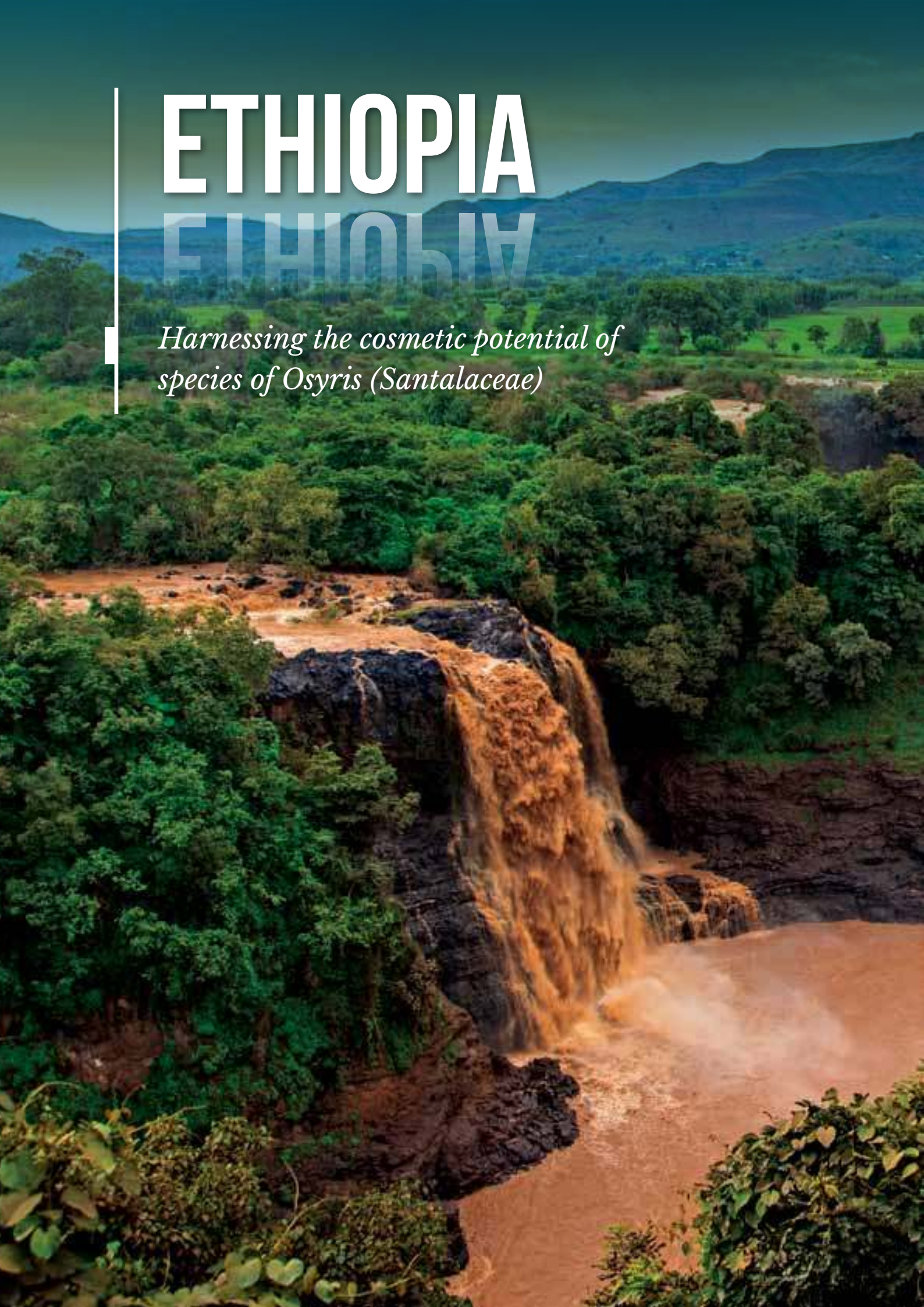
We have also seen that conservation strategies for the protection of genetic resources and local biodiversity and ecosystem services must be prioritized before nature is exploited. And where private sector partners commit to support local development, it is positive to construct infrastructure in areas that generate new avenues for work for local youth. For example, in the case of the Echinops and Mondia value chains, a factory or processing plant could have been installed in Lebialem to extract essentials oils before export to France. This would have ensured that a valuable component of the value chain remained in Cameroon bringing additional long-term benefits.

It is important to persuade local communities that ABS is a reality and not a myth!"

MR WILLIAM LEMNYUY BANYE, Divisional Delegate of Ministry of Environment and Sustainable Development (MINEPDED), Wouri Department, Littoral Region of Cameroon

ETHIOPIA

Harnessing the cosmetic potential of species of Osyris (Santalaceae)



AUTHORS

ASHENAFI AYENEW HAILU
Director Genetic Resources and ABS area,
Ethiopian Biodiversity Institute

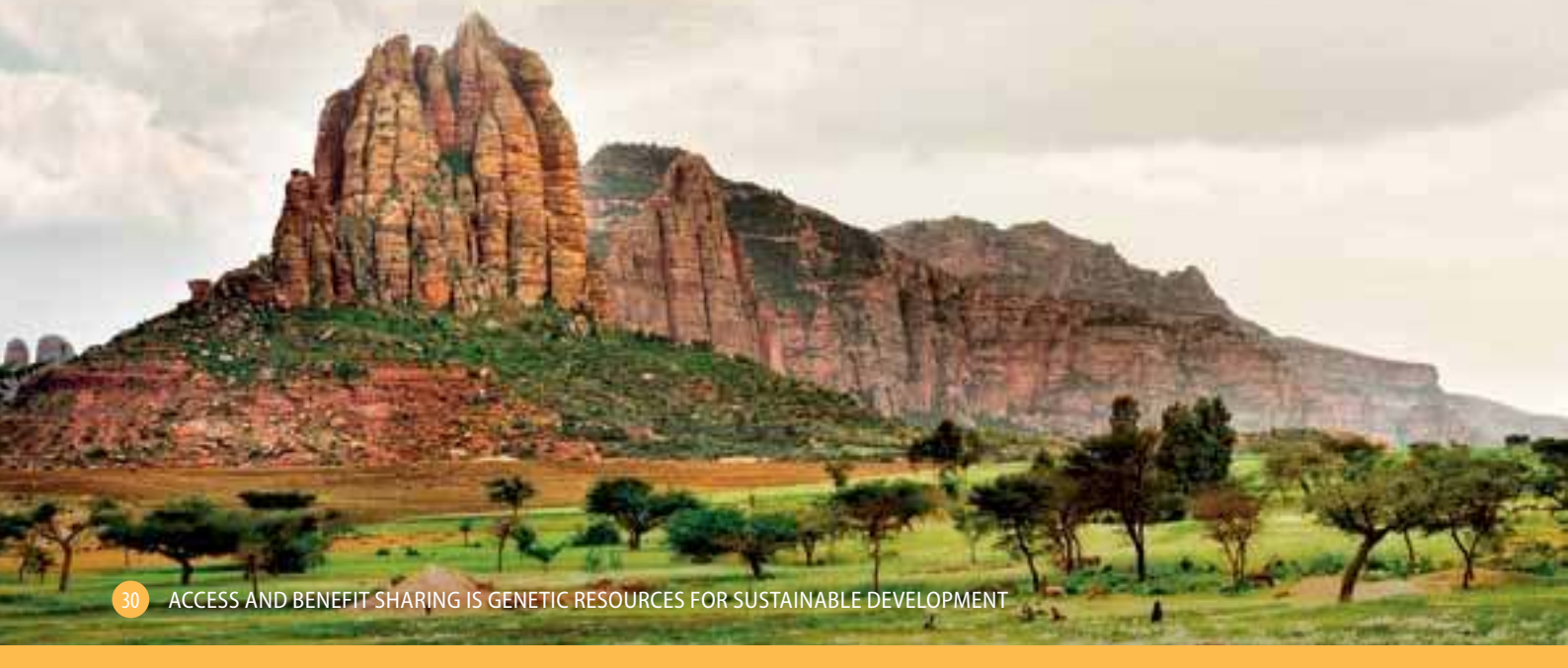
SETTING THE SCENE

Ethiopia is endowed with geographical diversity and climatic variability. From 126 m below sea level in the Danakil Depression to 4 620 m above sea level at Ras Dashen Mountain, agroecological zones spread across rugged mountains, flat topped plateaus, deep gorges, incised river valleys and rolling plains, making Ethiopia one of the world's biodiversity hotspots.

Out of 6 000 higher plant species known in Ethiopia, 10% are considered endemic. There are 75 breeds of cattle, sheep, goat, dromedary, equines and chickens and six species of honey bees. Large numbers of wild species of mammals, birds, reptiles, fish, amphibians and arthropods have been recorded with many being endemic to Ethiopia.

In fact, the country has a large number of endemic plant and animal species, and a higher number of endemic bird species than any other country in mainland Africa.

Biodiversity in Ethiopia is of very high agricultural and industrial significance. Agriculture amounts to 40% of national GDP and generates about 74% of export earnings. The country is a center of origin for cultivated crops like coffee, tef (*Eragrostis tef*, Poaceae), enset (*Ensete ventricosum*, Musaceae), and is a center of diversity for many crop species like durum wheat, barley and sorghum. Industries in the country that produce food and beverage, textile and leather, largely depend on plant and animal resources for their raw materials.





Biodiscovery case

The Osyris Project utilizes genetic resources and derivatives from *Osyris* species (Santalaceae), such as *Osyris quadripartita*, known as the African sandalwood, for developing essential oil products based on light, middle and heavy fractions of Osyris, used in the form of compounds in the cosmetic, perfumery and aromatic industries and as ingredients for the food and flavour industries.

With the involvement of the South Omo people, the products are being developed with Aditi International, a research lab based in Mumbai, India, and with Docomo Oils PLC, an international company which has more than 30 years of experience in the field of essential oils and cosmetics. The Ethiopian Biodiversity Institute (EBI) is the authority that granted a national access permit based on PIC and MAT.

In terms of benefits, the company paid US$50 000 as an upfront payment when signing the agreement and agreed to pay a lump sum equal to 3.5% of net profits after taxes, an annual royalty of 3.5% of the net profits, and an annual license fee equal to $2 000.

The company has invested over $3 million to start a first-of-its-kind industry in Ethiopia, providing 125 Ethiopians with permanent employment. The project promotes employment and access to an alternative revenue sources to thousands of people in the rural areas as suppliers of the Osyris materials to the company.

The industry is 100% export-oriented and will bring in a minimum of $2 million of foreign revenue each year into the country. The company has pledged to pay 2% of the cost of all raw materials purchased from the local community to establish nurseries that propagate new plants for rehabilitation and for sustainability purposes. The company also pays to each collection-site association 30% of the purchase price of all raw material purchased to assist them to grow and support other initiatives within their communities.



EYEWITNESS STATEMENT

"On commencement of the Osyris Project, through the guidance and direction of the zone and district administration offices, associations were formed as resource suppliers and collectors that harvest the raw material for the cosmetic industry throughout the harvesting sites of Hamer (14), Bennetsemay (27) and Malie (5) and it is through these associations that the raw material is collected and paid for by the company.

A total of 46 associations were created throughout the three above-mentioned harvesting sites. The total amount paid to the association for raw material to date is about US$421 400. The amount of material collected to date is about 520 tonnes.

It was of paramount importance that the project be sustainable in the long term and it was for this reason that the Docomo Oils initiated the discussion with the South Omo Zone officials whereby it would provide funding, technical information and know-how to the Zone and District experts so that nurseries within the districts could be started and the seeds of Osyris could be propagated for re-establishment back into the rangelands.

The company has supplied a training manual to the Zone and District Experts which gives step-by-step instructions on how to grow Osyris from seed, air layering and cuttings. The manual was translated into local languages. It has also, to date, paid an amount of about US$6 600 to the districts for this purpose. The company has also gone so far as to say that it will pay the associations for the seeds collected. The company also pays for the electricity to pump water 24 hours per day to the Lemat Village in Arba Minch, where the company established their factory. Previously the village had no water supply.

In addition to this, and because of the presence of the factory in Arba Minch, eucalyptus wood is purchased from government plantations and used to fuel the boiler at the factory. To date, about US$56 000 have been paid to District governments for the purchase of eucalyptus wood, which is then another source of income generated as a result of this ABS value chain and which will be sustained as long as the factory is operational.

This project is sustainable over the long term and can be an extremely valuable source of alternative revenue for rural communities where Osyris occurs. Contrary to conventional crops, Osyris grows in semi-arid and harsh conditions, does not need any care, does not displace any indigenous vegetation, does not need pesticides, herbicides nor water to grow, and does not need arable land to thrive.

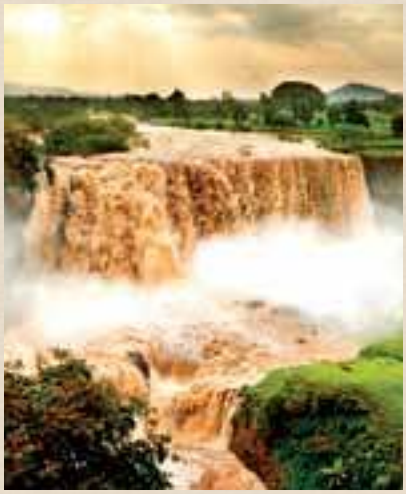
The people of Hamer, Benne Tsemay and other parts of South Omo experienced a severe drought last year which saw the demise of thousands of head of livestock. The community thanked the national government for bringing in Docomo Oils to their districts as this company was, during this very distressing time, the only source of income for many of the people.

Before Docomo Oils arrived, Osyris was not well known for its economic importance, but when the local community earned money and as a result improved their livelihood, Osyris became more popular as a high-value plant resource with the highest priority for conservation. This implies that the ABS project contributes to conservation and sustainable utilization of genetic resources.

One of the aims of the youth job-creation opportunities and initiatives of the government is for the youth to be able to kick-start and sustain entrepreneurial-type businesses. Thanks to the ABS value chain, and income received by community members from the sale of Osyris to Docomo Oils, many of these people have used this income to start other business (e.g., fattening of cattle). In essence, this sums up the spirit of the ABS project.

Docomo Oils is creating a 100% export, proudly Ethiopian, brand, which will be sold in the global market place, generate foreign revenue for the country and create much-needed jobs in the rural areas where they are needed most. Because Osyris is an indigenous and natural resource, it can be propagated and replanted on a large scale and be an important source of income for the communities and foreign revenue for the country for many years to come."

ASHENAFI AYENEW HAILU, EBI



In fine focus: SDGs implemented by the biodiscovery case

The Osyris biodiscovery case contributes to SDGs 1, 2, 8, 9 and 15 as follows:

- SDG 1: End poverty – Supported through job creation and reflow of benefits to local communities and associations.
- SDG 2: Achieve food security and promote sustainable agriculture – Benefits shared with the local community (including farmers and pastoralists, for example) contribute to rural development, food security, improved nutrition and sustainable agriculture given that African sandalwoods are used as fodder crops.
- SDG 8: Promote inclusive and sustainable economic growth and productive employment – This ABS partnership brings new opportunities for socio-economic development, employment, and support of pro-poor growth in rural areas.
- SDG 9: Foster innovation – The Osyris case builds upon the existing potential for scientific progress and innovation.
- SDG 15: Sustainable management of terrestrial ecosystems – The establishment of nurseries for new plant propagation is a critical contribution to ecosystem rehabilitation and sustainability.

Legal and political enabling environment for ABS and the Nagoya Protocol

Ethiopia made its accession to the Nagoya Protocol in 2012. The country has enacted a law to regulate access to genetic resources – *Access to Genetic Resources and Traditional Knowledge and Community Rights Proclamation No 482/2006*, which entered into force in 2006. The law applies to ex situ and in situ genetic resources (including derivatives) and the traditional knowledge associated with them, and includes procedures for access and community consent, administration and utilization of access payments, and other provisions. It contains two templates for commercial and non-commercial access requests and confers a mandate on regional states to administer requests for access to resources within their boundaries. The country also has a Code of Conduct for administering ABS issues.

With the support of the UNDP-GEF Global ABS project, an advanced draft of the updated ABS proclamation was finalized and is now going through the approval process. Codes of Conduct to preserve and valorize associated traditional knowledge are also being developed.

A number of awareness-raising events took place, while a series of capacity-building interventions are being planned to strengthen institutional capacities and to share experiences and good practices to catalyse ABS partnerships.

MESSAGE FROM AN SDG ADVOCATE

"At the beginning of harvesting, there was non-selective and indiscriminate harvesting due to lack of awareness of the desired raw material (the male and female plants of the species, the host and semi-parasite plant (Osyris), and also reported destructive harvesting (uprooting or cutting at the upper part of the stem). To overcome the aforementioned problems, awareness-raising activities were conducted and improvement has been shown; however, a series of training programmes and awareness-raising activities for the wider public are needed.

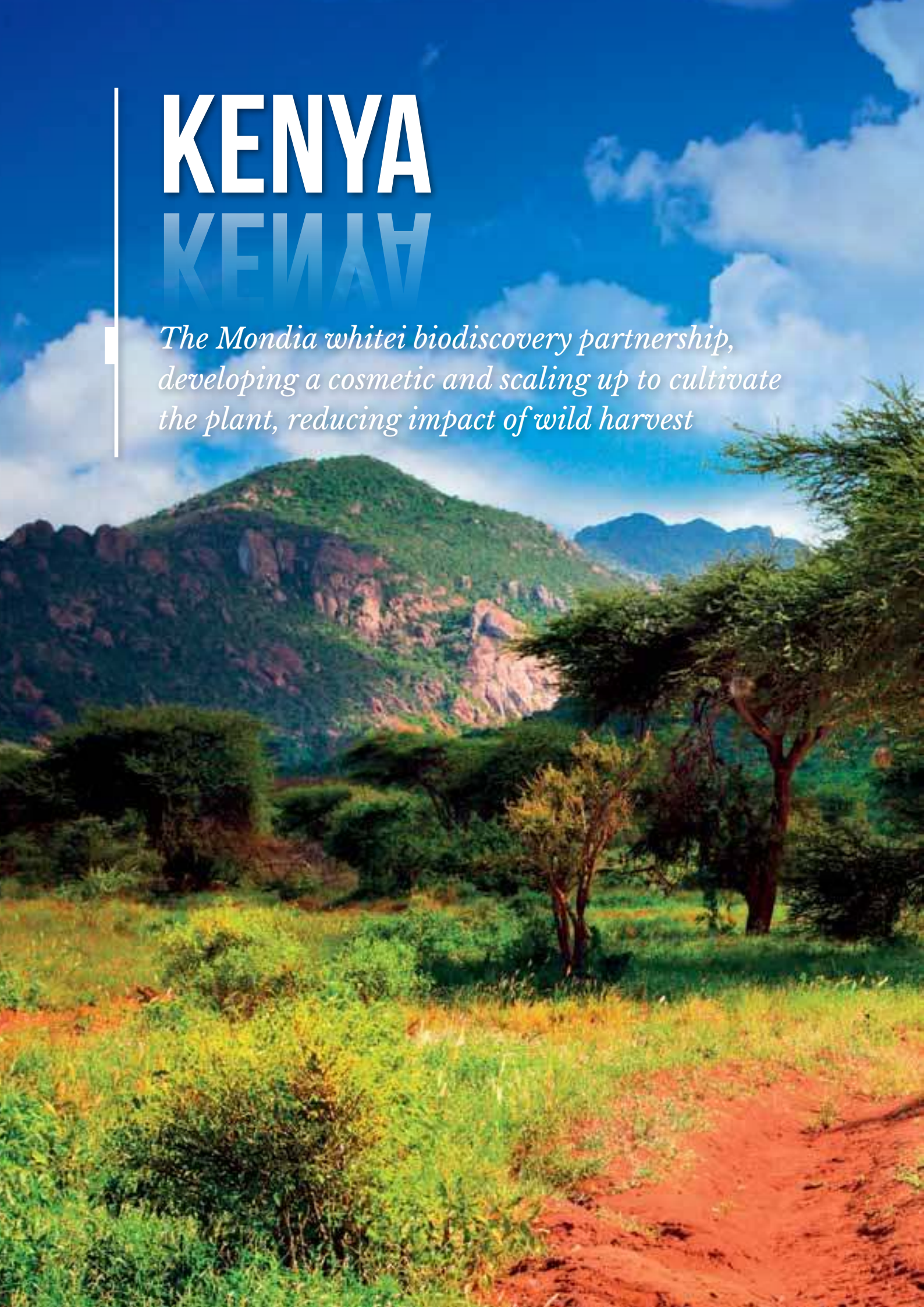
Other challenges are lack of sufficient seed, the low rate of seed germination and poor protection and management of a new regenerating shoots (threatened mostly by being eaten by goats). There are some initiatives taken by the company to fund for seed collection, multiplication and establishment of nurseries, but these need to be strengthened.

Through many years of research and development, the company has succeeded in developing sought-after formulations for many markets around the world. The company used a laboratory called Aditi International in Mumbai, India to analyse the oil content of Osyris quadripartita samples accessed from Ethiopia. The results of the laboratory are promising and the company will start to produce its first product very soon. Ethiopia will subsequently maximize its benefit sharing from benefits arising from utilization of this genetic resource called Osyris quadripartita. The Osyris Project definitely contributes to implementation of the SDGs such as SDG1, SDG2, SDG8, SDG9 and SDG15."

ASHENAFI AYENEW HAILU, EBI

KENYA

The Mondia whitei biodiscovery partnership, developing a cosmetic and scaling up to cultivate the plant, reducing impact of wild harvest

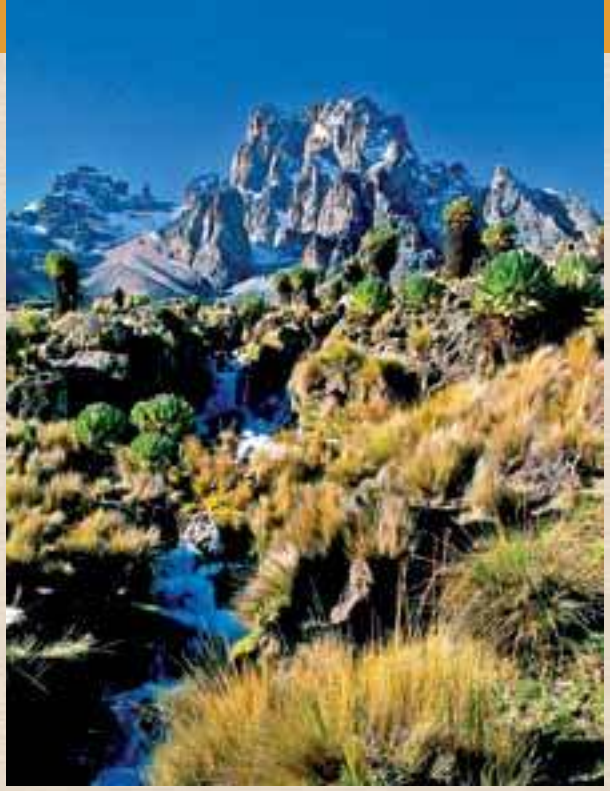


AUTHORS

MUKONYI KAVAKA WATAI
Head of Bioprospecting Kenya Wildlife Service

GEOFFREY OMEDO
UNDP Kenya

SETTING THE SCENE



Kenya covers a land area of approximately 583 000 km^2. Approximately 28% of its ecosystems are marine and 72% are terrestrial. The country is endowed with diverse ecosystems and habitats with unique flora and fauna. Kenya's rich biodiversity can be attributed to a number of factors, including a long evolutionary history, the country's varied and diverse habitat types and ecosystems, diversity of landscapes, variable climatic conditions and the convergence of at least seven biomes.

From its crowded and colourful coral reefs to icy alpine moorlands, some 30 000 animal species, 7 000 plant species and 2 000 species of fungi and bacteria have been recorded in Kenya.

The country's ecosystems offer a unique pool of genetic variability that includes endemic, rare, critically endangered, threatened or vulnerable species. Against this backdrop, it comes with no surprise that Kenya's biodiversity is praised by key industries and businesses using genetic resources in their research and development pipelines.

For instance, Kenya's lakes are home to a unique array of microbes and micro-organisms that are feeding the multi-million biotech industry to produce enzymes used in antibiotics and cleaning products. This is to say, there is tremendous and yet untapped potential for Kenya's genetic resources to leverage biodiscovery partnerships to support the country's economic growth and social development while preserving and sustainably using its natural capital.

Biodiscovery case

A project is supporting a prospective biodiscovery partnership between V. Mane Fils Company based in France, specializing in cosmetics and flavourings using biotechnology and botanicals, as a user and, the Kenya Wildlife Service, the Kakamega and Vihiga counties and the Luhya indigenous communities of Western Kenya who are represented by KANFCCO in this partnership as providers. The local research institution is Jomo Kenyatta University of Agriculture and Technology (JKUAT).

V. Mane Fils seeks to extract ingredients from the *Mondia whitei* plant, locally known as mkombera, for flavouring and cosmetic industrial applications. The partnership provides a model to demonstrate access to and utilization of genetic resources and associated traditional knowledge through PIC and MAT per the Nagoya Protocol based on domestic measures. To meet the demand of over 10 tonnes of *Mondia whitei* per year, the local community has embraced the project and are in the process of establishing large-scale nurseries to meet the envisaged industrial demand. This alone will significantly reduce reliance on wild harvest of *Mondia whitei* and generally contribute to sustainable utilization, species conservation and ecosystem protection.

Whereas the plant has been known for its flavouring and various traditional medicine uses which have partly been published, the company has not applied to utilize local traditional knowledge. However, the local knowledge on various *Mondia* varieties or cultivars will be sought from the local people. This is currently a subject for negotiation under the ongoing PIC and MAT for the partnership. The experiences gained are to be shared to inform decision making processes at local, county, national and global level.

The project was identified as a low-hanging fruit to showcase practical examples of implementation of the Nagoya Protocol. It was prioritized among others because the industrial partner had already requested to access and utilize the genetic resource (*Mondia whitei*, Apocynaceae) for commercial purpose. The partner was informed of the requirements to provide for relevant permits and PIC and MAT as part of national legislative requirements.

Specifically, for the Mane/KWS/Kakamega County/KANFCCO-local community partnership, initially there were no clear community and county structures for granting PIC and MAT. The UNDP-GEF Global ABS Project facilitated stakeholder identification, i.e., appropriate community structure adjacent to the Kakamega forest ecosystem, establishment of an appropriate county ABS technical committee, capacity building of identified groups through training on PIC and MAT and negotiation skills and now initiating a PIC between the private company and the resource providers. A draft PIC has been prepared, and robust discussions about this are ongoing with the prospective investor.

To unlock these processes, the seed financing from the UNDP-GEF Global ABS Project acted as an incentive to the investor. The country ABS technical committee is now vibrant and this model is being upscaled in other counties. These achievements were showcased during the Fifth Devolution Conference hosted by Kakamega County. The Conference brought together all 47 counties, and the important lessons on access and benefit sharing were disseminated, with some of the products from Kenya's genetic and biological resources being exhibited.

EYEWITNESS STATEMENT

"... Benefits are still under negotiation and include the establishment of a processing unit on the provider side, training support, various technology transfer, CSR support on afforestation by the company and monetary benefits including compliance with ethical sourcing for sustainability and where possible royalties ... ."

MR KABAKA WATAI, KWS Bioprospecting

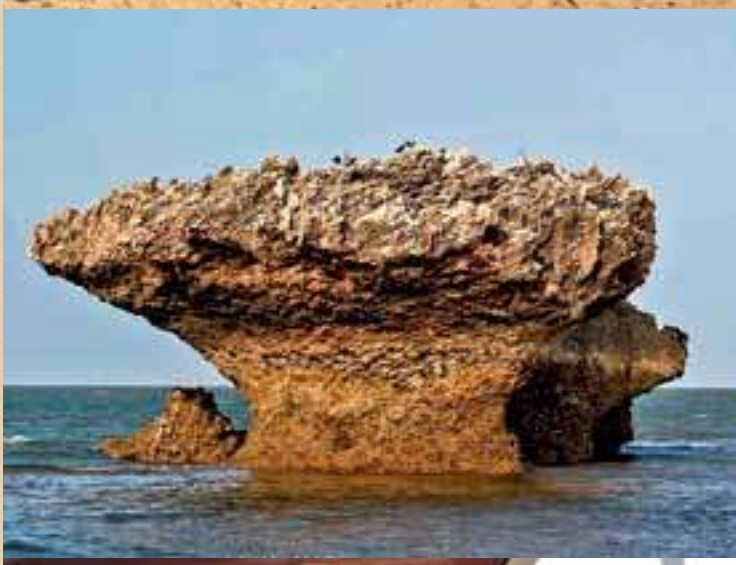
"... We are sensitizing the community to preserve their Mondia, and to cultivate even more, as we await the finalization of this process. Hopefully, the people of Kakamega and Vihiga Counties will derive some direct benefits from this important plant, which has been part of the community for ages now."

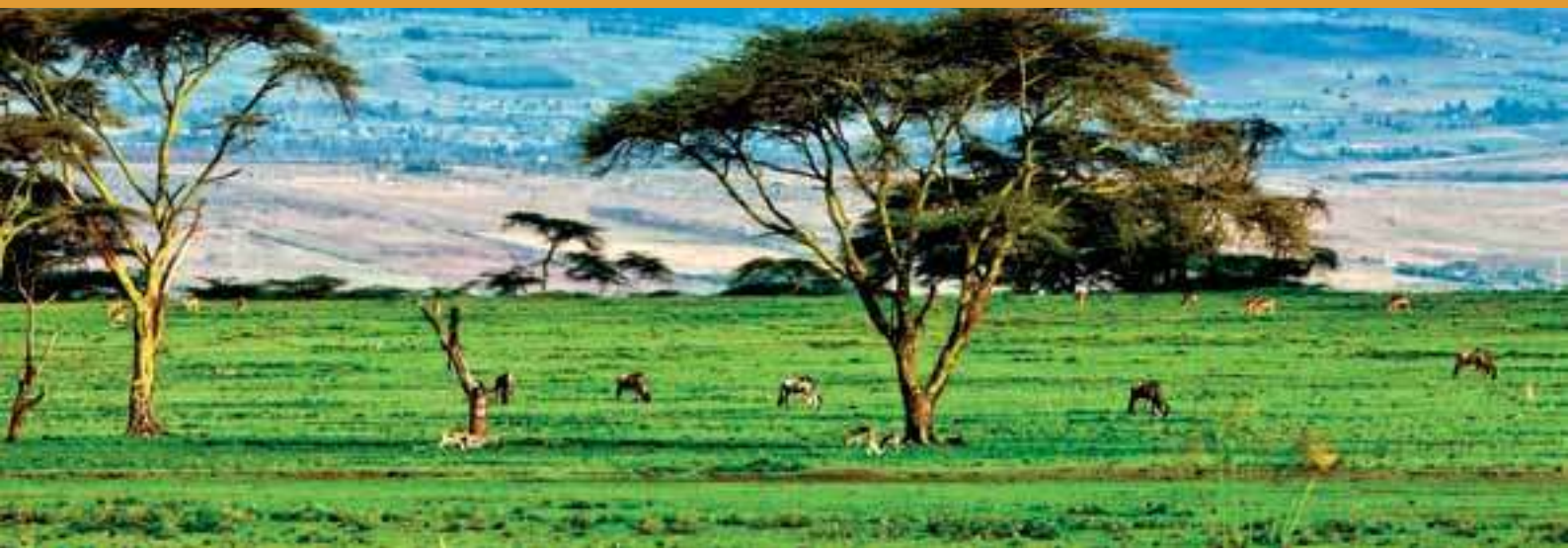
DR ANTONY MBAYAKI, Community Representative, on behalf of the local community

"... The regulatory framework for Access and Benefit Sharing for genetic and biological resources in Kenya is being reviewed, to make it consistent with the global best practices and to facilitate Kenya's effective participation in the global ABS arena. The Global UNDP ABS Project is working with the government partners to ensure this framework is in place ... . The upcoming V. Mane Fils interest in Mondia whitei in western Kenya will provide good lessons on how the legal framework should be done."

GEOFFREY OMEDO, UNDP

Currently, the Kenyan government is in dialogue to develop an effective framework that will provide legal, policy and institutional clarity, and certainty at all levels of governance and that will attract investments on the utilization of genetic resource in accordance with the Nagoya Protocol. Already, the government, in partnership with the GIZ ABS initiative, are in the process of digitizing the permitting process. The digitized process and the ongoing legal framework process are expected to reinforce each other, and lead to a coherent synergetic journey for users interested in the country's rich biodiversity.





In fine focus: SDGs implemented by the biodiscovery case

The key SDG targets include:

- SDG Target 8.9 "By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products." *Mondia whitei* is a revered cultural plant by the Luhya people of Western Kenya, and marketing its products promotes their cultural values as well as creation of jobs.
- SDG Target 9.5 "Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries." This is within the promotion of natural products industry and resource valorisation envisaged by the country's medium-term and long-term plans.
- SDG Target11.4 "Strengthen efforts to protect and safeguard the world's cultural and natural heritage." The Project focused on the Kisere block of the Kakamega forest to begin with, since it has been protected because of threats to it, such as the long-term pressure on communities from the smuggling of *Mondia whitei* products. This area also hosts the rare Debrazza monkeys.
- SDG Target 15.6 "Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed."
- SDG Target 17 "Strengthen the means of implementation and revitalize the global partnership for sustainable development," especially 17.6, 17.7, 17.8 and 17.16. The Mane Company is implementing this project in Cameroon and Kenya where scenarios will be compared with aim of enhancing partnerships and developing appropriate frameworks.
- SDG Target 17.14: "Enhance policy coherence for sustainable development." This project is contributing significantly to the ongoing initiative at the county level in developing an appropriate and effective ABS Nagoya framework in Kenya.

Legal and political enabling environment for ABS and the Nagoya Protocol

Kenya has a rich history of being a global leader in strengthening international environmental governance. The country has been a party to the Nagoya Protocol since 2014. However, biodiversity aspects in the country are handled under various legislation and there is no specific biodiversity act or substantive ABS laws. The Wildlife Conservation and Management Act (2013) has some provisions on access to wildlife and benefit sharing and have also developed wildlife sector regulations on bioprospecting and research and development, which have been submitted to the Attorney General's office. Genetic resources under the International Treaty on Plant Genetic Resources for Food and Agriculture, specifically for the Standard Material Transfer Agreement (SMTA) on multi-lateral benefits, are handled by the Gene Bank of the Kenya Agricultural & Livestock Research Organization (KALRO). Biological resources under WHO are approved under the National Commission for Science, Technology and Innovation (NACOSTI) and the Ministry of Health. The level of education and awareness among users and providers is moderate and there is need for enhancement. Kenya now has a law on traditional knowledge, but implementation is yet to commence fully.

Protocol in October 2017. The country has uploaded five Internationally Recognized Certificates of Compliance (IRCC) to the global ABS Clearing House, with a total of nine officially recognized checkpoints as listed below:

1. The National Commission for Science, Technology and Innovation (NACOSTI)
2. The Kenya Copyright Board
3. The Kenya Agricultural and Livestock Research Organization (KALRO)
4. The Kenya Revenue Authority
5. The Kenya Industrial Property Institute (KIPI)
6. The Kenya Plant Health Inspectorate Institute (KEPHIS)
7. The National Museums of Kenya (NMK)
8. The Kenya Forestry Service (KFS)
9. The Kenya Wildlife Service (KWS)

The ABS subsidiary regulation (2006) under the Environmental Act (EMCA) has been reviewed in various stakeholder forums where it has been agreed that the regulation addresses ABS issues within a very limited scope. There is a rising consensus of the need for a substantive national ABS framework or an inclusive biodiversity law, similar to what other countries such as Costa Rica, South Africa and India have.

Although at present, national environment management matters cut across various agencies, the National Environment Management Authority (NEMA) is charged with the coordination and establishment of an appropriate legal and institutional framework for the management and conservation of biological diversity. Furthermore, there is some expertise in relation to ABS within the Kenya Wildlife Services. There are institutional arrangements as defined under the Nagoya Protocol, although not under a defined national legal framework at the moment. The country has ABS permitting and compliance procedures ranging from PIC, MAT and SMTA to access permits and exports of scientific collections, whereby the latter is the core component of approvals of access permits. In fact, Kenya submitted its ABS Interim National Report on the Implementation of the Nagoya

In Kenya, to access genetic resources for utilization under research and development, one requires a PIC and MAT from resource providers, a Research Permit from the National Council for Science and Technology (NACOSTI) and an Access Permit from NEMA as evidence of the granting of PIC and MAT. Granting of the PIC and MAT is the rate-determining step and is a process which involves various players during the negotiation process. The stakeholders include local communities, the county government and the national government. Biological resource management in Kenya is in three tiers, i.e., devolved systems where we have roles and responsibilities for granting of rights during access and utilization of genetic resources and associated knowledge.

It is important to note here that although the process of obtaining PIC and MAT is a critical step in the acquisition of relevant permits such as access permits, this is overlooked by most users. In most cases, there is no clear institutional arrangement at the county government level, with non-existent local community engagement frameworks, due to lack of legal clarity on who should grant what, thus causing uncertainty for investors.

MESSAGE FROM AN SDG ADVOCATE

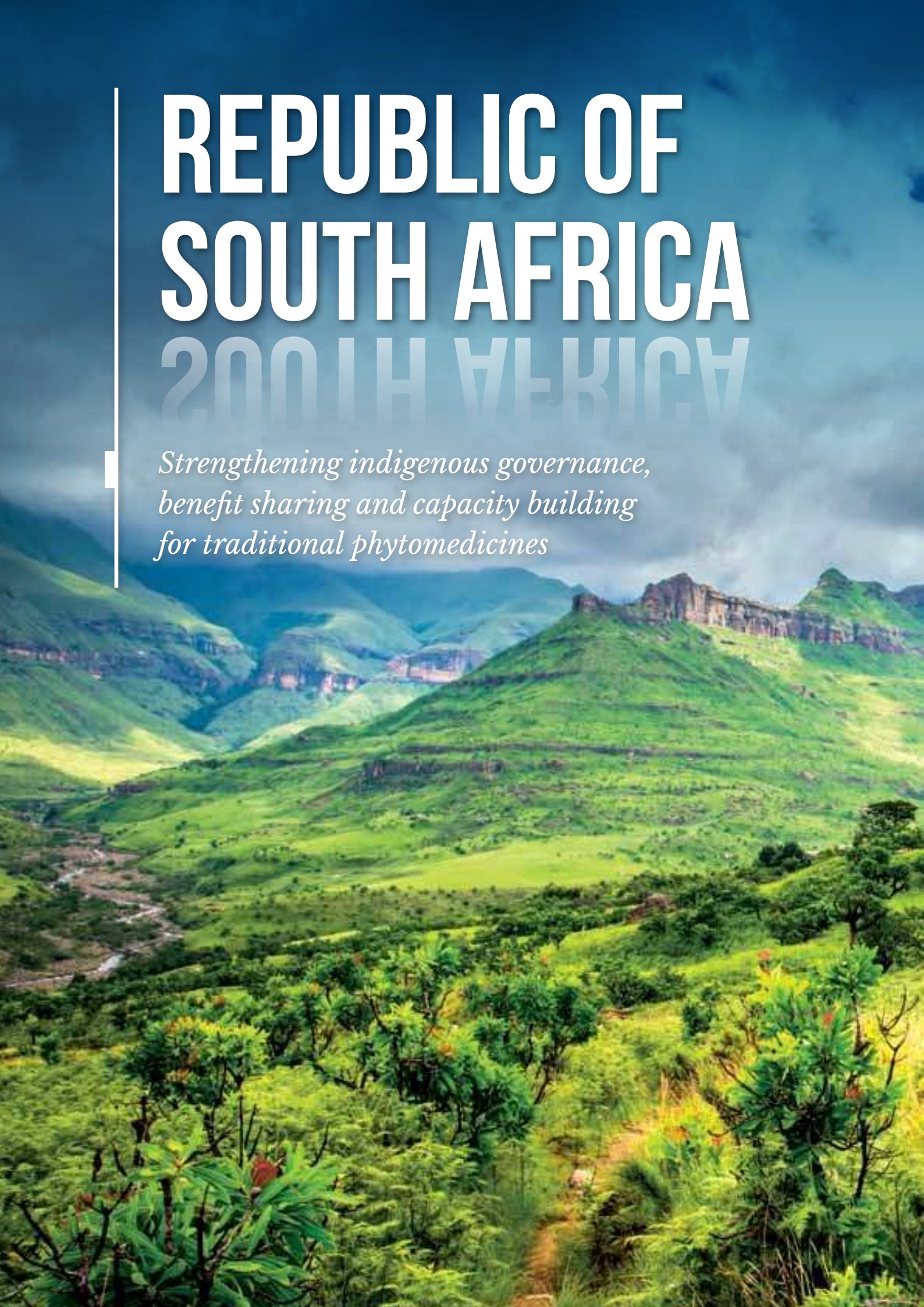
Kenya's global leadership in the SDG agenda is well documented. In fact, Kenya's Permanent Representative to the United Nations, Ambassador Macharia Kamau (currently working as a Principal Secretary in the Ministry of Finance) was one of the Co-Chairs of the Open Working Group that successfully led the world in adopting the 17 Sustainable Development Goals and the 169 targets. In recognition of this, Ambassador Macharia was bestowed with the prestigious Elizabeth Haub Award for Environmental Diplomacy for "extraordinary leadership and personal commitment to the negotiation and adoption of the United Nations Sustainable Development Goals (SDGs)".

Therefore, the ongoing ABS activities are meant to upscale the country's stated commitment to achieve the SDG targets. To bolster global efforts in this area, Kenya will also be hosting a High Level Global Sustainable Blue Economy Conference planned for November 2018 in Nairobi. Canada has already joined Kenya as a co-host for this conference, which is aimed at providing the international community with a platform for establishing blue economies that are integrated, inclusive and innovative while also supporting the transition to sustainable ocean-based economies. The Conference will not only be about oceans but will also pay attention to the myriad of related issues attendant to the sustainable use of inland waterways including lakes, rivers and aquifers, where significant genetic and biological resources lie.

Therefore, the outcomes of the ABS activities as recorded under the UNDP-GEF Global ABS Project so far is that we already have a significant impact, whereby the Kakamega County ABS technical committee represented by various sectors is already in the process of mainstreaming ABS elements within the county budgeting process, as well as within their five-year county integrated planning process. This shows contributions toward Aichi target 16 and to the SDGs. The major contributions involve poverty alleviation and conservation, contribution to national legal policy and institution framework and protection and promotion of cultural and tradition knowledge.

REPUBLIC OF SOUTH AFRICA

Strengthening indigenous governance, benefit sharing and capacity building for traditional phytomedicines



AUTHORS

ALBI MODISE

Chief Director Communications,
Department of Environmental Affairs

SETTING THE SCENE

South Africa is widely regarded as the third most biologically diverse country in the world, after Indonesia and Brazil, with many endemic species. While the country represents around 2% of the world's landmass, it is home to 10% of the world's plants, 7% of the world's reptiles, birds and animals, 15% of known coastal and marine species and an entire floral kingdom within its borders, namely fynbos. This richness in biodiversity represents a variety of opportunities in the form of marine, freshwater and terrestrial animals, plants and micro-organisms that may be used for scientific research or commercial exploitation.

South Africa's rich biodiversity is an economic sector that can be tapped to contribute to job creation and rural development. Through a number of initiatives, this economic sector has shown a constant annual growth of 6% in recent years. The development of the country's biodiversity economy takes place within the context of a National Development Plan adopted in 2012, the National Biodiversity Economy Strategy (NBES) and Action Plan adopted in 2015, the National Strategy for Sustainable Development and international obligations emanating from the Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES), the United Nations Convention on Biological Diversity (CBD), including the Nagoya Protocol on Access and Benefit Sharing, as well as the Aichi targets and the implementation of the CBD Strategic Plan.

The NBES is the country's blueprint for sustaining the growth of the wildlife and bioprospecting industries. Its aim is to provide a basis for addressing constraints for growth in the sector; outline stakeholder responsibilities and monitor progress with regard to transformative enabling interventions. The NBES provides the opportunity to develop the rural economy of the country while addressing environmental imperatives of government, and includes the establishment of a Bio-Products Advancement Network South Africa (BIOPANZA) to enhance development in the natural products sector.

Collaboration is required at local, regional and international levels to respond meaningfully to the challenges posed by market forces. Therefore, we need to intensify our investments in research and innovation in order to strengthen our capabilities for value addition or benefit innovation from plants in the agro-processing sector and improving the quality of local products.

Among the species presently being sustainably utilized by local communities is *Sceletium tortuosum,* also known as kanna. This is a climbing or creeping plant with white to pale yellow, pale salmon or pale pink flowers. It belongs to the ice plant family (Aizoaceae) prevalent in the karroid areas of Western, Eastern and Northern Cape Provinces of South Africa. Kanna is also commonly referred to as *kougoed* (an Afrikaans word derived from the old Dutch word Kauwgoed meaning "chewing stuff"). It is a kind of low-growing, succulent shrubby species containing mesembrine which is known for its effects on the central nervous system. To this day kougoed is held in great esteem by indigenous people as a versatile masticatory, tea, health tonic and herbal extract.

Biodiscovery case

A bioprospecting permit was awarded to HG&H Pharmaceuticals (Pty) Ltd by the South African Department of Environmental Affairs allowing it to commercialize the medicinal properties of kanna. The company acknowledges the fundamental role indigenous knowledge plays as a departure point for new product discovery and innovation. It is an acknowledgement that was formalized through a landmark benefit sharing agreement with the San Raad van Suid Afrika (San Council of South Africa) jointly with the Paulshoek and the Nourivier communities. This agreement marked Africa's first prior informed consent and benefit sharing agreement with an indigenous community for the commercialization of an indigenous medicinal plant.

HG&H Pharmaceuticals (Pty) Ltd is a local innovative pharmaceutical and natural ingredients company that focuses on the discovery, research and development of evidence-based natural medicines and dietary ingredients for common mental health and wellness conditions. The company conducted research and development on kanna and developed a quality-based extract called Zembrin®, which has mood-enhancing, anxiety-reducing and cognitive-function-enhancing activities, all of which can be of benefit to healthy people suffering from stress. The unique signature of Zembrin® is 'alert serenity'. Zembrin® is currently being marketed across the world including South Africa, USA, Canada, Brazil, Malaysia and Japan. In Canada, Zembrin® has been approved for sale to "support cognitive function in adults".

The benefit sharing agreement concluded with the South African San Communities is based on unconditional monetary benefits. Since 2010, HG&H Pharmaceuticals (Pty) Ltd has shared more than 10 million rand (i.e., US$660 000) in financial benefits with the community. In terms of the agreement, the company shares 6% of all income from Zembrin® with the South African San Communities, which, in turn, allocate 50% of their share with the villagers of Paulshoek and Nourivier in the Namaqualand region of the Northern Cape Province. It is in these communities that the ethnobotanical research was conducted. As a result, Zembrin® is the only *Sceletium* product to carry the logo of its indigenous beneficiaries, the San Raad van Suid Afrika.

Further, HG&H Pharmaceuticals (Pty) Ltd, through its partnership, has established massive cultivation and processing plants in the Mpumalanga and Limpopo provinces. This project has created employment opportunities across the value chain. During the annual cultivation and handling of this crop, approximately 30 people are employed in the process, the majority of whom are women.

EYEWITNESS STATEMENT

Melvin Cloete, Chairperson of the Paulshoek Raad (Council) describes Paulshoek as a very laid-back community. This is one of the poorest communities in the Northern Cape and is managed by the Kamiesberg municipality. He believes the collaboration between HG&H Pharmaceuticals (Pty) Ltd and the community is important, particularly since the annual benefits received from the supply of kanna benefits everyone, not just a few individuals.

"I love the peacefulness and way of life. Given that we are the poorest community, we live off nature. This is a real highlight for me about this place. Before we use the money, we have a community meeting. One of the main activities is to take primary school kids to the veld (fields) and teach them about the different plantations and medicinal properties/values. Due to the recent drought, anything that we get from the company is put back into the veld. One of the things that we did was to dig boreholes to ensure water conservation. The aim is to ensure that the money is not spent on luxuries, but on essential community expenditures".

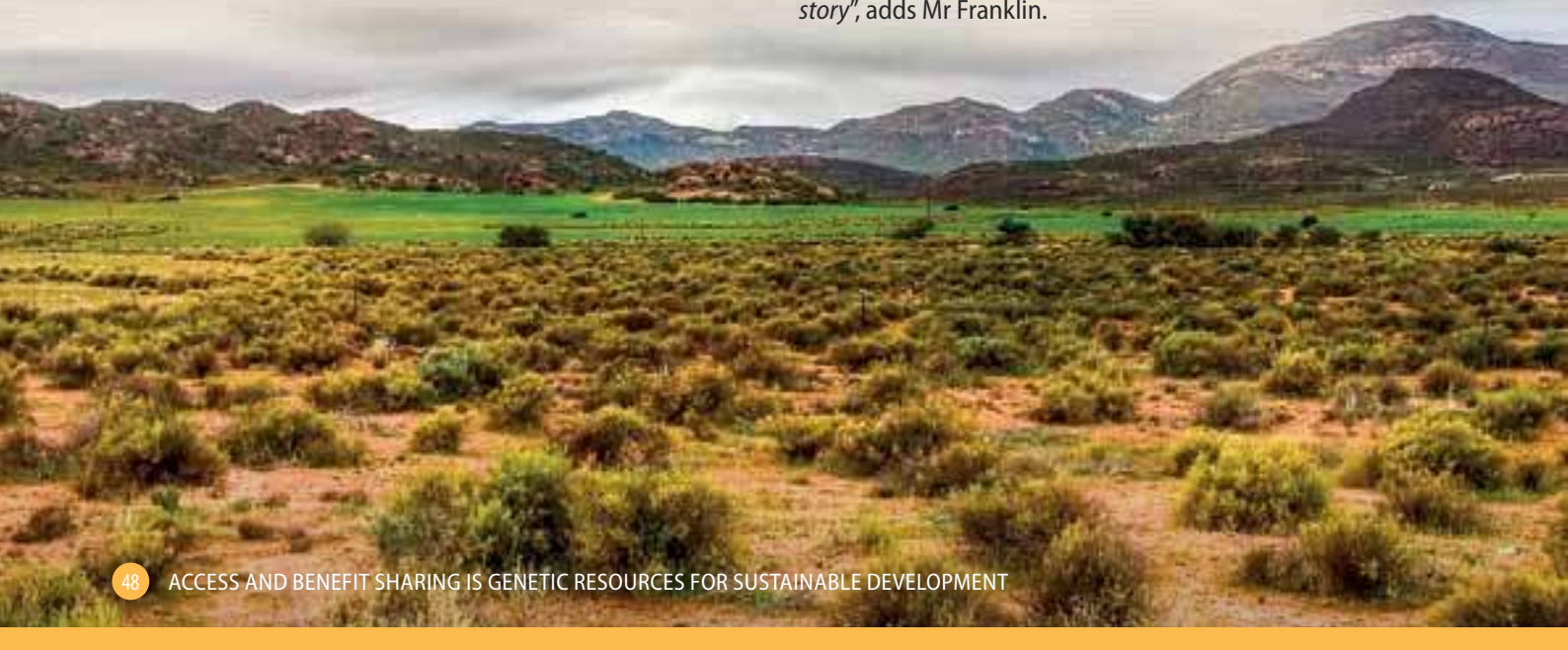
MELVIN CLOETE, Chairperson of the Paulshoek Raad

Committee and board member elections are some of the challenges faced by Paulshoek and Nourivier communities. Confirming Mr Cloete's sentiments, Mr Collin Louw of the San Raad said that is where the relationship with the Council is valuable, because it helps resolve some of these challenges.

Reflecting on the use of Kougoed in Paulshoek, Melvin giggles: "*The older generation still uses kougoed and people on the farm still use it. It is like a bubble gum that you put in your mouth, or you boil it for flu or other minor ailments as a remedy. The younger ones do not use it. All they are interested in is DSTV* [the main satellite TV service provider in South Africa]*, but some of them do use it*", he says.

Mr Richard Franklin, Managing Director of HG&H Pharmaceuticals (Pty) Ltd, appreciates the three-way partnership between the San Raad van Suid Afrika, HG&H Pharmaceuticals (Pty) Ltd and the Government of South Africa, particularly the Department of Environmental Affairs. "*It was very useful to engage with a recognized organization that represented the indigenous community. Whilst they might have recognized traditional leaders in the community, it is often difficult to engage, and even more complicated when there is a need to enter into a legal agreement. This is where the San Raad van Suid Afrika really came through and made things easier than they would have been. The government provided very good assistance by providing guidance regarding the requirements and aspects of the regulation that we did not understand.*"

It is the sentiment of HG&H Pharmaceuticals (Pty) Ltd that it is amazing that modern science is now being applied to validate traditional medicine that goes back to more than 300 years of use in the community. It is a very different world that we live in, but the same plant is allowing the people from the modern day to cope the same as those in the ancient times. "*It is great for us to see how the international community has reacted to this story*", adds Mr Franklin.



In fine focus: SDGs implemented by the biodiscovery case

The cultivation of *Sceletium tortuosum* happens away from its natural habitat because during research and work with the original traditional healers "*We discovered that there are different chemical properties of the same plant that occur in the wild and we were interested in the one specific chemical property that certain plants have. We have isolated those plants and we try and grow them outside of their natural habitat, preventing cross-contamination with any natural plants that might change the chemical properties*", says Mr Franklin.

The cultivation and processing plants are located in the Mpumalanga and Limpopo provinces. This project has created employment opportunities across the value chain. During the annual cultivation and handling of this crop, approximately 30 people are employed in the process, the majority of which are women, thereby contributing to SDG 5 on gender equality. The project also directly contributes to SDG 8 by promoting sustained, inclusive and sustainable economic growth, and full and productive employment and decent work for all.

Due to the recent drought in the Northern Cape, the community of Paulshoek has used some of its proceeds from this project to install a borehole for the benefit of all members of the community. Their knowledge exchange programme and the effort to plough back into the bush to conserve nature is a clear illustration of SDG 17, partnership for the goals, (climate action) in action.

Zembrin® is currently being marketed across the world including South Africa, USA, Canada, Brazil, Malaysia and Japan. It is the world's first patented, standardized and clinically studied extract of an elite selection of *Sceletium tortuosum*. This contributes to building the South African economy and puts South Africa on the map.

Legal and political enabling environment for ABS and the Nagoya Protocol

In 2011 and 2013, respectively, South Africa signed and then ratified the Nagoya Protocol on ABS, symbolising the importance of this legal instrument. The country has made remarkable progress since it became a contracting party to the CBD in 1995. This has included taking policy and legislative steps towards promoting conservation, sustainable utilization of indigenous biological and genetic resources and associated traditional knowledge, while promoting the fair and equitable sharing of benefits arising from their utilization. The relevant legislation is the National Environmental Management: Biodiversity Act (NEMBA), 2004 (Act No. 10 of 2004) and the Bioprospecting, Access and Benefit Sharing (BABS) amended Regulations, 2015 – both introduced and implemented before the adoption of the Nagoya Protocol on ABS.

HG&H Pharmaceuticals (Pty) Ltd is the first company to be issued with a bioprospecting permit in South Africa after the BABS Regulations of 2008 came into effect. These regulations, which regulate bioprospecting activities through a permit system, were developed in terms of NEMBA, which establishes rules for ABS in South Africa.

MESSAGE FROM AN SDG ADVOCATE

"These are encouraging initiatives that demonstrate the value of new kinds of partnerships to kickstart local economic development, and to provide an inspiring platform for jobs and entrepreneurship, innovation and social upliftment, particularly among women. South Africa is among the first countries in the world to regulate the protection and use of indigenous biological resources and associated traditional knowledge. South Africa was also among the earliest signatories of the Nagoya Protocol, in fact it was the 12th country to ratify it, in January 2013. This highlights the full inclusivity of communities and the private sector; and it emphasizes the need to aim for donor and public, technical, and financial harmonization within the overall sphere of implementing the Nagoya Protocol in a coordinate and purposeful way. UNDP South Africa will continue to bring knowledge, lessons learnt and experiences from other countries to South Africa, and as well as catalytic financial assistance so that the country can leap ahead and learn from mistakes and successes elsewhere without going through inefficiencies of misdirected effort. The UNDP South Africa Country Office is extremely proud that for the last 24 years, we have been able to mobilize funds and to support the development priorities of the South African Government."

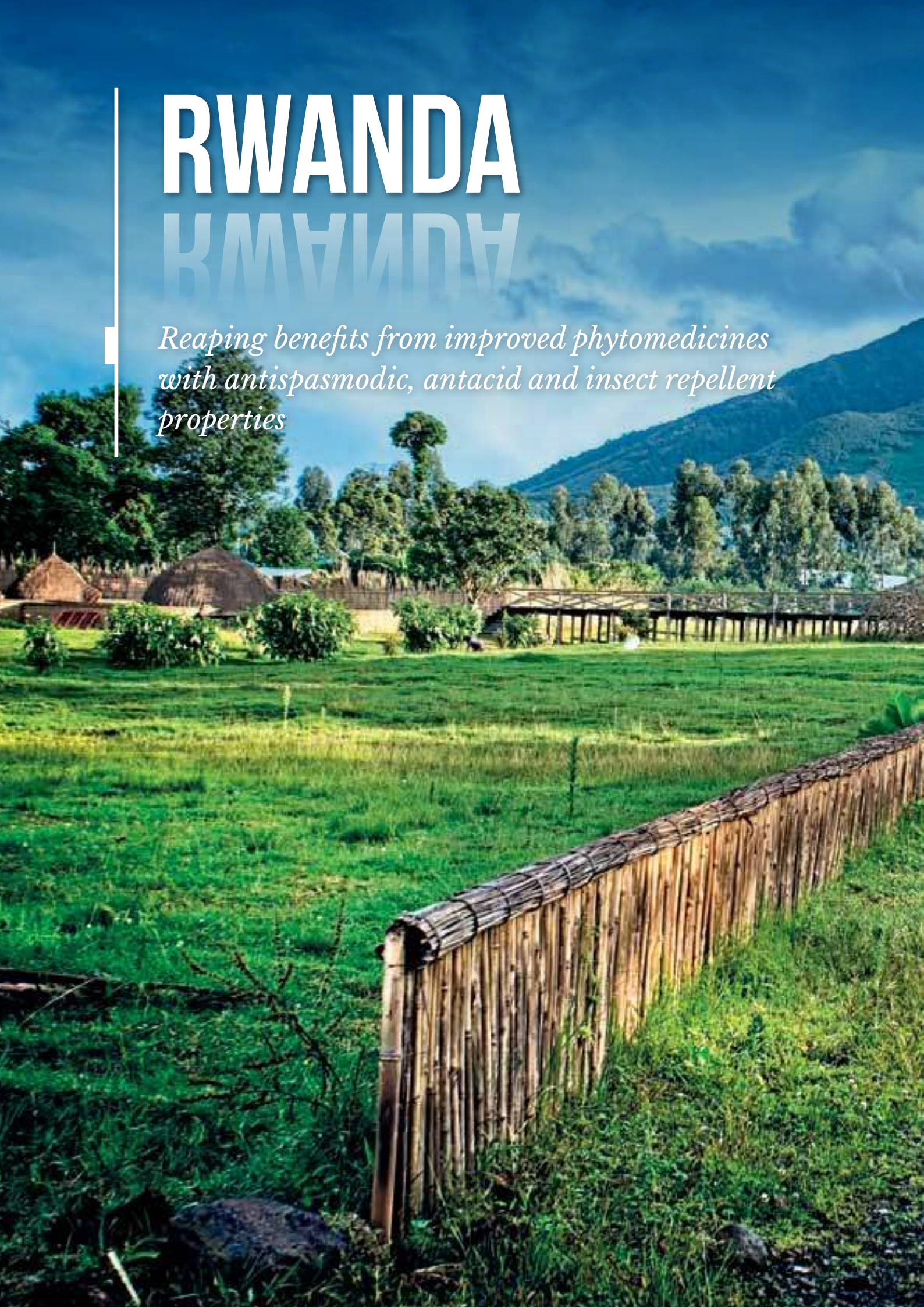
DR JANICE GOLDING, UNDP South Africa Environmental Focal Point

"South Africa believes that meaningful partnership and collaboration between the traditional knowledge holders and scientific community or research institution is critical for ABS success. Bioprospecting and Biotrade activities have supported local livelihoods through the sustainable utilization of indigenous biological resources as informed by the associated local traditional knowledge. Since then, we have seen a steady growth of the bioprospecting industry in the country, driven by the increased demand of indigenous plants by various industries. The Department of Environmental Affairs recognizes the contribution of this bioprospecting project to conservation and sustainable use efforts through cultivation of Sceletium tortuosum in order to reduce pressures on the wild species. The cultivation site and processing facility for the high-quality raw material for this project are in rural farming areas, where there is a high level of unemployment, hence this project is also contributing in terms of creating the necessary jobs for those local communities."

THE HONOURABLE EDNA MOLEWA, Minister of Environmental Affairs

RWANDA

Reaping benefits from improved phytomedicines with antispasmodic, antacid and insect repellent properties



AUTHORS

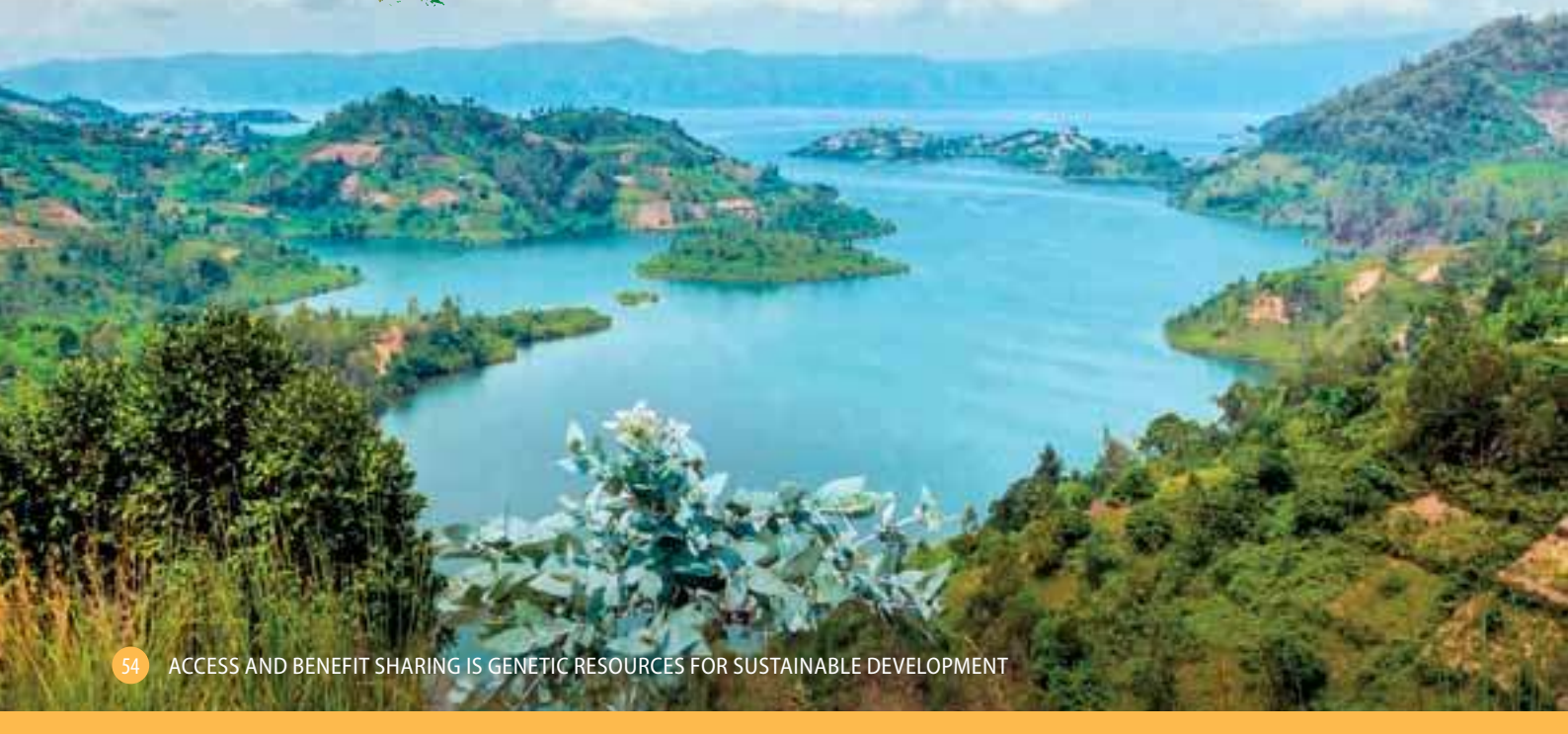
BEATRICE CYIZA

ABS Focal Point, Rwanda Environment Management Authority (REMA) Officer

SETTING THE SCENE

Rwanda, also known as *a country of thousand hills*, is endowed with rich and unique gifts of flora and fauna and with large numbers of endemic species seen in protected areas such as national parks and reserves, which are sites of both scenic and scientific importance. Direct benefits are acknowledged, as Rwanda is one of the countries whose tourism activities are concentrated in protected areas. In 2013, estimated revenues from tourism amounted to US$293.6 million, and its contribution to GDP is growing at an average annual rate of over 11%. Likewise, agriculture, through the utilization of agro-biodiversity, had a GDP share of 32.7%. Still, little is known about the more intangible benefits associated with the utilization of biodiversity and genetic resources.

In Rwanda's "Vision 2050", biotechnology was identified as one area among key scientific and technological innovations to increase productivity and competitiveness while providing jobs for the people of Rwanda. The case of genetic resources is of great importance to put forward the clear linkage between biodiversity use, ecosystem services and economic benefits to boost the national economy. Different research and development activities using genetic resources are ongoing and are very much contributing to the achievement of the Sustainable Development Goals.





Biodiscovery case

An example can be drawn from a research project entitled "Standardization of the Production Process and Quality Control for Selected Phytomedicines Produced in Rwanda". The research is being conducted through a cooperation project between the University of Rwanda and the University of Liège in Belgium, targeting the pharmaceutical industry. Traditional knowledge is obtained from traditional healers who describe the use of their traditional medicine and raw materials.

This ABS partnership aims to initiate a Rwandan pharmacopeia of phytomedicines. The objective of this laboratory research is to standardize the production process of selected phytomedicines. They include "Gifurina" which is a syrup that reduces the acid produced by the stomach and also has antispasmodic properties. Gifurina is derived from the species *Datura stramonium*; "Tembatembe" is an ointment used to treat scabies and it is made from *Neorautanenia mitis*; and "Rusendina" which is an insect repellent with an anti-inflamatory effect. Some of these are already available in the market, however non-standardized production can bring variation in the levels of constituents such as active ingredients and chemical and physical properties from one batch to another. Researchers are setting up the best way to prepare these products and the most reliable methods we can use locally for quality control. By standardizing the production process of raw materials and finished products, the National Industrial Research and Development Agency (NIRDA) can ensure the reproducibility and quality production of selected phytomedicines.

The University of Rwanda is now processing a permit through the Rwanda Environment Management Authority (REMA) to take plant samples from Rwanda to the University of Liège. The project is based on a Memorandum of Understanding (MoU) between the two universities, and between the University of Rwanda and NIRDA.

The study will avail safe, qualified and affordable herbal medicines in the Rwandan market. This is beneficial for both supplier and consumers, as the market for those products is already proven, while consumers will benefit from reliable and high-quality medicine. Immediate non-monetary benefits are expected in terms of technology transfer and scientific capacity-building, benefiting national institutions and human resources.

EYEWITNESS STATEMENT

"The implementation of the basic measures of the Nagoya Protocol in the country will release a wide range of monetary and non-monetary benefits. Rwanda has developed legislative and administrative frameworks to ensure fair and equitable sharing of benefits, a ministerial order soon to be endorsed. Once adopted, it will unleash the full potential of the protocol and leverage tangible impacts in all aspects, ecological, social and economic.

The study will avail safe, qualified and affordable herbal medicines in the Rwanda market. This is beneficial for both supplier and consumers, as the market for those products is already proven, while consumers will benefit from reliable and high-quality medicine. Immediate non-monetary benefits are expected in terms of technology transfer and scientific capacity building benefiting national institutions and human resources."

MS BEATRICE CYIZA, ABS Focal Point – Rwanda



In fine focus: SDGs implemented by the biodiscovery case

Quality control and standardized production of Rwandan phytomedicines are expected to contribute to the achievement of the following SDG targets:

- SDG 3: Ensure healthy lives and promote well-being for all at all ages, especially target 3b. Rwandan phytomedicines may lead to new medical breakthroughs resulting in treatments that may help cure millions of people and contribute to overall well-being.
- SDG 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation, especially targets 9.5 and 9b. This research between the two universities has great potential for scientific progress and innovation. It will enhance technology transfer and scientific capacity by significantly contributing to upgrading the technological capabilities of the pharmaceutical industry in Rwanda.

Legal and political enabling environment for ABS and the Nagoya Protocol

Rwanda ratified the Nagoya Protocol on 12 October 2014 and is on track to develop an enabling legal and institutional framework for the implementation of the Protocol. A draft Ministerial Order governing the Biodiversity permits has been developed, and some of its articles determine the access to genetic resources and the fair and equitable sharing of benefits arising from their use. Other related existing laws are the Organic Law No. 04/2005, which determines the modalities of protection, conservation and promotion of the environment in Rwanda, law No. 70/2013 of 2 September 2013, which governs biodiversity in Rwanda, and law No. 31/2009 of 26 October 2009, which enforces protection of intellectual property rights.

With the support of the UNDP-GEF Global ABS project, guidelines to preserve and valorize Rwandan traditional knowledge are being drafted. Pilot ABS value chains are being identified and analysed to assess their economic, social and environmental potential to conclude public-private ABS partnerships to reap the real benefits of Rwanda genetic resources and traditional knowledge.

A number of awareness-raising activities took place while capacity-building interventions are planned. For instance, the pan-African ABS workshop in Kigali is a knowledge hub bringing-in diverse country delegations together with top-notch ABS experts and practitioners to share experiences and key innovations in implementing the Nagoya Protocol in Africa, present good practices while strengthening critical ABS capacities and disseminate state-of-the-art knowledge.

MESSAGE FROM AN SDG ADVOCATE

"The project revealed that many people in Rwanda, even health professionals, did not trust phytomedicines produced domestically, arguing that no quality control has been done. However, sadly, the people are relying on imported phytomedicines, even if no quality control is done! The project will balance this mismatch and contribute to SDG 3 (Good health and well-being) by availing safe, efficient and affordable local herbal medicines, while also contributing to SDG 15 (life on land) by focusing on medicinal plants available in Rwanda."

REINA OTSUKA ISEDA, UNDP Rwanda

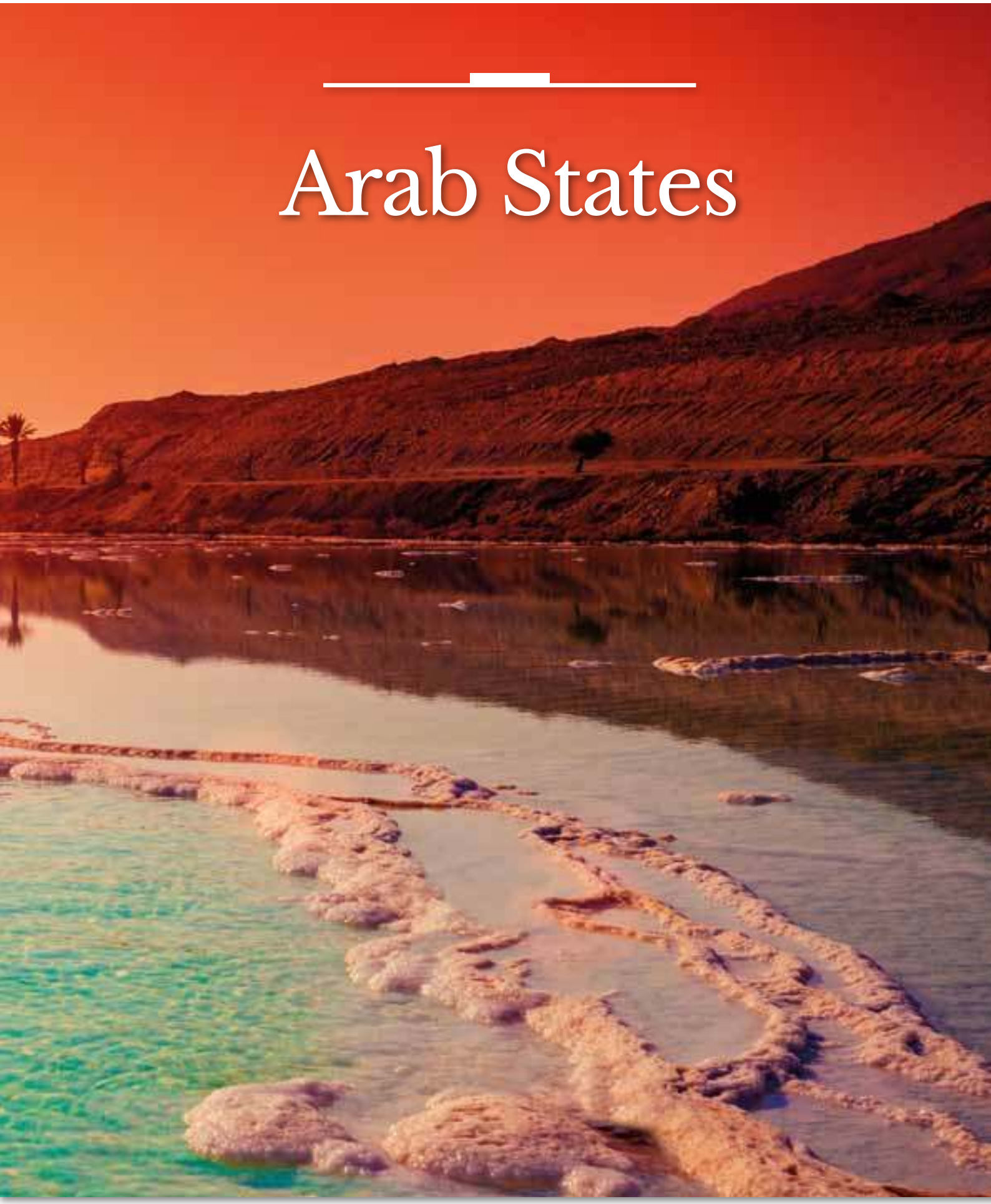
BIODISCOVERY CASES

SUDAN

THE HASHEMITE KINGDOM

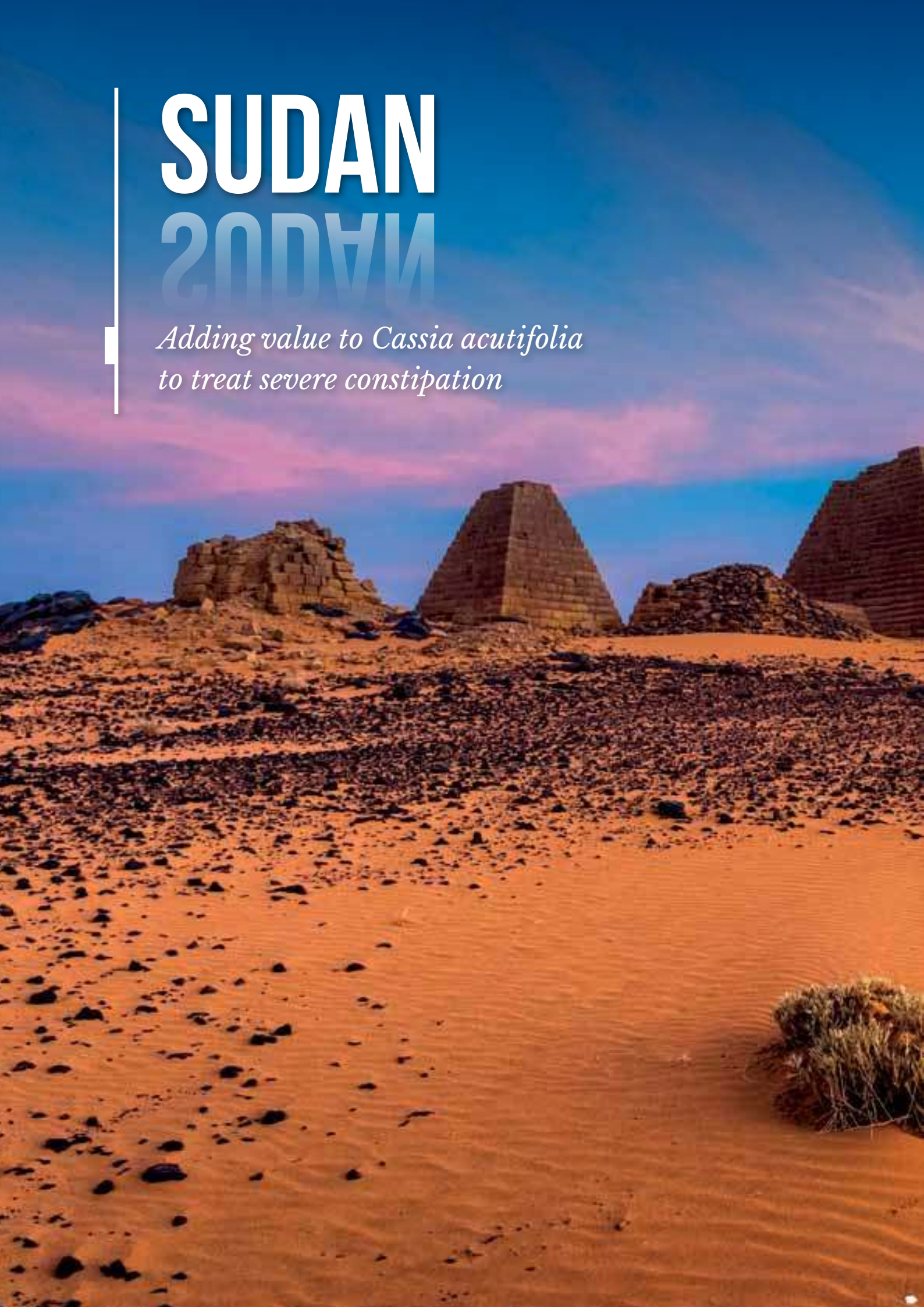
OF JORDAN

Arab States



SUDAN

Adding value to Cassia acutifolia to treat severe constipation



AUTHORS

AWATIF A.M. SIRIBEL
Medicinal and Aromatic Plants and Traditional Medicine Research Institute (MAPTRI)

MAGDA A. OSMAN
Medicinal and Aromatic Plants and Traditional Medicine Research Institute (MAPTRI)

SAADA N. A. EL MAHI
Medicinal and Aromatic Plants and Traditional Medicine Research Institute (MAPTRI)

SETTING THE SCENE

Sudan is situated in northeastern Africa and is the 16th largest country in the world, with a population of about 40 million. Thanks to its diverse ecosystems, including desert and semi-desert, savannah, mountains and seascapes, Sudan is endowed with unique flora and fauna. The country is part of the centres of origin or diversity or both for sorghum, pearl millet, okra, melons, sesame and dry dates. Forests provide potentially highly marketable products such as gum Arabic and medicinal plants. Rangelands support about 105.4 million head of cattle, sheep, goats and camels and a wide range of wildlife species. About 927 bird species and 90 species of reptiles have been recorded. Marine ecosystems feature diverse marine life including mangrove, coral, fish, turtles and sea birds.

Medicinal and aromatic plants are significantly important for subsistence, national economy, and foreign-exchange earnings, with about 2 530 species of flowering plants known to be found in Sudan.

Even though 75% of the population relies on traditional medicines, medicinal plants are neglected, given how they are produced, processed and marketed. The value chain of medicinal plants in Sudan is either supplied from wild collections by local inhabitants or small traders, or from cultivation under controlled environments. Villagers either collect a few species in large quantities for export purposes or collect many assorted species in small quantities for the local market. Brokers buy large volumes of medicinal plants from villagers in local markets.

Looking to the current trend, local industries tend not to source raw materials, but rather acquire extracts of medicinal and aromatic herbs from local research centres specialized in extractive technologies. Sudan's National Centre for Research (NCR) signed a number of agreements and partnerships with businesses and industries to develop R&D programmes to process raw medicinal plants and supply extracts used in sectors such as herbs and spices, pharmaceutical, cosmetic and food supplements.



Biodiscovery case

NCR and partners launched an integrated research and development programme to develop formulations of medicines and cosmetics based on traditional knowledge associated with medicinal and aromatic plants. In the case of senna (*Cassia acutifolia*, Fabaceae), a perennial wild herb indigenous to tropical Africa and India, the focus is on its purgative properties attributed to the presence of anthraquinone derivatives and their glycosides. The drug from senna is used to treat acute constipation and in all other cases in which defecation with a soft stool is required e.g., for haemorrhoid sufferers, after anal rectal operations, before and after abdominal operations and for persons with anal fissures. The US Food and Drug Administration (FDA) has approved senna as a non-prescribed drug and an ingredient in several commercial laxatives.

Indigenous to western Sudan and traditionally used as laxative, senna is collected in the wild for both local markets and export purposes. Poor collecting practices associated with climate change and an increasing international demand pose serious threats of genetic depletion. The organic cultivation of senna gives Sudan a strong comparative advantage, yet quality varies significantly given that active ingredients are affected by the season, method and time of collection, age of used part and the habitat in which it grows.

Annually senna exports amounted to about 2 000 tonnes of raw pods with an estimated value of roughly US$1.5 million (according to Sudan's central bank records over the last five years), compared to annual imports of laxatives, mainly sourced from senna, of about $30 million over the last five years (according to Sudan's National Council for Drugs and Poisons records). Senna can be produced in different value-added forms including blended and unblended herbal tea, powder, crude extract, sennoside extracts and pharmaceutical drugs.

NCR and partners are adding value to associated traditional knowledge by using it as a lead in their R&D programmes. This will result in additional benefits for local people by building their capacities, increasing their revenues and acknowledging their traditional knowledge.

Business partners include Citypharm pharmaceutical industry and Sanhorial Medical and Cosmetics for cosmetic products. Benefits are expected in monetary and non-monetary terms which will include capacity building of technical staff, technology transfer, joint Intellectual Property (IP) applications, joint publications, trainings and development services benefiting local communities.

EYEWITNESS STATEMENT

"Up until now senna was collected from the wild, which increased the hazards of sustainability of production and the genetic resources as well as the variation of product quality which is affected by the method, season and time of collection, age of used part, and the habitat in which it grows. Therefore, MAPTRI commenced an intensive research and training programme to elaborate the GCP, GAP and GMP for senna. Promising results are expected, looking forward to cultivating this valuable plant in the most suitable areas, which will lead to sustaining the productivity within international standards in order to satisfy both the local and international markets in terms of demand and timing. Making sure that collectors and local farmers are getting more involved in the whole process, maximizing their benefits, and seeing how this will reflect positively on their standard of living, will be the future focus of MAPTRI".

AWATIF AHMED SIRIBEL, Medicinal and Aromatic Plants and Traditional Medicine Research Institute (MAPTRI), Director, 2018

"I have worked for MAPTRI as a technician since it was established in 1971. I participated in more than 100 field visits and plant collection tours all around Sudan. I am the one responsible for documenting the information collected from traditional users during the investigations and surveys. I speak different Sudanese dialects, especially the Bija language, the tongue of the biggest tribe in the eastern part of Sudan, as well as the north inhabitants' dialects; this allows me to almost write every single word I hear from the people dealing with herbs and their traditional uses in those areas. When we analyzed the collected information and compared it with the scientific findings in the lab, it happened that more than 90% of the results are identical to those stated by local users. Sudan is a huge country with a great diversity and over time I learned something new from the local people dealing with traditional medicines. They are real treasures."

MAHJOUB OU, Technician, MAPTRI, 2018



In fine focus: SDGs implemented by the biodiscovery case

Establishing an ABS-compliant senna value chain will significantly contribute to the achievement of Sustainable Development Goals (SDGs). These SDGs include, but are not limited to, rural development, economic growth, food security, improved nutrition, health and sustainable agriculture and innovation in addition to also opening a window for international partnerships. More specifically:

- SDG 1 (No Poverty) and SDG 2 (Zero Hunger) are addressed by establishing an ABS-compliant senna value chain which will allow indigenous people and local communities to harness some of the benefits arising from their genetic resource and associated traditional knowledge and create incentives for the cultivation, conservation and management of senna. It will also create new job opportunities and improve existing traditional practices through the introduction of new technologies.
- SDG 8 (Good Jobs and Economic Growth) and SDG 9 (Innovation and Infrastructure) are addressed through the provision of new technologies and the creation of new markets for local people, contributing to economic growth and infrastructure development.
- SDG 11 (Sustainable Cities and Communities) is supported by the income generated in the senna value chain and the settlement of the targeted communities will increase their ability to adapt and improve their resilient capacity to cope with their environments and sustain their livelihoods.
- SDG 15 (Life on Land) is addressed by the senna value chain which will promote fair and equitable sharing of benefits from the use of genetic resources and encourage reinvestment of benefits into conservation and sustainable management of biodiversity and ecosystems.
- SDG 17 (Partnerships for the Goals) is supported by promoting partnerships between R&D institutions and private businesses with indigenous peoples and local communities.

Legal and political enabling environment for ABS and the Nagoya Protocol

Sudan ratified the Nagoya Protocol in 2014. Sudan is one of the 24 countries selected to implement the UNDP-GEF Global ABS project to develop and strengthen its national ABS frameworks, human resources and administrative capabilities to implement the Nagoya Protocol. In this context, a multi-stakeholder national committee chaired by H.E. the Minister of Environment, Natural Resources and Physical Development was established for the drafting of an ABS law and its alignment with issues of benefit sharing in sectoral laws.

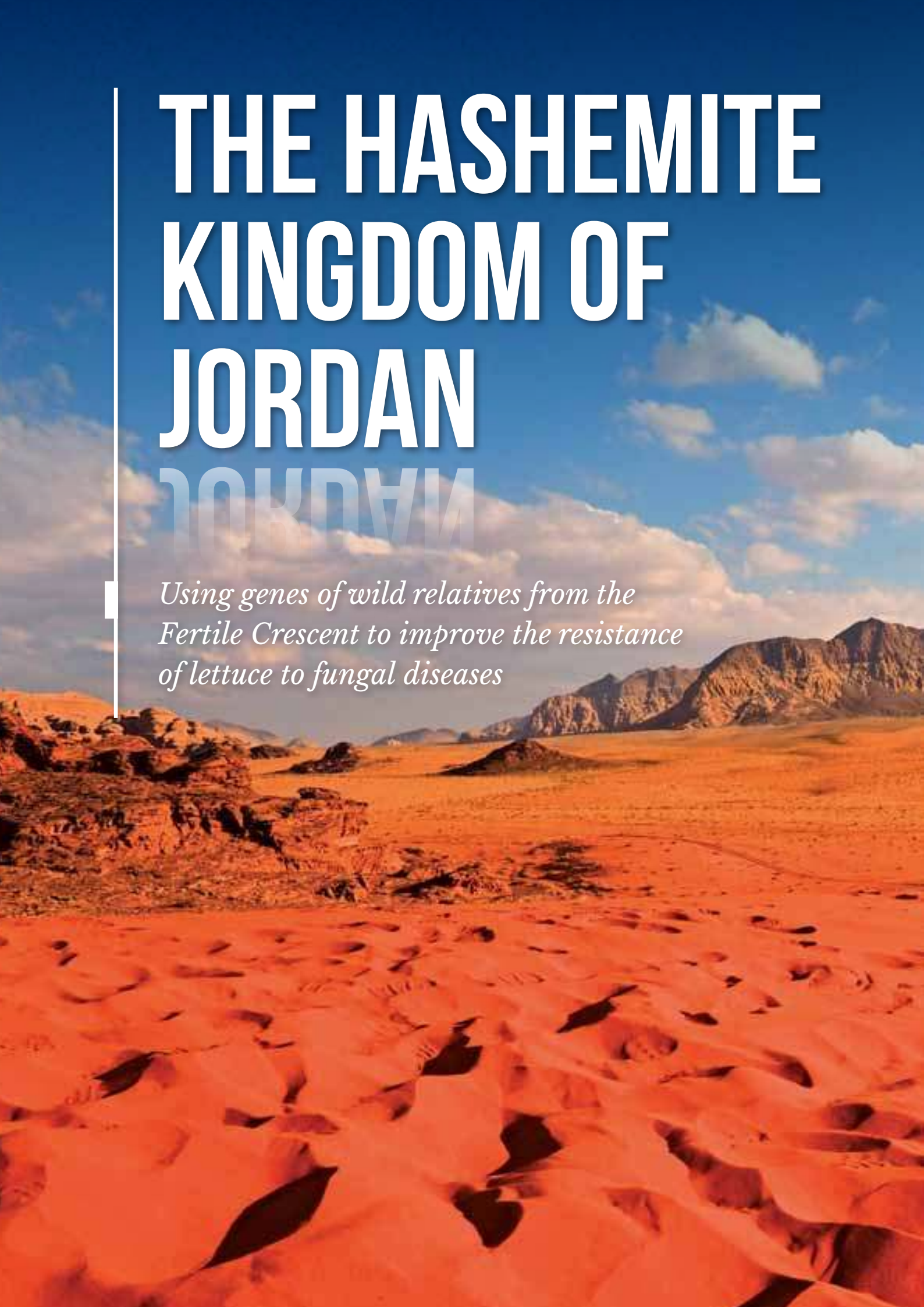
So far, multidisciplinary teams made of national experts and backed by international ABS specialists have delivered tangible results, including an advanced draft of the ABS law which was finalized and is now going through the approval process. Guidelines for documentation of associated traditional knowledge were developed and four pilot ABS-compliant value chains are being developed. They have a sector-specific focus on agriculture, medicinal and aromatic plants, wildlife and animal resources. A national biodiscovery strategy is being developed, including a mapping of current and potential users of genetic resources from research institutions and private businesses to unleash a wide range of benefits derived from public-private partnerships. A number of awareness-raising workshops have taken place and others are planned to strengthen critical ABS capacities and share experiences and good practices, while also disseminating knowledge.

MESSAGE FROM SDG ADVOCATES

"Sudan is committed to the implementation of the SDGs, with specific focus given to relevant SDGs such as SDGs 1, 2, 7, 13, 16 and 17. Increasing agricultural productivity, peace, and social development were identified as main accelerators that can have a clear impact on several SDG goals at the same time.

Increasing land productivity has been shown to be a powerful engine for poverty reduction and to provide flows of income and investment that can feed into economic transformation in Sudan. By establishing appropriate legal frameworks and policies, by promoting access to benefit sharing through ABS compliant value chains and biodiscovery partnerships, as in the senna case, the UNDP-GEF Global ABS project is expected to significantly contribute to the achievement of national SDG targets."

THE ABS COUNTRY TEAM of the UNDP-GEF ABS Project in Sudan



THE HASHEMITE KINGDOM OF JORDAN

Using genes of wild relatives from the Fertile Crescent to improve the resistance of lettuce to fungal diseases

AUTHORS

KHALED ABULAILA

Director of Biodiversity, National Agriculture Research Centre (NARC)

MOHAMMAD ABUMUGHLI

Project Officer, UNDP-GEF Global ABS Project in Jordan

SETTING THE SCENE

Jordan is a relatively small country with area totaling almost 90 000 km^2. It is divided into four different biogeographical zones; the Mediterranean, Irano-Turanian, Saharo-Arabian and Sudanian or Tropical penetration. Within these diverse zones, there are 13 different vegetation types, each representing different elements of flora and fauna.

The Jordanian climate is mostly of arid desert with a relatively short rainy season between November and April. The topography of the country is highly contrasting; from more than 400 m below sea level at the Dead Sea, to 1 854 masl at the southernmost boundary on Um Addami Mountain. This variation in physical environment is strongly reflected in the diversity of life in the country, in terms of natural heritage along with its associated cultural values and biological diversity.

Due to Jordan's varied terrain, it hosts diverse ecosystems, which are divided into four major groups: desert, scarp and highland, subtropical, and freshwater. The diversity of Jordan's flora and fauna are indicative of their many origins. However, the country also has many endemic species. Of its 2 650-recorded species of vascular plants, representing about 1% of world flora, 100 are endemic.

Crop wild relatives and medicinal plants are particularly important floral groups in Jordan. There is a total of 78 mammal species and 425 bird species. Jordan's avifauna is especially rich because of its geographical location by the Great Rift Valley, lying within the route for migratory north palearctic waterfowl. The Gulf of Aqaba hosts more than 1 000 species of fish, 250 species of coral, in addition to sponges, snails, crabs, and sea turtles. Jordan also hosts 102 species of herpetofauna, the majority of which are reptiles. Although invertebrates are estimated to form more than 70% of Jordan's total number of faunal species, the exact number is still unknown.

As the country ranks as the world's second poorest country in terms of water resources, it is limited in natural resources, agricultural land, and severely scarce water, with potash and phosphate as its main export commodities. The main agricultural products include citrus, tomatoes, cucumbers, olives, strawberries, stone fruits, sheep, poultry and dairy. Only around 2% of Jordan is arable land, including a total irrigated area of 800 km^2. Drought is the main natural hazard facing Jordan in addition to the potential for periodic earthquakes. The main issues related to the environment in the country are limited natural freshwater resources, deforestation, overgrazing, soil erosion, desertification and pollution. To combat these issues, Jordan signed many Multilateral Environmental Agreements (MEAs) and is focused on protecting and rehabilitating many threatened locations.



Biodiscovery case

Jordan is part of what used to be known as the Fertile Crescent, a midpoint between two centres of origin of crop species. As mentioned earlier, the native flora of Jordan includes many economically important groups of plants such as plants of medicinal values, many wild edible plants and crop wild relatives (CWR).

CWRs are the wild cousins of our cultivated crops and are genetically related to food crop varieties. Untended by humans, they continue to evolve in the wild, developing traits such as drought tolerance or pest resistance. Breeders can make use of their superior genetic traits to improve commercial varieties towards resisting different stress conditions. They have been used to improve yields and nutritional quality of food crops as well. The National Agriculture Research Centre (NARC) in Jordan, which is responsible for research and biodiversity conservation under the Ministry of Agriculture, oversees the conservation and sustainable utilization of Plant Genetic Resources for Food and Agriculture (PGRFA) and is officially designated as the focal point of the International Treaty on PGRFA. NARC's national gene bank, which is officially designated as the National Gene Bank of Jordan, hosts more than 4 000 seed accessions of different plant groups, including crops and landraces. At the practical level, NARC, represented by the Directorate of Biodiversity, has implemented many projects and initiatives toward the conservation and utilization of CWRs native to Jordan. For this purpose, NARC signed a MoU with the Royal Botanic Gardens at the United Kingdom to collaborate and share benefits in collection, conservation and research on the local Jordanian flora. This included funding collection missions, capacity building of the NARC staff, collaborative research and sharing of results. The first phase was from 2001 to 2010 and, because of the great results achieved out of this collaboration, it was extended until 2021.

Another ongoing collaboration was established with the Centre for Genetic Resources (CGN) at the University of Wageningen in the Netherlands for the five-year period 2015–2020. This collaboration focuses on the conservation and utilization of CWRs of mainly vegetable crops and includes funding collection missions, conservation and capacity building, mainly for techniques of sampling breeding materials and pre-breeding approaches. In order to regulate the transfer of the shared collected seeds between Jordan and the Netherlands, an MoU was signed between the two parties. Under the MoU, Material Transfer Agreements (MTAs) are signed by the competent authority of the Treaty (NARC) and approved by the competent authority of the CBD (Ministry of Environment) for each transfer of PGRFA.

A good example of the CGN collaboration concerns the collection and sharing of materials (seeds) and related information about the gene pool of *Lactuca* species (Asteraceae) in Jordan. Material exchanges have involved the crop wild relatives of cultivated lettuce, which is a genus of great importance to food and agriculture but not included in the Multilateral System of the International Treaty on PGRFA. Therefore, such material exchanges are regulated in accordance with the bilateral ABS approach of the Nagoya Protocol. The crop wild relatives of lettuce that grow mostly in

disturbed habitats possess genes of resistance to fungal diseases. Such genes can be introgressed into cultivated lettuce (*Lactuca sativa*) to induce resistance to diseases. The initial stages of utilization included the propagation of the stock material collected from the natural habitat, then the sharing of the seeds to be conserved in both gene banks (NARC and CGN). In the subsequent phase, portions of the collected seeds are planted for pre-breeding under inoculation with various strains of fungi.

With the aid of genetic markers, the resistant lines are selected and crossed with the cultivated lettuce. Then a routine procedure of backcrossing with the cultivated parent with marker-assisted screening is used to develop to the resistant cultivated variety. Besides the researchers at CGN, third parties (private companies) will also be involved during the product-development value chain, starting from the propagation stage. The main benefits will be the sharing of knowledge, capacity building of NARC staff by the CGN and the private companies both in Jordan and outside the country, support for the missions of collection and conservation and for the establishment of breeding programmes in Jordan and the joint publication of scientific reports and papers.

The Biodiversity Directorate at NARC is seeking further collaboration to expand the scope of such work with other international organizations to support research on the conservation and utilization of local flora and landraces.

EYEWITNESS STATEMENT

"The rich traditional knowledge of local communities, and particularly the knowledge possessed by local women, is essential for implementing the Nagoya Protocol in Jordan. Such knowledge will ensure more sustainable access and benefit sharing of genetic resources and biological diversity in the Kingdom."

MS RANA SALEH, UNDP Jordan, Environment, DRR and Climate Change Portfolio



In fine focus: SDGs implemented by the biodiscovery case

The research collaborations, plant breeding and traits discovery, such as in the above examples, help the country cope with the most pressing obstacles to achieving the global SDGs by targeting issues related to biodiversity conservation and sustainable use, access to genetic resources and benefit sharing, climate change, hunger, biodiversity, responsible consumption and production, poverty and economic growth.

Jordan with the support of the UNDP-GEF Global ABS project is working to implement Target 15.6 of SDG 15 on access to genetic resources, its sustainable use and benefit sharing. Similarly, the project is supporting Target 2.5 of SDG 2 which states that: "By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed".

The UNDP has been working on these and other environmental issues in Jordan through its Environment, Climate Change and Disaster Risk Reduction (DRR) Pillar. The pillar provides dynamic support to the Government of Jordan and other institutions of the country, including non-governmental organizations, community-based organizations, and the private sector, to address environmental challenges facing Jordan, such as climate change, loss of biodiversity, desertification, and water scarcity, and contribute to achieving sustainable development. Jordan is fully committed to achieving the SDGs and contributing to global sustainability.

Legal and political enabling environment for ABS and the Nagoya Protocol

Jordan is advancing towards the sustainable and equitable use of genetic resources by developing a culturally acceptable, inclusive, and beneficial legal framework for implementing Access to genetic resources and Benefit Sharing (ABS) that is compliant with the Nagoya Protocol of the Convention on Biological Diversity.

On 25 July 2018, representatives of the Jordan Ministries of Environment and Agriculture, The Royal Society for the Conservation of Nature, The Royal Botanic Garden, The Badia Restoration Programme, The National Convention on Biological Diversity Committee, Bird Life International, The Royal Marine Conservation Society of Jordan, Jordan Customs, Pharmacists Syndicate, German Technical Cooperation, universities, the International Union for the Conservation of Nature (IUCN), and UNDP, met in a workshop at the Dead Sea to review and validate a draft ABS bylaw for the country. The workshop followed a comprehensive analysis, coordinated by the Jordan Ministry of Environment with support from the UNDP-GEF Global ABS Project and IUCN, of bylaws and other legal provisions relating to access and use of genetic resources in the country. These included the National Biodiversity Strategy and Action Plan 2015–2020, the Environment Protection Law (Number 52, 2006), the Bylaw on Protected Areas and National Parks (Number 29, 2005), the Bylaw on Environmental Impact Assessment (Number 37, 2005), and the Agriculture Law of the Ministry of Agriculture (Number 44 of the year 2002).

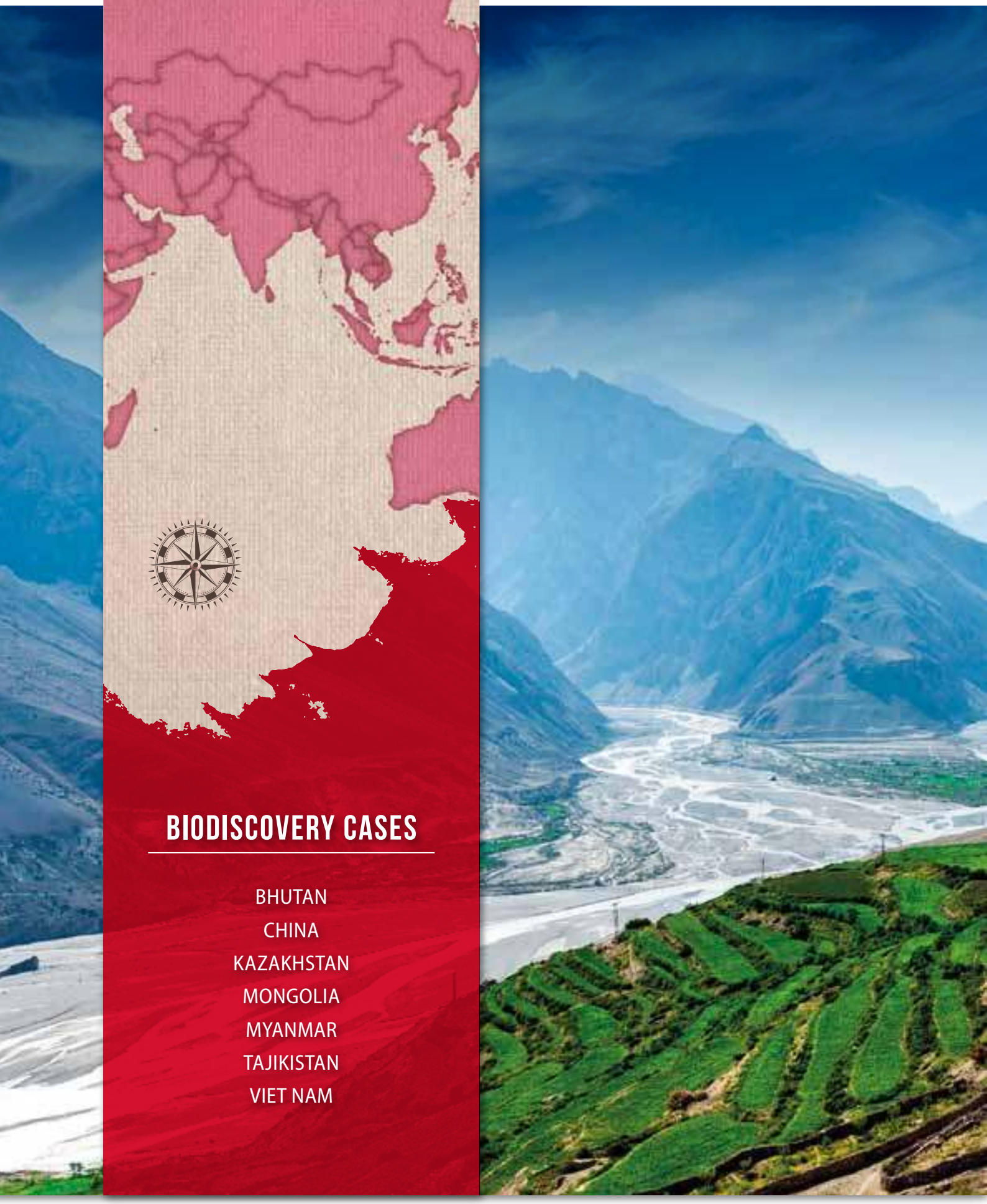
The new bylaw, which was developed in consultation with relevant stakeholders, provides a legal framework for strengthening institutional capacities and clarifies institutional mandates and responsibilities for ABS implementation in the country. The draft law will be submitted to the Cabinet for discussion and endorsement.

"This bylaw will define the roadmap for implementing fair and equitable sharing of benefits from genetic resources in Jordan" – **Mr Raed Bani Hani**, Director of Biodiversity Directorate at the Jordan Ministry of Environment.

MESSAGE FROM AN SDG ADVOCATE

"The conservation of genetic resources contributes to food and agricultural security in the country and it is important that there be close coordination between decision making and scientific research. Conservation of genetic resources highly depends on the local communities, especially those surrounding protected areas."

DR NEDAL AL ORAN, Specialist for Environment, Climate Change, and DRR Pillar, UNDP



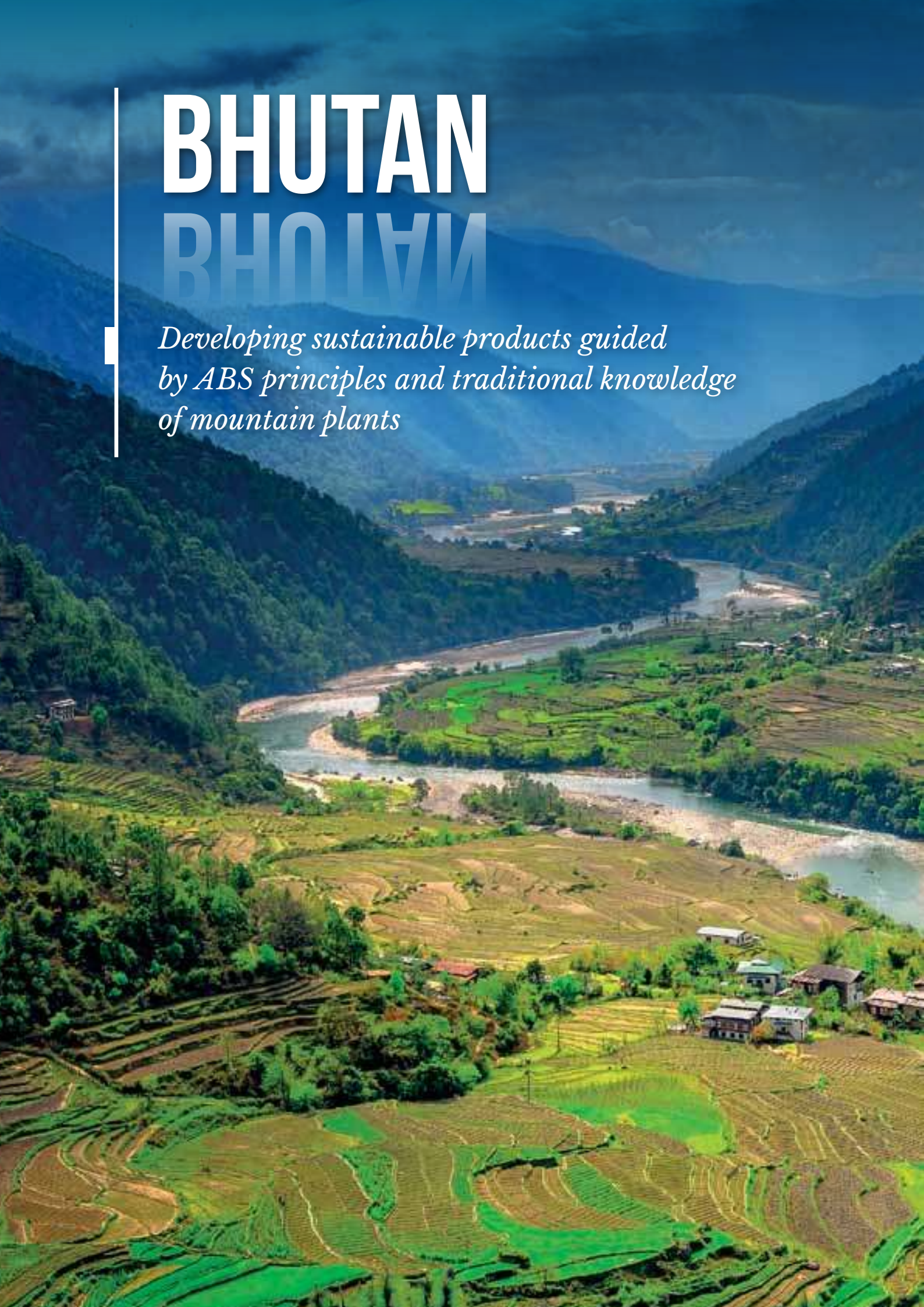
BIODISCOVERY CASES

BHUTAN
CHINA
KAZAKHSTAN
MONGOLIA
MYANMAR
TAJIKISTAN
VIET NAM

Asia

BHUTAN

Developing sustainable products guided by ABS principles and traditional knowledge of mountain plants



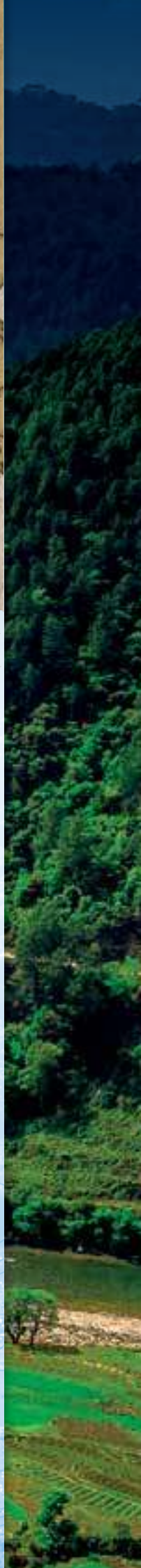
AUTHORS

JIGME DORJI

Portfolio Analyst Environment & Livelihoods, UNDP Bhutan

CHENCHO DORJI

Project Manager, UNDP-GEF ABS national project Bhutan



SETTING THE SCENE

Bhutan's unique biogeographic location at the intersection of the Indo-Malayan Realm and the Palearctic Realm combined with an extreme altitudinal range and micro-climatic conditions have given rise to an outstanding diversity of flora and fauna. More than 5 600 species of vascular plants, close to 200 species of mammals, and some 700 species of birds have been recorded in a country that is just 38 394 km^2 in geographical size, the second smallest in South Asia. At the global level, the country forms the core of the Eastern Himalaya, which is recognized to be a global biodiversity hotspot and a globally important eco-region. The global significance of the country's biodiversity is accentuated by the fact that it hitherto occurs virtually un-fragmented over vast stretches of natural land as a result of limited human intrusion.

Bhutan has been fortunate to have visionary leaders who have tirelessly advocated and demonstrated global leadership on the importance of environment conservation. There is a profound nexus between the country's biodiversity and its people. Sixty-nine percent of the population lives in rural areas subsisting on an integrated farm-based livelihood system that combines crop agriculture, livestock rearing, and use of a wide range of forest products. The strong culture of ethno-botanical uses, even to this day, remain significant, and rural communities have vast stores of traditional knowledge on the use of more than 200 species of medicinal plants that exist in the country.

To counter the various threats to biodiversity, Bhutan has in place various strategies supported both by policy and legal instruments. The access to genetic resources and benefit sharing (ABS) mechanism supported through the UNDP-GEF project ("Implementing the Nagoya Protocol on Access to Genetic Resources and Benefit Sharing in Bhutan") is just one example of an innovative approach to complement the ongoing efforts of the Royal Government of Bhutan.



Biodiscovery case

At first glance, the Dzedokha village, located in the south-west of Bhutan might not seem to have the makings of a lucrative industry. With 2 672 residents, this mountainous village, like thousands of other communities in this largely rural kingdom, is off the beaten track; it is only accessible via a single unpaved farm road, mostly impassable during the monsoon season.

Although the Dzedokha community is blessed with relatively fertile soil conditions to grow cash crops such as cardamom, ginger and mandarin oranges, the prices of cardamom and ginger have always been a gamble for the farmers subject to disappointments due to volatile market conditions – a challenge for these isolated rural farmers. To add to their woes, citrus greening disease caused mainly by climate change affected the entire orange orchards in the villages almost a decade ago. The 35 km access road from the nearest highway to the community is not only unpaved, but vulnerable to landslides during the monsoon season.

But the Dzedokha area's cultivation of a plant utilized in traditional medicine – *Zingiber cassumunar*, or Mountain Ginger – is opening up a world of economic potential, while simultaneously preserving traditional knowledge (TK). Given its relatively fertile soil conditions, mountain ginger grows well in Dzedokha and yields a stable market price – with possibilities for increased demand.

Working in partnership with UNDP Bhutan, and financed by the UNDP-GEF ABS project, the National Biodiversity Centre (NBC) has developed natural products based on the documented traditional knowledge of using Mountain Ginger. The initial idea came while documenting traditional knowledge, when members from the community noted that mountain ginger was often used for relieving joint pains. The pilot project, then began with a formal agreement drawn between the NBC and the community members, followed by training on cultivation techniques. Currently, the project is in its third year of commercial harvest of Zingiber cassumunar for the community. Many farmers mentioned that the plant is relatively easy to cultivate and is generally not destroyed by wild animals – a common threat to other crops.

The NBC on the other hand, with the technical collaboration of the Herbanext Laboratory Inc. and through its bioprospecting program has tested the TK holders' claims that the plant contains active ingredients that can reduce joint pains. After a year-long research work, the NBC in line with the ABS processes of the country developed two products namely a massage balm and a liniment oil from the Mountain Ginger, which were launched by the Prime Minister of Bhutan on 5th April 2018 along with seven other nature based products: such as anti-wrinkle cream, perfume, soaps, and hand sanitizer to support sustainable livelihoods of the rural communities.

A win-win situation for all parties has been created under this ABS project by helping the government and the local communities to harness the potential uses of the country's rich biological resources and its associate traditional knowledge sustainably. Chencho Dorji, Project Manager said that "*this pilot project has immensely benefited the NBC in better understanding the ABS processes through first hand-experiences of drawing an ABS agreement with the community. It is foreseen that the project will not only empower the community through premium prices for the genetic resource but also benefit from additional incentives such as capacity building for sustainable harvesting and sharing of a percentage from the sale of the products.*" He further elaborated that "*the users benefit in terms of less investment and time saving in biological resources exploration due to the guidance from the Traditional Knowledge and a steady supply of raw materials from the local community groups.*" Additionally, a portion of the monetary benefit resulting from these ABS agreements will go to the Bhutan Access and Benefit Sharing Fund as a plough-back mechanism to support and sustain biodiversity conservation efforts in the country.

EYEWITNESS STATEMENT

On 5th April 2018, Mr Chencho Dorji, the Project Manager of the UNDP-GEF ABS project, dressed in one of the finest raw silk suits looked excited and bit nervous too. He was excited as it was the day of the much-awaited ceremonial launch of the nine nature-based products that the team from the NBC had worked on for the last four years in collaboration with Menjong Sorig Pharmaceuticals Corporation Limited, Bio Bhutan and local communities of Dagala, Lingzhi, Logchina and Langthel. However, his nervousness was not because of the launch, but because the launch event had been elevated to a higher level to be graced by the Prime Minister as the Chief Guest.

The nature-based products, being first of their kind and produced in line with a national ABS framework not only impressed the guests, but also received a huge praise from the Prime Minister calling it 'pristine products' produced from the pristine environment of Bhutan.

He further elaborated that Bhutan must optimally use its rich genetic resources in a way that benefits the Bhutanese and the rest of the world.

As the room got flooded with promotional packages and the guests started to walk in, Mr Chencho said "*I am very happy not just because of the success of the launch, but because of the high-level endorsement and nationwide media coverage, encouraging more such ABS ventures in the future.*" However, he said "*I will be the happiest when the proceeds from the sale of the products are handed over to the farmers*", as he recalled **Mr Nar Doj Ghalley**, Chairman of the Dzedokha Farmers Group and his friends mentioning pressures to pay off their farm loans and meet their children's education expenses had lessened from extra income they earned from the sale of the Zingiber.

In fine focus: SDGs implemented by the biodiscovery case

The project contributes to advance the following Sustainable Development Goals (SDGs):

- SDG 1: No Poverty
- SDG 3: Good health and well-being
- SDG 5: Gender Equality
- SDG 8: Decent work and Economic Growth
- SDG 13: Climate Action
- SDG 15: Life on Land

The project supports the livelihoods of far-flung rural communities that are less privileged, and do not have an easy access to modern developmental facilities. The implementation of the Nagoya Protocol compliant ABS agreements generated employment and income opportunities for both men and women (SDG 1 and 8). Monetary benefits through the sale of the nature-based products leveraged children's education and basic necessities for the poor households of the communities.

The project rationalizes the conservation and use of Bhutan's genetic resources in response to addressing a wide range of biodiversity threats and impacts by enhancing the social and economic value of biodiversity conservation. The project's support in strengthening National ABS Policy and Regulatory Framework helps the country to guide and regulate the use of biodiversity and conservation, thereby protecting, restoring and promoting sustainable use of terrestrial ecosystems, sustainably managing forests, combating forest degradation, and most importantly halting the loss of biodiversity under the SDG 15.

The ABS project supports rural communities, who are the custodian of traditional medicines, sustainable harvesting, processing, marketing and utilization of medicinal plants. The project supports the good health and well-being (SDG 3) of local communities, ensuring healthy lives and the promotion of well-being for all ages of men, women and children. The traditional medicines are cheap and affordable to poor people of the Bhutanese society, who can't afford modern medicines.

The project's emphasis on research and commercialization and the discovery of nature-based products and diversification builds the resilience of local communities against climate change, thus contributing to SDG 13.

Gender-disaggregated capacity development, awareness and sensitization programs contribute to ensuring gender equality and women's empowerment. The fact that women are in the executive position, in managing the different genetic resource management groups across the pilot sites empowers them to make rational social and economic decisions that benefit their lives (SDG 5).

Legal and political enabling environment for ABS and the Nagoya Protocol

In June 2017, the interim 2015 Access and Benefit Sharing (ABS) Policy was adopted by the Government as the National Access and Benefit Sharing (ABS) Policy of Bhutan. The Biodiversity Act of 2003 has been revised, recognizing the importance of regulating access to and utilization of genetic resources and associated traditional knowledge. The draft Biodiversity Bill has been reviewed by the Office of the Attorney General and with the incorporation of their feedback, it has been finalized and submitted to the Cabinet Secretariat for further submission to the Parliament. However, the passage of the Bill will be delayed, as the Parliament is hesitant to take up any new issues before the 2018 elections. Nonetheless the interim ABS policy has been approved by the Government, which will mitigate the impact and pave a way forward for ABS implementation, should the Bill does not pass this year.

Furthermore, the formulation of the rules and regulations for the implementation of the Biodiversity Act, identification and designation of competent/authorised agencies for the implementation and regulation of the ABS regime in compliance with the Nagoya Protocol, and establishment of an institutional framework, administrative systems, rules and procedures to facilitate implementation of the national ABS framework have all been completed. Bhutan signed the Nagoya Protocol in 2011 and ratified it in 2013 in keeping with its commitment to international law and as a State Party to the Convention on Biological Diversity.

MESSAGE FROM AN SDG ADVOCATE

"The ABS project is very special to the National Biodiversity Centre as it is first of its kind in supporting the Government, the private sector and local communities to develop nature-based products from the country's rich biological resources in a sustainable way through the access and benefit sharing regime. For us, this means growth and development are inclusive and sustainable with a focus on conservation.

The ABS project is also very close to my heart as it has directly benefited the communities of Bhutan. The ABS project has enabled the people to come up with innovative ideas for income generation opportunities through sustainable harvesting, domestication and commercialization of wild plants and other biological resources.

The project has also renewed the appreciation of people to the natural environment, reinforcing the benefit of biodiversity conservation.

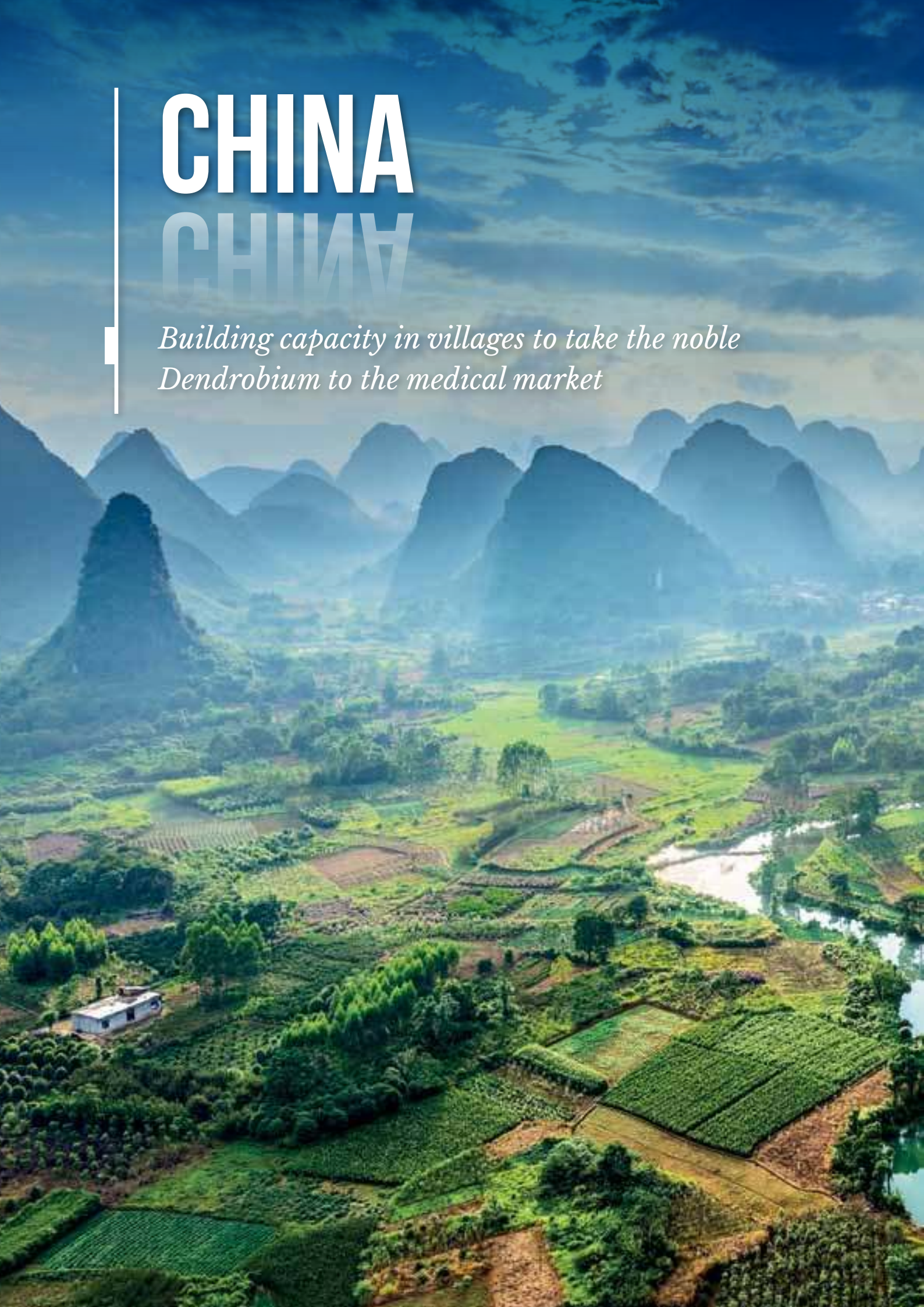
One of the key challenges that we faced during the implementation of the project was in managing the expectations of the local communities especially, benefit sharing. This was overcome by promoting partnerships with the local communities in every step of the project implementation; keeping them informed on every progress and empowering the community to lead the process. Furthermore, creating awareness on ABS, product value chains, market forces, sustainable utilization, etc. helped manage their expectations at a realistic level. This process strengthens the trust and respect between the parties which greatly influenced the negotiations of the benefits.

I also believe in the importance of imparting legal awareness to the local communities before proceeding to the negotiation and signing of the ABS agreements. The other important lesson that I have learnt throughout the process is a need for strategizing a localized communication plan for effective communications with the local communities."

DR TASHI YANGZOME DORJI, Program Director of the National Biodiversity Centre, Ministry of Agriculture and Forests.

CHINA

Building capacity in villages to take the noble Dendrobium to the medical market



AUTHORS

YE WANG
Project M&E Specialist, UNDP-GEF ABS Project

YULIN FU
Project Assistant, UNDP-GEF ABS Project

LEI GAO
Project Financial Specialist,
UNDP-GEF ABS Project

CHAODE MA
Portfolio Manager of UNDP,
UNDP-GEF ABS Project

YUEYU ZOU
Project Manager, UNDP-GEF ABS Project

SETTING THE SCENE

China is a megadiverse country, home to some 10% of all known plant species and 14% of known fauna. Of the 34 984 species of higher plants known in China, 50% are endemic. Medicinal properties have been identified for 13 800 species of China's flora and fauna. The country's long agricultural history has produced a rich diversity of agricultural varieties and subspecies, through natural selection and artificial selection. China's population includes multiple ethnic groups in geographically diverse areas, who possess wide-ranging traditional knowledge related to crops, livestock, poultry, fish, traditional medicine, processing techniques, prescriptions and therapies, traditional farming methods and production models, traditional culture, folklore and biological products.

China's biological resources offer huge potential for the development of a national biotechnology industry and for providing sustainable benefits to the country, including the communities that depend on them. However, the traditional means of reaping benefits from biodiversity has been changing internationally. While traditional agricultural practices – including the development and marketing of the products of cultivation, propagation, animal husbandry and wild collection – continue, increasingly modern scientific methods are being used to enable the artificial synthesis of products based on the genetic and biochemical make-up of a particular variety or subspecies. These processes can result in the deterioration of supply chains for agricultural products and wild-collected specimens, by eliminating the user's need to acquire more than a small quantity of samples or to return and resupply more than one or two times. Thus, existing uses increasingly find their products in competition with products developed by synthesizing or otherwise utilizing the genetic or biochemical information from the species.



Biodiscovery case

Dendrobium nobile, Orchidaceae (known as *Shi Hu* in Chinese) has long been recognized for its unique properties and use for the treatment of stomach and kidney disorders and also for diabetes (*Compendium of Materia Medica*, 1603). Locally, it is also recognized to have curative properties with regard to vascular conditions such as phlebosclerosis. Initial chemical analysis confirms that *Shi Hu* contains a number of compounds of potential interest, including its own chemical compound of dendrobine and generates naturally more than ten other kinds of elements that are beneficial to human health, as well as high levels of polysaccharides and amino acids.

In the Xishuangbanna Dai Autonomous Prefecture of Yunnan Province, where *Shi Hu* is harvested and cultivated, the Dai People and Hani People and other minorities are engaged in the UNDP-GEF ABS Project ("Developing and Implementing the National Framework on Access to and Benefit Sharing of Genetic Resources and Associated Traditional Knowledge"), implemented by the Foreign Economic Cooperation Office, Ministry of Ecology and Environment (FECO/MEE), which has selected Yunnan as one of its three pilot sites in China. Since *Shi Hu* and its associated traditional knowledge are collected from local communities, the project will facilitate the signing of formal agreements on access and benefit sharing by both the providers and users of the GR/TK with PIC procedures. Training programmes and capacity building on dendrobium production and ABS will be organized for local communities, and the internationally recognized certificates for GR/TK will be issued by the government with the full participation of minority communities.

Local communities will receive dendrobium tissue culture, fertilizers and agricultural infrastructure, such as plastic tents from companies. The harvested plants will be purchased by companies. They will also sign agreements with companies, with the possibility of becoming shareholders in them bringing a positive impact to the level of employment and agricultural income and creating stable businesses within the area. Similar activities related to the involvement of minorities will be undertaken at other pilot sites in Guangxi Autonomous Region and Hunan Province. In all cases, care will be taken to ensure that participation and benefit sharing are gender responsive.

The practice of using biological resources as raw material to produce foods and beverages, for example, have been ongoing for centuries; however, scientific and technological advancements, as well as consumer needs and preferences are changing the way in which enterprises use biological resources. Many Chinese entrepreneurs are engaged in identifying new (genetic and biochemical) uses for traditional Chinese medicinal plants, including dendrobium, golden camellia, *Siraitia grosveborii* (Cucurbitaceaae) and even tea. While most of these uses still appear to focus on the use of direct production of extracts, powders and essences as ingredients in new products, some research work involves more advanced utilization of DNA and related knowledge.

Ming Hong Trading Co. Ltd, a company that produces and processes dendrobium in Xishuangbanna, has been processing harvested dendrobium in various forms, such as granules, lozenges, beverages, and capsules, mostly for local markets. Ming Hong Trading Co. Ltd uses dendrobium in medicines, which includes "Mailuoling", an eyesight-improving bolus of noble dendrobium and "Jinsangzihoubao", herbal throat lozenges that sooth sore and swollen throats. Some products are sold to Germany, Malaysia, Thailand and the USA.

EYEWITNESS STATEMENT

"For people in Xishuangbanna Dai Autonomous Prefecture of Yunnan Province in Southwest China, getting rid of poverty is an absolute necessity. The prefecture has had a magnificent cultural heritage and unique genetic resources and traditional knowledge for thousands of years, but people living here benefit little from what they have, making locals live in poverty and undermining their cultural confidence. We hope the project will promote our resource conservation and bring us a better life in the near future."

XIE YONG, staff of the Ming Hong Trading Co. Ltd

Xie Yong also mentioned that the UNDP-GEF project "Developing and Implementing the National Framework on Access to and Benefit Sharing of Genetic Resources and Associated Traditional Knowledge" promotes a vision that all the locals who are the providers of genetic resources and traditional knowledge could benefit from the users, such as Ming Hong Trading Co. Ltd. For people living in the prefecture, the ABS project is a great hope for them to improve their livelihoods. Their expectation provides motivation to the Project Management Office (PMO), inspiring all the involved staff in the project.

In fine focus: SDGs implemented by the biodiscovery case

For the remote and less-developed regions which are endowed with rich natural resources and long agriculture traditions, ABS has surely brought new opportunity for development by the valorization of genetic resources and associated traditional knowledge, and by the empowerment of the peoples who live in the local communities. They are now aware of the intrinsic value of the crops they cultivated and the experiences and knowledge they have accumulated on agriculture, medicine and even daily life, and know there are ways to protect them. This is how the UNDP-GEF ABS Project in China contributes to SDG 1 (No poverty) and SDG 2 (Zero hunger).

The Project also helps to realize SDG 8 (Decent work and economic growth) and SDG 9 (Industry, innovation and infrastructure), since the project implementation requires the assembling and documentation of local genetic resources and associated traditional knowledge, which not only increase jobs related to the use of them, but also favours research and the development of genetic resources and associated traditional knowledge.

Legal and political enabling environment for ABS and the Nagoya Protocol

The Government of China has identified the introduction of a national ABS framework consistent with the CBD's provisions as a priority and a key step to conserve biodiversity and promote access to genetic resources and associated traditional knowledge. China signed and ratified the Nagoya Protocol in 2015. The Ministry of Ecology and Environment of China published a draft administrative regulation on ABS in March 2017 to solicit public opinion.

China has attached great importance to ABS and the protection of natural resources and the environment. The 2nd paragraph of the 9th section of the Constitution stipulates: the country ensures the rational utilization of natural resources and protects rare animals and plants.

In the spirit of the Constitution, a series of legislation/laws have been adopted by the National People's Congress and its Standing Committee for natural resources and environmental protection, most of which involve biodiversity conservation and the conservation and rational utilization of genetic resources. For instance, the Animal Husbandry Law enacted at the end of 2005 involves benefit sharing, in which the 16th article stipulates: when transferring the genetic resources of livestock and poultry in protection lists overseas or conducting cooperative research with overseas institutions and individuals, an application should be applied to the livestock veterinary department of the provincial government, and a proposal to share the benefits should be submitted. The 10th article of the Seed Law established the national sovereignty of germplasm resources. The 5th article of the Patent Law stipulated that no patent right shall be granted for any invention where acquisition or use of the genetic resources on which the invention relies is in violation of the provisions of relevant laws and administrative regulations. Besides the aforementioned legislation, there are many other regulations pertaining to the conservation and utilization of genetic resource that have been promulgated by relevant departments of the State Council, including the Ministry of Agriculture and Rural Affairs, the State Administration of Forestry and Grassland and the General Administration of Quality Supervision, Inspection and Quarantine. In general, China has basically established a relatively complete legal/political enabling environment for the Nagoya Protocol, and will continue to promote ABS legislation to protect biodiversity.

MESSAGE FROM AN SDG ADVOCATE

"Based on the long-term partnership, UNDP cooperated with Foreign Economic Cooperation Office (FECO)/Ministry of Ecology and Environment (MEE) to formulate and implement the UNDP-GEF ABS Project for 2.5 years. We are generally satisfied with the progress of the implementation of the project, as it promotes ABS progress in China both from mainstreaming efforts such as policy, regulations, institutional management, standards perspectives, as well as piloting the innovation in China based on the best practices and lessons learnt from other continents, especially promoting the Public-Private Partnerships (PPP) for biodiversity conservation efforts. Furthermore, the project is also a good approach for systematically promoting UN SDG 2030 in China, as through the implementation, the project could promote most of the the SDG goals, which could systematically catalyze sustainable development in China."

DR MA CHAODE, Portfolio Manager of UNDP China

KAZAKHSTAN

Extracting novel wound-healing and anti-inflammatory phyto-products from liquorice root

AUTHORS

ANATOLY MISHENKO
Biodiversity expert, Institute of Ecology and Sustainable Development Officer

FIRUZ IBROHIMOV
Chief Technical Adviser, UNDP Kazakhstan

ARKAIY RADIONOV
Legal Expert, Institute of Ecology and Sustainable Development

KURALAY KARRIBAYEVA
Director of the Institute of Ecology and Sustainable Development

SETTING THE SCENE

The Republic of Kazakhstan is located at the heart of Eurasia. The length of the country is 1 600 km from north to south and 3 000 km from west to east, with a total area of 2.72 million km^2.

The fauna of Kazakhstan includes about 500 species of birds, 178 species of mammals, 49 species of reptiles, 12 species of amphibians, 107 species of fish and cyclostomes in rivers and lakes, and about 100 000 species of invertebrates, including 50 000 species of insects.

The flora is represented by 5 754 species of vascular plants, 4 851 species of fungi, 2 000 species of algae, 516 species of mosses and 485 species of lichens. Among the plants, 14% of species are endemic. Forest plant communities include 68 tree species, 266 species of shrubs and 433 species of herbs.

The agricultural flora is represented by 226 species of wild crop relatives that determine the genetic potential of 24 crops. Valuable plant genetic resources also include 10 species of currant, wild relatives of carrots, purslane, asparagus, onions, garlic, and 120 species of tulips. A gene pool of global significance for fruits includes Sievers and Nedzvetski apples, apricots and others.

Kazakhstan produces more than 70 varieties of crops, 68 varieties of fruits, and more than 60 varieties of vegetable and melon crops. More than 20 varieties of potatoes are bred and well adapted in the country. Among other things, the UNDP-GEF Global ABS Project in Kazakhstan facilitates and supports bioprospecting research on genetic resources that come from the following key plant species: *Allochrusa gypsophyloides*, species of *Glycyrrhiza*, *Rhaponticum carthamoides*, *Rhodiola rosea*, *Ferula assa-foetida* and species of *Cistanche*. Another species to which the project has payed attention is *Glycyrrhiza glabra* and its genetic resources. Liquorice is the root of *G. glabra* from which a sweet flavour can be extracted. The liquorice plant is an herbaceous perennial legume native to Kazakhstan. It has a wide range of substances useful to the human body.



Biodiscovery case

The Kazakhstan company "Zerde-Fito" LLC acknowledges the fundamental role of traditional knowledge as an important 'lead' for their work on genetic resource-based product discovery and innovation, as well as in its efforts towards biodiversity conservation and sustainable marketing.

The company has received a certificate of recognition that they produce and process the medicinal plants in compliance with Chinese traditional medicine standards and that the project is compliant with an ABS permit from Kazakhstan. The permit has been formalized through a benefit sharing agreement with a Chinese pharmaceutical company, jointly with the local communities of the south and southeastern part of Kazakhstan. This agreement is the first benefit sharing agreement in a Central Asian country with local communities for marketing of medicinal herbs.

"Zerde-Fito" LLC, which is the largest company in the Central Asian region, processes and produces phyto products. Today the company occupies a leading position among domestic producers of medicinal plant preparations, covering more than 80% of the market.

"Zerde-Fito" LLC regularly conducts research and development on medicinal and aromatic plants and develops an extract from liquorice and other plants. Liquorice has a wide range of substances useful to the human body. Its chemical composition is diverse: in the roots and rhizomes it contains the saponin derivative glycyrrhizin – a substance that is a mixture of potassium and calcium salts of tribasic glycyrrhizic acid. In addition, more than 27 flavonoids, ascorbic acid, steroids, estriol, a little gum, tar, essential oil and asparagine have been identified in the plant. Flavonoids have multifaceted effects on the body – spasmolytic, wound-healing and anti-inflammatory. The therapeutic effect on the body of liquorice root is due to its content of carbohydrates, glucose, fructose, starch and cellulose, as well as organic acids – fumaric, malic, citric and succinic. Liquorice as raw herbal plant material is widely marketed and exported to China and to European countries with the market name "liquorice root".

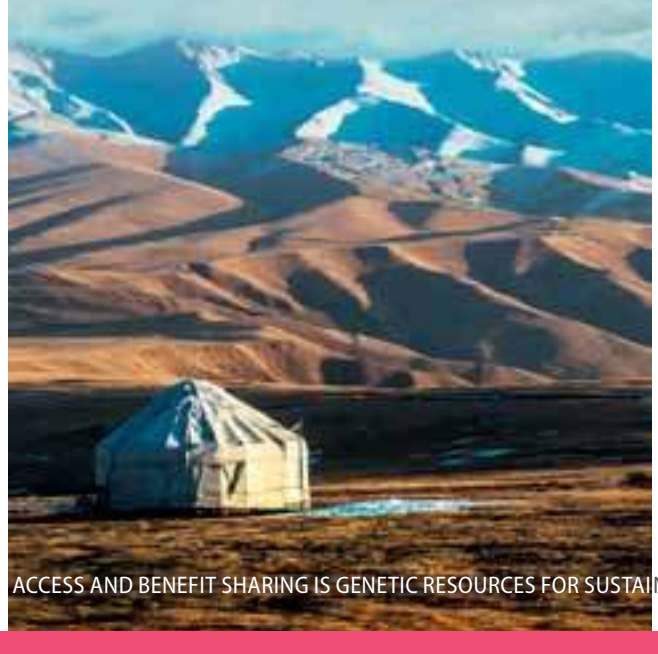
The terms of the Benefit Sharing Agreement are applied through notary-verified agreements between the company and the community, with which all of the monetary benefits are being shared. With a typical community-based contract, the company has agreed on all aspects of monetary benefits in advance with the community. The company makes a prepayment for the cultivation and conservation of the medicinal herbs, and when the community collects and delivers the medicinal herbs to the company, the latter makes final payments to the community based on the contract.

In the meantime, the company has provided technological equipment and tools for the local community to enhance their effectiveness for both the herbal plant's conservation and its management. Such benefits are among the non-monetary benefits that are included in the agreement, which also refers to the exchange of information and development results, collaboration, cooperation and contribution to training and capacity building, reinforcement of the technology-transfer capabilities, creation of institutional capacity, human resources and materials to reinforce the conservation and sustainable utilization of the genetic resources.

EYEWITNESS STATEMENT

"As a plant legal expert I have noticed that there are dozens of herbal plants which are not yet legalized due to unclarities on their origins, such as Ferula assa-foetida. Ferula should be legalized nationwide because it can help people from many different walks of life with their medical issues and also maximize revenue for the government. Legalization will positively impact the economy of most of the herbal farmers. Medical ferula is also constantly used as a painkiller in the place of Vicodin and other prescribed drugs."

MR ARKADY RADIONOV, legal support and adviser to the local community to protect both their traditional knowledge and newly developed intellectual property rights



"For many common infectious diseases herbal therapy using liquorice offers more effective and more wholesome treatment than traditional or synthetic medicines."

DR ANATOLY MISHENKO, business partner who, along with **MRS KURALAY KARIBAYEVA,** provides technical support for the community and the company



In fine focus: SDGs implemented by the biodiscovery case

The biodiscovery case contributes to implementation of the following SDGs:

- SDG 1 (Target 1.2): Incomes of 211 farmers (91 men and 120 women) will benefit from increases of 15 to 61% as a result of improved land productivity due to the use of genetic resources of liquorice; cultivation of high value genetic resources such as this would also have other environmental sustainability perspectives.
- SDG 1 (Target 1.3): Access to economic resources facilitated for the poor and vulnerable (especially previously displaced people and women) through job creation on sustainably managed genetic resources (19 new family users throughout the district with total restored genetic resource sites of 1 200 ha, creating jobs for 145 households (seasonal workers who come from the neighbouring regions) and 33 (permanent local residents) and through recruitment of (31) local residents (mostly women) to work in nurseries.
- SDG 3 (Target 3.9): Well-being and health of population in Kazakhstan as well as abroad to be improved due to wider processing and utilization of liquorice.
- SDG 15 (Target 15.1): Conservation, restoration and sustainable use of dryland ecosystems will be enhanced to over 1 200 ha.

Further, "Zerde Fito" LLC, through its partnerships, have established massive areas of recultivation and processing plants in eastern and southern parts of Kazakhstan. This project has created employment opportunities across the value chain. A total of about 1 200 people, of whom 71 % are women, have been employed in the process.



Legal and political enabling environment for ABS and the Nagoya Protocol

Kazakhstan ratified the Nagoya Protocol on ABS in 2015. Kazakhstan attributes great importance to the Nagoya Protocol on ABS. It has made significant progress since it became a contracting party to the CBD in 1977, by taking policy and legislative steps towards promoting conservation, sustainable utilization of wild species, biological resources and associated traditional knowledge, while also promoting the fair and equitable sharing of benefits arising from their utilization, namely through the National Biodiversity and Strategic Action Plan (NBSAP) and Environmental Code of 2007.

The inspectorate of the protected areas under the Committee of Forestry and Wildlife has been issuing bioprospecting permits since the coming into effect of the *Bioprospecting, Access and Benefit Sharing Regulations* (BSAP regulations) of 2015, which were developed in accordance with the Environmental Code of 2007. The BSAP regulations, which came into force in 2007, regulate the bioprospecting activities through a permit system. The UNDP-GEF Global ABS Project is supporting the upgrade of the existing legislative framework on ABS with the view to complying with the new obligations under the Nagoya Protocol. All legal and policy instruments have been reviewed at the national level with the view to harmonizing them and to fulfill the country's obligations under the Nagoya Protocol. Moreover, the ABS legal mainstreaming activities pursued by the project facilitate the implementation of the Nagoya Protocol in the country by enhancing legal certainty and transparency of the ABS procedures and supporting the implementation of monitoring mechanisms to encourage oversight of the utilization of genetic resources along the value chain, including through the internationally recognized certificate of compliance.

MESSAGE FROM AN SDG ADVOCATE

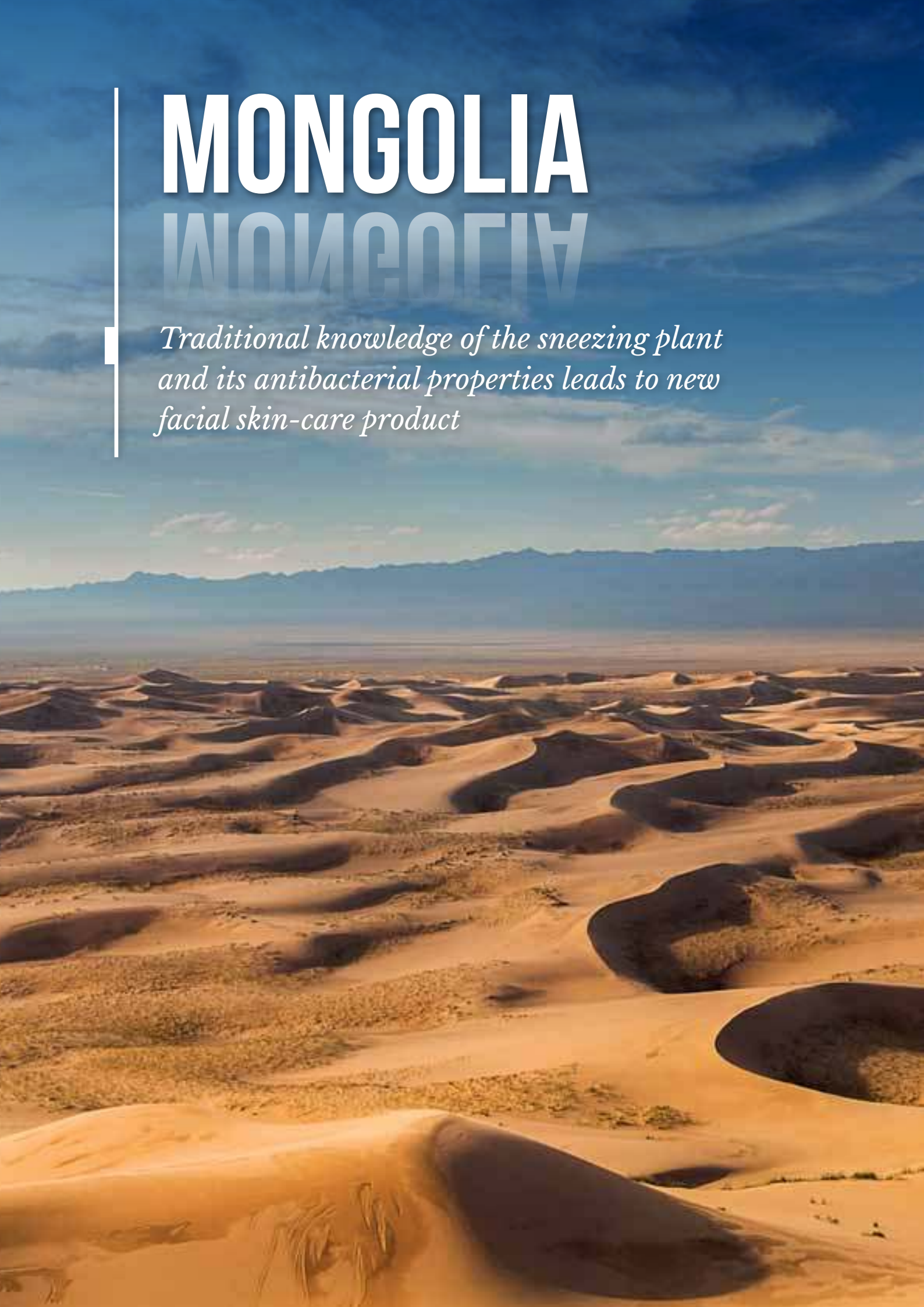
"To date the Nagoya Protocol echoes the sovereign rights of Kazakhstan over its natural resources and stipulates that Prior Informed Consent (PIC) with the custodians of the genetic resources and associated traditional knowledge is a prerequisite for adequate access by national and international users. It is very important to urge that we now can negotiate Mutually Agreed Terms (MAT) using all needed conservation prerequisites that clarify the use of genetic resources between the parties based on clear rules and procedures".

DR ANATOLY MISHENKO, business partner who provides technical support for the community and the company

Partnership and collaboration between traditional knowledge holders, the scientific community, research institutions, and small and medium entrepreneurs are critical for ABS success. The development of national legislation on ABS, with the full and effective participation of key stakeholders, is instrumental in facilitating access, ensuring that PIC is obtained, leading to negotiations and entering into MAT. Clearly defined holders of traditional knowledge coupled with legal representation is key to many successful benefit sharing agreements of ABS projects.

Harmonization and comprehension of the legal and policy documents including the establishment of a clearing-house mechanism is important to ensure transparency of the national ABS system and possibly additional income generation for traditional knowledge holders.

Key to the UNDP-GEF Global ABS Project is the full mainstreaming of the ABS principles into the legal and policy instructions, including with a view to ensuring that the cultivation of Kazakhstan indigenous genetic and biological resources reduces pressures on wild species thereby promoting their conservation and sustainable use. The cultivation site and processing facility for high-quality extracts that is supported by the ABS Project is located in a rural area, where there is a moderate level of unemployment, hence the ABS Project also aims to create new jobs at the community level in the cultivation site as well as in the processing facility.



MONGOLIA

Traditional knowledge of the sneezing plant and its antibacterial properties leads to new facial skin-care product

AUTHORS

JAVKHLAN ARIUNBAATAR
National Project Coordinator, UNDP Mongolia

ERDENECHIMEG ERDENE
Communication Specialist, UNDP-GEF Global ABS Project in Mongolia

BATKHUU JAVZAN
Professor, School of Engineering and Applied Sciences, National University of Mongolia

JARGAL JAMSRANJAV
ABS Lead Expert, UNDP-GEF Global ABS Project in Mongolia

BEATE TRANKMANN
UN Resident Coordinator and UNDP Resident Representative, Mongolia

SETTING THE SCENE

Mongolia is a landlocked and high-altitude country located between Russia and China, where the southern edge of Siberian Taiga forests meets the Asian Steppe, and the Gobi Desert encounters the plateau. Transitional ecosystems and extreme climatic conditions have created a unique environment with high intraspecies genetic diversity. There are 7 315 species of vascular (3 127) and non-vascular (4 188) plants, 486 species of birds, 141 species of mammals, 74 species of fish, 16 species of reptiles, 6 species of amphibians and 13 000 species of invertebrates recorded in Mongolia.

Through the everyday lifestyle and traditional bioculture, local people have preserved great traditional knowledge, such as the 5 000-year-old traditional medicine. In Mongolia 72% of traditional medicinal ingredients originate from herbs, whereas 14% are of animal origin and the remaining 14% are of mineral origin. One-third of all vascular plants in Mongolia are defined as medicinal plants and can potentially be used under the Nagoya Protocol by relevant industries. Moreover, it is estimated that approximately 800 species of plants are commonly used in traditional medicine, about 200 species of herbs are used as tea plants, 50 species are used as livestock fodder, 50 native wild food species are also used by nomads and 90 species are used for nomads' daily life such as construction materials and household goods.

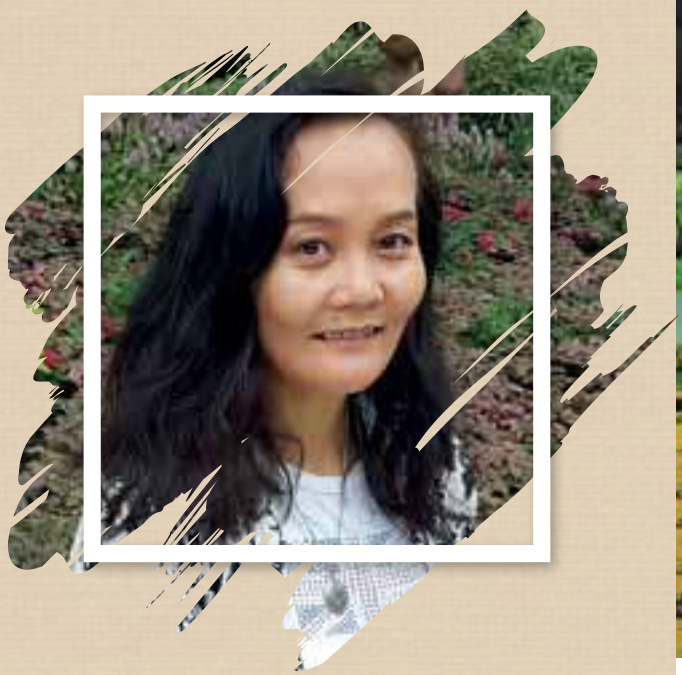
Biodiscovery case

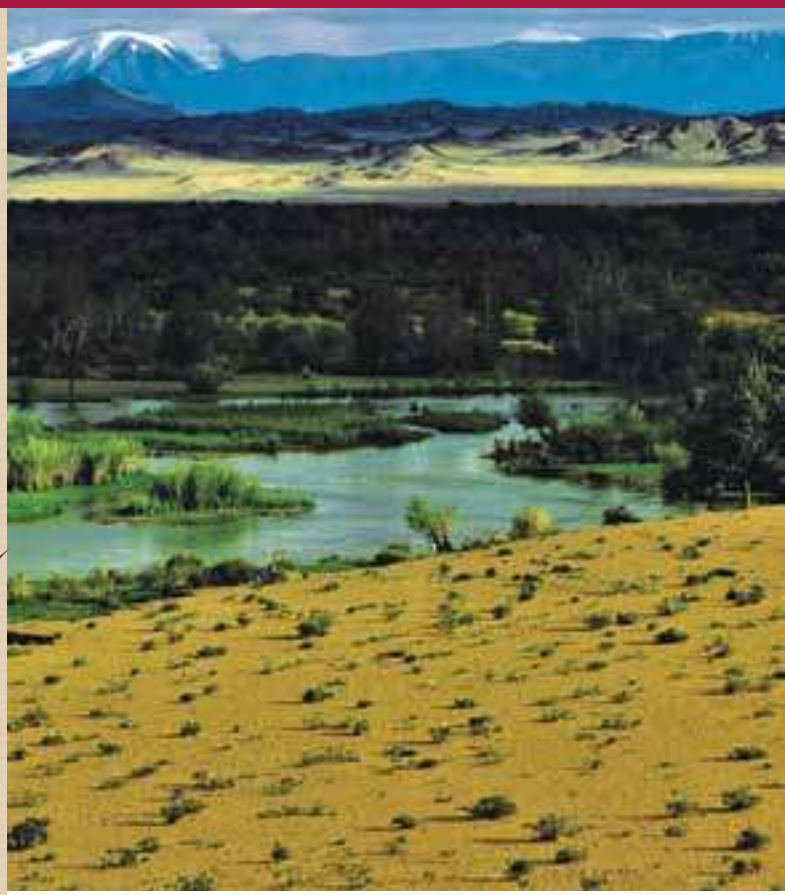
The Bioorganic Chemistry and Pharmacognosy Laboratory of the National University of Mongolia (NUM) found antibacterially active phenolic lipid derivatives from the dichloromethane fraction extracted from aerial parts of *Comarum salesovianum* (Roasaceae), a plant that grows in ravines and valleys of western provinces of Mongolia, i.e., Gobi-Altai and Bayankhongor aimags.

The locals have known about the plant's antibacterial activity for generations, and they call it the "sneezing plant", as any human or animal will sneeze if they smell it. High antibacterial activity of the plant attracted the NUM researchers, which led them to join forces with the "Monos" Medical Institute (a private institute owned by the Monos Group), the National Center for Dermatology of Mongolia (a public institute) and the Tohoku Pharmaceutical University of Japan. After a decade-long research collaboration, they found that the phenolic lipid derivatives extracted from the plant can treat acne caused by pathogenic microorganisms in Mongolia; thus the "Phyto-acne" cream was created. "Phyto-acne" is a certified product with license agreement, trademark and producer standard, substantiated by all relevant reference laboratory conclusions. A valid patent for it as a new product and invention was issued from the Intellectual Property office in Mongolia.

The cream is being produced and sold by the "Mongolia Bio Products – Lab (MBP-Lab)", a start-up company of the NUM, the oldest and most prestigious university in Mongolia. Sales of the product started at the NUM Brand Shop in March 2018. In June, Monos pharmacies have started selling it and they will have to pay royalties to the start-up company. It is also interesting to note that numerous postgraduate students defended their research theses related to the plant and the product. The joint research group published several scientific articles in both international and local peer-reviewed journals. As part of the partnership, the bioorganic chemistry and pharmacognosy laboratory of NUM has also received non-monetary benefits such as new analytics equipment.

EYEWITNESS STATEMENT





"Professor Barkhuu is a member of the Department of Chemical and Biological Engineering at NUM, and the principal researcher studying chemical structure and bioactive compounds of medicinal plants. He is well known for his research and collaboration with the Monos Group, a pharmaceutical company, which shares royalty fee with the NUM. In September 2017, I had a chance to visit his laboratory and meet him in person, with Anthony Foronda, Regional Project Advisor for Asia-Pacific region of the UNDP-GEF Global ABS Project. He explained the new product, Phyto-acne, which was developed in cooperation with Japanese scientists. His team collected samples of acne bacteria from the skin of Mongolian people, conducted a series of lab experiments and achieved successful results. They are aiming to produce a plant-based anti-acne cream that is likely to be more effective than antibiotic-based creams.

Professor Batkhuu emphasized that the harsh environmental conditions caused the rich and diverse genetic resources in Mongolia, which can be potentially used under the Nagoya Protocol. He also said that the nomadic pastoral lifestyle is the most efficient lifestyle in such harsh and extreme conditions.

Studying interactions between livestock and wild plant species, interactions between wild plant species and microorganisms, and the herders' traditional knowledge give him inspiring scientific hypothesis. He said his research team is also studying two species of Pasque flowers. These flowers protrude from the snow in early spring and eating them makes goats recover very quickly after the harsh Mongolian winter. His lab extracted 20 different chemical compounds from these species and found they suppressed activities of parasites found in the goats."

JARGAL J., Lead expert, ABS-Mongolia

In fine focus: SDGs implemented by the biodiscovery case

In general, all biodiscovery projects in Mongolia aim at achieving the SDG Target 15.6: "Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed". The biodiscovery case chosen for this publication has both monetary and non-monetary benefits as per the Nagoya Protocol and Bonn Guidelines, especially the product "Phyto-acne" which is produced and sold by the MBP-Lab start-up company, established by the NUM. The MBP-Lab start-up company directly contributes to SDG Target 9B: "Support domestic technology development, research and innovation in developing countries, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities" and SDG Target 8.2: "Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors". Furthermore, the non-monetary benefits obtained from the biodiscovery case contributes to SDG Target 4.4: "By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship".

Most of the biodiscovery projects in Mongolia are derived from scientific prospects from everyday lifestyle or traditional knowledge. To further successfully achieve more SDG targets, the biodiscovery projects should focus on the engagement of local residents, who are the primary guardians of the genetic resources and the associated traditional knowledge. In that case, the biodiscovery project can further contribute to SDG 1 (No poverty), SDG 5 (Gender equality), SDG 10 (Reduced inequalities), SDG 12 (Responsible consumption and productions) and SDG 17 (Partnership for the goals).

Legal and political enabling environment for ABS and the Nagoya Protocol

Mongolia signed the Nagoya Protocol in 2012, ratified it in 2013 and became a party in 2014. As a party to both the CBD and the Nagoya Protocol, Mongolia is obliged to develop legislative, administrative and policy frameworks to facilitate ABS. In 2012, the Mongolian parliament ratified the Law on Legislation, which requires a concept to be approved, multifaceted research and consultations with all relevant stakeholders to completed, and an impact assessment of the law to be conducted. In June 2018, the revised Concept of the Law on Genetic Resources has been approved by the Minister of Justice, Minister of Finance and the Minister of Environment and Tourism. As per the Mongolian Law on Legislation, a series of consultations with relevant stakeholders including ministries, research institutes, local communities and private- and public-sector representatives are being conducted at the time of this publication. Consultation with different stakeholders ensure the direct democracy and successful development of the law. An assessment of socio-economic impacts of the law is also being conducted in parallel to the discussions. Once the impact assessment and series of consultations are completed in September or October 2018, the Ministry of Environment and Tourism will submit the draft Law to the government as well as to the parliament of Mongolia.

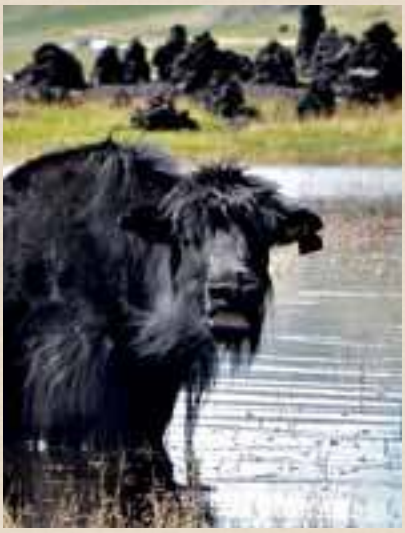
MESSAGE FROM AN SDG ADVOCATE

"It has been only a year since the Global ABS project started implementation in Mongolia and both the ABS concept and the initiatives taken within the framework of the project were brand new in the country at the start of the journey. Despite the short time-span, the project has made significant progress on the development of the legal framework on ABS, documentation of disclosed traditional knowledge associated with genetic resources, and the identification of priority biodiscovery projects in the country. All of these initiatives are expected to contribute substantially to devising mechanisms for the creation of positive incentives and policies, as well as administrative measures to facilitate local communities to conserve their local genetic resources.

However, the biggest challenge remains in the mistrust between the pertinent stakeholders, i.e., the research institutes, private-sector representatives, local communities, civil-society organizations, non-governmental and government organizations. Such mistrust is often instigated by lack of information and knowledge, misunderstanding of the proposed policies as well as administrative measures. Therefore, a combined effort is needed for all the stakeholders to fight against over-consumption, the illegal export of genetic resources and inequality.

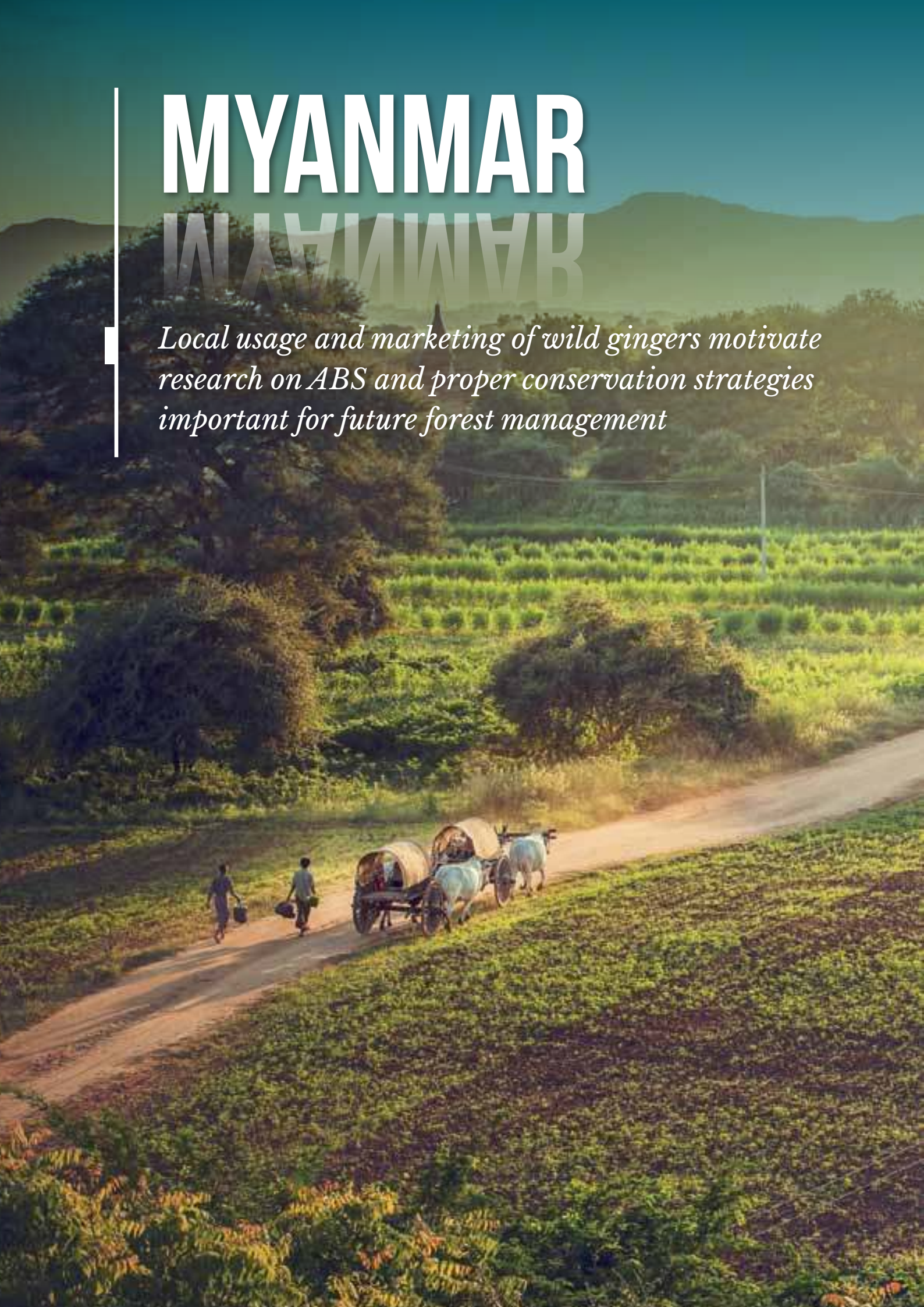
A robust legal framework with clear guidelines and measures, effective information and knowledge sharing and an efficient coordination of activities on capacity building are the stepping stones for establishing mutual understanding and building trust between stakeholders. Hence the partnership for a greater good and common goal is the key to the foundation for inclusive and sustainable management of the country's precious genetic resources for the benefit of all people in Mongolia."

MS BEATE TRANKMAN, UN Resident Coordinator and UNDP Resident Representative, Mongolia



MYANMAR

Local usage and marketing of wild gingers motivate research on ABS and proper conservation strategies important for future forest management



AUTHORS

MU MU AUNG
Assistant Director, Forest Research Institute, Forest Department, Ministry of Natural Resources and Environmental Conservation

NYUNT KHAING
National Consultant, Sustainable and Inclusive Growth Unit, UNDP Myanmar

MARTIN COSIER
Project Manager and Chief Technical Advisor, Governance for Resilience and Sustainability Project, UNDP Myanmar

SETTING THE SCENE

The Republic of the Union of Myanmar is endowed with some of the most extensive and least disturbed coastal and marine ecosystems in mainland Southeast Asia. The country has a rich variety of habitats and ecosystems, including 14 terrestrial ecoregions and an extensive coastline that accommodates half a million hectares of brackish and freshwater swampland. This coastline supports essential ecological functions and habitats such as spawning, nursery and feeding grounds for aquatic organisms like fish, prawns and other aquatic fauna and flora of economic importance. Available information on species diversity and endemism indicates that Myanmar supports extraordinary plant and vertebrate diversity with levels of endemism that are comparable to other countries in the Indo-Myanmar (Indo-Burma) Hotspot. Myanmar's forests support a great diversity of timber species that are of very high commercial value and used in furniture and handicraft manufacturing.

This rich ecosystem is however being threatened by the introduction of modern crop varieties and alien invasive species, hunting, overfishing, forest depletion and degradation, encroachment, forest fires, habitat destruction, climate change and illegal trade in wildlife and wildlife products. As of 2005, about 50% of the total land area was covered by forests, but this has decreased over the years because of human pressure and forest-cover changes. Inland water biodiversity has also declined due to increased demand on freshwater resources and drainage of wetlands for agriculture and urbanization. In many parts of the country, exploitation of plants is taking place on a commercial scale and as a result, over 300 of the country's species are critically threatened and have been red-listed by the International Union for Conservation of Nature (IUCN).

While significant environmental policy development has occurred in recent years, Myanmar has a recognized need for a legal and institutional framework for ABS of genetic resources. Myanmar is now drafting new Intellectual Property (IP) laws such as the Patent Law to ensure its IP legislation is more in line with the Trade Related Aspects of Intellectual Property Rights (TRIPS) and the draft trademark law includes a chapter for Geographical Indications (GIs), the first of its kind in Myanmar. At the same time, the Intellectual Property Department of the Ministry of Education is preparing GIs for a number of plants and products from specific areas of Myanmar such as Paw hsan gyi rice (also known as Shwebo paw hsan from Shwebo Township in the Sagaing Region), coffee from Ywangan Township in Shan State and silk from lotus (Inle Lake). A new ABS regime would complement these efforts and provide greater clarity to the use of Myanmar's valuable genetic resources.

Biodiscovery case

Zingiber (Zingiberaceae) is one of the most important genera of plant groups having economic value among the non-timber forest products in Myanmar and it has been cultivated for various uses (e.g., traditional medicines, religious matters and spices) by local people for a long time. Species such as *Zingiber capitatum*, *Z. ottensii*, *Z. flavomaculosum*, *Z. orbiculatum*, *Z. tenuiscapus* and *Z. pygmaea* (which are used as ingredients for cooking and herbal medicine) are newly recorded in Myanmar.

Zingiber capitatum (wild ginger, locally called *gyin*) grows in forest areas in Kachin State (in the northern part of Myanmar) and is of economic importance for local people's cash income. It is used as a spice and vegetable. They sell fresh rhizomes for Kyats 1 000 (about US$0.75) per 1 kg in the local market. Its fresh rhizomes are used as spice. According to the local people in the Kachin State capital, Myitkyina, the taste is better than the more commonly used Myanmar ginger (*gyin/gyin-sein*: *Z. officinale*). Kachin's ethnic groups are well versed with traditional knowledge of medicinal uses and other purposes.

Zingiber zerumbet is distributed commonly in wet habitats from lowland evergreen forest to hill evergreen forest. It is used especially for women's healthcare during pregnancy, childbirth, breastfeeding and postpartum recovery. Local people call this species *lin-nay-gyi*.

Zingiber species are harvested and supplied in the local markets, as local communities are well aware of their value as medicine or health supplements and utilization. The Ministry of Health's Department of Medical Research, Department of Medical Services, and Department of Traditional Medicine, as well as the University of Yangon and Institute of Medicine, are at an early stage in conducting research on the genus *Zingiber*.

EYEWITNESS STATEMENT

"Although the use of gingers (Zingiberaceae) is documented, about 13 species of Zingiber and their uses are newly recorded in Myanmar. Gingers are used as flavouring for food and traditional herbal medicine; one of the main sources of livelihood for rural households and income for their daily life. There is a need to clarify the diversity and traditional utilization of gingers, while some chemical evidence would also be significant to facilitate proper management and conservation strategies either in situ or ex situ for future forest management of Myanmar as well as for ABS."

DR MU MU AUNG, Assistant Director, Forest Research Institute, Forest Department, MONREC, Myanmar

In fine focus: SDGs implemented by the biodiscovery case

The project is directly contributing to SDG 1 "end poverty in all its forms everywhere by 2030", and especially, to its target 1.4 "By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including micro-finance."

The project is directly contributing to SDG 3 "Ensure healthy lives and promote well-being for all at all ages", and especially, to its target 3.11 "Support the research and development of vaccines and medicines for the communicable and non-communicable diseases that primarily affect developing countries, provide access to affordable essential medicines and vaccines, in accordance with the Doha Declaration on the TRIPS Agreement and Public Health, which affirms the right of developing countries to use to the full the provisions in the Agreement on Trade Related Aspects of Intellectual Property Rights regarding flexibilities to protect public health, and, in particular, provide access to medicines for all".

The project is directly contributing to SDG 15 "Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss" and particularly, to its target 15.6 "Promote fair and equitable sharing of benefits arising from the utilization of genetic resources and promote appropriate access to such resources as internationally agreed".



Legal and political enabling environment for ABS and the Nagoya Protocol

Myanmar ratified the CBD on 25 November 1994, and became a party (accession) to the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS) on 12 October 2014. In 2004, the Ministry of Science and Technology drafted new IP Laws in cooperation with the Union Attorney General's Office and other related ministries based on TRIPS, IP Laws of the ASEAN countries and WIPO Conventions and Treaties. Additionally, there is one chapter for GIs in the draft trademark law. The Ministry of Science and Technology is planning to draft a separate GIs law in the future. The Environmental Conservation Department will indicate and identify National Competent Authorities (NCA) for ABS.

MESSAGE FROM AN SDG ADVOCATE

"Myanmar is an extraordinary and diverse country, blessed with beautiful people, rich culture and widespread natural assets. In many ways, it's the prime candidate for implementation of the Nagoya Protocol as a way of helping ensure local communities benefit from the development of genetic resources. But in a context like Myanmar, where there are multiple environmental challenges, pressing development needs and limited capacity, it can be difficult for decision-makers to find time and space to consider new policy approaches, especially in fields that can seem overly academic or technical.

This is where UNDP can help by supporting government counterparts to understand how the ABS framework can be applied in practice. Finding tangible examples of biodiscovery, such as the zingiber case, can also help to ground the discussions of what ABS might mean for both regulators and communities. While this is an ongoing learning process, UNDP supports all efforts to pursue sustainable development that protects the environment and benefits all people in Myanmar."

MARTIN COSIER, Project Manager and Chief Technical Advisor, Governance for Resilience and Sustainability Project, UNDP Myanmar

TAJIKISTAN

From raw-material exports to sustainable local ABS value chains: the example of the glucose-impacting ferula species

AUTHORS

NARGIZAKHON USMANOVA
Team Leader Environment, Energy and Disaster Risk Management UNDP Tajikistan

SUKHROB IRGASHEV
Technical Coordinator Global ABS Project in Tajikistan

CLAUDIO CHIAROLLA
Regional Specialist, UNDP-GEF Global ABS Project

SETTING THE SCENE

Tajikistan is a country in Central Asia with 93% of its territory composed of mountains. Tajikistan contains a great wealth of biodiversity resources in species, ecosystems and landscapes. Although the nation is small in terms of its overall landmass, Tajikistan displays a wide variation in elevations and geology, leading to a broad range of habitats as reflected in the high diversity of species. The landscapes consist of plains and low mountains (300–1 600 masl) with desert savannoide flora and fauna with gray desert soils; midlands (1 600–2 800 masl) with mountain woodlands and forests and brown mountain soil; highland zones (2 800–4 500 masl) with alpine cold desert flora and fauna, with meadow-steppe, steppe, and desert soils; and nival zones (4 500 masl) with cryophyte flora with skeletal soils. The country's flora and fauna make up 1.9% of the world's species. Floral diversity is relatively rich considering the small size of the country, with wild relatives of cultivated plants totaling 1 000 species, in addition to 1 132 endemic species.

Of particular importance are plants grown for food that comprise about 300 species. The national gene bank for grain, leguminous and oil crops contains about 3 000 specimens. Medicinal plants are the basis of traditional medicine, which is widely used by the population in their daily lives. Additionally, there are 81 species of mammals, 385 species of birds, two species of amphibians, 49 species of fish and 12 000 species of invertebrates. A prominent feature is the large number of animals endemic to Tajikistan.

An increase in economic development and activity in the past years is the main cause of changes in biodiversity and its loss. Owing to soil degradation, arable land has decreased by 3.2% over the last 15 years. In the last 15–20 years, the population has reached a population of about 9 million, and this has had an impact on biodiversity resources, which in turn has led to high deforestation rates, grassland degradation, overfishing and overhunting. Such activities have been observed in the habitats of valuable wild fruit trees. Further, drastic changes to habitats due to the direct removal of plants for wildlife hunting have led to several species being threatened with extinction.



Biodiscovery case

Although the territory of Tajikistan is small, its biological composition is extremely diverse. In Tajikistan, there are 9 000 species of wild plants and 13 000 species of wild animals. There are many valuable species for both science and production among them. Many plants growing in Tajikistan are used for pharmaceutical purposes.

Ferula is a genus of about 170 species of flowering plants in the family Apiaceae, mostly growing in arid climates. Several species of ferula grow in Tajikistan. One species of ferula, which is native to Iran and Central Asia is asafoetida (*Ferula asafoetida*). It is an herbaceous perennial plant growing up to 2 m tall, with stout, hollow, somewhat succulent stems with a diameter at the base of the plant of 5–8 cm. Asafoetida has certain medicinal uses, most commonly as a digestive aid. It is reputed to lessen flatulence and is often added to lentil or eggplant dishes in small quantities. It is also said to be helpful in cases of asthma and bronchitis.

In total, ferula is distributed in about 18 000 ha throughout Tajikistan. Of these, the Forestry Agency maintains 975 ha. It takes a lot of time and hard work to cultivate and harvest ferula. According to scientists, the first-year harvest is limited to a single leaf when ferula is grown from seed. The second-year harvest gives no more than 2 to 3 leaves. Full-size ferula reaches 2.5 m in height. Harvesting is carried out by cutting the stem and collecting the excreted lacteal juice on the scoop. The harvest from one plant lasts 3–4 weeks. When a stem is cut, the plant withers leaving no seeds. Agency staff and collectors are constantly monitoring the process to make sure that there are some plants left for the soil seed bank.

In Tajikistan, traditional medicine is based on plants and use of medicinal plants is an ancient tradition of the indigenous communities that is applied throughout modern Tajikistan. The collection and use of medicinal plants is not limited to Tajikistan, but to neighbouring countries as well. Actually, Tajikistan is primarily a producer of raw materials. For example, ferula and liquorice are regularly exported to Russia to be processed there. Until very recently, due to limited knowledge and demand and a lack of technology, indigenous communities have limited their practices to supporting growth of ferula and liquorice without pursuing any real processing and production.

A recent example of biodiscovery and application of traditional knowledge is the pharmaceutical product "Ferubet" invented and developed by Dr Tojinisso Zubaydova.

The invention relates to a medicine in the field of pharmacology and endocrinology. It can be used for the prevention and treatment of pre-diabetes, type 2 diabetes and diseases involving the gastrointestinal tract and nervous and cardiovascular systems. The product contains an agent with a glucose-lowering effect, made from herbs, and contains ferula gum, resin, root and oil. For the development of the pharmaceutical product, research has been conducted to study the raw material base and all species of ferula from all over Tajikistan. Research showed that the most suitable type of ferula for pharmaceutical use is *Ferula asafoetida* which grows in the vicinity of the town of Penjikent.

EYEWITNESS STATEMENT

"Treatments based on the use of medicinal plants is an ancient tradition for Tajikistan that is still in use nowadays. At the same time during the past few decades Tajikistan was treated as a raw material base. For example, ferula or licorice was sent to Russia to be processed there. With information being spread about the Nagoya Protocol, interested government bodies, universities, research institutions are now making efforts to change the situation in this field, including by research on GMP [Good Manufacturing Practices] standards applied in pharmacology."

DR TOJINISSO ZUBAYDOVA, Head of the Department of Experimental Pharmacology and Biotechnology of the State institution "Pharmaceutical Centre" of the Academy of Medicine Sciences

In June 2017, Dr Zubaydova was awarded a gold medal at the Korea International Women's Invention Exposition for her biodiscovery work that resulted in development of the pharmaceutical product "Ferubet" (a glucose-lowering medicine).



In fine focus: SDGs implemented by the biodiscovery case

Biodiscovery activities contribute to the implementation of the SDGs in Tajikistan. By working with communities on their awareness of ABS principles, the project helps them collaborate and form unions (SDG 16: Peace, Justice and Strong Institutions and SDG 17: Partnerships for the Goals). Given that both UNDP and GEF place a particular emphasis on accelerating gender equality within the project scope, the project team prioritizes work with rural women-headed households (SDG 5: Gender Equality). In the future, the project will strive to contribute to the implementation of SDG 1: No Poverty and SDG 9: Industry, Innovation and Infrastructure since the government aims at securing a royalty stream for Tajikistani researchers, agencies, companies or resource stakeholders, through the retention of intellectual property in downstream commercial products. Although only a small proportion of bioactive substances reach the stage of commercial production, the creation of a high value, widely sold product, such as a pharmaceutical, may produce significant income streams.

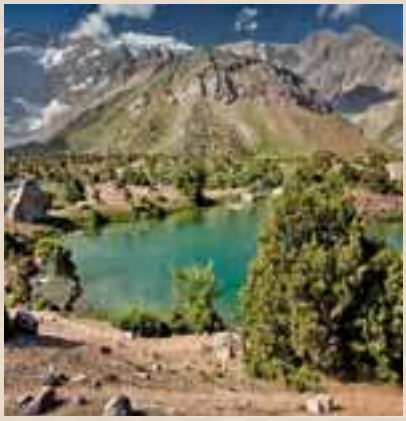
Legal and political enabling environment for ABS and the Nagoya Protocol

The Republic of Tajikistan acceded to the Nagoya Protocol by Decree No. 1312 in 2012. It is expected that the implementation of the Nagoya Protocol in the country will further improve food security, sustainable development, and the conservation of biological diversity and genetic resources. A key place in the hierarchy of legal acts in the sphere of regulation of natural resource management and environmental conservation belongs to the Law of the Republic of Tajikistan "On Environmental Conservation", which was adopted in 2011. This law is updated annually to strengthen control with regard to the preservation and use of biodiversity. Furthermore, national actions are also guided by the National Strategy and Action Plan on Preservation and Rational Use of Biodiversity of the Republic of Tajikistan and by the implementation of the Law of the Republic of Tajikistan "On Special Protected Natural Areas."

The institutional base for biodiversity conservation consists of institutions and organizations working on, studying and conserving biodiversity and its components, namely: the Committee on Environment Protection, the National Biodiversity and Biosafety Centre (NBBC), the Forestry Productive Enterprise of the Republic of Tajikistan (FPERT) and the institutes of the Academy of Science specializing in biology, botany and zoology. The Ministry for Nature Protection (MNP) provides coordination and is responsible for implementing the CBD requirements, and develops and implements state policies on nature conservation and natural resources management. The main units of the MNP are specialized inspection bodies as well as research institutions. The NBBC is in charge of coordinating activities on biodiversity conservation and implementation of the CBD through the NBSAP. The Tajik Academy of Agricultural Sciences and the Ministry of Agriculture work on the conservation and sustainable management of agricultural biodiversity, genetic resource preservation and breeding of new agricultural plants as well as the improvement of existing varieties. Local executive administrations (such as Khukumats) are the executive bodies that implement the CBD in local communities and provide for environmental education.

Tajikistan has yet to develop national legislation that will incorporate fully the ABS principles under the Nagoya Protocol. The absence of legislation at the moment is overcome through the establishment of contracts.

"*To help the Government of Tajikistan deal with these issues, the UNDP-GEF project collaborates with the authorities to develop a Law on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits, but also provides advisory support to the development of a national Clearing House Mechanism and National Reporting under the Nagoya Protocol of the UN Convention of Biological Diversity.*" – Ms Nargizakhon Usmanova, Team Leader, Environment, Energy and Disaster Risk Management of UNDP, who helps facilitate the project implementation in Tajikistan.

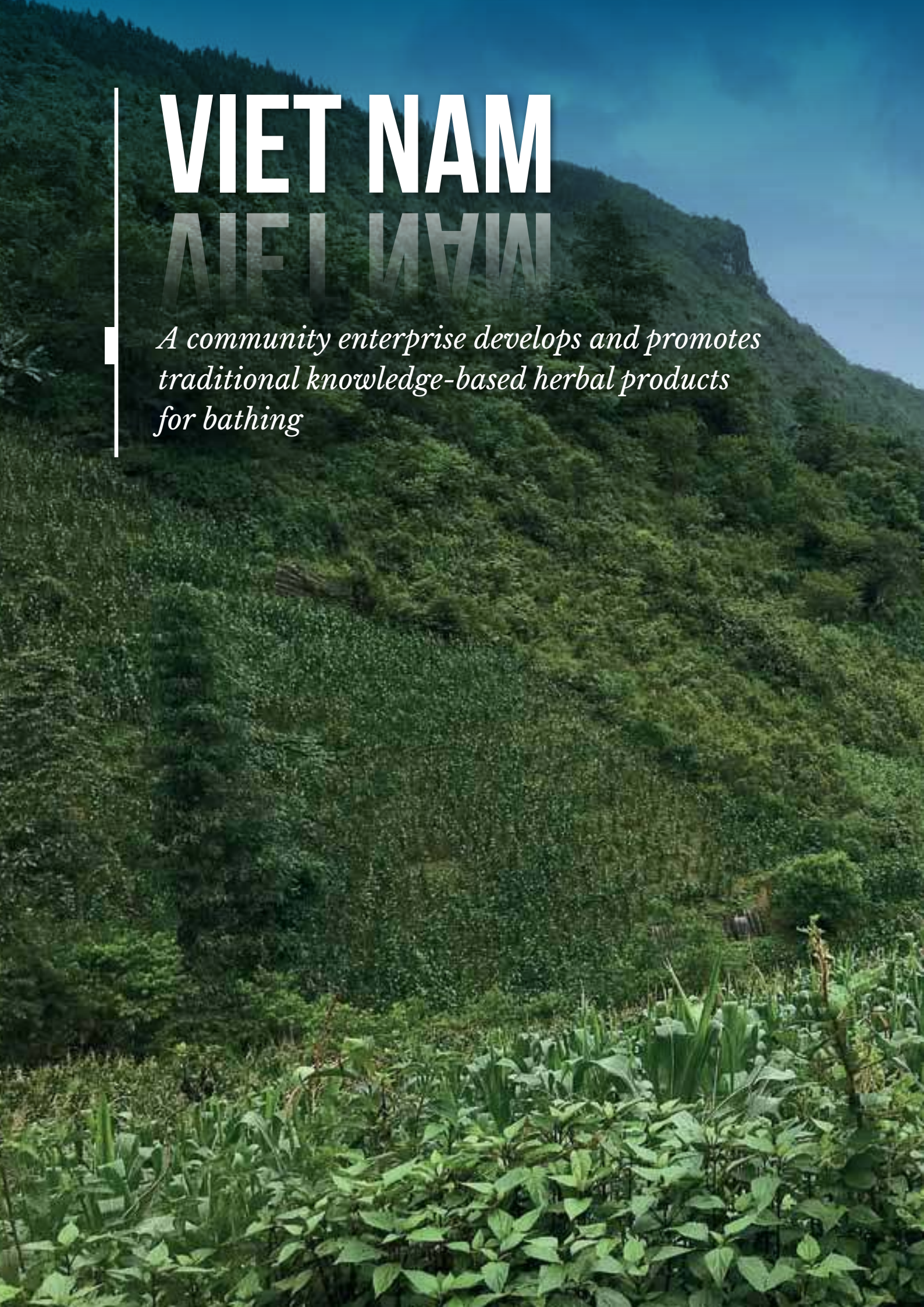


MESSAGE FROM AN SDG ADVOCATE

Generally, community governance structures are strong in Tajikistan, but there is little awareness of the Nagoya Protocol among most of the governmental stakeholders and communities in the country. At the same time, the existing systems, regulations and procedures in place to monitor research on, and access to, genetic resources and traditional knowledge are inadequate and fragmented. Therefore, strong national and local structures are needed to facilitate and improve cooperation and exchanges in the context of ABS implementation. These structures need to be harmonized with the existing Law on genetic resources and the forthcoming legislation on ABS. The challenge is clear: users and providers of genetic resources need to deal both with communities and various levels of government that are involved in the authorization process concerning PIC and MAT. If ABS procedures are improperly designed and implemented, this can make the process rather long and cumbersome.

"The UNDP/GEF project provides a platform for information exchange and discussion between government, industry, indigenous communities and research stakeholders engaged in the exploration of biodiversity. The stakeholders participating in the project also have a unique opportunity to explore the state of play in biodiscovery research in the Central Asia and CIS region. These discussions, facilitated by the project, help the Government of Tajikistan to be prepared for taking effective decisions regarding the possible commercialization of ABS products within the context of the global framework."

MS NARGIZAKHON USMANOVA, UNDP



VIET NAM

A community enterprise develops and promotes traditional knowledge-based herbal products for bathing

AUTHORS

NGUYEN DANG THU CUC
Project Coordinator, UNDP-GEF ABS Project, Biodiversity Conservation Agency, Vietnam Environment Administration, Ministry of Natural Resources and Environment

NGUYEN THI MINH THAM
Project Manager, UNDP-GEF ABS Project

DAO KHANH TUNG
Programme Officer of UNDP, UNDP-GEF ABS Project

SETTING THE SCENE

Owing to its long history and specific geographical location, which includes complicated topographical, ecological and social features, Viet Nam is one of the most biodiverse countries on the planet. Thousands of years of prosperous cultural development and agricultural practices by 54 ethnic groups have enriched the national traditional knowledge (TK) about the use of genetic resources, especially in traditional medicine.

Lao Cai province is located in the mountainous north-western region of Viet Nam, with the Sapa district being in the western part of this province. The terrain of Sapa is very complex, with stratified high elevations and fragmented lower levels. The province includes the Hoàng Liên Son mountain range, which is at the eastern extremity of the Himalayas. This range includes Viet Nam's highest mountain, Fan Si Pan, at a height of 3 143 m above sea level.

The forest in Sapa can be classified as belonging to three types: sub-montane dry evergreen forest, tropical montane deciduous forest and sub-alpine forest. Annually, the mountain experiences a dry cold climate from October to March, with tropical monsoons during the rainy season, which lasts from April to September. The geographical location and ecological features make it a unique place for many interesting plants, which contribute to the rich diversity in natural medicinal plant genetic resources in Viet Nam. Among the many ethnic groups residing in the Lao Cai province are the Hmong, Dao, Kinh, Tay and Giay. Each group maintains valued knowledge on the medicinal uses of plants. This makes this province an attractive place for bioprospecting for the pharmaceutical industry.



Biodiscovery case

The bath medicine of the Red Dao ethnic group is well known and has been remarked upon by almost all visitors to the Sapa district of the Lao Cai province. It is an old tradition of the Red Dao people to use wild plants for bathing. These bath medicines consist of herbal remedies made from mixtures of various plants collected in the mountains. The herbal plants are cooked with water and then they can be used for soaking the body in medicinal water at 40-degrees Celsius for 15–30 minutes. An example of one use is for women to bathe with herbal plants several days after delivering their babies. This helps them recover their health and prevent diseases. In this way, women can work again in the forest or fields only a week after giving birth. Bath medicine is also used for children and men. It is used for relaxation, relieving sore feet and pain, skincare, and the treatment of diseases such as rheumatism, arthritis and headaches. The understanding of these practices and the identity of the plants has become valuable TK maintained by generations of Red Dao families. Normally it is the women who collect and maintain the remedies and the knowledge and transfer them to their daughters. In 2006, SapaNapro Company – a community enterprise – was established with the support of Hanoi University of Pharmacy (HUP) and the Centre for Research and Development of Ethno-Medicinal Plants (CREDEP), to commercialize traditional bathing medicines of the Red Dao ethnic people. Their main products are bath medicines for women after pregnancy based on TK of the Red Dao ethnic group. The SapaNapro Company is a community-private model for conserving and developing medicinal plant genetic resources and associated TK on bathing medicine. It engages the Red Dao people themselves in the protection of their genetic resources and TK, through the sharing of accrued company benefits from commercialized products back to the Red Dao communities. These benefits include monetary benefits to the holders of TK ("*bà mế*" in Vietnamese), and the company also pays the collectors of medicinal plants according to the value of the plant species collected. In addition, the company contributes a proportion of company profits to the communal development fund for the community's socio-cultural activities. The model contributes both to the improvement of the local community's livelihood and to biodiversity conservation.

With their successful bath medicine, the case of SapaNapro Company is a good example of an ABS-like mechanism where the benefits of all involved stakeholders are taken into account. For that reason, SapaNapro Company and the Red Dao people in Ta Phin ward, Sapa district, have been chosen as the core of the project's demonstration activities, with the aim to produce a new pain-relief product for which a proper agreement will be established between the TK holder, genetic resource providers and the company.

EYEWITNESS STATEMENT

Mr Ly Lao Lo is a member of the Red Dao ethnic group and director of the SapaNapro company. He is the son of Mrs Ly Mei Chay, who is a famous master in the Red Dao community in Ta Phin commune, Sapa district. He is a typical young ethnic man who helps his community protect the herbal plants available in their locality and promote their uses, for example, as traditional bath medicines.

According to Mr Ly Lao Lo, the Red Dao people have been familiar with bathing using leaves, flowers, roots or fruits of plants from the forest to protect their health for thousands of years. This ancestral knowledge has been handed down for generations. The bathing techniques combine various herbs that have a particular influence on the nerves, respiratory system, skin, muscles, bones, joints etc. He added,

"The bathing remedies normally use tens of plant species and there are even bathing medicines that use more than 100 herbal species. There are also different processing methods for each kind of plant species, for examples, dried parts or fresh parts. The Red Dao masters make different mixes as cures for different symptoms and pains. Before, the Red Dao people only collected herbs for their own private uses. They have now participated in the commercialization of many products. In recent years, the SapaNapro company's revenue has significantly increased, which has helped improve the life standards of local communities."



In fine focus: SDGs implemented by the biodiscovery case

The aforementioned ABS case has surely contributed to the implementation of the Sustainable Development Goals (SDGs). It directly supports SDG 15.6, which promotes fair and equitable sharing of the benefits arising from the utilization of genetic resources. In this case, local communities, particularly the Red Dao ethnic people in Ta Phin district, benefited from their medicinal plants and bathing remedies, which are used by the SapaNapro Company. The community-private partnership under the SapaNapro Company, where local people are both provider (owner) and user of genetic resources and associated TK, is a good example for promoting equitable benefit sharing and biodiversity conservation.

In addition, the local people are shareholders of the company; they collect and grow medicinal plants and provide bathing remedies and materials for SapaNapro. This creates livelihoods for local communities. It is very meaningful for ethnic groups who used to be very poor to now make their livelihoods by collecting wood and herbs and selling them. Therefore, the project contributes to SDG 1 (No poverty), SDG 2 (Zero hunger) and SDG 8 (Decent work and economic growth).

Furthermore, the women from the Red Dao ethnic group in particular, are the masters and repositories of the techniques of bathing-product development. They play key roles in the company activities. This helps to enhance their participation as well as their voices or influences in the community which contributes to SDG 5 on gender equality.

Legal and political enabling environment for ABS and the Nagoya Protocol

Viet Nam set up the national ABS legal framework under the Biodiversity Law in 2008; however, the implementation of the ABS requirement in the Biodiversity Law is in its early stages. After adoption of the Nagoya protocol in 2014, Viet Nam has made progress in creating an enabling environment for research and development activities that involve the utilization of genetic resources originating within the country. The scheme 1141/QD-TTg for capacity building on ABS was adopted by Prime Minister Nguyen Xuan Phuc in 2016. It identifies key areas of focus to enhance capacity and increase awareness on ABS for different target groups. Later, Decree 59 was enacted by the Government on 12 May 2017 with the aim to regulate all activities related to research and development using genetic resources, and activities to transfer them out of the country.

The UNDP-GEF ABS Project ("Capacity Building for the Ratification and Implementation of the Nagoya Protocol on Access and Benefit Sharing in Viet Nam") supported the development of the legal framework on ABS, in which, the Decree 59 on ABS management was issued. It should be noted that TK associated with genetic resources has not been mentioned fully in the current Decree due to the lack of its management experience on the ground. Regardless, the project is piloting the private-public community partnership on ABS in the Sapa district, where an abundance of valued medicine are plants and associated traditional knowledge. By doing so, an understanding of TK management and experience on managing genetic resource sustainable utilization will be built up.

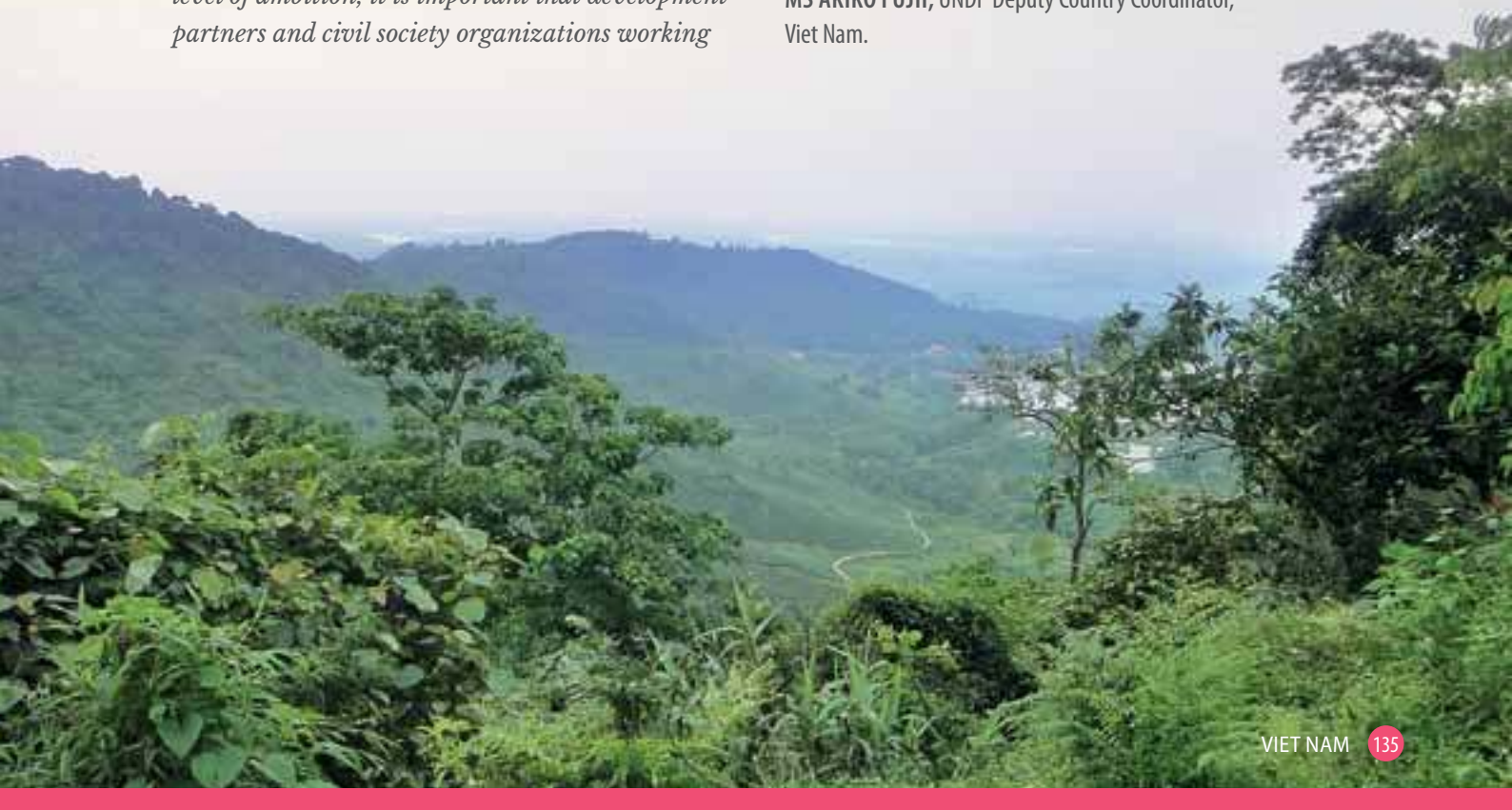
A framework in alignment with international standards of the Nagoya Protocol has been established. This includes requiring PIC for access to genetic resources and negotiating MAT between the holders of genetic resources and potential users of these resources. The process and procedure for the issuance of an Access License has also been defined. To date, a number of applications for Access Licenses have been submitted to the National Competent Authorities and are being handled. Twenty decisions allowing the transfer of genetic resources out of the country have been granted to national research institutions.

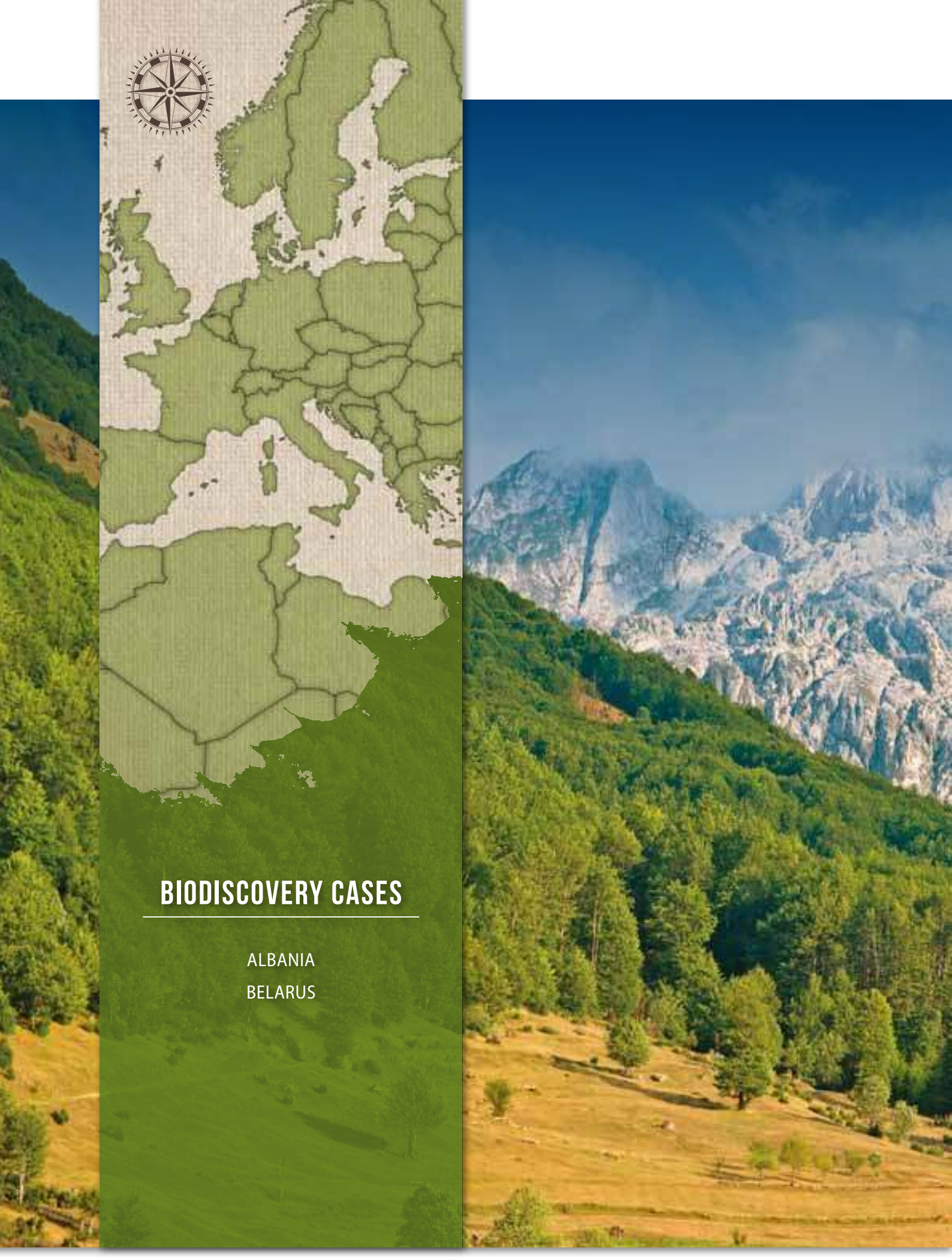
MESSAGE FROM AN SDG ADVOCATE

"The SDGs adopted by world leaders in 2015 have opened new avenues for a more integrated development in Viet Nam and worldwide. The SDGs envision a development path where environment and biodiversity are better protected and sustainably managed to benefit poverty eradication, economic prosperity and cultural diversity.

The country's legislation and policy environment offer a great opportunity to localize the targets for SDG 14 and 15 – corresponding to life below water and on land – and to mainstream biodiversity concerns throughout the socio-economic development agenda. To achieve this level of ambition, it is important that development partners and civil society organizations working on biodiversity issues, including responsible utilization of genetic and indigenous resources, join hands to support Viet Nam in formulating and enacting a truly progressive legislative framework. In the meantime, as 1 of the 16 top biodiversity-rich countries, Viet Nam needs to tap into indigenous knowledge about the responsible utilization of genetic resources. Mobilizing the participation of sectors, including public and private as well as other concerned stakeholders and community people, in the implementation the SDGs in general and the SDGs 14 "life below water" and 15 "life on land" is essential."

MS AKIKO FUJII, UNDP Deputy Country Coordinator, Viet Nam.





BIODISCOVERY CASES

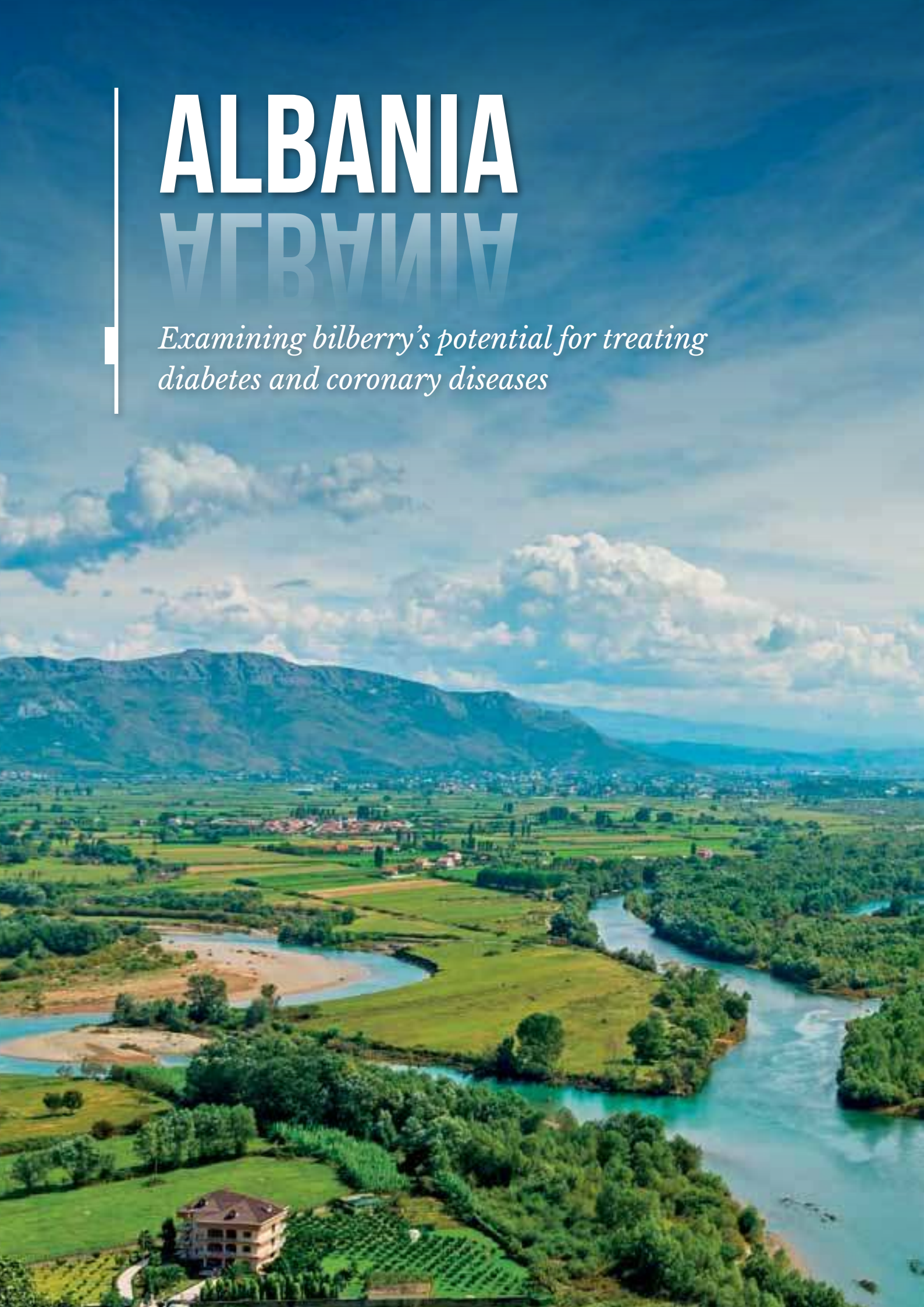
ALBANIA

BELARUS

Central & Eastern Europe

ALBANIA

Examining bilberry's potential for treating diabetes and coronary diseases



AUTHORS

ALBAN IBRALIU
Department of Plant Science and Technology,
Faculty of Agriculture and Environment,
Agricultural University of Tirana, Albania

ANNI KOCI KALLFA
National Environmental Expert

FRÉDÉRIC PERRON-WELCH
International Legal Consultant,
UNDP-GEF Global ABS Project, Albania

SETTING THE SCENE

Albania is a small Mediterranean country in the southeastern part of Europe, bordering the Adriatic and Ionian Seas. Geographically, Albania has a surface of 28 748 km^2 and most of its landscape consists of mountains and hills that occupy 76.6% of the territory. The country comprises a rich and complex hydrographic network of rivers, lakes, wetlands and underground waters. Much of Albania is within the Mediterranean geographical region, inheriting a very changeable climate.

Despite its small size, Albania is well known for a high diversity of ecosystems and habitats. The country is examining the potential of genetic resources as a strategy to expand the development and trade of products derived from medicinal and aromatic plants and to contribute to economic growth and improved livelihoods. This has been done with the valuable contribution of the UNDP-GEF Global ABS Project which supported a biodiscovery-oriented study of important genetic resources.

Currently, in Albania, there are many species and varieties of fruit-trees, olives and grapes that have a high level of adaptability to agricultural ecosystems, with high nutritional value, and which are suitable for competitive markets, particularly for bio products. The widespread presence of medicinal and aromatic plants also suggests their strategic importance as a medical and economic resources for the local population and as a source of innovation leads for the pharmaceutical sector.

Furthermore, as part of the UNDP-GEF Global ABS Project activities in Albania, a detailed pilot database of crop wild relatives (CWR) has been established, which contains information such as the classification of genus, species, group of species, family name in Latin and Albanian, a unique record number, phenology and threat status according to the IUCN red list categories. The inventory identifies a total of 86 genera of CWR in Albania. The Global ABS Project in Albania also supports local communities and is aimed at strengthening their role along product value chains and to protect traditional knowledge in communities for their own benefit.

Albania's rural areas offer a rustic getaway experience, where many communities living in and out of national parks derive their income from agriculture, forestry, grazing and medicinal and aromatic plant collection. The latest government flagship programme called '100 Villages' aims at establishing the first successful model of integrated rural development in Albania, following the best European standards. As this initiative starts to flourish, the role of the ABS project is important in providing a clear regulatory framework and enabling environment for the development of partnerships between providers and users of genetic resources, thereby creating ample opportunities for communities, the government and the private sector alike.

Lately, the trade of medicinal and aromatic plants has become of great interest due to its increased demand in markets. This is a sector that benefits some of the poorest communities in the country, as they obtain most of their earnings by collecting and selling medicinal and aromatic plants to intermediaries and in the local markets. The sector's key players are also making important efforts to find new business models through sustainable cultivation and production that is conducive to high benefits and sustained economic growth.



Biodiscovery case

Bilberry (*Vaccinium myrtillus*), a species native to Europe and North America, is a perennial subshrub from the family Ericaceae, subfamily Vacciniaeae. According to germplasm documentation and to scientific studies, the bilberry is widely used to improve night vision and to decrease vascular permeability and capillary fragility; moreover, the berry has various other reputed health benefits, although most interest has been focused on anthocyanin-related antioxidant effects. Antibacterial compounds from *Vaccinium myrtillus* may have important applications as natural antibacterial agents. Furthermore, bilberry has antioxidant and anticancer properties and protects against coronary diseases. Bilberry has also been reported to have anti-obesity and hypoglycaemic effects, which would bring cardioprotective benefits. In Albania, bilberry has been used in traditional remedies as treatment for diabetes and coronary diseases. The Agricultural University of Tirana (AUT), among others, is currently undertaking research to assess and further develop the biodiscovery and product development potentials of these leads.

The harvest of bilberry occurs between mid-July to the end of August and may extend till beginning of September in different areas of Albania. The production of anthocyanin in fruit tissues varies during the growth cycle of the plant. Researchers at AUT have studied the expression of flavonoid biosynthesis genes during the development of bilberry fruit in relation to the accumulation of anthocyanins, proanthocyanidins and flavones in wild berries and in berry colour mutants. The contents of anthocyanin, proanthocyanidins and flavones in ripening bilberries were analysed with a high-performance liquid chromatography-diode array detector and were identified using a mass spectrometry interface by researchers of the Genetic and Plant Breeding WG, Department of Plant Sciences and Technology, AUT. Based on quality testing of bilberry samples from different sites of the project, samples from the north of Albania have very good potential to treat several conditions, including diabetes and coronary disease. They can be used as fresh, frozen or dried whole fruits, or processed into food supplements. With economic development and commercial use of these available natural resources, farmers in these rural areas could achieve a better standard of living.

Access to information on the benefits, opportunities, necessary commitments, investment and managerial needs to strengthen successful business models must be improved to ensure that interested members of society can effectively engage in the process. Technical assistance to local producer organizations with potential to develop local ABS products must also be improved when compelling opportunities have been identified.

Since the collection and manipulation of medicinal plants are considered important processes for the development of commercial products, the conservation of wild plants and, improved livelihoods of local communities, they are regulated by the Law No. 10120, on the "protection of natural medicinal, ether oil and tanifer plants".

EYEWITNESS STATEMENT

"Scientific research should be an important part of local and central decision-making. In 2014, Albania became a party to the Nagoya Protocol, but in order to be fully effective, the NP should be further developed into policy documents to be included in national legislation. Linking research to practice, such as provision of economic benefits from genetic resources will contribute to improve the livelihoods of local communities that use these resources."

MS ORNELA ÇUÇI, Deputy Minister of Tourism and Environment

In fine focus: SDGs implemented by the biodiscovery case

The still untapped biodiscovery potential of Albanian's genetic resources in strategic sectors, such as the aromatic and medicinal sectors, is significant. As shown by the bilberry biodiscovery case illustrated above, researchers at the Agricultural University of Tirana and partners have undertaken ground-breaking work on the characterization and study of the biochemical value from Tropoja bilberry and Kukesi bilberry. Further work along their production value chain has already increased the commercial and export value for local, primary, or processed products and for the concerned local communities. By supporting such ongoing efforts, while also establishing a clear and transparent legal framework to regulate ABS activities, the UNDP-GEF Global ABS Project in Albania contributes to achieving Target 15.6 (SDG 15) which is to promote the fair and equitable sharing of the benefits arising from the utilization of genetic resources and to facilitate appropriate access to such resources, as internationally agreed. This will foster local development and the empowerment of communities, including access to, ownership and control over natural resources and appropriate new technologies.

Additional SDG-related achievements that are directly supported by the biodiscovery case in Albania include: Target 2.5 (SDG 2), on the preservation and sustainable management of agricultural ecosystems including plant and animal genetic resources as well as associated traditional knowledge; and SDG 3, namely, by promoting partnerships in R&D in the context of the EU integration process, including towards the development of new drugs that can help combating epidemics, neglected and other communicable diseases. Finally, it is worth mentioning the UNDP-GEF Global ABS project's contribution to SDG 17, Targets 17.9, 17.14 and 17.15, which highlight the importance of international cooperation for reviewing the legal framework and, as necessary, sectorial policies to make them ABS coherent including by promoting multi-stakeholder partnerships.

Legal and political enabling environment for ABS and the Nagoya Protocol

Albania adopted its first law addressing access and benefit sharing in 2006, Law No. 9587 on biodiversity protection. The Biodiversity Protection Law contains provisions on access to in-situ and ex-situ genetic resources, as well as traditional knowledge, innovations and practices of local communities, but Albania lacks the regulatory measures required to make the provisions operational.

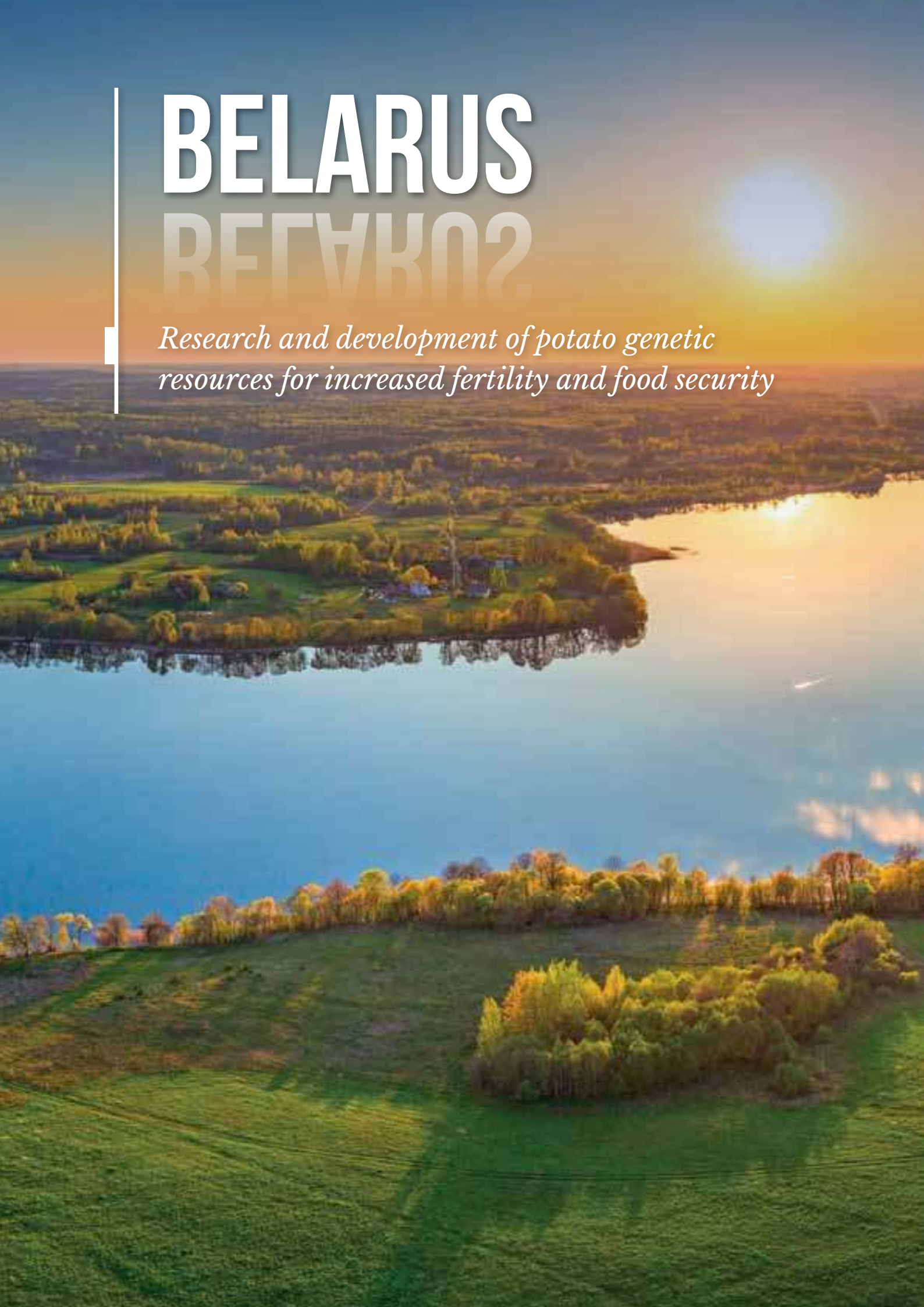
In accordance with national Law No. 113/2012 Albania acceded to the Nagoya Protocol on 29 January 2013. Albania was awarded candidate status by the European Union (EU) in 2014, and must now harmonize its legislation with the, *acquis*, the body of common rights and obligations that is binding to all EU Members States.

Albania adopted the Strategic Policy Document for the Protection of Biodiversity 2016, which incorporates commitments to implement the *acquis* and the Nagoya Protocol. UNDP is currently providing support for the development of a regulatory framework on ABS that is in conformity with the Nagoya Protocol, Regulation (EU) No 511/2014 of the European Parliament and of the Council of 16 April 2014 on compliance measures for users, and European Commission Implementing Regulation (EU) 2015/1866 on the register of collections, monitoring user compliance and best practices.

MESSAGE FROM AN SDG ADVOCATE

"Regulated access to genetic resources and a fair benefit sharing regime in Albania will empower communities and create bridges of cooperation with the private sector as a key actor in reducing biodiversity over-exploitation, while the government enables equitable sharing of benefits all along the supply chains. This triangle is at the core of the sustainable development goals and the right recipe for producing inclusive growth while preserving common goods in Albania."

MS ELVITA KABASHI, Programme Officer, Head of Environment and Climate Change, UNDP Albania.


BELARUS
Research and development of potato genetic resources for increased fertility and food security

AUTHORS

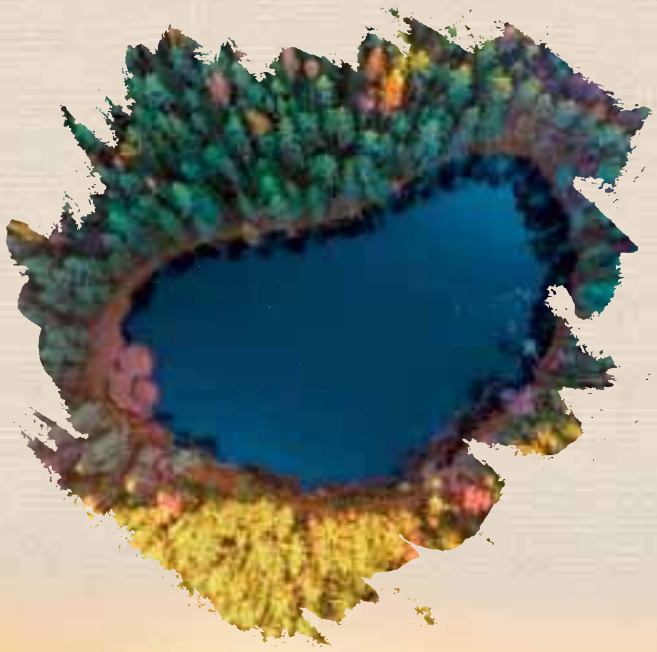
ELENA MAKEYEVA
Head of the National Coordination Centre on Access to Genetic Resources and Benefit Sharing (NCC-ABS), Institute of Genetics and Cytology (IGC)

KSENIYA PANTELEY
National Project Assistant

LARISA USHKOVA
National Project Focal Point, UNDP-GEF Global ABS Project, IGC, Belarus

SETTING THE SCENE

Located in the European deciduous broad-leaved zone, over 60% of Belarusian landscape is covered by diverse ecosystems, comprising of wetlands, forests, kame moraine and lakes. These are some of the rarest landscapes in Europe. The Belarus Polesie, located in the southern part of the country, is one of Europe's most important inland water regions and has been given priority for conservation and sustainable use. The wetlands, which were extensively drained in the 20th century, have increased in recent years due to rewetting. The population of Belarus is about 9 million people. Two million of them live in Minsk, the capital of Belarus, 3.5 million live in towns and the remainder live in villages.



The Republic of Belarus has a significant endowment of plant and animal genetic resources. The most valuable genetic materials can be found in the national parks, wildlife reserves and in botanical gardens as living organisms and in addition, they are also stored as cell culture and DNA collections in genetic banks. The Republic of Belarus recognizes the value of biodiversity as an essential condition for the stability of the biosphere.

National traditions used by Belarusian people since centuries ago provide effective practices that ensure the sustainable use of biosphere resources. These include field cropping, livestock farming and gardening. During the past 24 years the political and administrative system in the Republic of Belarus enforced the legislative basis for protection and restoration of national traditions, including traditional knowledge relevant to the utilization of plant and animal genetic resources for food production, local industry restoration, and improvement of the national art and craftsmanship. Today, national traditions used in farming, breeding of pigs, cows, goats and horses, and the use of local medicinal plants for people's health care are promoted by a State Programme on traditional agricultural farmsteads and country estates in Belarus. Research and development of plant genetic resources is a priority for the country in order to ensure food security and sustainable agriculture.

Biodiscovery case

Belarus has not yet developed a fully functional national legal mechanism to ensure access to and benefit sharing of genetic resources. However, the country, through the Institute of Genetic and Cytology (ICG) of Belarus has invested in research and development of three Belarusian potato lines (SvSvl, SvSv2, and IGC10/1.21) which were transferred to the Potato GeneBank of the US Department of Agriculture in 1997. The transfer was made in accordance to basic principles of the Nagoya Protocol and this was the first pragmatic step to guide the development of a national system of access to genetic resources and benefit-sharing. The transfer was authorized by the Ministry of Natural Resources and Environmental Protection of the Republic. One of these potato lines has been improved to increase fertility and the other two will act as "messengers" to facilitate interspecies hybridization of wild and cultivated potato species. The importance of these two lines as a breeding tool for the creation of new commercial potato varieties can be a significant step forward since currently hybridization between wild and cultivated potatoes remains a challenge for plant breeders. This tool can unlock a great potential for food security.

Initially, a non-commercial research agreement was established between the parties based on Mutually Agreed Terms (MAT) for the joint use of the concerned genetic resources and the sharing of benefits arising from their use, such as scientific collaboration and joint publication of research results, in line with the requirements of the Nagoya Protocol. Under the agreement, the USA Potato Genebank may be allowed to provide breeding lines to third parties for further research, development and commercialization. However, in such cases, a specific clause has been introduced into the agreement to deal with the possibility that a change of intent might occur from non-commercial to commercial use. The USA Potato GeneBank will also share genetic materials with Belarus and this has been envisaged as a modality for benefit sharing. Additional forms of benefit sharing include co-authoring scientific publications and filing joint intellectual property applications for products resulting from the research on the potato genetic resources from Belarus. A contract clause is also included in the aforementioned Agreement to that effect. The IGC has also proposed other forms of non-monetary benefits, such as direct involvement in the research and development carried out by third parties.

EYEWITNESS STATEMENT

"Finding additional research partners is an important goal of the collaboration with the USA Potato Genebank. The USA Potato Genebank will facilitate the dissemination of information on the most genetically valuable specimens stored in the Genebank, which is an enabling condition for attracting new partners for joint research. The Laboratory of Potato Genetics at the Institute of Genetics and Cytology has achieved outstanding results in the field of potato genetics and breeding.

Specialists at the USA Potato Genebank have invited the Institute to deposit the most genetically valuable specimens within their Genebank in order to facilitate their accessibility for scientists and other interested entities in the USA and in other countries. Potato is a strategic staple food that contributes to ensuring food security almost in every country across the globe."

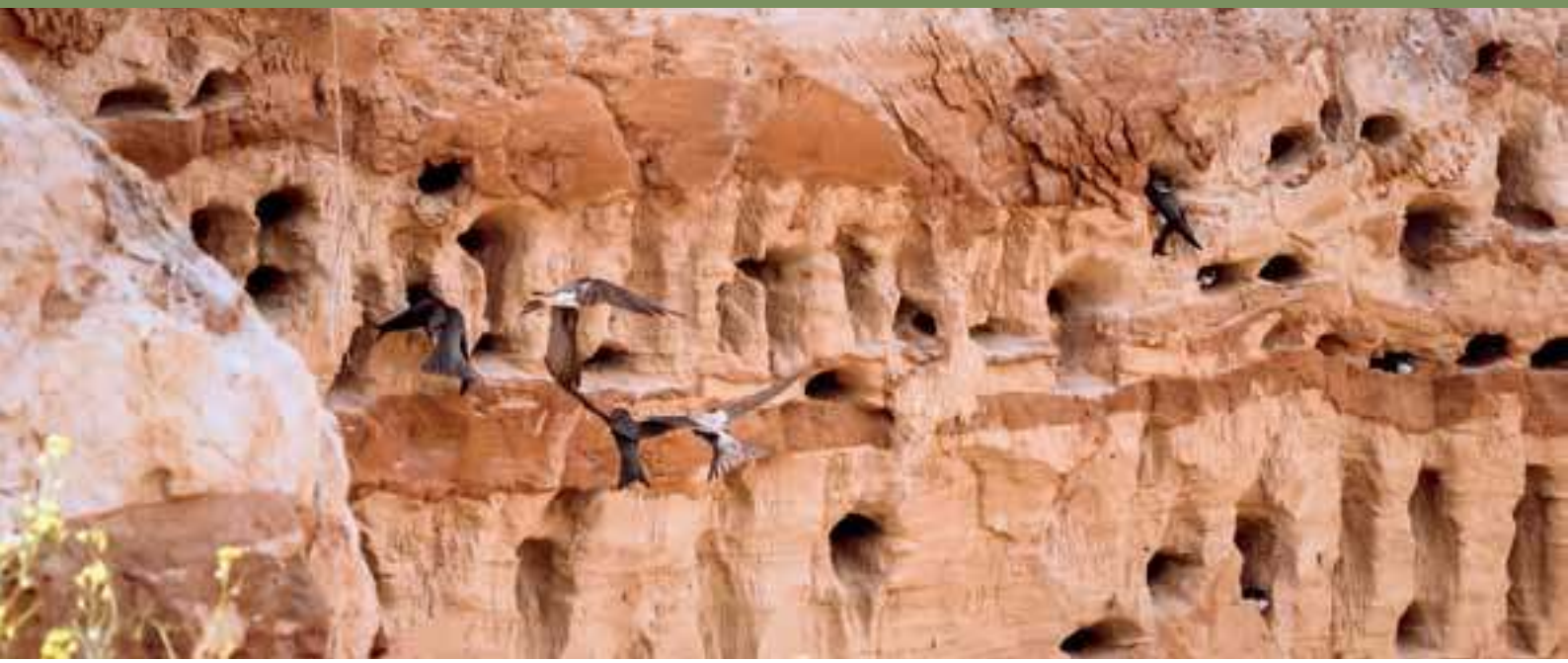
DR ELENA MAKEYEVA, Associate Professor and Head, NCC-ABS, IGC



In fine focus: SDGs implemented by the biodiscovery case

In Belarus, the UNDP-GEF Global ABS Project is supporting implementation of the SDG 15, aimed at ensuring life on land through the conservation and sustainable use of biodiversity, including access to genetic resources and benefit sharing. The Project supports a policy-making process to develop a national ABS framework; the establishment of a systematic inventory of DNA of genetic resources; the further development of the database of the Republican DNA Bank, which provides access to genetic information on animal, plant and microorganisms; and a study on access to genetic resources and innovation by the different industry sectors (SDG 9). The integration of effective DNA technology for the rapid screening of wildlife species diversity through the use of modern DNA-barcoding techniques will make a significant contribution to the development of long-term measures for the conservation of biological diversity.

The country is also assessing traditional knowledge associated with genetic resources as a national heritage with innovative potential (SDG 9), with a view to further the collection and dissemination of information about traditional knowledge holders and the legal protection of such knowledge under a gender perspective (SDG 5). Ongoing awareness-raising activities with stakeholders emphasize the importance of traditional knowledge associated with genetic resources and of communities and civil society's involvement on ABS issues.



Legal and political enabling environment for ABS and the Nagoya Protocol

Belarus has a vibrant research community with advanced research infrastructure. The country has been a Party to the Nagoya Protocol since its entry into force in October 2014 and has established a formal institutional structure for its implementation. Most investments in genetic resources have been by the government and are channeled to support research institutions that undertake work on genetic resources.

However, despite some legal provisions in nature resource protection legislation, at present, there is no uniform procedure for implementing ABS and there was no mechanism for monitoring the use of genetic resources and associated traditional knowledge. The UNDP-GEF Global ABS Project is currently supporting the Government in establishing an effective legal framework to fully implement and operationalize the ABS obligations under the Nagoya Protocol.

As a result, the first internationally recognized certificate of compliance for Belarus was issued by the Clearing House of the Nagoya Protocol in January 2018.

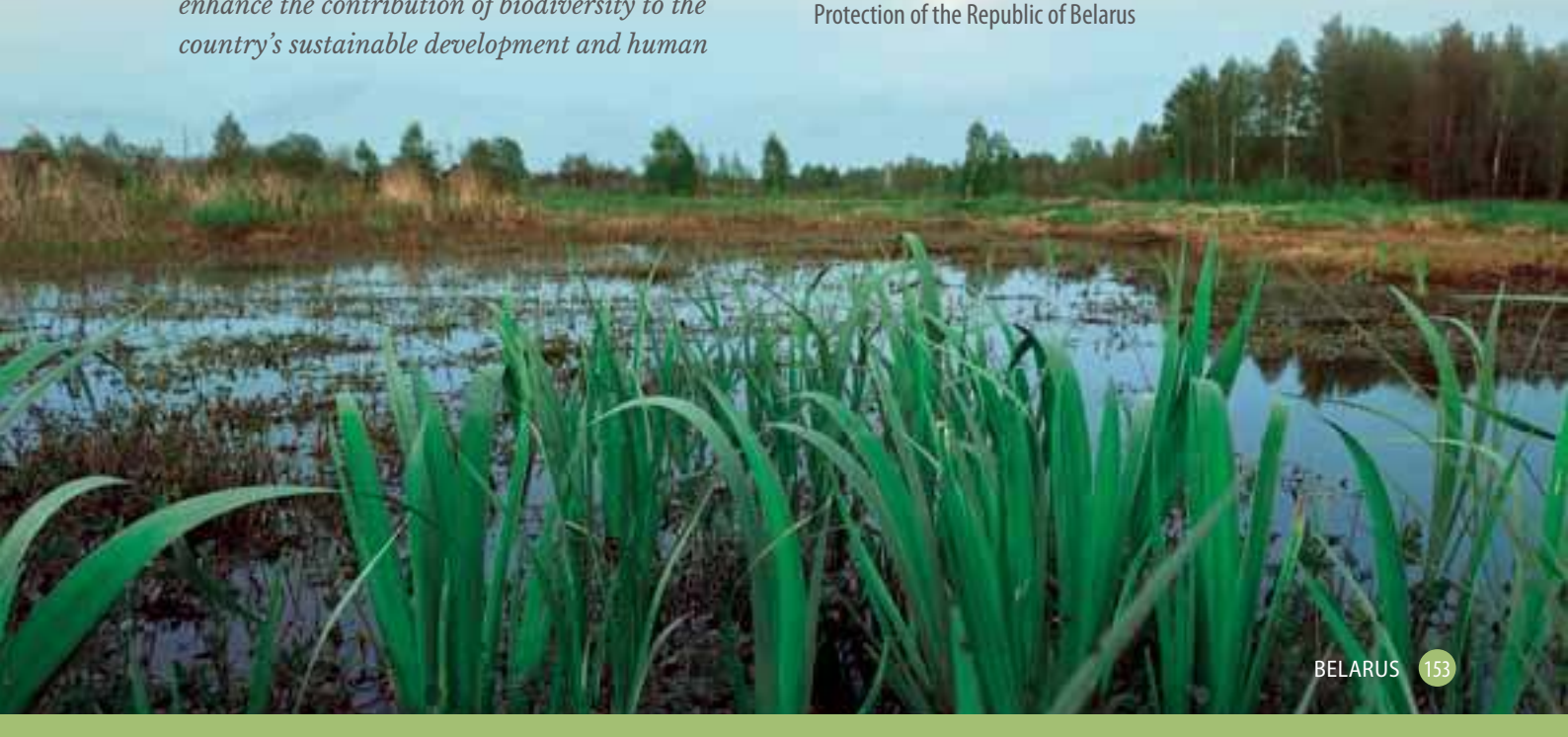
Under the leadership of the Ministry of Natural Resources and Environmental Protection and the National Coordination Centre on Access to Genetic Resources and Benefit Sharing (NCC-ABS), the Project is assisting the country in modernizing its ABS legislation. It is helping in the determination of liability measures for cases of non-compliance with the Nagoya Protocol and in the establishment of effective access measures related to the granting of PIC and the establishment of MAT for the transfer of genetic resources.

MESSAGE FROM AN SDG ADVOCATE

"The Republic of Belarus considers this international instrument [the Nagoya Protocol] not only as a successive step in fulfilling its obligations under the Convention on Biological Diversity, but also as an opportunity to develop the genetic resources' market in the country and the promotion of Belarus' interests internationally. This also gives an opportunity to use new technologies and developments, to revitalize the sharing of experiences in this area.

By stimulating the use of genetic resources and strengthening the opportunities for the fair and equitable sharing of benefits arising from their utilization, the Nagoya Protocol provides incentives to conserve genetic resources as a valuable source of biological diversity, to sustainably use its components and to further enhance the contribution of biodiversity to the country's sustainable development and human well-being, which will catalyze implementation of not only SDG 15 but many more SDGs to support economic growth and the livelihoods of local communities."

MR ALEKSANDR NIKOLAEVICH KORBUT,
Deputy Minister of Natural Resources and Environmental Protection of the Republic of Belarus



BIODISCOVERY CASES

ARGENTINA

COLOMBIA

COSTA RICA

DOMINICAN REPUBLIC

ECUADOR

MEXICO

PANAMA

URUGUAY

Latin America & The Caribbean

ARGENTINA

Fighting pediatric diarrhea with nanobodies from a wild camelid, the guanaco

AUTHORS

DIEGO MORENO
Secretary of Environmental Policy – National Project Director

MATIAS MOTTET
Programme specialist – Environment and Sustainable Development Program, UNDP

VIVIANA PARREÑO
Coordinator I&D – Research, National Agricultural Technology Institute

MICAELA BONAFINA
Project Manager, UNDP-GEF national ABS Project

JULIETA SARNO
National Directorate of Biodiversity

ROCÍO LAIZ QUIROGA
Project consultant, UNDP-GEF national ABS Project

SETTING THE SCENE

The Argentine Republic holds a great range of geographic and environmental variety over its extensive 3 700 000 km^2 surface, which are reflected in the 18 ecoregions. These ecoregions include rain forests, tropical and subtropical forests, meadows, temperate grasslands, steppe, savannahs, shrub lands, wetlands and marine ecosystems.

The region known as Patagonia is located in the southern region of the country and includes Argentina's southernmost provinces: Neuquén, Río Negro, Chubut, Santa Cruz and Tierra del Fuego, the Atlantic South Islands, Antártida and a small southern part of each of La Pampa, Mendoza and Buenos Aires provinces. Patagonia has features that makes it distinct from the other regions like its arid and semi-arid weather, its steppe biome and its two types of characteristic relief: mountains and plateaus.

One of the characteristic species of steppe biome is the guanaco (*Lama guanicoe*, Camilideae), one of the biggest herbivores of South America and the biggest one among wild camels in the continent. Of all South American camelids, the guanaco is the only species that inhabits lands at sea level, being distributed along the coastal zones. Consequently, from September to March, guanacos can be observed sharing their habitat with penguins in the Punta Tombo National Reserve in Chubut Province.

A specific component of the UNDP-GEF project "Promoting the application of the Nagoya Protocol on ABS in Argentina" is being developed in Chubut Province, which is rich in natural resources and possesses a unique ecosystemic and genetic patrimony. Specifically, the UNDP-GEF project has been using genetic resources from the guanacos in the Chubut Province to develop a treatment against pediatric diarrhea.



Biodiscovery case

The guanaco was a valuable resource for the indigenous communities who inhabited Argentina, who consumed its meat and valued its skin and fur to make clothing. Populations of this camelid were adapted to different types of weather and elevations such as the wet plains of the Pampas, the Andes Mountains and even the arid Patagonian steppe, where it currently still lives. The hostility of the climate conditions to which guanacos were adapted and their powerful immune systems have made them attractive to science and biotechnology.

By the end of the 20th century, a group of researchers had already discovered the genetic value of old world camelids (camel, dromedary and bactrian) by identifying that these species carry a special type of antibody (known as heavy chain antibodies) from which the fragment corresponding to the variable domain, called VHH, can be obtained and expressed as a recombinant protein called nanobody, which is the smallest molecule present in nature capable of recognizing and binding to an antigen.

These nanobodies can bind to special sites unrecognizable by conventional high affinity antibodies due to their small size, 15 kilodaltons. On the other hand, these nanobodies have a large number of special properties, such as resistance to extreme temperatures, resistance to extreme pH, ability to refold under physiological conditions, and ability to inhibit enzyme activity. All these properties position them as versatile molecules with a large number of biotechnological applications.

From a practical perspective, these nanobodies can be used for diagnosis and treating of many diseases, and, to date, many nanobodies have been developed and patented against different viral agents such as the AIDS, dengue, ebola and influenza viruses. An Argentinian investigation group, IncuINTA, has been in search of nanobodies against the Group A rotavirus, which is the main viral agent responsible for pediatric diarrhea worldwide, and which also causes high mortality rates in developing countries. Rotavirus causes 1 300 cases of diarrhea per day and 200 000 annual deaths in children under five years of age.

To date, libraries of nanobody expression have been developed from domestic camelid species (dromedaries, bactrian camels, llamas and alpacas); however wild species, like the guanaco, have not been investigated yet.

Bactrian camels and dromedaries have nanobodies with excellent properties, differing from those of llamas and alpacas. It is believed that given the evolutionary differences between wild and domestic camelids, guanacos (which are the evolutionary ancestors of llamas) may have a type of nanobody with intermediate characteristics between the domestic camelids of the old world and the domestic camelids of the new world. For this reason, and to add value to the genetic resources of a wild, native Argentine species, the IncuINTA research group is exploring the use of wild guanacos as a source of nanobodies. The structural and biochemical properties of guanaco nanobodies will be evaluated and then compared with the lama and dromedary nanobodies. Researchers with the project have immunized a guanaco specimen and generated a VHH library to rotavirus.

This study hopes to show the value of guanacos as a source of molecules for biotechnological application, which will hopefully contribute to the promotion of their conservation. Finally, it is intended to generate the necessary information to establish whether it is possible to develop a dignosis test, functional immune milk or a pediatric drug as a preventive strategy against rotavirus diarrhea. All the information generated by this project and the benefits that can derive from the utilization of genetic resources will be shared between the collaborating parties and the province of Chubut. At this time, the material obtained from sampling the guanaco specimens is still being processed for characterization.

EYEWITNESS STATEMENT

"I am a doctoral fellow at the National Scientific and Technical Research Council (CONICET) and my thesis project addresses the utilization of wild South American camelids as a source of nanobodies for biotechnological and pharmaceutical applications. I am currently working at the National Institute of Agricultural Technology (INTA, in Spanish).

Since the beginning of my career I have been working with nanobodies and I can affirm that their range of application is as wide as the limits of our imagination. They can be easily combined with different proteins or molecules to fulfill a specific biological function.

By working with this bioprospecting case, I had the amazing opportunity to visit the Chubut Province to interact with several guanaco specimens. Once they were captured, a blood sample was extracted and then they were released. The samples obtained were first processed and after the corresponding permits were approved, they were exported to the Vrije Universiteit Brussel (VUB), in Belgium. I got the chance to travel with the purpose of developing, with success, the first guanaco nano-antibody expression library.

From this experience, I got the chance to become more conscious about biodiversity and the ecological role that the wild guanaco populations play. I believe it is important to highlight that nanobodies, besides having a wide spectrum of sustainable uses and interesting properties, also constitute a technology that is sustainable in its development. It demonstrates a use of biological diversity components that will not significantly impact the guanaco population.

I hope that this project raises awareness on the importance of conservation and sustainable use of our biological diversity and the fair and equitable distribution of the benefits that arise from the utilization of genetic resources. I also desire that the results of my work in this project contribute to the fight against pediatric diarrhea and provide information for a better understanding of this disease. This is an opportunity for us scientists to become sustainable users of our biological diversity and conservation tools."

MATIAS ADÚRIZ GUERRERO, Argentinean researcher, National Agricultural Technology Institute

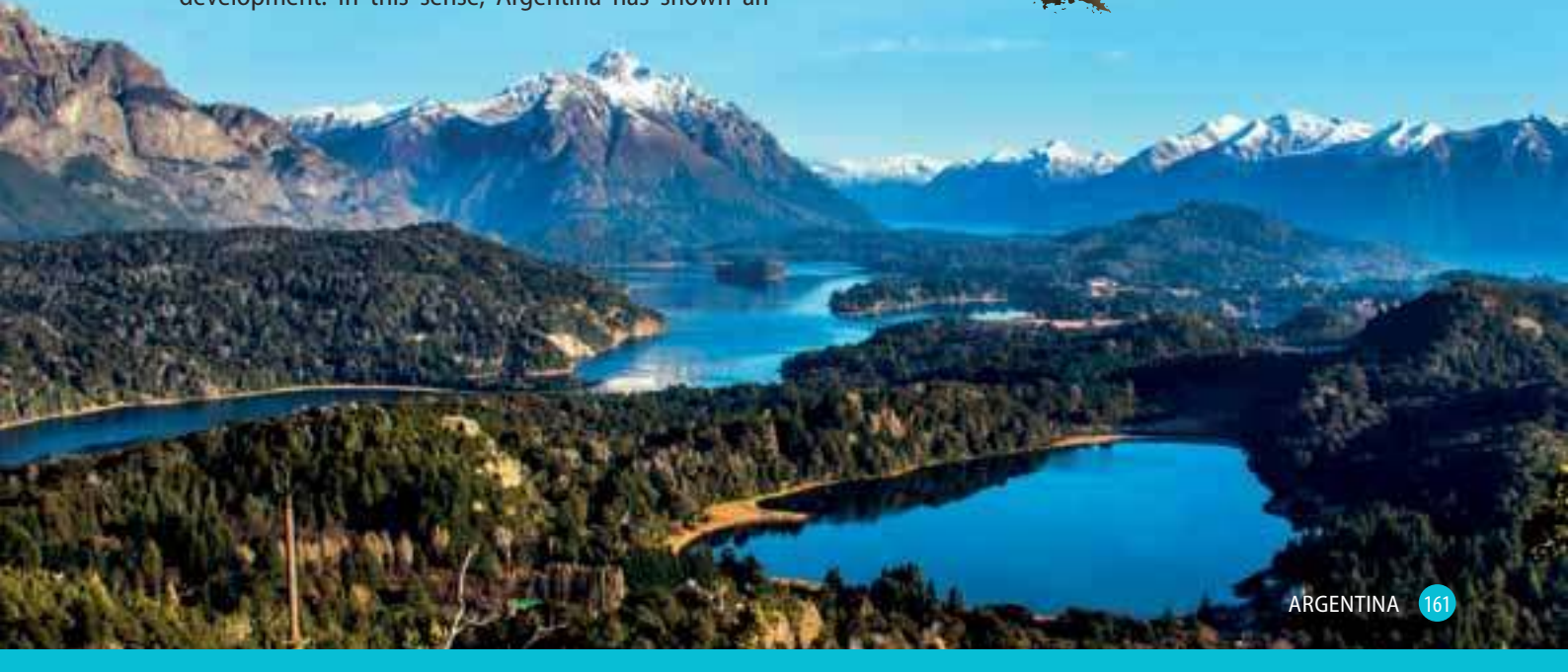


In fine focus: SDGs implemented by the biodiscovery case

The UNDP together with the Ministry of Environment and Sustainable Development are promoting various actions to contribute to the national adaptation process that is being carried out and to the implementation of 2030 Agenda, in an integrated and coordinated manner. SDGs directly related to genetic resources are fully integrated with those related to, for example, "Life below water" (SDG 14) and "zero hunger" (SDG 2).

The project has directly contributed to the implementation of target 15.6, by promoting sustainable use of biological diversity, demonstrating the biotechnological value of a wild species (guanacos) and its genetic resources, and also promoting the fair and equitable sharing of the benefits arising from the utilization of these resources, and adequate access to these resources, since all information generated by this project and the benefits that may be derived from the utilization of the genetic resources will be shared between the parties involved and the province of Chubut.

In Argentina, biodiversity requires conservation to be promoted through the sustainable use and management, in order to ensure national and inclusive development. In this sense, Argentina has shown an evolution in conservation policies, sustainable use of biodiversity, and in the fair and equitable sharing of the benefits derived from the utilization of genetic resources. The aforementioned achievements have been mainly reached through the National Strategy on Biodiversity and Action Plan 2016–2020 and the implementation of the Nagoya protocol activities, among others.



Legal and political enabling environment for ABS and the Nagoya Protocol

The Republic of Argentina is a democratic state, consisting of 23 provinces and the autonomous city of Buenos Aires, which is the nation's federal capital. According to the National Constitution, the provinces hold the original domain over their genetic and biological resources. For this reason, provinces are a key element in allowing access to genetic resources and ensuring the fair and equitable sharing of the benefits that may result from the project. The National Constitution establishes that international treaties that are approved and passed by the National Congress preempt domestic law (specific human rights treaties have "constitutional" category) and that the Nation has to establish minimum standards for environmental protection.

The Argentinean National Parks Administration (APN) holds domain over the natural resources found within the national parks territories, natural monuments and those lands set aside in national reserves. Thus, the provinces and the APN should, in principle, be the agencies to grant access to genetic resources, except for certain specific cases, in which access will be granted by the National Ministry of Environment and Sustainable Development.

Argentina approved the CBD through national law Nº 24.375, and became a party to the convention in 1995. The Nagoya Protocol was approved through national law Nº 27.246 and entered into force on 3 September 2017. It should be noted that before the Nagoya Protocol, there were previous regulations on ABS at national and provincial levels.

On the national level, two resolutions can be mentioned: Nº 226/2010 from what was then the Secretary of Environment and Sustainable Development and the Nº 81/2016 from the APN, that regulated the proceedings and the requisites to access genetic resources for scientific or research purposes for application to industry or commerce sectors. On the national level, through Resolution MAyDS Nº 151/2017, the "National Strategy on Biodiversity and Action Plan 2016–2020 (ENByPA in Spanish)" was implemented, tasking the National Directorate on Biodiversity (within the framework of the National Commission for Assessment on Conservation and Sustainable Use of Biological Diversity) the settlement of the necessary resources to make possible its implementation.

The ENByPA constitutes a state policy that Argentina established for the conservation and sustainable use of its biodiversity, and the fair and equitable distribution of the derived benefits. The Strategy consists of nine areas, objectives and priority goals, all of which, in a coordinated way, guide actions, regulations and procedures. The fifth area addresses specifically genetic resources and topics linked to their management within the CBD and Nagoya Protocol´s frameworks, with the purpose of developing the institutional articulation and legislative measures that tend to bring into play more legal security and transparency, as much as for the suppliers as well as for the users of these genetic resources. It also aims to create incentives for genetic resources conservation and sustainable use.

The National Ministry of Environment and Sustainable Development through the GEF funded project "Promoting the Application of the Nagoya Protocol on ABS in Argentina", with UNDP as the supporting agency, has started the process of implementation of the Nagoya Protocol aiming to establish an effective and efficient regime for ABS at a national level. The main challenges facing this objective are strengthening the local capacity (human and institutional), harmonizing and adapting the existing legal frameworks (gaps) and enforcing the Nagoya Protocol commitments.

MESSAGE FROM AN SDG ADVOCATE

"The 2030 Agenda appeals to Member States and everybody 'to leave no one behind' in its commitment to end poverty and join efforts to reach sustainable development based on inclusion, economic growth and environmental protection. Implementation of SDGs requires focusing and specific adaptation to each regional, national and local reality, in which consistency, coherence and institutional harmonization are key elements.

The UNDP-GEF ABS Project aims at promoting biodiversity conservation and sustainable use, as well as the value of its ecosystem services, considering the equal and fair distribution of benefits from genetic resources and associated traditional knowledge.

This project is implemented by the Ministry of Environment and Sustainable Development in partnership with the National Institute of Agricultural Technology, Chubut Province, UNDP and GEF, in order to operationalize the Nagoya Protocol implementation. It encompasses a robust technical approach in tandem with a multi-governmental level as well as stakeholders' involvement, with an inter- sectoral and inclusive perspective, and it is three-fold, considering: a) The Pilot project; b) Capacity building activities at the national and provincial level; and c) ABS Legal Framework and Institutional Strengthening.

From UNDP we have the privilege of working in partnership with the different national and provincial authorities aiming at catalyzing different governmental as well as sectoral, community and stakeholders whose contributions consider biodiversity and ABS as key pillars in order to achieve an inclusive, fair and sustainable development."

MARÍA EUGENIA DI PAOLA, Coordinator, Environment and Sustainable Development Programme, UNDP Argentina

COLOMBIA

Development and production of a blue dye derived from Genipa americana with industrial and commercial application

AUTHORS

PAULA ROJAS
Coordinator of the Genetic Resources Group, Ministry of Environment and Sustainable Development

CARLOS OSPINA
Professional of the Genetic Resources Group, Ministry of Environment and Sustainable Development

JIMENA PUYANA
National Manager for Sustainable Development, UNDP Colombia

DIANA MEJÍA
Sustainable Development Specialist, UNDP Colombia

ADRIAN GIRALDO
Manager, Ecoflora cares

SETTING THE SCENE

Colombia, thanks to its geographic location, has favourable characteristics and environmental conditions for the development and diversification of all kinds of living forms. It shelters almost 10% of the world's biodiversity, with more than 300 types of ecosystems, distributed in five geographic regions: the Andes, the Caribbean, the Pacific coast, the Amazon and the Eastern Plains. It occupies first place in species diversity of birds and orchids worldwide, second place in plants, butterflies, freshwater fishes and amphibians; and is one of the richest countries in water resources. Almost 10% of Colombia's area of 1 100 000 km^2 is forest area, 10% is territorial waters and another 10% is protected waters.

All this biodiversity is a potential source of genetic resources and derived products that may be translated into goods and services for humans, that can be exploited from the expressed form of these genetic resources into foods, raw materials, natural medicines, among others and to which biotechnology may be applied to produce goods and services of high added value, that satisfy the basic needs and the evolution of the market.

In Colombia, access to genetic resources is granted through an access contract that allows bioprospecting and commercial activities with genetic resources and their derivatives. So far Colombia has granted 227 contracts for research purposes, 17 framework contracts with universities and centres of research and 10 commercial contracts. From these, the country has received important contributions derived from the sharing of monetary and non-monetary benefits.

Biodiscovery case

A UNDP-GEF project ("Development and production of natural dyes in the Chocó Region of Colombia for the food, cosmetics and personal care industries under the provisions of the Nagoya Protocol") was developed under the framework of the access contract to resources and derived products No. 111 of 2014, granted by the Ministry of Environment and Sustainable Development. Under this framework, the Colombian company Ecoflora Cares developed the economic potential of a derivative of the genetic resources (blue dye of the jagua tree, *Genipa americana*, Rubiaceae), through which monetary and non-monetary benefits were shared with the Colombian State and the Afro-Colombian communities of the biogeographic Chocó region. Although traditional knowledge is not associated to the dye developed by Ecoflora in the laboratory, the local communities were the suppliers of the biological resource that was the raw material for the development of the dye. Through project support, a local company was created to sell the jagua fruit and other non-timber forest products. This company, called Planeta, was founded by ten entrepreneurs from the region. They developed the value chains of non-timber forest products together with small-holder farmers that had no access to regional or national markets. The project created the conditions for Planeta to flourish and become sustainable during the first year of operation.

Understanding the technical potential of the dye, Ecoflora also got in contact with Fundación Espave, a local NGO looking for development alternatives derived from the rainforest. Espavé and the project strengthened the capacities of local communities to ensure the sustainable harvesting and supply of Jagua to Ecoflora.

The project promoted the conservation and sustainable use of biodiversity in the Choco region. It also raised awareness on the science and technology used to transform an extract of the Jagua fruit into a blue dye with applications for the food, cosmetics and personal care industries. The Ministry of Environment and Sustainable Development also strengthened its capacity to negotiate benefit sharing agreements, develop ABS contract models and harmonize access procedures with ABS policies.

EYEWITNESS STATEMENT

"The blue dye of jagua gives consumers the possibility of accessing a natural, healthy product that, at the same time, generates a positive impact for the forests in which the raw materials are generated from are found. Consumers are increasingly aware of their role in sustainability and prefer to consume products which they feel generate a positive impact on a productive sector. In the rush to bring to consumers sustainable and natural ingredients, the industry looks for natural ingredients and finds technical barriers that, in many occasions, prevent the replacement of synthetic inputs. The blue colouring of jagua has the technical conditions that in some applications even exceed the performance of traditional chemicals. In this way the impact is double because the product fulfils technical functions and allows consumers to obtain products as they require them.

After identifying naturally occurring blue stripes in the fruit, we started a research project showing that the jagua fruit had been fully botanically and chemically described. We understood that the fruit has a high content of genipin, a compound which reacts with several amino acids, creating colours.

Additional research around the reactions between genipin and amino acids led Ecoflora to fully re-create the natural process,thus creating this natural blue water-soluble colour. In addition to the technical research, market research was also being undertaken, understanding that the food industry was looking for a natural, water-soluble, acid-stable and heat-stable blue colour. All those characteristics are found with the natural blue colour derived from jagua, exceeding the performance of other natural blue colours and even some synthetic colours. Since approvals from health policy authorities are required for the free commercialization of the product (a natural blue colour derived from jagua), Ecoflora started working to identify and describe the product at a molecular level. This research led to the chemical elucidation of the molecules and several trials showed their lack of toxicity. Currently the product has been approved for use in Colombia and is under evaluation by the FDA in the USA and by Codex Alimentarius for its free use around the world.

Once the blue colour of jagua passes the regulatory barriers for its free consumption, such as the approval by the FDA and other regulatory entities, the fruit can continue providing a sustained income for local communities. A resource that before had no economic use (jagua fruit) will become the raw material that can be collected and sold, thus generating additional income and improved livelihoods for local communities.

The jagua tree, having no prior commercial value, was traditionally eradicated or even sometimes used for timber purposes indiscriminately.

With the development of this investigation, the jagua fruit acquired a commercial value, which was derived in the interest of conserving this species on part of the community but also leads to the conservation of species associated with the ecosystems where the jagua is found. In this way, the sustainable use of this resource becomes both an alternative for economic development for the communities and an incentive for protection of the forests of the Colombian Pacific. Additionally, protocols for the sustainable use of this species were developed in the area influenced by the project and the community was trained in its management for conservation and use.

The development of the blue colour of jagua was a pioneering use of the framework for the generation of high-value products from biodiversity. The product development allowed the national authorities the possibility of applying ABS regulations and related laws in a real case that sought to generate value. Although at first this was perceived as a barrier, today and after going through all the steps with the authorities, in Colombia, it can be said that the path to follow is easier and clearer. It is possible to have a real use of biodiversity from access to genetic resources and their derivatives and to generate positive impacts for businesses, communities, ecosystems and the state. Additionally, jagua's blue dye demonstrates that it is possible to relate biodiversity to economic development, the development of scientific knowledge and community development in a responsible and sustainable manner."

ADRIAN GIRALDO, Manager, Ecoflora Cares

In fine focus: SDGs implemented by the biodiscovery case

The research on the jagua fruit dye contributed to the following SDGs: SDG 15 (protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss): The project promoted the implementation of sustainable management of Colombian Pacific forests through the development of protocols for the use of the jagua tree that integrated actions aimed at reducing deforestation by means of sustainable use. The development of these new alternative uses of the species resulted in additional income to the local communities. Additionally, the project incorporated the fair and equitable sharing of benefits derived from the use of the jagua genetic resource and promoted the adequate access to those resources, through contract No. 111 for access signed between the Colombian State and the company Ecoflora Cares. In this contract, different actors (state officials, private sector actors and communities) were linked around the promotion of the jagua value chain. Based on this experience and others such as the use of active ingredients obtained from cape gooseberry (*Physalis peruviana*) and other species from the Solanum family for the cosmetics industry, Colombia has formulated and implemented legislative, administrative and policy frameworks to ensure the fair and equitable sharing of benefits, which has enabled the country to promote these types of development alternatives at the national and international level based on the use of biodiversity, its genetic resources and its derivatives. SDG 9 (build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation): This project promoted the development of technologies, research and innovation in the generation of products from biodiversity with added value to the resources of Colombian forests, linking the communities that inhabit these megadiverse territories and encouraging alternatives for employment and income generation.

Legal and political enabling environment for ABS and the Nagoya Protocol

Colombia has a robust regulatory framework for the implementation of ABS. The Convention on Biological Diversity (CBD), was adopted by Law 165 of 1994 and recognizes the sovereign rights of States over their natural resources in the areas within their jurisdiction. The Parties to the Convention, therefore, have the authority to determine access to genetic resources in areas within their territory and the obligation to take appropriate measures in order to share the benefits derived from their use. Colombia designated the Ministry of Environment and Sustainable Development as the Competent National Authority in terms of access to genetic resources through Decree 730 of March 14, 1997 and established a procedure to process requests for genetic resources. In July 1996, the five Andean countries (Bolivia, Colombia, Ecuador, Peru and Venezuela), signed the Andean Decision 391 on a "Common regime of access to genetic resources". During the last few years, Colombia strengthened the national ABS framework with Resolution 1348 of 2014 and Decree 1076 of 2015 to clarify which activities require access and compile pre-existing regulations on the environment and sustainable development sector respectively. These include regulations on biological collections and the permit for the collection of wild species for non-commercial research purposes. In 2016 a manual for users to request an access contract to genetic resources and derivatives was published. Colombia signed the Nagoya Protocol in February 2011 and is working to ensure its ratification in the near future. To date, Colombia has signed 254 contracts for access to genetic resources and their derivatives, among which 10 are for commercial purposes.

MESSAGE FROM AN SDG ADVOCATE

"This project implements the Nagoya Protocol provisions and is a successful case of the development and production of natural colourants from Genipa americana in Colombia, guaranteeing fair and equitable sharing of benefits to the country and fair income generation for local communities, suppliers of the biological resource.

With this project we seek to strengthen the development and commercialization of other products in this same region and in other regions of the country. We have the challenge of consolidating the capacity of the black and indigenous communities of the biogeographic province of Chocó in the management of species of the region, and the harvest and supply of other fruits as alternative economic developments. In addition to this, we must generate capacity in the different institutions of the National Environmental System (SINA), on the ABS provisions of the Nagoya Protocol and its implications for the country.

Currently, we have transferred capacities to local institutional actors (universities, research centres, companies, regional environmental authorities, etc.) in terms of access to genetic resources and derived products, which has allowed us to increase the number of research initiatives focused on development of new alternatives for the use of biodiversity.

The great challenge of the Project was to demonstrate that it is possible for the government, private sector and the ethnic communities to work hand in hand so that, based on the contract of access to genetic resources, bioprospecting activities are possible, which then can lead to bioproducts derived from the biodiversity of the country and contribute to generating sustainable development alternatives in which monetary and non-monetary benefits can be perceived for the Colombian state and the ethnic communities of the country."

PAULA ROJAS, Coordinator of the Genetic Resources Group, Ministry of Environment and Sustainable Development

COSTA RICA

Using genetic resources to develop a crop-protection agent for the agriculture sector

AUTHORS

ANA LUCIA OROZCO
Biodiversity Specialist, UNDP Costa Rica

ALLAN JIMÉNEZ
Project Coordinator, UNDP-GEF Nagoya Protocol

SANTIAGO CARRIZOSA
ABS Global Advisor, UNDP-GEF

SETTING THE SCENE

Costa Rica is a small country located in Central America, with a relatively small terrestrial area (51 100 km^2) and a much larger marine area (589 683 km^2), that altogether holds a significant proportion of the world's known species (5%). This is mainly due to the country's strategic geographic position, constituting a bridge between the Neartic and Neotropic biogeographic regions, its tropical location, and the variable topography which contributes to its microclimates and habitats. The country can be regarded as a complex mosaic of terrestrial and marine habitats, each one holding a particular combination of species. Some regions are very important endemism areas, such as the Talamanca Highlands and even agroecosystems in Guanacaste are home to populations of wild relative of important agricultural crops, such as maize and beans. Nevertheless, the distinctiveness of the country does not lie in the number of species but their density, meaning the number of species per unit area, a category in which Costa Rica surpasses all the megadiverse nations. For more than 40 years the country has made important efforts to conserve its biodiversity. About 25% of its terrestrial territory and 2.3% of its marine territory are under some category of protection.

Half of the national territory is still covered by natural ecosystems and agroecosystems with some tree coverage. Ecosystems and agroecosystems provide fundamental services for society, such as the regulation of the hydrological cycle, soil fertility and quality, scenic beauty, micro-climatic regulation and provision of materials and food. Some economic valuation estimates consider that ecosystems in Costa Rica provide an average income of US$48 814/ha/year, other studies have quantified that National Parks and Biological Reserves alone may contribute to more than 5% of GDP. There are other values, such as those derived from the use of genetic resources and their contribution to products used by the pharmaceutical, agriculture, cosmetic and other industries that also need to be estimated. This story provides a glimpse into a long process followed by scientists and other stakeholders to develop a crop-protection agent from Costa Rica's genetic and biochemical resources.



Biodiscovery case

Dry deciduous forests are among the ecosystems safeguarded in the Guanacaste Conservation Area (GCA), and it was there, in Santa Rosa National Park during the 1980s, where Dr Daniel Janzen first observed that mice would not eat the seeds of a tree species in the genus *Lonchocarpus, Fabaceae*. A research collaboration among the University of Pennsylvania in the USA and the Royal Botanic Gardens Kew and the University of Strathclyde in the UK determined that a mixture of flavonoids obtained from the seeds caused the observed rejection, and also identified the presence of a key compound, known as DMDP, with potential as an organic crop-protection agent.

Further research determined that a series of sugar alkaloids, DMDP among these, affect nematode behaviour. In 1990, the British Technology Group (BTG) funded a project to further assess these compounds, and DMDP was chosen because its use as nematicide was patentable, no immediate toxic effects were evident and *Lonchocarpus costarricensis* had the potential to be utilized through a sustainable commercial supply that required further research.

Between 1999 and 2002, BTG and the National Institute for Biodiversity (INBio) engaged in further investigations in order to extract and evaluate DMDP activity in several crops under tropical and temperate conditions. The original provider of the genetic resource (GCA) joined the INBio-BTG consortium and finally the Ecos-La Pacifica Group joined and formalized this partnership. INBio and ECOS-La Pacifica S.A. initiated a study for the evaluation of other species of the *Lonchocarpus* genus, quantification of DMDP levels in other plant parts such as leaves and domestication and management conditions for establishing crop plantations. Preliminary results of this second phase confirmed some activity of DMDP extract in greenhouse and field trials, but results were not conclusive and required further research to fill certain gaps of the initial research findings.

This led to the UNDP-GEF project: *Promoting the application of the Nagoya Protocol through the development of products based on nature, the distribution of benefits and conservation of biodiversity in Costa Rica*, developed by INBio and UNDP between 2011–2013 and implemented from 2014 until the end of 2018. The project was designed to validate the efficacy of the DMDP nematicide effect as a crop-protection agent and to improve, "scale-up" and meet the licensing conditions for a new natural product to generate economic benefits for the different stakeholders involved in the project and to support biodiversity conservation efforts.

The project included the testing of different types of DMDP formulations (granulated and liquid under different concentrations) that were developed by Formuquisa, to enhance adhesiveness and specific properties for each crop. Several field trials have already been conducted by Monreri in two commodities of great economic impact in Costa Rica: banana and coffee. Preliminary results for non-systemic nematode control in coffee plantations are promising; laboratory testing for the effect of DMDP on different species of nematodes is to be carried out in the final months. The project is also running DMDP field and greenhouse trials in pineapple and vegetables (onion and carrot) to explore potential use in other crops.

EYEWITNESS STATEMENT

"I have known the story of DMDP research through many roles and lenses, initially as an attorney with INBio when the access, research and development agreement was signed with BTG, then promoting the research process as an INBio Board Member, a policy advocate in Conservation International, twice as the Minister of Environment, and I must say that this experience reveals important lessons for achieving the Convention of Biological Diversity objectives to: conserve, sustainably use and achieve fair and just distribution of benefits deriving from biodiversity.

Through the use of a biological compound that derives from the Lonchocarpus tree, we are finding a way to reduce agrochemical run-off to our rivers, one of the greatest environmental and social challenges to be faced currently in our country. The material was extracted from a National Park that perhaps would have not existed if conservation policies and a legal framework including the determination to conserve and halt land-use change were not in place through our Biodiversity and Forestry Laws. The initial finding might have not occurred if a biodiversity investigation led by Dr Daniel Janzen and national experts was not promoted; and it was only through strategic alliances with national and international research institutions such as BTG, Kew, Royal Botanic Gardens and INBio, and the engagement of the private sector in the domestication of Lonchocarpus in a forestry plantation that our current knowledge and commercial exploration of DMDP is available.

The DMDP story in Costa Rica is an ABS example that highlights the importance of how countries need to combine academic, private and governmental efforts and agree on multi-sectorial approaches to take sustainable biodiversity use from theory to practice. It is also an eye-opener case that contributes to the national debate in pursuing a clear ABS legal framework such as the Nagoya Protocol to enhance win-win solutions for both conservation and the agro-productive sector."

MR CARLOS MANUEL RODRIGUEZ, Minister of Environment and Energy, Costa Rica



In fine focus: SDGs implemented by the biodiscovery case

Agriculture plays a relatively strong role in the economy, contributing 5.3% of the country's GDP and employing 12.7% of its labour force. There is a strong link between the agricultural sector and rural poverty by income, which represents approximately 25.7% of households in those areas (SDG 1). During the last decade there has been an increase in the area devoted to permanent crops, generally linked to export products (such as pineapple or oil palm) and a decrease in areas destined for livestock. Regarding agro-exports, the share of agri-food exports of total exports has fluctuated around 40% since 2010. Almost half of Costa Rica's agricultural exports are primary crops for final consumption, such as bananas, coffee and pineapple. The crops with the greatest expansion of their cultivation area were oil palm, pineapple, sugar cane, cassava and citrus fruits. There have been changes in areas of crops such as coffee and pineapple since 1997, with a drastic decline in total coffee areas and an increase in the pineapple sector. This increase in pineapple areas is a threat to the stability of mature forest and secondary cover of the country. The State Phytosanitary Service (SFE) reported that, in 2016, 6.7 million kilograms of active pesticide ingredient were imported and 5.6 million kilograms were formulated. It is estimated that 8.9 million kilograms of pesticides were used in that year, which put considerable pressure on ecosystems, particularly soil and water. The impact of finding a nature-based solution such as the DMDP compound (SDG 9) with a low toxicological profile is of great relevance to reduce the use of synthetic agrochemicals in the market and directly contributes to SDG 12 to ensure sustainable consumption and production, while also reducing contamination of freshwater, marine and terrestrial ecosystems (SDGs 14 and 15).



Legal and political enabling environment for ABS and the Nagoya Protocol

The current legislative, administrative and policy frameworks to facilitate access and ensure fair and equitable sharing of benefits that the country has in place for ABS and the Nagoya Protocol include: the National Political Constitution *to "ensure the right to a healthy and ecologically sound environment for all inhabitants of the country"*, the ratification of the Convention on Biological Diversity (CBD), the current Biodiversity Policy and its National Biodiversity Strategy 2016–2025. Although Costa Rica has signed but not ratified the Nagoya Protocol, the 1998 Biodiversity Law No. 7788 responds to the goal to promote conservation and sustainable use of biodiversity and to ensure the fair and equitable sharing of benefits derived from it (Article 1).

All research or bioprospecting projects on the genetic of biochemical components of biodiversity to be carried out in the Costa Rican territory require an access permit, unless it falls into one of the exceptions of the Law. The Biodiversity Law created the General Access Procedure (GAP) functions since 2013 as a by-law of the 1998 Biodiversity Law and also created the National Commission for the Management of Biodiversity (CONAGEBIO) as the Competent National Authority in Costa Rica, to propose policies and mechanisms regarding ABS. Ratification of the Protocol is still under study in the Congress Environmental Commission.

It should be noted that in 1998 Costa Rica was an example to the world with its pioneer Biodiversity Law which implements the provisions of the CBD including those related to ABS of genetic resources. Developing this Law was a major undertaking which took about two years and revealed two opposing positions. Some regarded legislating access as a way of promoting bioprospecting and legitimizing biopiracy while others defended the law as a way to promote the sustainable use of genetic resources. In 1996, the first draft of the law was developed. The draft law was widely distributed to the public by mail and it was also made available on the internet. Many stakeholders considered this first version to be particularly restrictive and opposed both to the public good and scientific research.

In January 1997 a second draft was developed. Even though this draft addressed some of the objections made to the first draft, it also repeated several of the contentious concepts stated in the initial version of the document. Therefore, it received similar opposition. This situation led to the creation of a Special Commission in the Legislative Assembly. Its mandate was to create a new draft, taking into consideration the previous ones. The Assembly promised to respect the outcome. The Commission met until December 1997 when the new draft was sent to Congress. It received the favourable opinion of the Environment Commission, and after a few modifications, the Legislative Assembly approved the draft law in April 1998 during the last days of the administration of President Figueres Olsen. The Law of Biodiversity entered into force on 6 May 1998.

MESSAGE FROM AN SDG ADVOCATE

"The time is now: we are indeed at a historic juncture for sustainable development in the world and in Costa Rica. In the 2030 agenda there is a clear vision of sustainable development with its three interconnected dimensions: environmental, social and economic development. Sustainable development will only be possible if wealth is shared, income inequality is reduced, poverty is eradicated, economic growth is inclusive while in full respect of environment and livelihoods.

As an economy dependent from its agroindustry and exports, Costa Rica is looking at addressing the use of agrochemicals in commodities such as pineapple, banana, and coffee in order to identify more sustainable practices. This is in terms of environmental sustainability, as well as this being income generation for vulnerable and excluded rural population. In this regard, these intensive production practices are commonly related to social and environmental grievance and this requires facilitation and response.

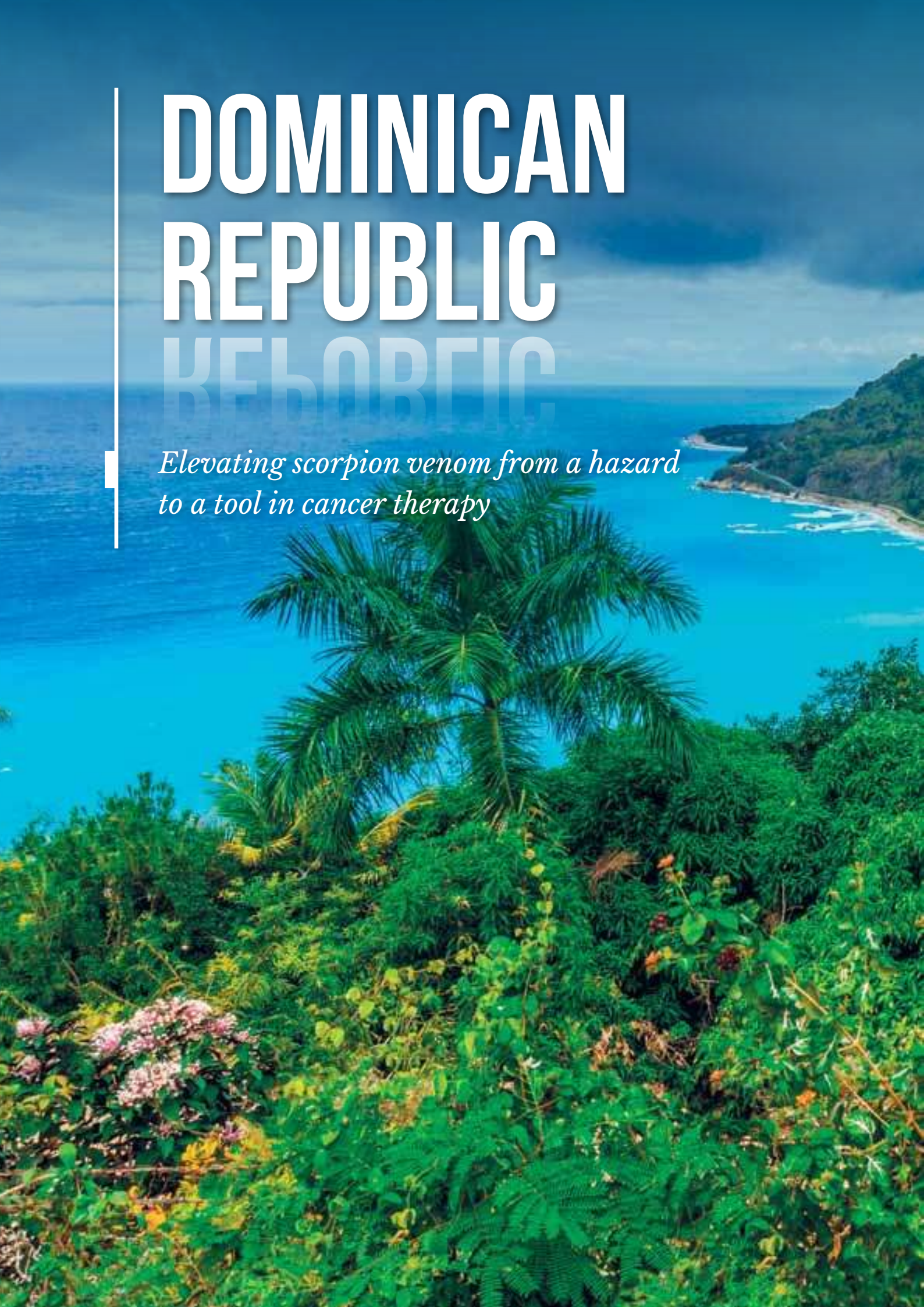
These areas are clearly directly connected to the implementation of the 2030 Agenda with focus on environmental sustainability and eradication of poverty and in particular to achievement of SDGs 1, 9, 12, 14 and 15. The UNDP-GEF Nagoya Protocol project has established a pathway to achieve these SDGs by using Costa Rica's genetic and biochemical resources to develop an environmentally friendly crop-protection product as an alternative to harmful agrochemicals. This product might reduce the total load of agrochemicals into the plantations and the consequent run-offs that harm wetlands and other ecosystems affecting the livelihoods of communities such as water for human consumption and fisheries. The project has evidenced some levels of willingness of the agroindustry to promote these changes within their own set ups, as portrayed through the public-private alliance fostered by the Nagoya Protocol project.

This project also shows how to catalyze the achievement of SDG 17: to revitalize the global partnership for sustainable development.

This was accomplished by promoting the active participation of SINAC's Guanacaste Conservation Area in the development of productive uses and the domestication of the Lonchocarpus tree along with national and international research partners, and the private sector in this case ECOS, and LA Pacifica S.A.

Bioprospecting is not a cheap or easy task, and it has taken more than three decades to develop findings such as the nematicide potential of the DMDP biochemical compound as a crop-protection agent. A privately led effort by itself would not have been commercially feasible enough to carry all these costs, and the governmental timing and procedures often limit the agility that academic organizations and the private sector may offer. It seems that establishing clear legal terms and an enabling framework, and the promotion of research capacities for sustainable use and nature-based solutions for environmental problems is the correct pathway to catalyze SDG achievement from a public standpoint. Regarding the legal framework Costa Rica has pioneered the establishment of agreements and benefit sharing mechanisms but there are still pending resolutions such as the ratification of the Nagoya Protocol."

MRS ALICE H. SHACKELFORD, Resident Coordinator of the UN System and UNDP Resident Representative in Costa Rica



DOMINICAN REPUBLIC

Elevating scorpion venom from a hazard to a tool in cancer therapy

AUTHORS

MERCEDES MARGARITA PEGUERO
Officer in charge of the Division of Access to Genetic Resources, Ministry of Environment and Natural Resources

MARIA PRISCILIA PEÑA
National Project Coordinator UNDP-GEF Global ABS Project in Dominican Republic

MARINA HERNÁNDEZ
ABS National focal point, Department of Genetic Resources, Ministry of Environment and Natural Resources

SETTING THE SCENE

The Dominican Republic is located in the eastern part of Hispaniola Island, the second largest of the Antilles archipelago representing two-thirds of Hispaniola Island with an area of 48 198 km^2. The climate is predominantly subtropical and influenced by the trade winds and rainfall ranges between 400 and 3 000 mm annually. The average temperature is between 17.7°C in high areas of the Central Mountain range and 27.7°C at low and coastal areas.

The Dominican Republic has a population of 10 913 714 inhabitants (50.15% male and 49.85% female). Of all the Antilles islands, the Dominican Republic is the one with the largest number of lakes and ponds such as Lake Enriquillo with an area of 265 km^2, the largest body of lentic waters of the Central Caribbean and located about 40 m below sea level. It also has the Pico Duarte, highest peak of the West Indies.

The vision for biodiversity in the Dominican Republic for 2025 (formulated in 2005) is "sustainable use of its various components (genes, species and ecosystems) is made, based on knowledge of their potential to contribute to national development, conserving and protecting species and habitats in an efficient and effective legal and institutional framework, with participation of the sectors involved". The same document expresses the national vision for ABS as "the conservation and sustainable use of the genetic resources, contributing significantly to the socioeconomic development of a society aware of its importance and that participates fairly and equitably in the benefits derived from its use, in accordance with local laws and international agreements, and maintaining the sovereignty over them".



Biodiscovery case

Neiba, known as the capital of grapes and main municipality of the Bahoruco province, is located in a valley with the same name, in the southwest of the Dominican Republic, located 180 km west of the Santo Domingo city, near Lake Enriquillo. In this community, inhabited by people of scarce economic resources, a liquid from scorpion venom has been traditionally used on a daily basis to relieve bone ailments. In this area, there are scorpions of the Buthidae family (*Rhopalurus princeps* and *R. abudi*), that have as habitat the areas of grape cultivation, under stones and small rocks.

According to information obtained from the Neiba community, the scorpion venom, a polarized dilute blue solution, is extracted and a liquid is prepared and sold in bottles. This is traditional knowledge used by the community. The Medolife International Pharmaceutical Company was interested in this product and requested a permit to investigate its potential use from the Ministry of Environment and Natural Resources. The permit was granted in 2008 and entomologist Kelvin Guerrero participated as a researcher and national counterpart.

The venom has beneficial effects in the treatment of cancers such as prostate, breast, brain, kidney and cervical. Advanced innovation by the company would help develop medicinal products that can help relieve pain, reduce inflammation, boost immune response, prevent cancer and tumour growth, treat cancer, minimize negative biological response to chemotherapy and radiation treatment, increase appetite and body mass during chemotherapy and radiation treatment and improve the quality of sleep.

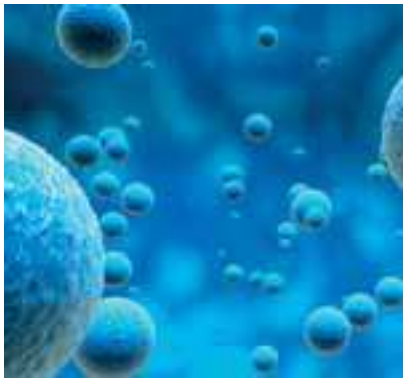
In 2018, the first ABS commercial agreement was signed between the Ministry of Environment of Dominican Republic and a pharmaceutical company, in which the company was committed to benefiting the country and the communities in which the species studied are found through support in training and transfer of technology, donation of medicines and implementation of conservation programmes. The resulting products, derived from the genetic resource will be labelled specifying the geographical origin, highlighting that the communities involved received benefits from this access. Extraction of the venom has not started in the community but the company plans to employ community members as local staff who would help in capturing the scorpions and extracting the venom after having received specific training as part of the technology and knowledge transfer and in compliance with safety measures. The development of the project will not affect the population of the species or the consuetudinary uses of the local community.

EYEWITNESS STATEMENT

"The Medolife Company has its origin in the first decade of the 2000s, when its President, Arthur Mikaelyan, arrived in the Dominican Republic. The company determined that the venom of scorpions from the region of Neiba included molecules with potential for treating oncological diseases. The poison has been studied by several laboratories in Switzerland, the United States and the Dominican Republic. Research has been conducted in the laboratory of Medolife in Los Angeles (California, USA) for the development of other medicines based on the poison. Its unique properties, increasingly attract the interest of oncologists from different countries such as the United States, Russia, Belarus, Armenia, Kazakhstan, England and France.

To obtain the poison, a tool has been developed that allows, in a harmless way for the scorpions, the extraction of the venom twice with a 25-day interval between extractions. The President and all the employees of the the company hope to contribute to improving the quality of life of the people and that's the reason why they make these efforts."

MR ARTUR MIKAELYAN, Manager Medolife, S.R.L



In fine focus: SDGs implemented by the biodiscovery case

This biodiscovery case has contributed to the implementation of the SDGs primarily in terms of reducing poverty and generating jobs for the community, which translates into raising the quality of life of the inhabitants of the area. The company will implement a biodiversity conservation programme in the community of Neiba and different local actions with the objective of benefiting directly women and youth.

This project also supports SDG 2 by fighting extreme hunger and malnutrition which are obstacles for development. The region of this project (Neiba) is one of the least developed areas in the country. The project contributes to the achievement of SDGs 5 and 8, since at least 30% of the direct jobs generated will be for people from the community of Neiba, especially women already included within the percentage of those employed by the project. Different levels of employment are included (technicians, plant employees, collectors and stewards). This biodiscovery project empowers women and this has a multiplier effect that helps promote economic growth in the family. This employment helps to reduce the extreme poverty of the Neiba community.

Along with the employment opportunities, there will be training and capacity-building activities as well as technology and knowledge transfer with university students that will be working in the lab and in the other stages of collection, ex situ maintenance and extraction of the venom.

There will also be biodiversity conservation programmes in the Neiba area, with different workshops and activities for conservation of biodiversity and public awareness. All these efforts will have a special focus on benefiting women and youth from this community.

The country also developed and adopted legislative, administrative and regulatory frameworks to ensure the fair and equitable distribution of benefits derived from the use of genetic resources and associated traditional knowledge as measured by indicator 15.6.1 of the SDGs. This will facilitate implementation of Target 15.6 of SDG 15.

Legal and political environment for ABS and the Nagoya Protocol

The Dominican Republic signed the Nagoya Protocol on 29 October 2010 and ratified it on 13 November 2014. The provisions of the Nagoya Protocol are supported at a national level not only by the Constitution of the Dominican Republic (2015) which established that genetic resources are a national patrimony, but also by the national General Law on Environment and Natural Resources, No. 64–00 which state that genetic resources must be inventoried (Article 18 number 17). Article 136 of this law also promotes the "… community participation in conservation and rational use of genetic resources, as well as … the fair and equitable benefit sharing that derive from their proper management and use".

The Nagoya Protocol is implemented by Law of Biodiversity No. 333 of 2015 and its 2018 Regulation on Access to Genetic Resources, Associated Traditional Knowledge and Fair and Equitable Sharing of Associated Benefits. The regulation adopted by Resolution 02/2018, establishes the Focal Point of the Nagoya Protocol and the Competent National Authority and its functions, and defines minimum requirements for the establishment of mutually agreed conditions, monitoring, and inspection and verification mechanisms, among others. In addition, the regulation defines the procedure for requesting a contract for access to genetic resources and associated traditional knowledge. The National Biodiversity Strategy and Action Plan 2011–2020 (NBSAP) and the Policy of Access to Genetic Resources and Fair and Equitable Sharing of the Benefits Arising from their Utilization will also contribute to implement the Nagoya Protocol.

MESSAGE FROM AN SDG ADVOCATE

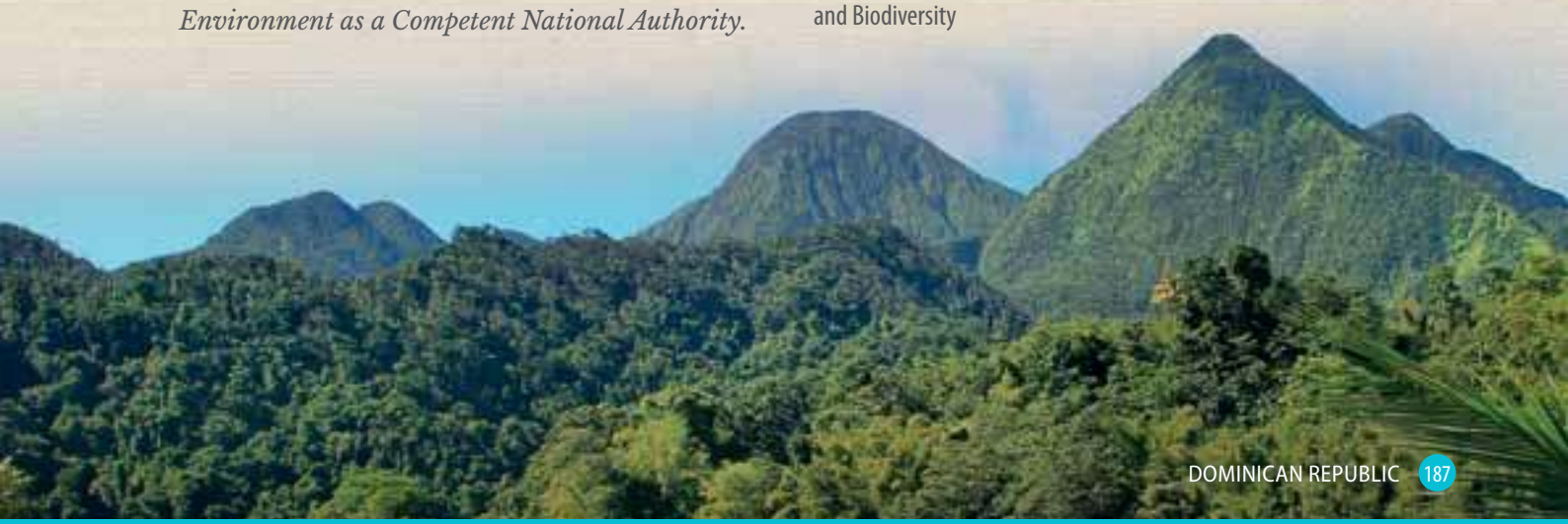
"The research project initiated by the Medolife Company began in 2008 and in the beginning the company was not very eager to offer the information requested by the Ministry of the Environment, so for a time the conversations between the parties did not flow. This research project generated high expectations in the population, as it touches on a very sensitive aspect, human health, and especially because of the type of disease that the biodiscovery addresses, cancer.

The flow of information and an open and effective communication line among the Ministry of the Environment, as Competent National Authority, the researchers and especially the community are key elements to be supported and strengthened. It is important to involve communities, especially in terms of information, and ensure that the communities are aware of the projects being carried out in their locality and their participation takes place under mutually agreed-upon conditions.

The sharing of information between scientists and local communities should be supported by a community authority and the Ministry of the Environment as a Competent National Authority.

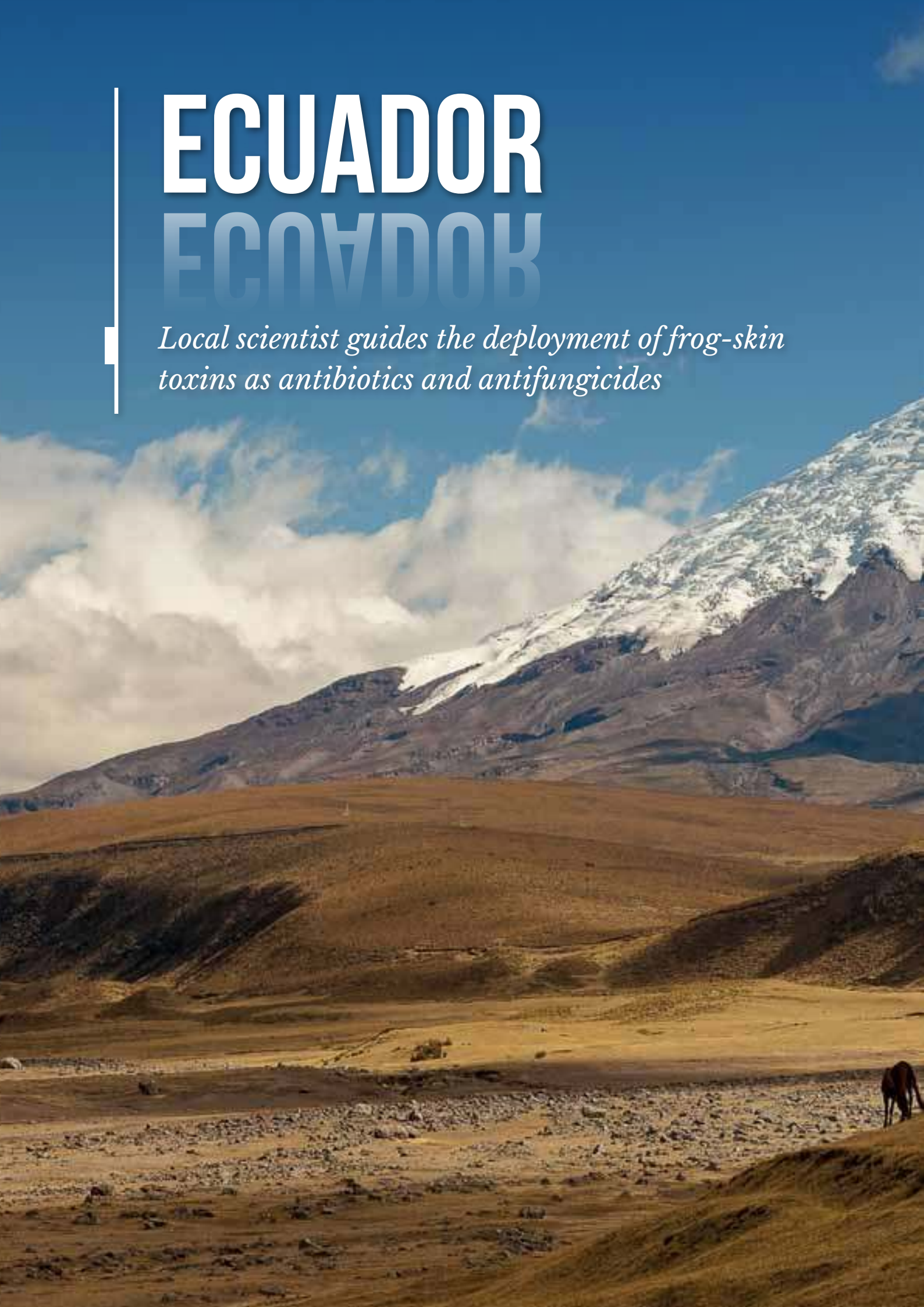
While some scientists act in accordance with the law, others do not and may be willing to steal traditional knowledge. Scientists should be fully trained on the intricacies of national ABS regulations. The project should also continue encouraging women to participate and be empowered by the activities that take place in their communities."

MR ÁNGEL DANERIS SANTANA, Vice Minister Protected Areas and Biodiversity



ECUADOR

Local scientist guides the deployment of frog-skin toxins as antibiotics and antifungicides



AUTHORS

PABLO LARCO ORTUÑO

National Coordinator, UNDP-GEF Global ABS Project in Ecuador

PAOLA GUIJARRO

Communications Officer, UNDP-GEF Global ABS Project in Ecuador

SETTING THE SCENE

Ecuador is a megabiodiverse country that conserves and uses in a sustainable way the resources coming from traditional knowledge of *Pachamama* (Mother Earth). The name of Ecuador refers, precisely, to the geographical location of this country on the equator. Ecuador is classified as one of the 17 countries with the greatest biological diversity on the planet. This geographical position, the presence of the Andean Mountains and the confluence of important ocean currents, explain the existence of 91 types of terrestrial and 24 types of marine ecosystems, in a small territory of 283 560 km^2, which shelters, for example, 4 300 species of orchids, of which 40% exist only in Ecuador; 1 642 species of birds and 18 198 species of vascular plants, representing 5.7% of all plants on the planet.

In relation to the size of the planet, Ecuador represents only 0.1% of the total land surface, but when analyses per square kilometre are performed, Ecuador leads in biological diversity per unit area. A particularly extraordinary case is the variety of amphibians in Ecuador. While Brazil and Colombia have the largest number of amphibians in their territories, followed by Ecuador, when the analysis per square kilometre is performed, Ecuador exceeds Brazil by 21 times and Colombia by almost 3 times; Ecuador has about 600 species of amphibians, especially in the foothills of the Andes.

This small country is also a multi-cultural and multi-ethnic state, with 13 indigenous nationalities, located on the coast, mountain range and Ecuadorian Amazon, along with significant populations of Afro-Ecuadorians and "montubios". This combination of biological diversity and huge cultural richness means great opportunities, as well as challenges, for the sustainable use of genetic resources, derived from flora and fauna, associated or not, with traditional knowledge. An experience that demonstrates the biomedical and economic potential of the use of biodiversity was developed by Universidad Regional Amazónica IKIAM, in Muyuna Campus, in the Ecuador Amazon.

Biodiscovery case

A new family of peptides (molecules formed by the union of several amino acids), which have antimicrobial properties, was discovered in the skin of the "splendid leaf frog" (*Cruziohyla calcarifer*, Hylidae). This new group of molecules was named *cruzioseptinas* and have been shown to have properties for protection against bacteria and yeast. The frog lives in the jungles of Chocó, in the Northwest of Ecuador, and is one of the focal species of the GEF Project for the "Conservation of the Biodiversity of Ecuadorian Amphibians and Sustainable Use of their Genetic Resources" – PARG, an ABS/Biodiversity initiative allied to the GEF Global ABS Project, executed, both projects, by the Ministry of Environment of Ecuador (MAE, by its Spanish acronym), with the support of the UNDP.

The study is being led by Carolina Proaño Bolaños, a young Ecuadorian scientist who worked at Queen's University, Belfast, in Northern Ireland, United Kingdom. Currently a Research Professor at Universidad Regional Amazónica IKIAM, strategic partner of PARG and ABS Projects, in the field of research and characterization of unknown bioactive molecules, derived from the skins of these animals. The scientific data collected show the great molecular diversity contained in the skin of this species, in which 53 new peptides have been identified to date. One of these molecules has the potential for the development of a new class of antibiotic and antifungicide, for medicinal use.

To get an idea of the importance of this discovery, since 2015, around 1 600 antimicrobial molecules have been registered from 165 species and 25 genera of amphibians in the world. Of these, 165 peptides of the *dermaseptin* family have been isolated in frog species of Central and South America.

Other species in the same family have been investigated by Dr Proaño, also in the framework of the referred PARG project, *Agalychnis spurelli* (the gliding tree frog) and *Boana picturata* (the colorful arboreal frog). Dr Proaño and her team of researchers discovered 13 and 7 new peptides, respectively, also with very high biological activity.

In Ecuador, more than 80 framework contracts for access to genetic resources have been signed thus far, for research and use of the genetic information of plants and animals; however, the greatest potential is demonstrated by the amphibian group, where 250 species are endemic to Ecuador, that is, 42% of the 600 species existing in the country.

EYEWITNESS STATEMENT

"There are two main reasons for studying frog skin secretions. First, I learnt about epibatidine – a pain killer alkaloid produced by the Ecuadorian poison frog, Epipedobates anthonyi, Dendrobatidae, that is 200 times more potent than morphine without addictive effects. Characterization of this alkaloid was performed in USA without participation of any Ecuadorian scientists. Second, Ecuador has an extraordinary biodiversity including ~581 species with ~40% endemism. However, at least 28% of these species are under extinction risk. Which makes the study of skin secretions a priority because with every extinct species also disappears the chemicals hidden in their skin. For those reasons, I decided to become a scientist exploring the secrets of Ecuadorian frog skin.

My aim is to unravel the complexity of chemical compounds in frog skin secretions of Ecuadorian amphibians. In particular, I am interested in antimicrobial and pharmacological active peptides. Through scientific research, I would like to understand the biological function of these molecules in the organism evolution context but also to identify lead molecules for the development of new drugs. I think that we have a responsibility to develop a science base for exploiting our biodiversity in a sustainable way for wealth creation from our unique natural resources not only for local benefit but also for the world.

Back in 2002, my research in Ecuador was pioneering but now there are strong lines of research developing studies on frog skin secretions in two local universities. As a result, I have already started to unravel the skin secretion peptides from three Ecuadorian species discovering at least 73 peptides including three novel peptide families with antimicrobial activity but more importantly, I am working with my colleagues at PUCE to transfer to them the technology and knowledge I have developed during my PhD training."

DR CAROLINA PROAÑO BOLAÑOS, Research Professor at Universidad Regional Amazónica IKIAM

In fine focus: SDGs implemented by the biodiscovery case

An innovative exercise was carried out, sponsored by the German Cooperation in Ecuador and the Ministry of the Environment, about the economic potential of the genetic resources derived from Ecuadorian amphibians. This exercise, which took the research of Universidad Regional Amazónica IKIAM as a reference, concluded positively about the significant economic benefits that genetic resources could represent for Ecuador, in the event that the investigations prove successful, after several years of successfully dealing with each one of the different stages usual in this type of investigations.

In essence, genetic resources have huge economic potential, in addition to medical, nutritional or cosmetic potential, that could contribute to the development of indigenous peoples or local communities, owners of traditional knowledge, linked to biodiversity. Likewise, genetic resources would contribute to a new model of national development and constitute an investment opportunity for the private sector. Thus, the greater the benefit perceived by the population, derived from biodiversity, the greater will be the awareness of its value and the greater resources and efforts available for conservation and sustainable development. In conclusion, there is an obvious contribution to the SDGs aimed at health and well-being (SDG 3), the development of industry, innovation and infrastructure (SDG 9), reaching sustainable cities and communities (SDG 11) and the life of terrestrial ecosystems (SDG 15).

Legal and political enabling environment for ABS and the Nagoya Protocol

Since 1996, ABS issues in Ecuador have been regulated by Decision 391 on the Common Regime on Access to Genetic Resources of the Andean Community of Countries. In 2011, the Ecuadorian government issued Executive Decree No. 905 on access to genetic resources to regulate key aspects of Decision 391 at a national level. This national framework was strengthened in 2016 and 2017 with the Organic Environmental Law, the intellectual property law "Ingenios (Ingenuity)" and the ratification of the Nagoya Protocol. Currently, the challenge is achieving adequate interinstitutional coordination between MAE (Ministry of Environment), SENESCYT (Superior Secretariat of Science, Technology and Innovation), INABIO (National Institute of Biodiversity), SENADI (National Secretariat of Intellectual Rights) and others, with competencies established in these instruments, to ensure the development of a coherent and expeditious secondary regulation, applicable at the national level.

Indeed, the National Assembly approved the ratification of the Nagoya Protocol, which became fully effective as of December 2017. For this ratification, the Global ABS Project contributed to a workshop addressed to 75 assembly members, with the purpose of providing information that allows them to take an informed position on the matter, through presentations by experts that included Alejandro Lago, Rodrigo de la Cruz and the Minister of the Environment, Tarcisio Granizo, in July 2017.

These legal instruments constitute a valuable opportunity and, at the same time, a great challenge, since they changed the institutional competencies that were maintained until April 2017, centralized in MAE, by establishing SENESCYT as the governing entity of the national system of science and technology, including the power to extend research permits and sign framework contracts for access to genetic resources.

In order to favour interinstitutional dialog, a process is carried out that seeks transparency and consensus, through the Global ABS Project as a facilitator. Thus, after talks during the second half of 2017, the Project Steering Committee approved, on 15 January 2018, an interinstitutional roadmap for the ABS Regime in Ecuador that is being executed to date.

MESSAGE FROM AN SDG ADVOCATE

"The objectives of Sustainable Development are considered for us, the indigenous and local populations, as a symbol of a global pact, a way forward for governments, in order to contribute to improving the quality of life of the most vulnerable populations and the protection and conservation of the Pachamama (Biodiversity).

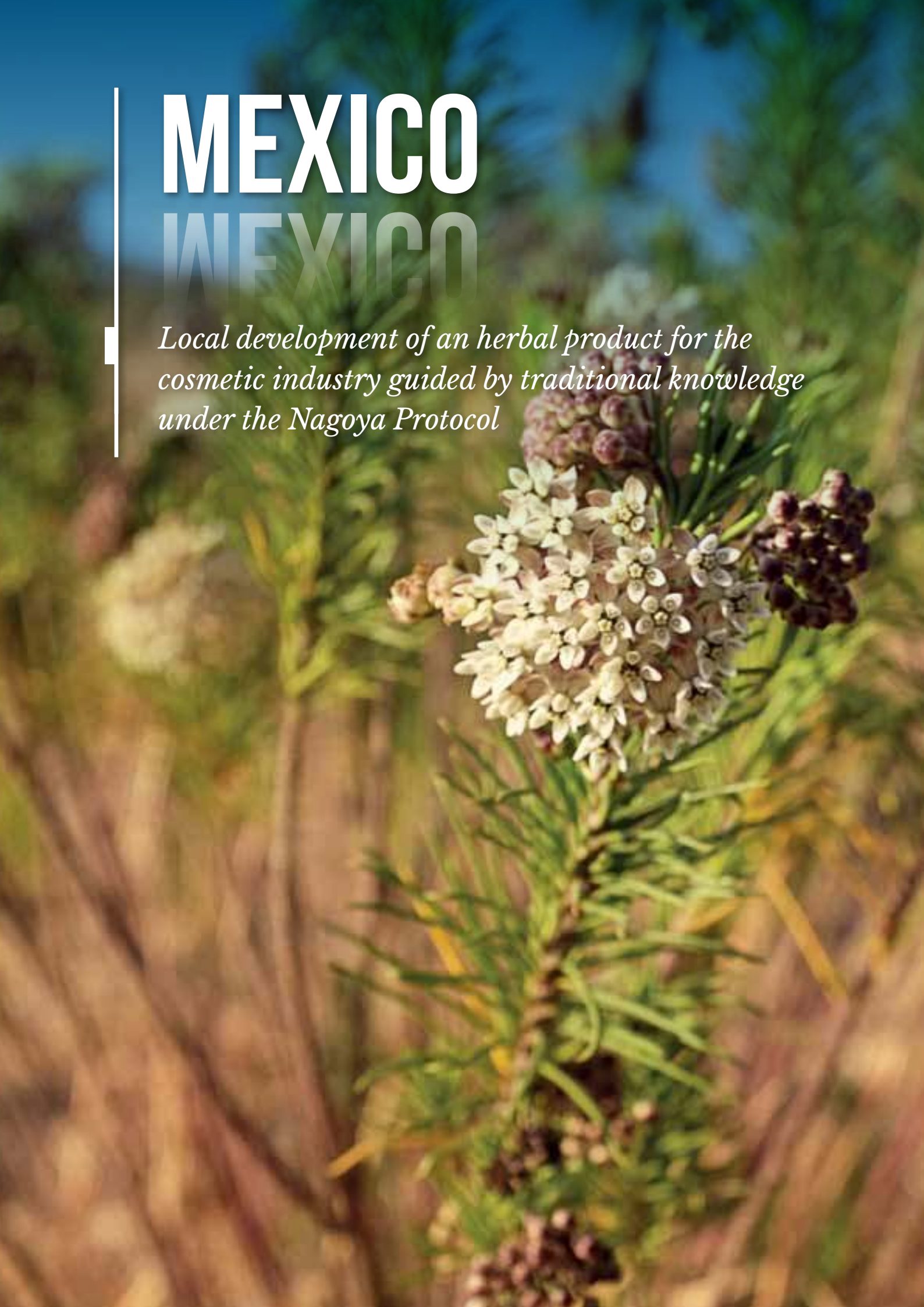
Therefore, it is important that all citizens know about the importance and impact of the 17 objectives for the development of countries. I am Ana María Guacho from Puruwá, a small community of Chimborazo Province, defender of the traditional knowledge rights of the indigenous and local peoples, because we, who are heirs of the ancestral wisdom, support the care of the moorland, the jungle, the mangroves and we know the value and meaning of the medicinal plants, in benefit of the physical and spiritual health of the members of our communities.

Achieving the fulfillment of sustainable development goals is a task for everyone, but the State has more responsibility through the Ministries, Municipalities and Parish Councils, to democratize their actions and link the direct participation of the population in the design of public policies, prioritizing the needs of each territory with a comprehensive vision, where the objectives of sustainable development are a fundamental part of their development plans. This is still a very difficult task, however, and to achieve influence from the territorial level we must legitimize our participation from a citizen initiative as I do, being representative of peoples and nationalities in the Cantonal Council for the Protection of Rights in the Municipality of Riobamba. From that space I have been able to strengthen the rights of women, of the Puruwá indigenous people and the conservation of biodiversity, which are priorities in the 2030 Agenda of the United Nations."

ANA MARÍA GUACHO, Puruwá, Chimborazo

MEXICO

Local development of an herbal product for the cosmetic industry guided by traditional knowledge under the Nagoya Protocol



AUTHORS

ALEJANDRO CALLEJAS
Coordinator, GEF ABS Project, UNDP

EDDA FERNÁNDEZ
National Focal Point for the Nagoya Protocol and General Director for the Primary Sector and Renewable Natural Resources, Ministry of Environment and Natural Resources

ALEJANDRA BARRIOS
Director for Regulation of Biosafety, Biodiversity and Genetically Modified Organisms, Ministry of Environment and Natural Resources

JANET ARTEAGA
Genetic Resources Specialist, GEF ABS Project, UNDP

PATRICIA TOVAR
Director of Economic and Legal Analyses of the Primary Sector, Ministry of Environment and Natural Resources

LYES FERROUKHI
UNDP Senior Technical Adviser: Biodiversity, Ecosystems, and Adaptation to CC

SETTING THE SCENE

Mexico is a megabiodiverse country, fourth at the global level, sheltering an estimated 12% of the world's species. These include an estimated 544 terrestrial and marine mammal species (second highest in the world), 804 reptile species (number one in the world), 366 amphibian species (fourth in the world), between 300 000 and 425 000 insect species, and 23 522 known species of plants (fourth in the world). An estimated 32% of the vertebrate fauna is endemic to the country and 52% is endemic to Mesoamerica. Mexico has 51 of the 191 terrestrial ecoregions recognized worldwide.

As a result of its biodiversity, Mexico is the centre of origin of many plant species and varieties with great potential use in the agriculture, forestry and pharmaceutical sectors.

As a global major centre of domestication and diversification of cultivated species, Mexico has plenty of plant families which may expand, or have expanded, the high genetic diversity of many cultivated species consumed worldwide. These species represent a significant resource in terms of world food security and contribute to a growing interest in their access and use.

The Charape-La Joya Ejido is located about 30 km from the capital city of the State of Queretaro, in the centre of the country. Located in what once was the crater of La Joya Volcano, the area is a high soil degradation zone, with low rainfall. In addition, there is a high rate of migration of mostly men to the USA in search of economic opportunities. Thus, the community's social structure is mostly combined of women, children and elderly people. In this region, a partnership between the community, the Regional Centre for Watershed Training (CRCC in Spanish) of the Autonomous University of Querétaro (UAQ) and Provital, a Spanish cosmetics company, was formed to promote the development of products from aromatic and medicinal plants.



Biodiscovery case

In 2010, Doña Eulalia Moreno, age 79, and her two daughters, Rosa and Angeles Balderas from the Community La Carbonera, nearby the Charape-La Joya Ejido, formed a community-based initiative known as Mujeres y Ambiente (Women and Environment – W&E), with help and support of the UAQ. W&E was created under the premise that the livelihoods of community members could be improved through a micro-enterprise focused on the sustainable use of vegetables and medicinal and aromatic plants.

Four years later, this effort was supported by the Spanish company Provital S.A. These organizations focused on the development of cosmetics from plants, and in early 2016 the W&E group was legally constituted as Women and Environment S.P.R. de R.L. de C.V. In June 2016, this collaboration, inspired by the guidelines of the Nagoya Protocol, approached the National Focal Point for the Nagoya Protocol (NFPNP) in Mexico, to learn about the requirements of obtaining the Internationally Recognized Certificate of Compliance for access to a plant useful for cosmetic purposes and its associated traditional knowledge. The name of this plant is confidential.

Along with the partnership at UAQ, contracts for the development of the supply chain were negotiated between local producers from the Charape-La Joya Ejido, and the group W&E. Technical and legal personnel from the NFPNP office advised Provital on legal requirements, such as those proposed by the Inter-Ministerial Group for the implementation of the Nagoya Protocol. A draft of the project and the Mutually Agreed Terms (MAT) was completed and then using a proposal from the Union for the Ethical Biotrade (UEBT) as a standard of good value chain practices to ensure the sustainable use of the biological and genetic resources.

Provital S.A. initiated the process to obtain the Prior Informed Consent (PIC) from the Charape-La Joya Ejido and the group W&E in accordance with the Mo'otz Kuxtalm Guidelines, adopted during the COP13 in Mexico in 2016.

Four meetings were held to obtain the PIC: the first two meetings were held in order to render a report on the project implications, the third was to make a thorough review of the MAT and the fourth, which took place on July 1, 2017, was to make the formal request for the access permit, witnesses by a notary public, validating the process and final agreements.

Once the regulatory file was completed, Provital S.A. presented a request for an access permit to the General Division of Forestry and Soil Management of the Ministry of Environment and Natural Resources and the permit was granted. In August 2017, once the permit was issued, the National Authority generated the Internationally Recognized Certificate of Compliance, which was posted on the website of the clearing house mechanism of the Nagoya Protocol, and work with the community and UAQ was initiated. In 2018, an amendment to the access permit was carried out to allow the shipment of samples to the laboratories of Provital in Spain. In accordance with the MAT negotiated with Provital S.A., People in the Ejido of Charape-La Joya and the group Women and Environment will receive monetary and non-monetary benefits derived from the marketing of the cosmetic produced from the local plant.

EYEWITNESS STATEMENT

"I have lived here all my life. I was born here, so were all my children, many years ago. Some of them are actually living in the United States now, sometimes I go there to visit them, but I don't like to live there. I like to live here, in my house, with my plants and animals, with my daughters and grandchildren. Here I work for myself. In this project we are participating as Women and Environment with the university and Provital. I am a supplier, I have a role to play."

DOÑA EULALIA MORENO, leader of Mujeres y Ambiente SPR de RL de CV, Community of La Carbonera, nearby the Charape-La Joya Ejido

"I'm so happy to work here, to go to the university in Querétaro and sell all our products. I really never imagined how beautiful it would be to do this job with my family. Actually all my daughters are helping me, collecting plants, drying them and making cosmetics. My husband supports me completely, and this project is helpful to other men by giving support to their own wives for work with us in the greenhouse, harvesting wild plants and participating in this project with Provital. We receive a lot of help from the university and Provital, in learning techniques, using materials and economic planning. I'm sure that what we are doing will bring more benefits to the community and more people will work with us."

ROSA BALDERAS, member, Mujeres y Ambiente SPR de RL de CV., Community of La Carbonera, nearby the Charape-La Joya Ejido

"We really need to know the origin of the plants that we are using. That is why we go directly to the farmer. For Provital, their corporate social responsibility goal is 'to cover our present needs without compromising the needs of future generations'."

RICARD ARMENGOL, Managing Director, Provital S.A.

"My father taught me how to appreciate land, nature, and water. With this work we look at the whole relationship between water, soil, people and biodiversity. We've brought together a team from different disciplines, offering different perspectives. We share a vision for our country, and for the people of our country. We are beginning to regain a vision of progress – not just in terms of cars or things, but in terms of our lives. We are changing conceptions of progress. We're trying to set up a new model. This is a beginning. You have to give solutions and begin to work. This is what the future looks like."

DR RAUL PINEDA LOPEZ, Professor, MSc course on Watershed Management, UAQ

In fine focus: SDGs implemented by the biodiscovery case

This biodiscovery case and the subsequent work led by the UNDP-GEF ABS project to support the development of biocultural community protocols are good examples of the strategic role that ABS processes can play to support the implementation of the 2030 Agenda for sustainable development. Through a relatively small initial investment, the alliance between the Women and Environment group and Provital S.A. is generating catalytic policy, economic, and social impacts that are yielding multiple development benefits across several SDGs.

The experience generated by the *Women and Environment* group is directly contributing to SDG 10 (Reduced inequalities) and SDG 1 (No poverty). By ensuring full and effective participation of women in the biodiscovery initiative, the project is supporting implementation of SDG 5 (Gender equality). This experience is also promoting capacity building for technological development thus supporting SDG 9 (industry, innovation and infrastructure) and encouraging more sustainable consumption patterns (SDG 12 on responsible consumption and production). The *Women and Environment* group is fully aware that unless their activities ensure the conservation and sustainable use of biodiversity (SDG 15 – Life on land) they are unlikely to have long-term incomes and livelihoods. This group is also facilitating implementation of a key target of SDG 15 which specifically aims to promote access and benefit sharing from the utilization of genetic resources.

Thus, as this case clearly highlights, ABS investments in Mexico and elsewhere have the potential to be true accelerators of the 2030 Agenda for sustainable development by triggering positive multiplier effects across the SDGs, and solutions to bottlenecks that were preventing a more sustainable involvement of the private sector in the conservation of biodiversity and associated traditional knowledge. The experience generated by the *Women and Environment* group is a wonderful reminder that while the SDG agenda needs the involvement of business actors, the latter can also greatly benefit from the 2030 Agenda for sustainable development.

Legal and political enabling environment for ABS and the Nagoya Protocol

In 2012, Mexico ratified the Nagoya Protocol, reaffirming the country's commitment to conserving its unique biodiversity while also promoting the sustainable use and sharing of the benefits derived from its utilization. In 2014, the Nagoya Protocol came into force and was formalized as Supreme Law according to the Mexican Constitution.

The Ministry of the Environment and Natural Resources, by means of the General Direction for the Primary Sector and Renewable Natural Resources, which serves as the office of the NFPNP since 2014, formed an inter-ministerial group for the implementation of the Nagoya Protocol (initially with 17 federal offices, which then turned into 22), and in the last three years has coordinated interinstitutional meetings to work on a legal instrument proposal, which may crucially define the correct implementation of the Nagoya Protocol in Mexico.

This instrument is still under legal review; however, this means unprecedented progress and technical and legal agreement on genetic resources, associated traditional knowledge and benefit sharing as the result of the institutional agreement which is meant to reach a proposal. In this sense, even if Mexico does not yet have a specific legal framework to govern access to genetic resources, the implementation of the Nagoya Protocol is still possible with the current legal framework as a result of the work of the inter-ministerial group and the national UNDP-GEF ABS Project. Building on this commitment, Mexico's ABS Project is working to ensure the needed capacity building to guarantee that genetic resources and associated traditional knowledge are properly accessed, and the benefits shared equitably.

With funding from UNDP-GEF, administered and implemented by UNDP Mexico, this project of the Secretariat of Environment and Natural Resources (SEMARNAT), is supporting local communities to oversee access to genetic resources and their associated traditional knowledge, and to ensure that the benefits arising from their utilization are shared equitably.

SEMARNAT, by means of the UNDP-GEF ABS Project has trained more than 700 federal public officials and this year, 2018, they will begin to work to obtain proposals related to the National Strategy of Genetic Resources and the Strategy for in situ Conservation of Agricultural Biodiversity, instruments that, added to the Biocultural Community Protocols on genetic resources held by locations in Mexico, will aim for a solid public policy which promulgates a legal framework and allows for greater legal certainty for the implementation of the Nagoya Protocol. UNDP-GEF ABS is proposing economic instruments with economic benefits for Mexico for access to genetic resources and is working with research centres and universities to develop a Massive Open Online Course (MOOC) about the Nagoya Protocol and specific cases and experiences in Mexico.

MESSAGE FROM AN SDG ADVOCATE

"All the process of this particular case are an example of good practices, to show that the Nagoya Protocol can be implemented in a transparent and fair way, including the Academic (UAQ) and Private (Provital) sectors working hand by hand with the Local Community of Charape/la Joya, respecting their rights, protecting their biodiversity and traditional knowledge, promoting gender equity, empowering people and working together in an equal and respectful way.

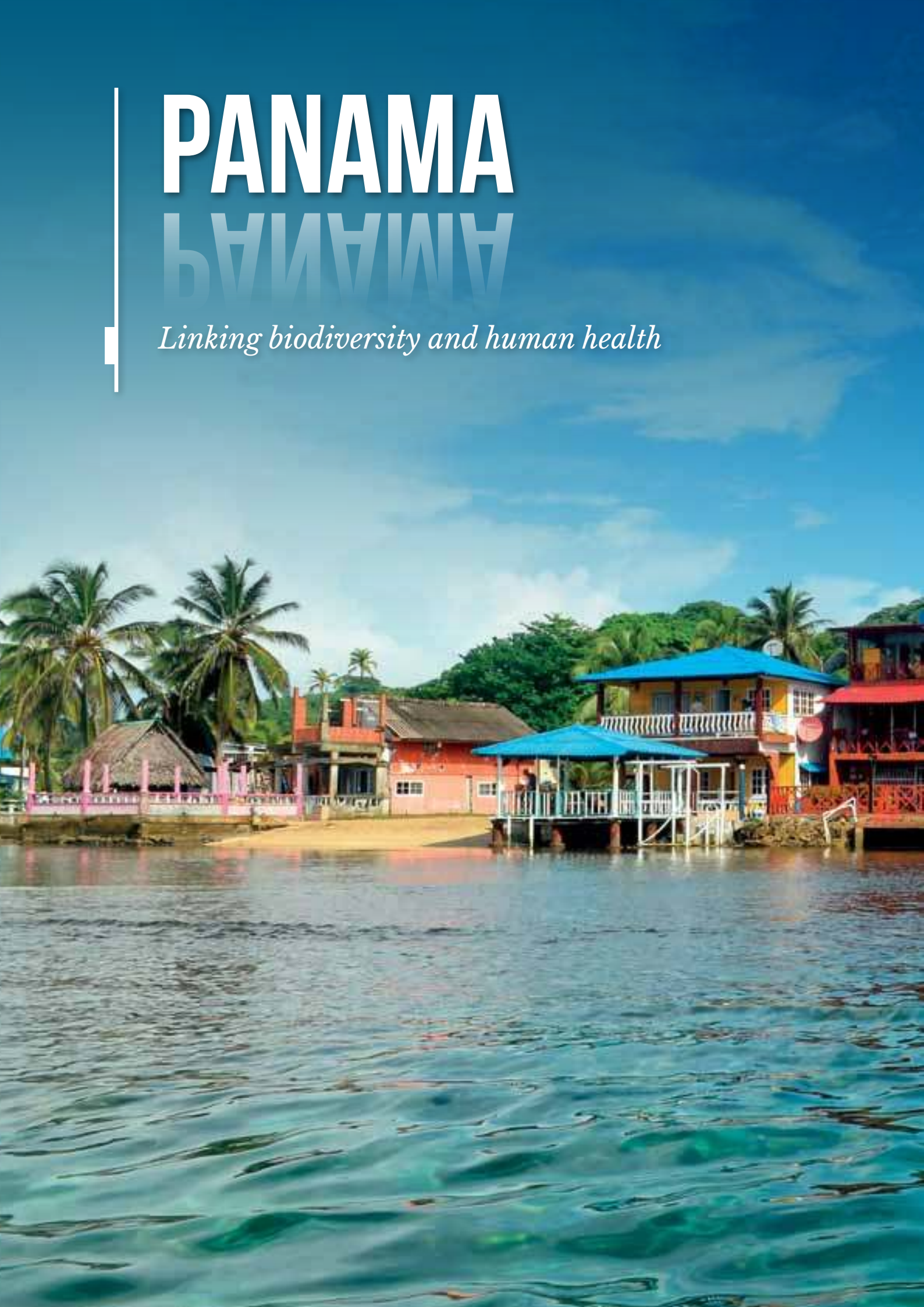
The research and collaborations made thanks to this alliance will have positive impact on the community and will nourish the objectives of the 2030 Agenda. This is a perfect example how we can address key drivers of biological, social and economic erosion through the SDGs.

Thanks to this project, we have the privilege of participating in fostering prosperity for the community, safeguarding the planet, and contributing to gender equity and equality. These activities integrate the three dimensions of sustainable development: the economic, environmental and social".

GERARDO ARROYO, Sustainable Development Official, UNDP Mexico

PANAMA

Linking biodiversity and human health



AUTHORS

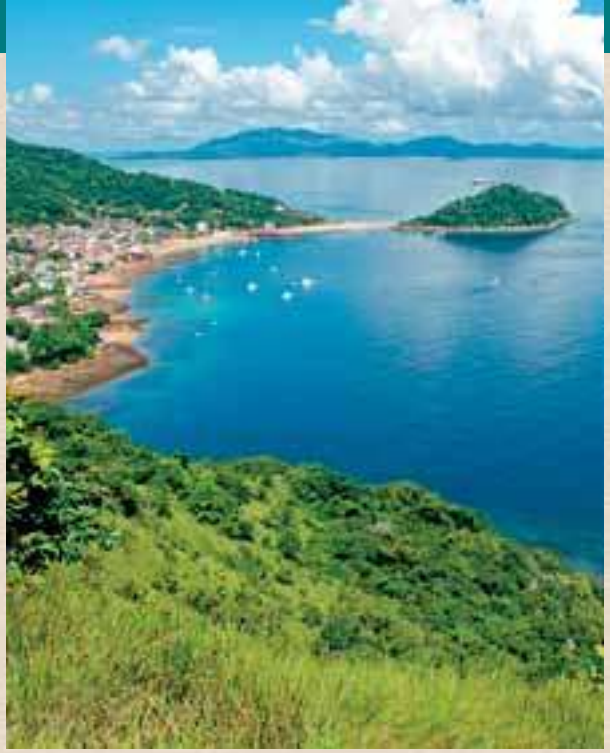
DARÍO LUQUE

Department of Biodiversity,
Ministry of Environment

SETTING THE SCENE

Panama is located in the southeast of Central America. It limits to the north with the Caribbean Sea, to the south with the Pacific Ocean, to the east with Colombia and to the west with Costa Rica. It has an area of 75 420 km^2. It is located on the isthmus of the same name, a strip that links South America with Central America. Panama is located in the region with the greatest biodiversity on the planet, and with multiple ecosystems containing 12 of the 30 Holdridge Life Zones on the planet.

Panama has 3.5% of plants with flowers and 7.3% of ferns and fern allies of the world; 10% of bird species on the planet (more than 1 002 species between residents and migrants); 5% of the 4 327 species of mammals known in the world; 4% of the total amphibian diversity of the world; and 3% (240 species) of the world's reptile diversity. In addition to the species common to other regions of America, there are between 1 300 and 1 900 species of plants, 23 species of amphibians, 24 species of reptiles, 8 species of birds and 10 species of mammals that are endemic or unique to the country.



With its 2 988 km of coastline and 66 405 km^2 of coastal waters, the country has unparalleled access to the flora and fauna of three different bodies of water: the Caribbean Sea, the Gulf of Chiriquí and the Gulf of Panama. Corals are present but rarely develop on elaborate reefs, with the exception of the 1.6 km^2 reef of Ensenada María, near Isla Coiba, in the Gulf of Chiriqui. While coral reefs constitute a comparatively trivial portion of coastal habitats in the eastern, more seasonal Pacific region of Panama, 91% of all genera of reef-building corals in the eastern Pacific occur in Panama. Many of these species are found in the very warm Gulf of Chiriqui. The Panama Bight eco-region includes the islands and waters in the East-Central Pacific of Ecuador, Colombia, Panama and Costa Rica. This eco-region, which includes the Gulf of Chiriqui, is one of the most productive areas of the Eastern Tropical Pacific, and one of the most biologically diverse geographic provinces in the world.The biological diversity of Panama represents one of its competitive advantages, offering potential genetic resources that can be used to obtain derived products, through the use of scientific and biotechnological tools.

Biodiscovery case

Since 2007, the University of Panama, in coordination with other national and international institutions, has developed a comprehensive research programme on scorpions that produce serious and fatal poisonings in the Republic of Panama. Thirteen species of scorpions have been described in Panama, of which four species are the most important for public health because they have been involved in the recorded cases of fatal and serious poisonings: *Tityus pachyurus*, *T. cerroazul*, *T. asthenes* and *T. festae*, Buthidae. The scorpions of the genus *Centruroides*, in the same family, (*C. grains*, *C. bicolor*, *C. limbatus*, *C. panamensis* and *C. margaritatus*) also live in Panama, however, most of the sting cases that occur from them are mild to moderate.

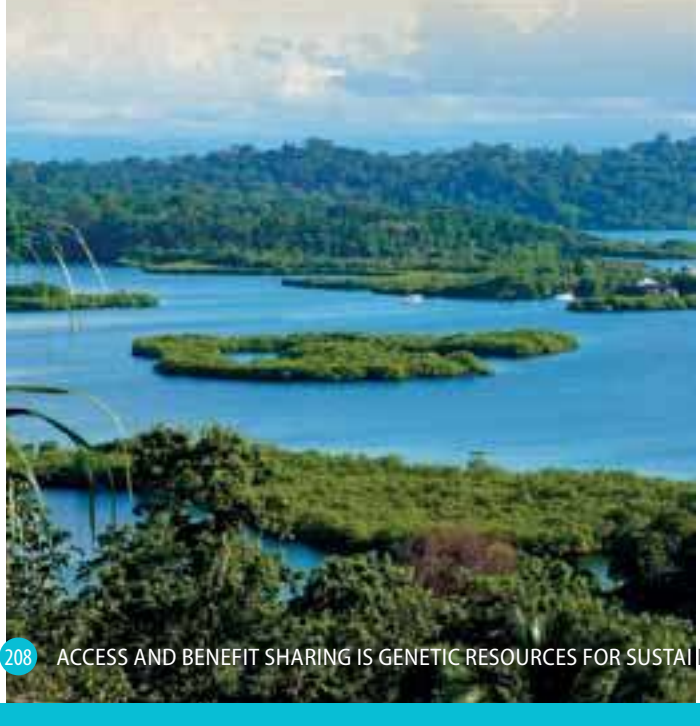
The poisons of the scorpions of the genus *Tityus* have been shown to have high toxicity and research studies on neutralization with Latin American antivenoms have shown that the antivenoms currently produced in Mexico, Venezuela and Brazil do not have the necessary coverage to counteract the effects of all the scorpions of Panama, especially the blue-throated scorpion (*T. cerroazul)* that is endemic to Panama and is the most toxic of all those studied. Nevertheless, the scorpion that causes more serious and fatal accidents is *T. pachyurus*. Panama ranks second in Latin America, after Mexico, in the incidence of scorpion stings. Annually 3 900 to 4 400 accident cases are registered, which occur most frequently in children under 15 years of age. Of the patients who die from this cause, 85% are children under 6 years of age coming from very remote places with low economic resources. There is a window of opportunity of 2 to 2.5 hours for the antidote to be administered to the patient, so its supply and efficiency are relevant.

The antivenom used in Panama currently comes from Venezuela. However, the current crisis underway in Venezuela may compromise the supply of the antivenom available to Panama. There is urgency to develop the technology and infrastructure for extracting in a standardized way the venom of the Panamanian scorpions, so that the antivenom specific for Panama can be produced for Panama and ideally in the mid-term it could be produced in Panama.

The Ministry of Environment is leading this initiative with support from the UNDP-GEF Global ABS Project to increase the sustainable production of poison that will allow the production of the specific antivenom for Panama. In addition to the improvement of methodology for the extraction of poison, there is need for deeper study of scorpion toxins.

EYEWITNESS STATEMENT

"Poisoning caused by scorpion stings affects very low-income children living in places far from health services. The death of three children in 2007 was the crisis that led to the creation of an Interinstitutional Commission to investigate the scorpions that exist in Panama and how to deal with this public health problem. The investigations have been financed with funds from SENACYT, from the University of Panama and recently from the UNDP-GEF Global ABS Project of the Ministry of Environment, with whose contribution, the strengthening of the scorpion colony and the production of the standard poison has been achieved.



The local capacity of the technical staff has been increased with specialized training in Panama with professors from Brazil and through internship and the development of highly specialized studies (proteomic/transcriptomic) in Mexico. The electrostimulation method for the extraction of venom will be incorporated. There will be a training of the personnel of the Ministry of Health for the preventive and control actions of the scorpions in the regions of greater risk in Panama. These funds have arrived at the most opportune moment and will allow us to give the response that is required to save human lives."

PROFESSOR HILDAURA PATIÑO, University of Panama



In fine focus: SDGs implemented by the biodiscovery case

This research on Panamanian scorpion venom contributes to the SDG 3 (Health and well-being). Panama being the second country in Latin America with the highest number of scorpion bites with 52 per 100 000 inhabitants (only after Mexico) and the first one in Central America, the normal and predictable access to antivenom is clearly a health priority for the country. Few labs produce general antivenoms in the region and none of them give full coverage to the most poisonous scorpion that is endemic to Panama. Therefore, the sustained production of the venom, in quality and quantity, is the first step of the research chain in order to obtain specific antivenoms for the country and develop the capacities to produce these antivenoms more effectively at the national level. The availability of these antivenoms is a matter of health and wellbeing for the entire population, but in particular for those communities that live in remote rural areas closer to biodiversity. The project contributes to the following targets of SDG 3:

- 3.B. Support the research and development of vaccines and medicines for the communicable and non-communicable diseases that primarily affect developing countries, provide access to affordable essential medicines and vaccines;
- 3.C. Substantially increase health financing and the recruitment, development, training and retention of the health workforce in developing countries, especially in least developed countries and small island developing States; and
- 3.D. Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks.



Legal and political enabling environment for ABS and the Nagoya Protocol

Executive Decree No. 25, 29 April 2009, is the legal framework for ABS in Panama. The Nagoya Protocol was ratified by Law 57, 4 October 2012. The Ministry of Environment of Panama (MIAMBIENTE) is the Competent National Authority on ABS. Also MIAMBIENTE is the National Focal Point for the Nagoya Protocol. The Access to Genetic Resources Section, within the Department of Biodiversity of MIAMBIENTE, is the administrative office responsible for processing applications for access to genetic resources for both commercial purposes and scientific research without commercial purposes. In 2016, two laws were approved, which complement the regulations related to ABS: Law 17 of 27 June 2016 established the protection of knowledge of traditional indigenous medicine and Law 37 of 2 August 2016 established consultation and free prior and informed consent for indigenous peoples. Currently an update of the Executive Decree No. 25 is being conducted to fully implement the provisions of the Nagoya Protocol in the country.

Panama has been investing on biodiscovery through the Center for Biodiversity and Drug Discovery of the Institute of Scientific Research and High Technology Services of Panama (INDICASAT). INDICASAT is also coordinating the design of a National Plan for the Promotion of Bioprospecting. Future efforts to strengthen research in the region include the creation of a regional research center of the International Center for Genetic Engineering and Biotechnology (ICGEB) and the establishment of Innova Park, a business center geared towards innovation in the Azuero region of Panama.

MESSAGE FROM AN SDG ADVOCATE

"It is essential that countries such as Panama generate, analyse and make scientific data available to the public, and that these data be updated periodically. Scientific information should include data on scorpion species and their general characteristics, range of geographical distribution, climatic factors, incidence of accidents and deaths caused by scorpion stings. It is equally important that these data be produced in a disaggregated manner to identify the most vulnerable populations such as minors up to 5 years of age and older adults from 65 onwards, disaggregated by sex, age and ethnicity. The goal is for Panama to have relevant and useful scientific data to improve knowledge about these species and their correlation with human beings and ecosystems. In addition, the country should be able to interest a greater number of national researchers who in turn should be connected to regional networks for the exchange of information, good practices, challenges and solutions to improve the contributions of biodiversity and the handling of cases through protocols of action and coordination, in terms of their impact on public health, as well as indicators for an integrated environmental management and to measure the impacts of climate change. Regarding the development of science, innovation and technology, the study of scorpions and their poisons opens an area of opportunity for Panama, which currently does not produce serum, but imports from countries in the region. The generated scientific information could result in alternatives that can be produced in the same country, responding to local needs and the local distributions of scorpions. The scientific research

that has been supporting the Global ABS project in Panama, under the leadership of the University of Panama and the Ministry of Environment, with the assistance of the UNDP, contributes to increase academic knowledge of science, but also of people, especially of communities that cohabit with scorpions; it also promotes the generation and strengthening of protocols for prevention and rapid action so that the rural populations of the country can eliminate fatal results. Finally, betting on this research supposes a clear endorsement of the 17 objectives included in the 2030 Agenda for Sustainable Development signed by Panama; in particular, it promotes the achievement of SDGs 3, the health and well-being of the population, and 9, promotion of innovation, infrastructure and industries in the countries."

JESSICA YOUNG, National Programme Officer, UNDP

URUGUAY

Traditional medicine usage of pitanga's leaves for medicinally valuable infusions is directing the search for potential chemotherapeutic agents against colon cancer

AUTHORS

DEBORAH J. KESZENMAN

Associate Professor of Biophysics, Universidad de la República, Uruguay

PIERINA GERMAN

National coordinator in Uruguay of the UNDP-GEF Global ABS Project

SETTING THE SCENE

The Oriental Republic of Uruguay is located in the temperate zone of the Southern Hemisphere of South America and has its coasts on the Atlantic Ocean and the Rio de la Plata. It has a territorial surface of 176 215 km^2 and 120 684 km^2 of territorial sea, plus the jurisdictional waters of rivers and lagoons. It is bordered on the north, northeast and east by the Federative Republic of Brazil, and to the west and northwest by the Argentine Republic.

Uruguay is located in an area of biogeographic transition on the South American continent, with an important matrix of the Pampean Province and intrusions of the Chaquena and Paranaense Provinces. The confluence of these biogeographical regions gives rise to natural fields interspersed with wetlands, different types of native forests (creek, riverside, mountain, park and palm groves), and important extensions of water such as coastal lagoons. For this reason, despite its surface and subtropical position, it houses important biological diversity, both ecoregional and ecosystemic, and genetic specific.

From a geographical point of view, Uruguay represents a terrestrial and marine ecotone of value in terms of biological diversity. Since it is a transition zone, even though it is outside regions of high species richness, it has the importance of being the southern limit of the distribution of many species. The degree of knowledge of Uruguay's biodiversity is very irregular, while some groups are relatively well known, others have only just begun to be studied. Currently, the registered native species are: 2 400 vascular plants; 140 continental mollusks; 226 freshwater fish; 48 amphibians, 71 reptiles, 453 birds and 114 mammals. In the Rio de la Plata and the marine front, 113 species have been identified. The country still needs to estimate the number of native insect species or microorganisms. In Uruguay, genetic resources are accessed with the purpose of developing pharmaceutical, cosmetic, food/beverage, agricultural and phytosanitary products.

Biodiscovery case

In developing countries medicinal products prepared from plants are often used at the primary care level and in traditional medicine. Compounds present in vegetables, fruits, spices and medicinal plants such as resveratrol and turmeric have been shown to have anticarcinogenic properties. These compounds have effects on cellular and molecular processes underlying the etio-pathogenesis of cancer such as inflammation and cell proliferation. In Uruguay, the native species *Eugenia uniflora* (Myrtaceae), popularly known as pitanga has a wide use in traditional medicine. The natives used it extensively according to the testimony of José Sánchez Labrador, an eighteenth-century missionary. It is common to find this shrub in the countryside and in the gardens of houses in cities. It is used as an ornamental plant, it has bright green leaves with repellent properties and its small and edible fruit is of various colours, yellow, red and purple. In Uruguay the fruit is well known and popular as an addition in alcoholic beverages (cane with pitanga). In addition, in Uruguayan popular medicine, the leaves of pitanga are used for the preparation of infusions with carminative, antidiarrheal and anti-inflammatory properties. Due to its effect on the digestive tract and the high incidence of colon cancer in Uruguay, a research group from CENUR Litoral Norte of the Universidad de la República has proposed the study of pitanga as a potential source of anticarcinogenic agents.

Studies carried out by the group of researchers from CENUR (Keszenman, Ferragut, Sánchez, Severi and Cedano) have shown that leaf extracts of *E. uniflora* (obtained by the researchers Vignale and Lombardo from the Faculty of Agronomy, Salto) present antiproliferative and cytotoxic effects. In addition, preliminary results suggest a potential immunomodulatory effect through its interaction with signalling pathways of the immune response. Although the bioactive principles present in the extracts of *E. uniflora* are not yet known, their quantitative chemical characterization (by Professor Dellacassa of the Faculty of Chemistry) will allow for the identification of substances with potential effects on the cellular events mentioned. From these *in vitro* results it has been proposed to undertake the *in vivo* determination of the potential chemotherapeutic preventive effect of leaf extracts of *E. uniflora* on the induction of colon tumours using a model of chemical carcinogenesis in rats. These studies will allow the scientific-technological development of a chemotherapeutic or preventive agent for colon cancer from a natural product of traditional use.

EYEWITNESS STATEMENT

"I must say that, even though I am a person of urban origin, I have always believed that the remedy for physical discomfort, such as heartburn, must be found on the ground in which you live. Those days on which this brief account is based, the burning heat in my stomach that was afflicting me was increasing. In spite of the uneasiness caused by this malaise, my gaze settled on a large solitary bush where a benteveo bird ate greedily his berries.

I thought, how curious that this bird was eating fruits of pitanga, because it is a bird that feeds on invertebrates and some small vertebrates, and yet there it was, eating fruit. My dream instinct dictated to me that it might well be a signal for me to recognize the shrub my grandparents recounted that their grandparents used to heal digestive ailments. Surely the bird also suffered from heartburn and with its primal instinct was taking the right medicine as our ancestors did. The fact is that I approached the bush and remembered the old teachings and experiences, took a few leaves of pitanga and chewed slowly. Nearby, there was a white-flowered ceibo, I sat down, I finished swallowing the mixture of vegetable fibres which the leaves had become when mixed with the saliva. I felt my breathing grow calmer, the burning heat became only a memory, my sense of belonging to the earth flowed like a crystalline stream from the bottom of my soul. I have never lost appreciation for the gift of the pitanga and, as in the time of yore, its leaves are always present for that "tecito" that comforts me."

ADRIAN MAMBERTO, Bachelor of Arts, specialized in Art Restoration

In fine focus: SDGs implemented by the biodiscovery case

The purpose of the project presented here is to search for new chemotherapeutic and preventive agents for cancer from the study of natural products used in Latin American traditional medicine. The bioactive principles identified will be incorporated into prevention and treatment protocols currently used to address the problem of increased cancer incidence, particularly colo-rectal cancer. We should point out that in Uruguay, this type of cancer occupies the third place of incidence and mortality in men, and the second in women, being the most frequent digestive neoplasm. The incidence rate in the country is 29.5 new cases per year per 100 thousand inhabitants.

The development of the project will be directly related to SDG 3 – ensure a healthy life for all and at all ages and more specifically to goal 3.9 which aims to "strengthen the capacity of all countries, particularly developing countries, in the subjects of early warning, risk reduction and risk management for national and global health", through its contribution to new preventive-therapeutic approaches for colo-rectal cancer. The project will also collaborate in advancing SDG 9, specifically target 9.b whose purpose includes "supporting the development of national technologies, research and innovation in developing countries, including ensuring a regulatory environment conducive to industrial diversification and addition of value to basic products, among other things". In effect, this project will contribute to strengthening the national biotechnological innovation capacities, and concomitantly, to the valuation of native genetic resources. Finally, it will contribute to advancing the achievement of SDG 15 and more specifically, to target 15.6 "to promote fair and equitable participation in the benefits derived from the use of genetic resources and promote adequate access to those resources, as internationally agreed". Given that the project is being executed by a public institution and will generate a biotechnological innovation that can bring benefits both for the national population and internationally in the treatment of a disease of high global incidence, it can be said that it will promote a fair and equitable participation of the benefits of this innovation process.

Legal and political enabling environment for ABS and the Nagoya Protocol

Uruguay ratified the CBD through Law No. 16.408, on 27 August 1993, and the Nagoya Protocol (NP) on ABS, by Law No. 19,227, on 24 June 2014.

In 2016, the National Environment Directorate (DINAMA) of the Ministry of Housing, Territorial Planning and Environment (MVOTMA) published the National Strategy for the Conservation and Sustainable Use of Biological Diversity of Uruguay 2016–2020, which, in its goal 16, establishes that by 2018, agreements will have been reached for the development of the national regulatory framework for access and conservation of genetic resources, in harmony with the international agreements and treaties assumed by the country. As part of reaching this goal, in April 2017 the execution of the UNDP-GEF Global ABS Project "Strengthening of Human Resources, Legal Frameworks and Institutional Capacities for the Implementation of the Nagoya Protocol" began; with the purpose of: (i) Strengthening the legal, institutional and political capacities for the design and implementation of the national ABS legal framework; (ii) Strengthening the trust between suppliers and users of genetic resources to facilitate the identification of biodiscovery initiatives; (iii) Improving the capacity of local communities and family farmers in the implementation of the Nagoya Protocol and (iv) Implementing of a community of practice and a South-South cooperation framework on ABS.

Within the framework of the UNDP-GEF Global ABS Project, the MVOTMA approved Ministerial Resolution No. 1844/017, on 30 November 2017. This Resolution – published in Official Gazette No. 29.844 on 12 December 2017, establishes a provisional regime of access to genetic resources in the country, designating the Biodiversity Division of DINAMA as the competent authority to manage the requests for access to genetic resources in Uruguay. In addition, through the Resolution of the National Directorate of the Environment R/DN/0165/18 of 4 June 2018, two forms for requesting access to genetic resources were approved, one for applications for non-commercial research purposes, and another for those with commercial purposes.

MESSAGE FROM AN SDG ADVOCATE

"The world is moving towards a much more robust and comprehensive concept of development that emphasizes sustainability and inclusion. The SDGs represent an unprecedented global consensus to align efforts in the coming years around a truly ambitious agenda for people and the planet. It is an agenda that aims to leave no one behind and to transform the world, the way we live, consume, produce, work and do business. But above all, the new agenda puts on the table the dependencies and interrelationships that exist between the different dimensions of development and the need to address problems in all their complexity with multidimensional views. In this sense, it highlights the importance of this initiative and the opportunity it offers to contribute to the aforementioned SDG issues (SDG 3 Health and well-being, SDG 15 Life of terrestrial ecosystems and SDG 9 Industry, innovation and infrastructure), to which the SDG 1 End of poverty could be added. It is an initiative that aims to work on these issues not only at the national level to generate benefits for the health of the population, but also at the territorial level in the search for benefits for local communities and the use of traditional knowledge of the native flora, in this case especially for pitanga, which has always been used for different curative uses."

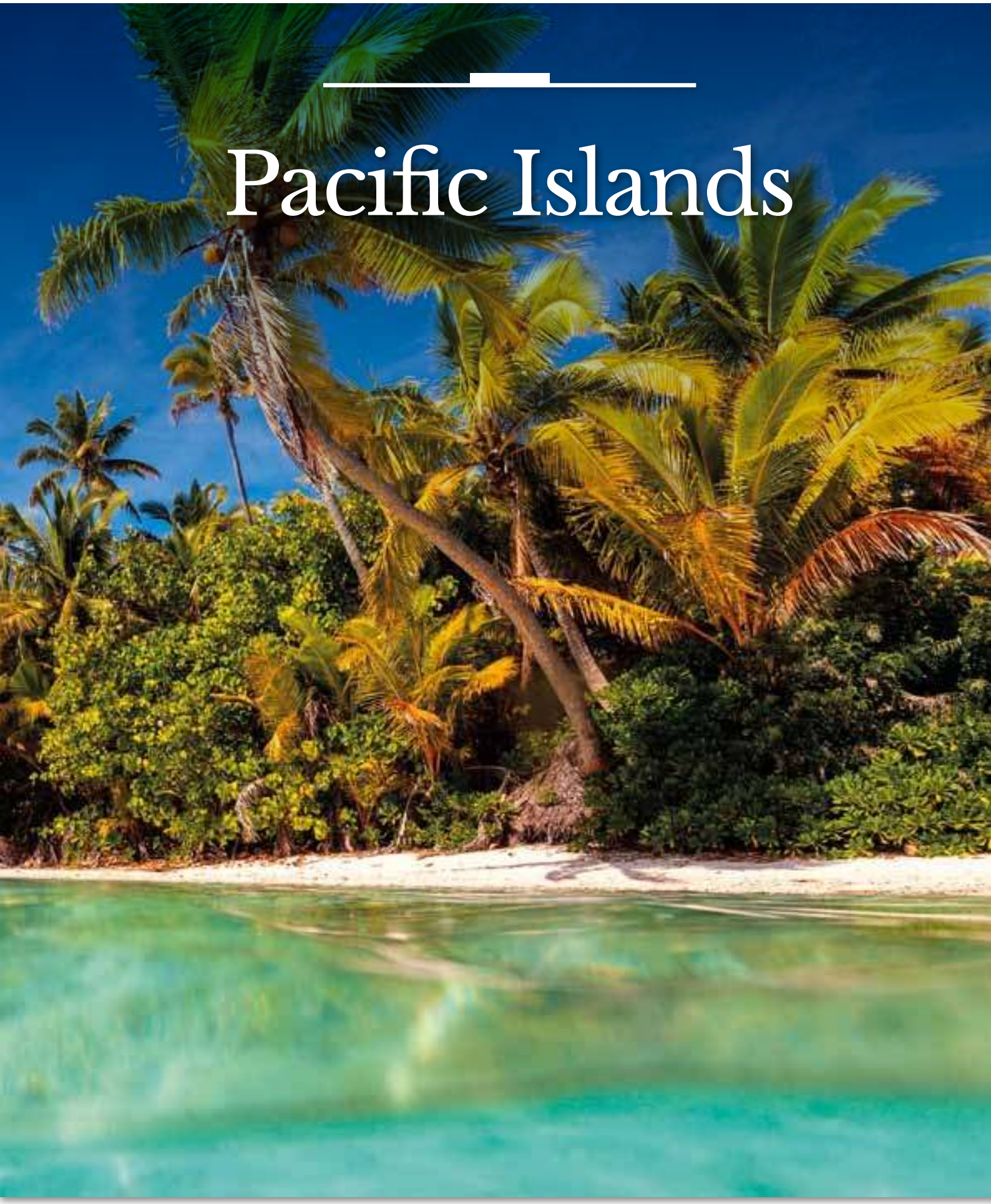
FLAVIO SCASSO, Programme Analyst in the Area of Sustainable Development, UNDP Uruguay

BIODISCOVERY CASES

COOK ISLANDS

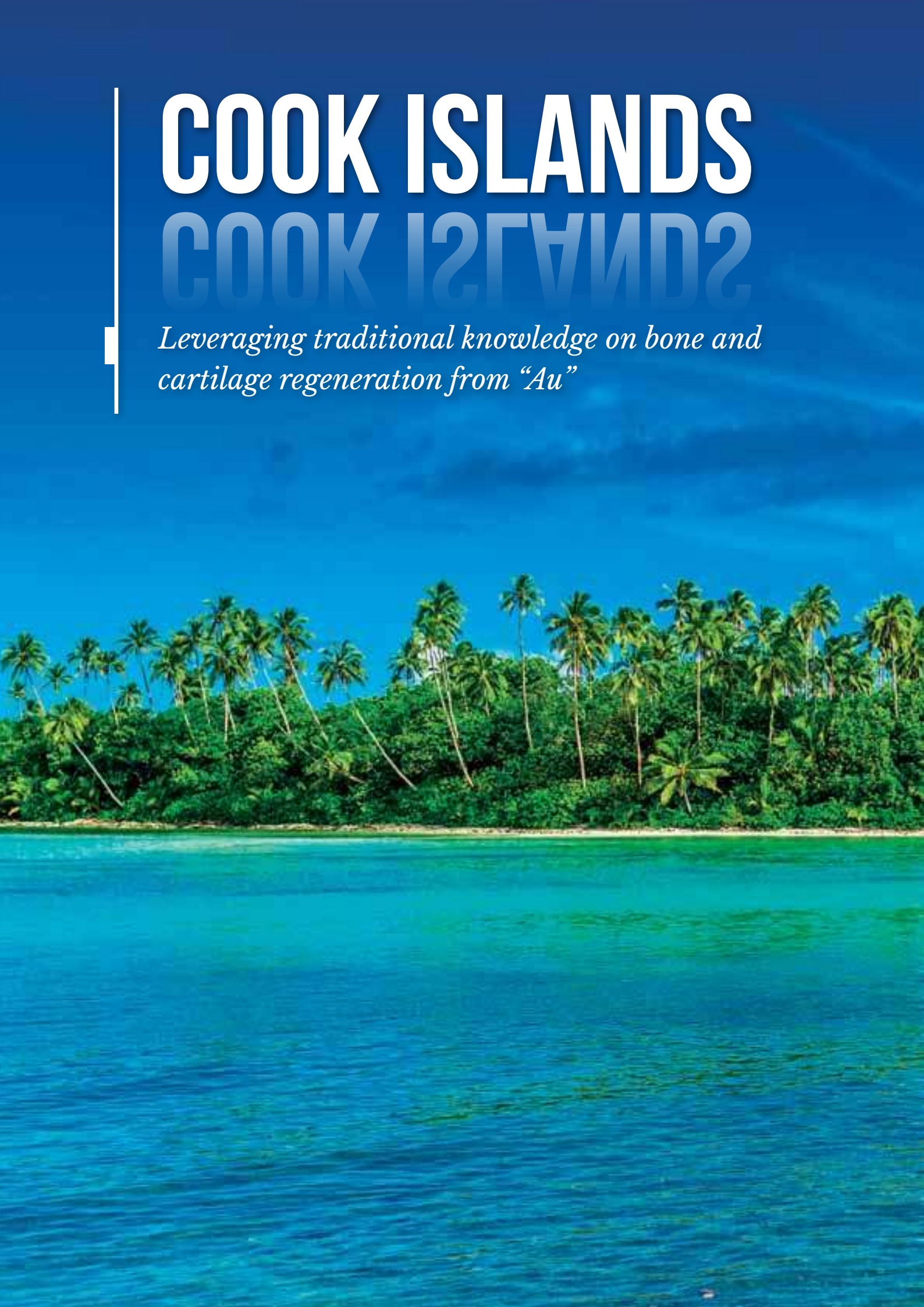
SAMOA

Pacific Islands



COOK ISLANDS

Leveraging traditional knowledge on bone and cartilage regeneration from "Au"



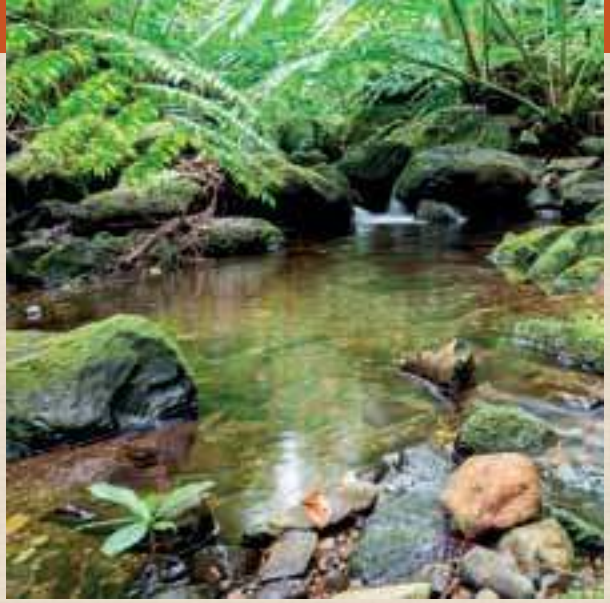
AUTHORS

JENNY HENRY
Matheson Enterprises, Cook Islands

TESSA TAFUA
Programme Analyst, UNDP-Samoa MCO

SETTING THE SCENE

Cook Islands consist of 15 islands located within a 2 million km^2 Exclusive Economic Zone (EEZ) in the Southern Pacific Ocean. The Islands are divided geographically into the Northern Group and Southern Group. Cook Islands has extremely limited land resources, with 99.99% of the area within the EEZ consisting of marine areas. Of its approximate 240 km^2 of land, 26.2% is *makatea* land (lime and rock), and only 4.3% is used for agricultural purposes. Approximately 70% of the land consists of steep sloping lands, wetlands, fernlands and escarpments. The Cook Islands' biodiversity has been considered globally important. The WWF has listed the forests of the Cook Islands (particularly on Rarotonga) as one of its key Global 2000 Ecoregions and considers them to be in a critical/endangered state. The Islands also fall under Conservation International's Polynesia-Micronesia hotspot. Birdlife International has listed at least 11 endemic birds on the Islands, and recognizes 2 endemic bird areas. Of the 538 known angiosperm species recorded in the southern Cook Islands, approximately 4% are endemic. About 13 endemic species of endodontid snails and 11 species of charopid snails have been recorded, with several already extinct, and others facing severe threats, especially on Rarotonga. Eight species of range-restricted birds have been recorded, six of which are endemic. Of the three single-island endemics, the Atiu swiftlet, Rarotonga starling and Mangaian kingfisher are globally vulnerable.



Key marine ecosystems of Cook Islands include shallow lagoons with fringing reefs around high islands in the south, and atolls in the northern group with their large, deep lagoons encircled by coral reef. Other notable marine ecosystems include seamounts, sea bed and the open ocean water columns. The diversity of marine species includes at least 7 species of mammals, 570 species of bony fish, 390 shellfish species, over 100 species of crustaceans, over 116 species of hard corals, and 62 species of seaweed and algae. The marine ecosystems are home to several globally endangered species such as the giant wrasse and the green turtle. They also host several globally vulnerable species including the bigeye tuna, black-blotched stingray, giant grouper, oceanic whitetip shark, blue marlin, the blacksaddled coral grouper and several coral species. Several endemic marine species have also been recorded such as the Cook Island brittlestar (*Asterostegus maini*, Euryalidae), the Cook Islands flashlightfish (*Photoplepharon rosenblatti*, Anomalopidae) and the orangespotted soapfish (*Belonoperca pylei*, Serranidae).

The Cook Islanders are mostly of Maori descent. Preliminary results from the 2016 census suggest that the total population of the country is 17 459 of which 13 044 live on the island of Rarotonga. The level of subsistence living in the Cook Islands (particularly in the outer islands) is also high, with an estimated 64% of all households engaged in subsistence farming and fishing activities. Most land in the Cook Islands is held under customary tenure. Cook Islanders have for centuries been using natural plant-based remedies to 'doctor' common ailments. The modern-day health care system in the Cook Islands is a combination of neo-traditional ways and Western medicine. The use of traditional medicine is still widely used, with traditional healers using a variety of herbal medicines and traditional practices to treat people from plants such as "*Au*" (*Hibiscus tiliaceus*).

Biodiscovery case

Cook Islands Medical Technologies (CIMTECH) is a natural products research and development company that draws on the traditional medicines of the Cook Islands to bring new natural beauty skincare, cosmeceutical, dermatological and pharmaceutical products to the market. CIMTECH through its local counterpart Matheson Enterprises has invested in the further development and extraction of plant chemicals in its quest for the commercialization of the Te Tika Skincare products. CIMTECH intends to build upon this successful programme with technology platforms resulting from the access and benefit sharing arrangement derived from the bone and cartilage regeneration properties of "Au".

Dr Graham Matheson, a Cook Islander, completed his medical degree at UNSW Australia including a research project on fracture healing and a Masters of Biomedical Engineering under Professor Walsh. After one of his friends, who was an athlete, sustained a significant fracture and was successfully treated by traditional healers, Dr Matheson decided to investigate the biological effects of this traditional remedy in the lab.

Dr Matheson retuned to the Cook Islands and approached TeTika Mataiapo Dorice Reid, President of the Koutu Nui (a legislated body of traditional leaders) for permission to research traditional medicine. Dorice was initially sceptical but had recently voyaged on the Vaka Te Au O Tonga with Jenny Henry, Dr Matheson's sister, using traditional navigation techniques and had formed the opinion that "our ancestors were scientists". If there was scientific basis to the traditional navigation then there was a good chance of a scientific basis for the medicinal traditions also.

Given that there was no specific ABS law in the Cook Islands at the time, the mutually agreed terms to access traditional and genetic heritage and the agreement to share the benefits was done under contract with prior informed consent and extensive prior discussion including written proposals, legal advice and an agreed-upon corporate structure to co-own and develop the technology. These contract terms are consistent and compliant with the stated objectives of the Nagoya Protocol. The Koutu Nui unanimously voted to allow Dr Matheson to research and develop the traditional medicine under these terms.

Dr Matheson and the Koutu Nui formed CIMRAD CI to develop the project with UNSW, and transferred intellectual property to the Australian subsidiary CIMRAD Australia to access the PCT international patent system (to which the Cook Islands is not a signatory). This company and UNSW continued further research for five years until significant novel discoveries had been made in bone regeneration, wound healing and skin regeneration resulting in the awarding of a PhD for the biological and chemical processes, and the awarding of three patents internationally. Current preclinical data available demonstrates a regenerative effect on bone injury from the chemical extracts from *"Au";* its actual utilization would be unprecedented and extremely innovative. The potential of this project to alleviate disability resulting from bone injuries in both the developed and developing world is significant. As further capital was required to develop the technology, the CIMRAD Australia subsidiary CIMTECH (Cook Islands Medical Technology) was created to attract investment and to bring new natural beauty skincare, cosmeceutical, dermatological and pharmaceutical products to the market. TeTika Skincare was launched in 2012 in the Cook Islands, and worldwide pharmaceutical license agreements were signed in 2014. CIMTECH has utilized the Cook Islands Company Matheson Enterprises to build and manage the plantations, extraction facilities and the distribution and marketing of TeTika Skincare.

A UNDP-GEF project (Strengthening the Implementation of the Nagoya Protocol on Access to Genetic Resources and Benefit Sharing in the Cook Islands) provided resources to support the establishment of a policy and legal framework for ABS to underpin these and future initiatives, and raise awareness about the Nagoya Protocol (especially among local communities). It has also supported CIMTECH in developing management protocols for the sustainable harvesting of "Au" as a precursor for the bone regeneration programme. The existing facilities in the Cook Islands for the production of materials to the requisite standard for this project are not adequate. All of the necessary improved extraction methods, equipment and processes would have to be custom designed and modified locally. Doing so creates considerable transfer of technology and innovation. It should be noted that the technology transfers involved in this project represent the first high-tech manufacturing project in the Cook Islands.

CIMRAD Australia (Koutu Nui and Dr Matheson remain the largest shareholders of CIMTECH). The project has resulted in improved benefits agreements to the Koutu Nui. The Koutu Nui will receive 10% of all CIMTECH profits with 25% of these Koutu Nui funds for the practice of Ra'ui, the traditional method of conservation and preservation by local communities of any or all resources whether on land, sea or air.

EYEWITNESS STATEMENT

"The ABS research and consultation with the Pa Enua communities was a team approach that included the policy analyst, a legal expert and ABS staff from the Cook Islands National Environment Service. The team also took along a media officer who recorded events along the way for a future documentary. Individual visits had initially been made to Aitutaki and Mangaia but the rest of the Pa Enua was visited during two weeks of chartered flights around the Northern Group islands (Pukapuka, Rakahanga, Manihiki and Penrhyn) in the first week and then the Southern Group Islands (Mauke, Mitiaro and Atiu) in the second. Consultation meetings were well received by the local inhabitants of these tiny communities.

It was important that the Pa Enua received the messages we wanted to impart to them in their own language and this was very much appreciated. They were therefore very eager to relay their concerns about the Access and Benefit Sharing concept that we were sharing with them.

Their priority interest was to protect their cultural resources as a means of protecting their cultural heritage and their island identity. This was foremost in the minds of those who had traditional knowledge based on local plant and animal resources, on all the islands we visited. At the same time, they understood that by sharing their knowledge, they could play an important part in the development of new products that might benefit the world."

MAUREEN HILYARD, Local Consultant

In fine focus: SDGs implemented by the biodiscovery case

The regenerative effect of "Au" on bone injury has contributed to the implementation of the following SDGs: SDG 8 (decent work and economic growth): The harvesting and development of products from local plant materials has offered an economic opportunity for growers who wish to cultivate "Au". SDG 9 (industry, innovation and infrastructure): CIMTECH and Matheson Enterprises have established a laboratory in the Cook Islands that is capable of processing and extracting materials for further research and development overseas. This is a new industry for the Cook Islands and offers immense potential to further investigate other natural resources in the Cook Islands, access for government and other private sector to expensive testing and monitoring equipment with a range of uses, as well as career pathways for students in this field. SDG 15 (life on land): The work directly relates to promoting fair and equitable sharing of benefits. Even though there is no ABS policy or legislation in place in the Cook Islands, CIMTECH and Matheson Enterprises have an established agreement for benefit sharing and through the National UNDP-GEF ABS Project, this agreement is being fine-tuned in line with the Nagoya Protocol.

Legal and political enabling environment for ABS and the Nagoya Protocol

The Cook Islands' National Research Policy outlines the National Research Committee and the research permit process, which currently requires foreigners entering the country to obtain a research permit prior to conducting any R&D activities, including those relating to biological resources. The national administrative processes for issuing ABS licenses and, negotiating and enforcing agreements have not yet been fully clarified and key stakeholders remain unaware of their roles in promoting ABS. The Cook Islands are in the process of developing a national ABS Policy with a view to developing ABS legislation in order to elaborate the ABS permits process, licensing, agreements, national competent authority etc. The country has not signed, ratified, nor acceded to the Nagoya Protocol on ABS and has maintained that policies and legislations for ABS need to be in place before this will be considered.

MESSAGE FROM AN SDG ADVOCATE

"Ensuring adequate consultations with communities in our outer islands for ABS education, awareness, policies and legislation has been a challenge to deliver due to the wide distribution of the islands and the costs associated with reaching these communities. A number of issues raised by these communities highlight the need for more awareness-raising to ensure 'informed' communities, review of ABS in light of the existing Traditional Knowledge Act and how these can work together; as well as local mechanisms for the protection of their 'cultural assets'.

Navigating the sensitivities of traditional knowledge, recognition of knowledge holders and resource owners and the registration of TKP requires extensive consultation and adjustment, requiring extended periods of time and resources to be able to find consensus and compromise. Guidelines for ABS Users and Providers developed specifically for Cook Islands communities and in our different dialects are recommended to support communities' understanding and awareness in the Cook Islands ABS process once completed."

MS HEIMATA LOUISA KARIKA, Island Futures Division Manager, National Environment Service, Cook Islands

SAMOA

Isolating and deploying bioactive compounds from the fauna and flora for human medicines

AUTHORS

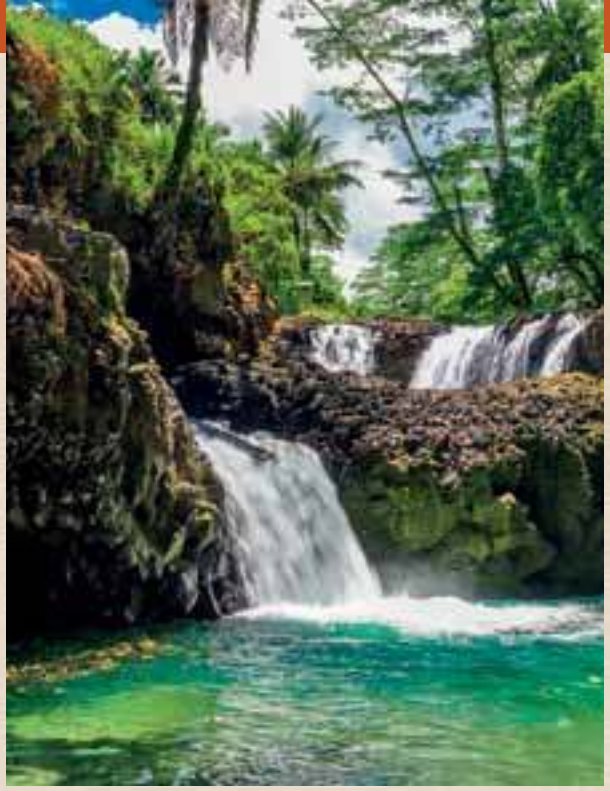
SEUMALOISALAFAI AFELE FAIILAGI
Assistant Chief Executive Officer, Division of Environment and Conservation, Ministry of Natural Resources and Environment

CZARINA IESE STOWERS
Principal Terrestrial Officer, Division of Environment and Conservation, Ministry of Natural Resources and Environment

SAMANI TUPUFIA
Manager Environment and Renewable Energy Division, Scientific Research Organisation of Samoa (SROS)

SETTING THE SCENE

The Independent State of Samoa (formerly known as Western Samoa) forms the larger and western part of the Samoan Archipelago. It is located in the southwest Pacific and consists of the two main islands of Upolu and Savaii, seven smaller islands, islets and rocks. The interior of both main islands is covered with mountainous forests with a cloud forest covering the highest altitudes on Savaii. Forests play an important role in the local communities as one of the main sources of food and particularly herbal medicine. The use of herbal medicine by traditional healers as an alternative to modern medicine is a common practice in Samoa where the barks, leaves, roots and other parts of trees are used in several concoctions for the treatment of various illnesses. Traditional knowledge associated with Samoan plants is widely applied by local traditional healers during the healing process of a wide range of sicknesses common in children and adults such as diarrhoea and bacterial skin infections but also extending to supernatural and ghost-related ailments.



Samoa's terrestrial biodiversity consists of over 3 300 terrestrial species. The Samoan flora contains about 500 native flowering plants such as *Piper graeffei*, Piperaceae and *Diospyros samoensis*, Ebenaceae which are two of the most commonly used medicinal herbs. There are more than 200 species of ferns in 96 families and 298 genera which makes it the second largest diversity of native flora in tropical Polynesia. In total, 25% of terrestrial plant species are endemic to Samoa such as *Psychotria bristolii*, Rubiaceae and *Manilkara samoensis*, Sapotaceae.

Samoa's marine biodiversity contains about 991 marine fish species of which 890 live in shallow reef water, 56 are found in deeper water and 45 are pelagic. Fish and shell fish are an important source of protein for most Samoan households.



Biodiscovery case

In Samoa, traditional medicine has relatively new beginnings and, it has shown great potential under scientific research scrutiny. In 1973, a broad pharmacological study was undertaken on 34 Samoan medicinal plants, with samples taken from various parts including leaves, bark, stem and roots. The extracts from these plants were shown to have antibacterial, antiviral and antitumor activities. In 1989, another study was carried out investigating 74 Samoan medicinal plants, where bioactivity was again detected. In 1992, the bioactive phorbol prostratin was isolated from the Samoan medicinal plant *mamala* (*Homalanthus nutans*, Euphorbiaceae) which was shown to have the ability to reduce HIV infection, as well as activate HIV replication in dormant HIV-carrier cells.

The Scientific Research Organization of Samoa and MNRE are working in collaboration to continue these investigations in Samoa in order to provide solid scientific evidence on the efficacy of Samoan plant extracts as potential inhibitors etc of organisms such as enzymes that initiated such illness.

In 2014, the Scientific Research Organisation of Samoa continued its research through the mentorship of Professor Kenji Sakamoto, a Japanese Pharmaceutical Expert and scientist, with the assistance of Julian Wong Soon and Agape Feunai Papalii on screening bioactive compounds from terrestrial plant species and marine species through qualitative testings. The project looks at all plants and is not solely focusing on known medicinal plants. These were sampled from three different site locations in Samoa, (Vailima botanical gardern, Vailele beach and Togitogiga rainforest). The study focused mainly on the reaction inhibition of lipase (extracted from porcine pancreas), α-glucosidase and tyrosinase donated by Nacalai, Japan. These enzymes were selected as they play key roles in metabolic disorders such as diabetes, obesity and skin de-colorization. Potential inhibitors will contribute greatly in the development and sustainability of new and improved treatments within the region. Several samples were extracted by either ethanol or methanol and assayed against each enzyme for reaction screening. The results showed efficacy of three edible plants, *Pometia pinnata* (Tava), *Barringtonia samoensis* (Falaga) *Barringtonia asiatica*(Futu) and two marine species, *Porifera* (Sponges) and *Syringodium isoetifolium* (Seagrass) ethanolic extracts as having the highest inhibitions. Thus, these species are suggested to be purified further to examine key compounds and therefore be utilized for the prevention of reaction disorders and progress of medical treatment.

In late 2017 and 2018, working together with Annie Toailoa, Maserota Ofoia and Malone Chu Ling, the project continued screening new plants samples focusing on alpha amylase enzymatic assay. A list of potential candidates was identified as powerful inhibitors of alpha amylase, extracts are being purified and active components within each extract are being examined.

EYEWITNESS STATEMENT

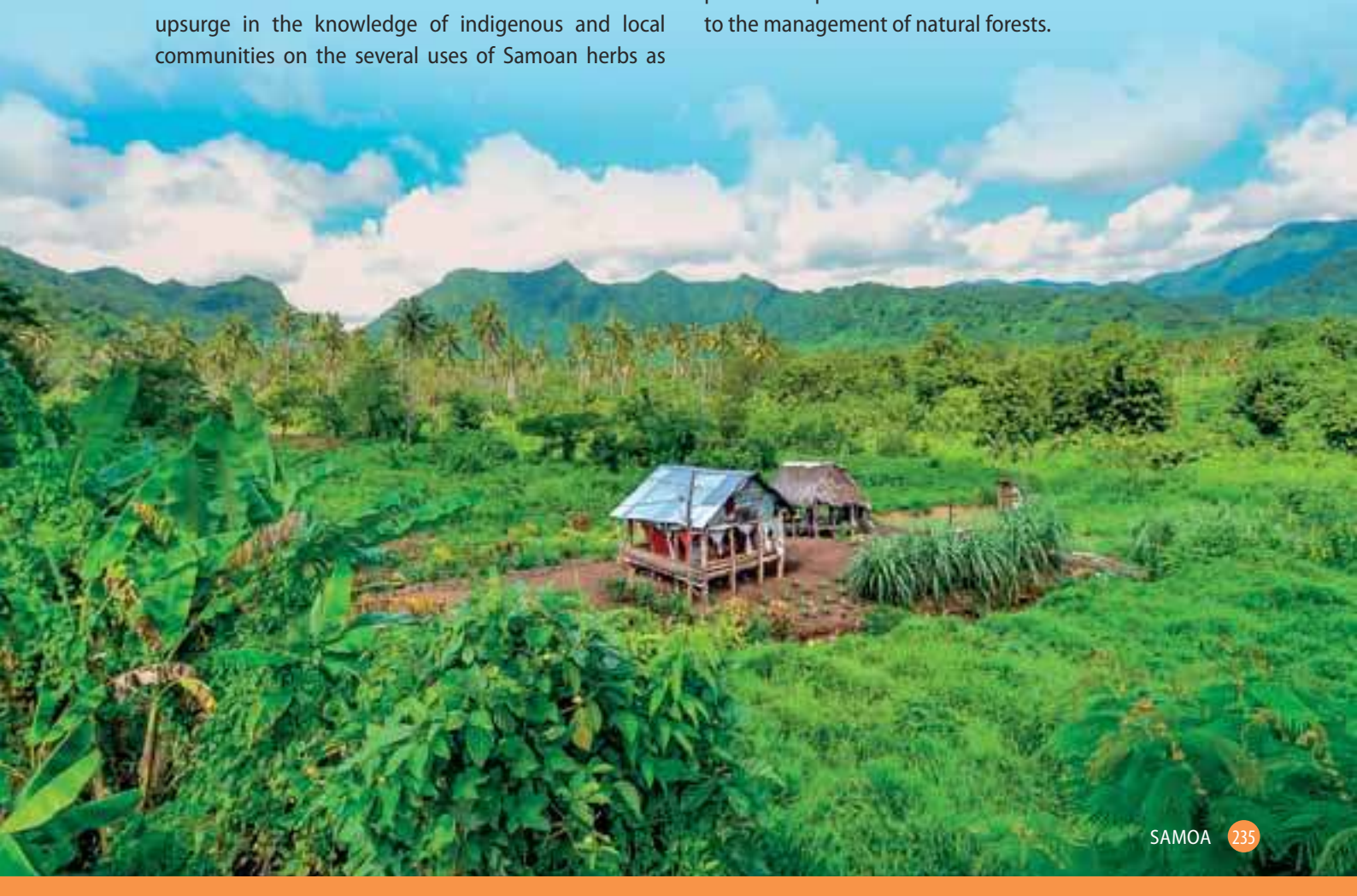
"As per the above account, SROS has had five years of working on Samoan medicinal plants. We are also in an interesting position of having started this project with a somewhat sceptical mindset that Samoan medicinal plants would have a low rate of bioactivity given the relative youth of Samoan traditional medicine, compared to the Indian Ayurvedic and traditional Chinese medicine which date back to ~2000 and ~1000 BC, respectively.

Indeed, the most scepticism was around medicinal plants used for supernaturally induced ailments, or sickness that was attributed to ghosts and spirits. Interestingly enough, our 2013 study identified that of the 11 plants we collected, the plant with the most bioactivity against the model organism Saccharomyces cerevisiae, was Psychotria insularum. The leaves and bark of P. insularum are crushed and made into a potion in Samoan traditional medicine to treat supernaturally attributed ailments, as well as fever, abdominal distress, abscesses, incontinence, skin infections and wounds, general body aches and swellings, as well as vomiting. With our five years of research, together with previous scientifically robust accounts, we are of the opinion that Samoan medicinal plants, together with our other diverse fauna and flora, warrant further scientific investigations, as potential sources of unique bioactive natural products that can be utilized for pharmaceuticals."

DR SEESEEI MOLIMAU-SAMASONI, Manager of Plants and Postharvest Technology, Scientific Research Organization of Samoa

In fine focus: SDGs implemented by the biodiscovery case

SDG 8 (Decent work and economic growth): The research described above is in its early stages and cannot yet predict the commercial value of any products. The research does however, demonstrate the importance of understanding the genetic compositions present in Samoan plants. The information derived from the research will drive further studies and create more employment opportunities for future generations. SDG 9 (Industry, innovation and infrastructure): Recognizing the biomedical potential of plants is critical in the pharmaceutical industry. Any new relevant and useful information from the research will contribute to an upsurge in the knowledge of indigenous and local communities on the several uses of Samoan herbs as the rapid transition to the use of traditional medicine increases. SDG 14 (Life below water): There is not much available information on the pharmaceutical potential of Samoa's marine resources. The products of this study will help increase knowledge on the therapeutic properties of marine species used in the research and will contribute to the proper conservation of marine resources. SDG 15 (Life on land): The protection and restoration of terrestrial ecosystems depend on how much we know about the natural resources available in the forest. This research will recognize the biomedical potential of plants in Samoan forests and will contribute to the management of natural forests.



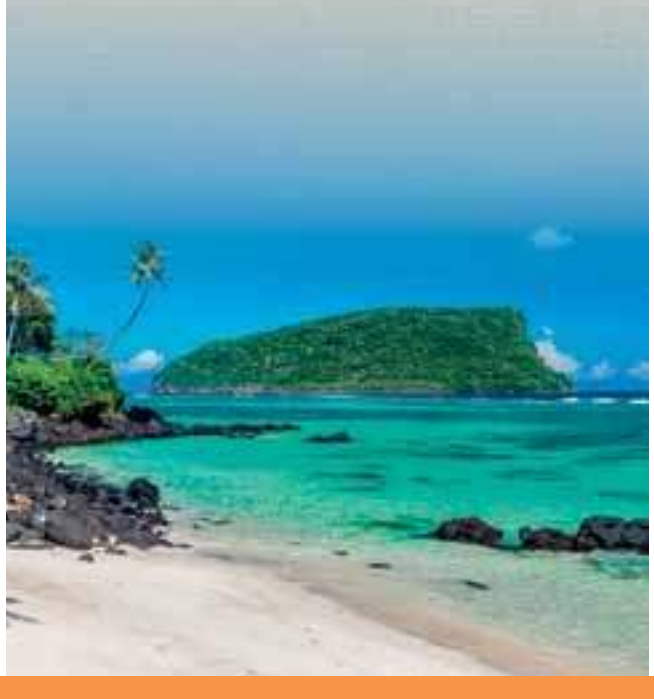
Legal and political enabling environment for ABS and the Nagoya Protocol

Samoa had already arranged provisions for biological prospecting in the late 1980s. The *Lands Surveys and Environment Act (LSE ACT 1989)* and its supporting regulations, *Environment (Access for Bio-Prospecting) Regulations 1999)* underlined a basic research process which has been insufficient to control arising issues throughout the decades since. In 2013, the draft Environment Management and Conservation Bill (EMC Bill 2013) repeals the Part VIII of the LSE ACT 1989 which was developed into a stand-alone legislation. It incorporates a thorough bioprospecting process which requires foreign researchers – as well as local researchers under certain conditions – to obtain PIC and sign a MAT before research is conducted.

As a party to the UN-CBD since 1993, Samoa also signed and ratified the Nagoya Protocol on Access and Benefit Sharing on 12 October 2014. In 2017, Samoa started working on the National Legal Framework on Access and Benefit Sharing which is in its final stage of development.

MESSAGE FROM AN SDG ADVOCATE

"Samoa's commitment to achieving its Sustainable Development Goals requires the involvement and contribution of its entire people. The way we engage with the people on the areas they prioritize drives the success of these SDGs. The people of Samoa hold its land and traditional knowledge at the highest importance and will do anything to protect this knowledge and resources for the future generations. The Government of Samoa looks to formalize the process to protect the genetic resources of Samoa and its traditional uses.



They have had experience working with universities and researchers for research purposes only, but in the future when a particular product is to be commercialized, a clear process and framework will be in place to guide and protect these genetic resources and the benefits to the owners of the traditional knowledge and resource.

The traditional healers of Samoa are often careful with whom they speak regarding the methods and mixtures that they use for medicinal purposes in the communities, because they have had experiences where their knowledge is exploited by some researchers. This was a general feedback when this project on ABS was introduced in the country at its inception workshop. For this reason, the government is working to set up the necessary mechanisms and frameworks to guide any interested researchers and institutions. It is equally important that the people are kept informed of any formal processes that are being developed and soon to be enforced."

TESSA TAFUA, Programme Analyst, Environment and Climate Change Unit, UNDP-Samoa



ACRONYMS

ABS	Access and Benefit Sharing
CBD	Convention on Biological Diversity
CITES	Convention on International Trade on Endangered Species
GEF	Global Environment Facility
ILC	Indigenous and Local Communities
IP	Intellectual Property
IRCC	Internationally Recognised Certificate of Compliance
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
IUCN	International Union for Conservation of Nature
MAT	Mutually Agreed Terms
MOU	Memorandum of Understanding
NBSAP	National Biodiversity Strategies and Action Plans
PIC	Prior Informed Consent
SDG	Sustainable Development Goals
SMTA	Standard Material Transfer Agreement
TK	Traditional Knowledge
UNDP	United Nations Development Programme

ACKNOWLEDGEMENTS

This book is a testimony to the dynamic and changing nature of ABS laws and policies around the world and their impact on benefit sharing and the research/development of products derived from biological and genetic resources. The multiple findings, insights and perspectives presented in this book would not have been possible without the support provided by the following UNDP colleagues: Handan Bezci, Gillian Chalmers, Edwin Chipsen, Tashi Dorji, Lisa Farroway, Lyes Ferroukhi, Alexandra Fischer, Michael Green, Zuhre Guven, Cathy Maize, Saskia Marijnissen, Martha Naanda, Pakamon Pinprayoo, Jose Rayos, Kifah Sasa, Yves de Soye, Estefania Samper, Penny Stock and Maxim Vergeichik.

We are grateful to the Ministry of Environment of South Korea and the Global Environment Facility (GEF) for their generous financial support for this publication.

We also owe a special debt of gratitude to the eyewitnesses and SDG advocates who provided helpful and insightful comments and context that contributed to the understanding of each chapter:

Eyewitness (in order of chapters): Thabang Leslie Botshoma (Botswana), His Majesty Fon Lekunze (Cameroon), Ashenafi Ayenew Hailu (Ethiopia), Kabaka Watai, Antony Mbayaki and Geoffrey Omedo (Kenya), Melvin Cloete (Republic of South Africa), Beatrice Cyiza (Rwanda), Awatif Ahmed Siribel and Mahjoub Ou (Sudan), Rana Saleh (The Hashemite Kingdom of Jordan), Chencho Dorji (Bhutan), Xie Yong (China), Arkady Radionov, Anatoly Mishenko and Kuralay Karibayeva (Kazakhstan), Jargal J. (Mongolia), Mu Mu Aung (Myanmar), Tojinisso Zubaydova (Tajikistan), Ly Lao (Viet Nam), Ornela Çuçi (Albania), Elena Makeyeva (Belarus), Matias Adúriz Guerrero (Argentina), Adrian Giraldo (Colombia), Carlos Manuel Rodríguez (Costa Rica), Artur Mikaelyan (Dominican Republic), Carolina Proaño Bolaños, (Ecuador), Eulalia Moreno, Rosa Balderas, Ricard Armengol and Raul Pineda Lopez (Mexico), Hildaura Patiño (Panama), Adrian Mamberto (Uruguay), Maureen Hilyard (Cook Islands), Seeseei Molimau-Samasoni (Samoa).

SDG Advocates (in order of chapters): Dineo Gaborekwe (Botswana), William Lemnyuy Banye (Cameroon), Ashenafi Ayenew Hailu (Ethiopia), Janice Golding and Edna Molewa (Republic of South Africa), Reina Otsuka Iseda (Rwanda), Nedal Al Oran (The Hashemite Kingdom of Jordan), Tashi Yangzome Dorji (Bhutan), Ma Chaode (China), Anatoly Mishenko (Kazakhstan), Beate Trankman (Mongolia), Martin Cosier (Myanmar), Nargizakhon Usmanova (Tajikistan), Akiko Fujii (Viet Nam), Elvita Kabashi (Albania), Aleksandr Nikolaevich Korbut, (Belarus), María Eugenia Di Paola (Argentina), Paula Rojas (Colombia), Alice H. Shackelford (Costa Rica), Ángel Daneris Santana (Dominican Republic), Ana María Guacho (Ecuador), Gerardo Arroyo (Mexico), Jessica Young (Panama), Flavio Scasso (Uruguay), Heimata Louisa Karika (Cook Islands), Tessa Tafua (Samoa).

PHOTOGRAPHERS

Most of the opener pictures contained in the publication, as well as other filler pictures contained in the different cases, are from the Shutterstock collection (https://www.shutterstock.com/) (obtained under UNDP license). Other pictures have been directly provided by the involved countries (ministries, research institutions and UNDP Country Offices) and we would like to thank all the colleagues for their generous support, crucial to the attractive visual journey that the publication stimulates through those countries.

We would like to thank in particular: Dineo Gaborekwe [Botswana]; Sonam Phuntsho [Bhutan]; Dr Mu Mu Ang and the Forest Department of the Ministry of Natural Resources and Environmental Conservation [Myanmar]; Sukhrob Irgashev, Safarov Neimatullo, Komil Saidov, Farhod Pulodov, Tolib Irgashev [Tajikistan];Albert Cmeta and Alban Ibraliu [Albania]; A.Skuratovich and D. Dubovik: p148 (top), p149 (middle-bottom), p151 (top-right), p153 (top-middle); V. Dombrovski: p149 (top), p151 (bottom), p153 (top-left); Z. Morkvenas: p151 (top-left), p153 (top-right); A. Dubinin: p152 (bottom-middle) [Belarus]; Paola Ciraolo [Argentina]; National Service of Intellectual Rights [Ecuador]; Andrea Egan [Mexico]; Michael Green and the National Environment Service [Cook Islands]; and the Ministry of Natural Resources and Environment and the Scientific Research Organisation [Samoa].

Tribute to the Late Minister of Environmental Affairs of South Africa

DR EDNA MOLEWA

South African Minister of Environmental Affairs, Dr Edna Molewa passed away in Pretoria following a short illness on 22 September 2018 at the age of 61. Dr Molewa's death is a loss to South Africa and the international community of a true champion for the environment.

Her active role in the negotiation of multilateral agreements resulted in South Africa hosting the 17th Meeting of the parties to CITES (COP17) whose legacy includes the sustainable livelihoods programme which will positively impact on communities globally. It is through these international platforms that she advanced the sustainable use approach as part of conservation and biodiversity management. Dr Molewa was convinced of the importance of bioprospecting and biotrade initiatives to improve the livelihoods of indigenous peoples and local communities as noted in the "Message from an SDG Advocate" of the South African chapter of this publication.

Rest in Peace.

DR EDNA MOLEWA
The Late Minister of Environmental Affairs of South Africa

ABS is Genetic Resources for Sustainable Development

Empowered lives.
Resilient nations.

UNITED NATIONS DEVELOPMENT PROGRAMME

304 East 45th Street, 9th Floor
New York, NY 10017, USA

For more information contact
http://www.undp.org/