UNEP

ENVIRONMENTAL DISPATCHES:

Reflections on Challenges, Innovation and Resilience in Asia-Pacific

APFED
Asia-Pacific Forum for Environment and Development

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FOREWORD

Asia-Pacific is a region of sharp contrasts. The region is the engine of the global economy pulling millions out of poverty over the past two decades. At the same time there are signs that the way countries are growing is undermining growth itself, and comes with large social and environmental costs. Air pollution, ecosystem degradation and waste management are some of the most visible signs. Floods, drought and increasingly unpredictable weather linked to climate change are also having a negative impact on food security and livelihoods and costing the region billions every year. However, the region is also producing innovative solutions to these multiple challenges. Local governments and communities have been helping to put Asia-Pacific on a more sustainable pathway, one community at a time. Yet, these micro-actions often fly under the radar of the media and the stories of the people who lead green innovations and those who are affected by the results, largely go untold.

This publication "Environmental Dispatches: Reflections on Challenges, Innovation and Resilience in Asia-Pacific" brings together some of these stories. The APFED Showcase Programme offered the chance for journalists in the region to tell those untold stories, spreading knowledge and awareness of how Asia-Pacific communities are addressing sustainable development.

Kaveh Zahedi
Regional Director and Representative for Asia and the Pacific
United Nations Environment Programme

PREFACE

Asia-Pacific faces major environmental issues, from climate change and biodiversity conservation to resource resilience and water security. As the greatest consumer of natural resources, the region is experiencing the effects of increased waste and pollution as they take a massive toll on resource availability, livelihoods and quality of life for many families. Addressing the challenges that come with climate change appears enormous and often insurmountable outside of top-down global and regional actions. Yet, local governments and communities in the region are facing these challenges head on by developing and utilizing innovative solutions to climate change and many other environmental challenges.

Through our support to 58 sustainable development pilot projects across Asia-Pacific, the Asia-Pacific Forum for Environment and Development (APFED) Showcase Programme witnessed the positive impact of local innovation. In China, local communities are utilizing new methods of mediation via public participation in protecting environmental rights of citizens. In Vietnam, a small conservation research and development center is working to develop effective rice-husk gasification techniques to mitigate climate change. Through local marine and coastal zoning management, communities in the Philippines are effectively protecting their sea-based livelihoods. Rural households in Pakistan are enabled to create and maintain water-purifying systems for better health.

In fact, it is these micro-actions, undertaken by individuals and communities on a daily basis that cumulatively creates the bottom-up approach to regional and global sustainable development. Community-based actions toward wildlife conservation, water availability and livelihood enhancement represent a vast array of available development solutions to help address existing and emerging environmental challenges throughout Asia-Pacific. This recognition of the necessity of using local, inclusive innovation to address the environment has been called for from the 1992 Earth Summit to the 2012 Rio+20 Summit. Despite the emphasis on the need for scaling-up and replicating proven successful grassroots solutions, such approaches are often unable to garner the attention of media with impactful reach. Due to their lack of visibility at the national, regional and global levels, much of the potential value of local innovations goes unrealized.

While supporting community-based pilot projects for sustainable development across Asia-Pacific, we identified localized success stories again and again in the areas of climate change adaptation, access to and use of natural resources, solid waste management and energy efficiency, just to name a few. But, we also recognize the low visibility of such successes is limiting the value of all the lessons learned and knowledge gained during project implementation. We believe the results of many of the pilot projects have the potential to act as valuable resources for other communities seeking solutions to similar environmental challenges. This publication is our way of telling these stories and bringing them to a greater audience.

We opted to do so through the creation of a UNEP-APFED Media Fellowship, which fostered ten competitively-selected environmental journalists from ten different countries in Asia-Pacific to explore the field and present these essential and engaging findings under APFED Showcase Programme, UNDP-UNEP Poverty-Environment Initiative (PEI), Global Environment Outlook (GEO-5), and a broader domestic environmental challenge, through print, audio or visual media. The result is a collection of intriguing, behind-the-scenes human-interest stories portrayed in varying styles. These stories offer a fresh perspective on the personal impacts of environmental challenges– insight that is not gained through general reporting guidelines on projects or outside of small, local news media.

The individual authors' works, which were originally published in national news outlets in the respective countries of origin, can now be found in this publication, accompanied by additional country-specific environmental information and supported by beautiful photographs that help to demonstrate both environmental hardships and solutions. The compilation of all of the stories offers the reader a unique perspective on the state of sustainable development from the community level to the national and regional levels. The fellowship and resulting publication aim to bring awareness to innovative solutions developed at the community-level, as well as, inspire young journalists to report on environmental issues in their communities.

APFED Showcase Programme Secretariat
United Nations Environment Programme
Regional Office for Asia and the Pacific

ENVIRONMENTAL ISSUES IN ASIA-PACIFIC COUNTRIES

NEPAL
The Himalayan Mountains of Nepal are the country's most well-known attribute. However, the small nation is full of valleys and forested watersheds which are rich in biodiversity. Environmental issues such as deforestation, land degradation, waste management and contaminated water are growing challenges for the country. On a daily basis, many people have only limited access to freshwater supplies. As the use of vehicles continues to rise, the country faces public health threats due to increasingly poor air conditions. The most significant emerging environmental issue in Nepal is the accumulation of black carbon particles in the atmosphere of Himalayas, which causes increased melting of snow and ice, raising risks of severe flooding.

KYRGYZSTAN
Rugged mountains cover the majority of Kyrgyzstan. Though it has largely avoided many of the environmental problems faced by other Central Asian countries, it does share efforts with its neighbors to decrease the rapid desiccation of the Aral Sea which it borders. In general, the terrain of Kyrgyzstan lends unique environmental challenges to the country. The economy depends heavily on mining, which has had negative effects on the natural environment, including loss of biodiversity, pollution from waste water and land resources degradation. Nuclear waste dumping during the mining of uranium and other rare-earth metals within Kyrgyzstan has also led to radioactive pollution of the surrounding lands and water resources in some regions. Water aquifers are also at risk of contamination from these mining activities, agricultural runoff and livestock wastes.

CHINA
China's diverse geography boasts plateaus, fertile plains, basins, foothills, mountains and some of the world's longest rivers. Recently, the country's vast economic growth and high population have led it to become one of the world's largest emitters of greenhouse gasses and carbon dioxide. Today, China faces environmental challenges such as severe air pollution in major cities and groundwater scarcity and contamination in rural areas. Nearly 30% of the land has been impacted by desertification, decreasing biodiversity and endangering rare species.

MYANMAR
Myanmar is rich in natural resources and still notes a high degree of biodiversity within its ecological landscape. The country is also one of the least-GHG and CO2 emitters in the region. However, as Myanmar seeks to develop economically, environmental pressures are expected to grow rapidly in the coming years, due to increased demand for agricultural goods, industrialization and energy consumption. Controlling the loss of forest resources, land degradation, biodiversity losses, waste management and climate change as the country develops represent key environmental challenges of the country.

VIETNAM
Vietnam is a country of tropical lowlands and highlands. As part of the Mekong River Delta, the country holds fertile lands, perfect for rice cultivation. Forest occupies nearly half of land coverage, making it an incredibly important resource for both economic growth and wildlife biodiversity. In recent years, rapid population growth has added to environmental pressures stemming from urbanization and intensification of agriculture in the country. Efforts are being made to combat logging and slash-and-burn agricultural practices which have led to deforestation and soil degradation due to excessive use of fertilizers in a number of areas. Along Vietnam's coastline, overfishing has also begun to threaten marine life populations.

PHILIPPINES
Comprised of 7,107 islands, Philippines is considered as one of 17 mega-diversity countries of the world. Its marine and coastal ecosystems are equally diverse, with coral reefs, mangroves, sea grass beds, wetlands, estuaries, lagoons, sandy beaches, rocky headlands and sand dunes. However, the country's marine ecosystems are heavily under threat from pollution stemming from households and industries in coastal areas. Additionally, increased tourism has put a strain on natural ecosystems and degraded habitat quality for wildlife. Overfishing and destructive fishing, coastal infrastructure development, deforestation and waste management are the country's most pressing environmental challenges to date.

INDONESIA
Indonesia is an archipelago consisting of the large islands of Borneo, Sumatra, Java, Sulawesi and Papua and over 13,000 small islands, many of which are low-lying. This makes the country vulnerable to monsoons, climate-related rainfall changes and sea level rise. Additionally, Indonesia has long combated mass deforestation due to global demands for palm oil and timber. These primary challenges have led Indonesia to face an overall declining capacity to produce food due to agricultural land conversion and a shortage of water from unregulated forest clearance. Wildlife over-exploitation is also severe in Indonesia, where human resources and funding are inadequate to monitor the wildlife trade and enforce existing protection laws. Most, if not all, of Indonesia's fisheries are fully or overexploited. There are also environmental problems linked to rapid urbanization of the country's coastal cities and economic development, such as air pollution, traffic congestion, garbage management, and reliable water and waste water services and energy supply.

SRI LANKA
As an island state, Sri Lanka is home to varying topography which has resulted in unique biodiversity found nowhere else in the world. This biodiversity faces major threats in the 21st century, stemming from population booms coupled with high levels of poverty. Sri Lanka is also particularly vulnerable to climate change and natural disasters such as sea-level rise, floods, landslides, cyclones, droughts, coastal erosion and earthquakes, just to name a few.

BANGLADESH
Bangladesh is a country largely defined by the congruence of three Himalayan rivers which pass through it and empty into the Bay of Bengal. The country's rivers help to make up a vast network of wetlands which are rich with biodiversity and wildlife. With 50% of its land standing a mere 10 meters above sea-level, the country is highly prone to climate change impacts and natural disasters. Over time, the clearing of lands for agricultural purposes and deforestation have increased this threat. In urban growth areas, increasing domestic and industrial activities and uncontrolled dumping have led to widespread water contamination. The conservation of mangroves is of major importance to the delta region of the country, as it preserves ecological integrity and helps to guard against flooding, storms and coastal erosion.

PALAU
As a small Pacific Island country, Palau's people and economy are tied to ocean resources. Through global warming, climate change poses the greatest environmental risk to the country causing rising sea level, coral bleaching, drought and other natural disasters. The country also combats destructive fishing practices such as deep sea bottom trawling, unsustainable harvesting of sharks and overexploitation of tuna stocks. Palau is challenged with inadequate water supply and limited agricultural areas to support the current size of the population.

THE AUTHORS

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Since 2008, Yan Wang has published some two hundred in-depth reports on environment-related topics. Her work through both domestic and International media receives frequent feedback from readers. Many of her publications have won international fellowships or nationwide awards. Her accomplishments include two Environmental Press Awards, issued jointly by China dialogue and the Guardian, received consecutively in 2011 and 2012.

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Based in Mandalay, Myanmar, Khin Su Wai has honed her journalistic skills from fieldwork and professional trainings. She has covered regional environmental news since 2004. Currently, she is working as the new editor for the Myanmar Times Journal.

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Dilrukshi Handunnetti is a lawyer by training and a journalist by choice. A journalist for over 20 years, Handunnetti had specialized in investigative journalism. She has taught journalism students and trained working journalists in many countries. Her work has received local and international recognition.

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Nusrat is very passionate about writing. Currently, she works as a country coordinator at The Media Alliance for the climate change campaign 'Redraw The Line' in Bangladesh. As a communications person, she has worked with Dnet, a renowned social enterprise in Bangladesh. Prior to this, she worked as an Environment Journalist with news media organizations like Banglanews24.com, Radio Today FM 89.6 and Somoy TV. Though she is working for electronic media, she enjoys feature writing for print media as well. Additionally, Ms. Khan works in documentary filmmaking as a freelancer. Crafting audiovisual documentaries is a true passion and she feels connected with the reality of a society and its people through her work. Achieving PANOS SACCA media fellowship for environment journalists was a great inspiration for her. She is also involved with various environment activist associations and youth volunteer organizations.

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Rolynda has always fancied the art of writing, but never had the courage to pursue it until her return home from living in the United States for more than a decade. For the past five years, she has worked at Oceania Television Network, a regional television station based in the Republic of Palau. As a TV reporter and an occasional presenter, she has covered countless local, regional and international events and issues. She hopes to continue to grow in the field of journalism and contribute to the Pacific for many years to come.

COUNTRY CHAPTERS

NEPAL

Grain conservation

Community seed banks underwrite food security in Nepal

■ BY **SMRITI MALLAPATY**

KATHMANDU and BARA, Nepal – Locals say they cannot do without it. Farmers seek it as an offering to a Hindu Goddess, Chhati Maiya, during annual celebrations in October. The subject of such attention is Sathi, a coarse rice native to Kachorwa, a village in Bara District, along Nepal's southern border.

This staple has come to stand out for good reason. Its appearance, for instance, where leaves envelope the panicles that host its dark black grains, is unique. Instead of the golden droplets typically seen drooping and swaying on paddy fields ready for harvest, one finds thin strips of straw protecting the grain from birds.

Its popularity with farmers is rooted elsewhere, too. Sathi, being drought and pest resistant, is ideal for upland plains and can be harvested within a 60-day crop cycle. Its taste is affirmed by the dishes churned out with this grain, such as rice pudding. But the continued presence of this native grain is only possible due to places like Kachorwa's community seed bank (CSB), which lists Sathi as one of its 88 local rice varieties in its registry. Each type of seed has a distinct characteristic related either to taste, aroma, adaptation, processing or some special quirk.

The seeds are stored in a small, minimally lit area in a one-roomed cement building. Tufts of dried, un-milled paddy hang off of bamboo sticks running lengthwise across the walls. Below them are round earthen pots storing more grain. Each item is labelled — even the few gourds hanging in the corner. Every year, these seeds are planted and replenished by members of the seed bank to sustain the richness of their reserves, and the knowledge that has developed around them.

Collective seed saving emerged across the United States, Australia, Canada and the United Kingdom in the 1970s, in response to the global commercialisation of agriculture. Gardeners, farmers and researchers formed seed saver networks to conserve and exchange traditional seeds. These developed into physical structures, where seeds could be stored and accessed by communities. Almost every country in the world now has some form of a CSB, with over 100 each in Nepal, India and Bangladesh. Bhutan built one last year.

The first CSB in Nepal was established almost two decades ago in Dalchowki village. Funds for it came from a Canadian charitable organisation, which supports biodiversity and food sovereignty in several countries. The bank sits just south of Kathmandu in Lalitpur, accessible only via a dirt road.

In 2003, the Pokhara-based non-governmental organisation (NGO), Local Initiatives for Biodiversity, Research and Development (LI-BIRD), teamed up with the autonomous government organisation Nepal Agricultural Research Council (NARC) and Bioversity International, a research organisation headquartered in Rome, to set up the bank

in Kachorwa. LI-BIRD has since succeeded in establishing over a dozen seed banks in the hills and plains of the country.That was followed by a 2009-venture, when the Department of Agriculture (DoA) set up seven more seed banks. The Nepal office of Oxfam, the international humanitarian agency, has also stepped in, supporting almost 100 seed banks in the mid-western districts of Dailekh and Dadeldhura.

Storing seed is neither new, nor is it the exception in Nepal. For centuries, farmers have maintained spring, summer and winter harvests by relying on seed stocks saved from the previous year and informally exchanged with their neighbours. These informal agriculture networks are still the main sources of seeds to meet local demand in a country where 76 per cent of households depend on agriculture for a living.

But newer policies and initiatives aimed at increasing access to improved seeds have led to shifts away from traditional agricultural practices and the gradual disappearance of local seeds. This has created the urgent need for institutions like community seed banks that not only conserve local biodiversity, but assure immediate and long-term food security of farmers.

The emphasis on yields has drawn attention to Hardinath 1, a rice seed variety introduced from Sri Lanka to Nepal in 2004. It has become popular among the farmers of Kachorwa because it matures vigorously and becomes a tall plant with volumes of fine white grains in just 120 days of springtime heat on well-irrigated and fertilised land. Its potential yield is 4.03 metric tonnes per hectare, compared to a national average of less than three, and its leaves and neck can withstand even the pestilent fungus called Blast. No wonder Hardinath 1 can be found advancing across the plains and valleys of the Tarai, in southern Nepal, and spreading further up along river basins into the hills.

It is one of almost 80 varieties of rice that the National Seed Board has formally 'released' (if bred in public sector research institutes) or 'registered' (if developed by private international companies then tested locally) since 1966. Only formally approved seeds can be legally commercialised.

It is these approved varieties that the government and most donor agencies are betting on for the future of Nepal's agriculture. "Our average national corn yield is 2.5 metric tonnes, compared to 6 to 7 in China and 10 in the United States. We cannot make such a quantum jump by depending on local varieties," says Suroj Pokhrel, programme director at the Crop Development Directorate, in his office in Kathmandu.

Pokhrel's argument echoes the global trajectory for seed modernisation: from highly diverse, lower-yielding populations to more uniform, higher-yielding selections. This marks a shift away from what once prevailed in local farming communities. In the past, there were only local varieties, sometimes called 'landraces,' that birds, insects and the wind would randomly pollinate. Thereafter, farmers selected and saved the seeds of a few prime candidates for future cultivation.

But the advent of rice breeders changed that natural order. They introduced increasing controls to the reproductive process, either through selective open-pollination or purified in-breeding to develop improved varieties. Eventually, they discovered that crossing two separate in-bred lines to form hybrids injected a surge of vigour into the immediate offspring. Further technical advances allowed for genes representing desirable traits, like drought-resistance, to be directly inserted into plants. The latter, better known as genetically modified organisms (GMOs), stripped the seed cultivation process of its randomness.

Nepal is on such a trajectory, albeit moving at a much slower pace. Agricultural research in Nepal goes back to the establishment of the Department of Agriculture in the early 1920s. The first to emerge was the national Rice Improvement Programme, founded in the early 1970s. Then, in 1988, came the Seed Act, which formalised the certification of seeds that were distinct, uniform and stable. The majority of seeds introduced to Nepal since the 1988 act have been improved varieties, only a handful of which are of local origin.

The national research system has released only a few hybrids, Srijana tomato being the sole competitive breed. One hybrid maize — Gaurab — could not be commercially produced, and another — Rampur hybrid 2, or RML2 — is still contending with the lengthy approval process. An increasing number of hybrids developed by foreign (mostly Indian) companies have been registered through the system. GMOs are practically banned in the country, except for research purposes, but can technically be introduced with an approved bio-safety report, the guidelines for which the Ministry of Forest and Soil Conservation is drafting.

Nepal's shift to modern rice breeding stems from the "huge food security problem" it faces. The majority of farming households in Nepal own and till less than half a hectare of land, hardly enough to grow sufficient food to feed their families for the whole year. "Given limited land resources and climate change, the yields have to increase," states Medha Devare, knowledge management specialist at the South Asia Regional Office of the International Maize and Wheat Improvement Center (CIMMYT), based in Kathmandu.

Hybrids offer the possibility of these higher levels of production, even though they are more expensive, need to be purchased every year and require more fertiliser inputs. "Assuming sufficient water availability and locally adapted, well-tested varieties, the yields can be high enough that even with the cost of the inputs including the seed it is profitable to go to hybrids," she discloses with confidence, referencing a colleague's in-house research conducted on maize crops in Nepal. Farmers can then sell these surplus crops in the market and make a profit. "Without a market-based approach to food security, it is difficult to sustain change and improve farmers' circumstances."

However, many farmers in remote, inaccessible areas are still to be touched by this vision. They have limited access to the market-based food security model and have been left to use local seeds as their only option. They need to be given the choice to try out improved varieties, insists Devare. "In any democracy, people have a right to choose — provide farmers with the smartest management and varietal choices based on good research, and let them make the choices." And there is growing proof that when farmers are given that choice, they prefer improved seeds over landraces, she points out.

Some southern farmers even risk it with unregistered hybrids that enter through Nepal's open-border with India — a practice that is widely known about.

But the introduction of farmers to modern varieties often leads to a rapid erosion of genetic diversity as farmers grow and retain fewer and fewer landraces. Despite its strong informal seed sector, Nepal's local seed-saving tradition is up against areas accessible to markets and government and donor support. "We declare that Nepal is rich in genetic resources at international forums, but our own projects and initiatives have led to huge losses," says Pitambar Shrestha, project officer at LI-BIRD and an early advocate for CSBs in Nepal. "Farmers are being told that they should use improved seeds from all sides — radio, television, newspaper — but only few voices tell them that they should also conserve local seeds." According to his rough estimates, Nepal has gone "from (having) an estimated 2,000 varieties of rice 30 years ago (to) only 200–300 varieties." The loss has been particularly dramatic in the Tarai, in places like Kachorwa.

The loss of local seeds to potent newer strains is an unavoidable sacrifice, asserts Krishna Joshi, consultant at CIMMYT. "Commercialisation and industrialisation cannot protect hundreds of different types of landraces. I think no country in the world can protect that process." Countries face a difficult choice in envisioning their agricultural future: "Do you want to be a subsistent, highly diverse country full of biodiversity, or do you want to be modern, industrialised, but still using useful genes?"

But LI-BIRD's Shrestha disagrees with the simple logic espoused by many government and donor representatives. The two are not mutually exclusive, nor can Nepal afford to treat them as such. "What they have not realised is that there are also local solutions to addressing food deficit," he says, thinking of the seed bank in Bara. The challenging realities of Nepal's geography and its diverse microclimates would not allow for an approach that singularly focuses on increasing production with modern seeds. Furthermore, the promise of higher yields from improved varieties is sometimes broken, for various reasons, and the environmental risks of their use have not been thoroughly investigated. Most of all Shrestha worries about the long-term implications of losing seeds, not least among them is reduced climate resilience.

In fact, the gap between the policies and programmes to support local seed conservation is striking, especially given how essential landraces are and will continue to be for farmers in Nepal, and the observed effect of prioritising modern varieties over seed diversity.

For example, Feed the Future, the United States Agency for International Development's (USAID) hunger and food security initiative, is being implemented in 19 countries across the world, including Nepal. Launched in 2010, it focuses on increasing agricultural productivity and incomes as well as improving nutrition and hygiene. The estimated total budget for Nepal is US$ 60 million.

But does it have any local seed conservation or agro-biodiversity components? I ask this question in an interview with four USAID professionals at the busy canteen in their Kathmandu office. "No," says economic specialist Anita Mahat-Rana, but USAID addresses biodiversity conservation in its other portfolios. Tahalia Barrett, deputy director of the Social Environmental Economic Growth Development office, follows up: "To the extent that this is a priority for the government we try to comply, and we are just not clear on whether this, as you mentioned, is a priority for the government."

A few days later, I raise the same question with LI-BIRD's Shrestha. "There is minimal focus on local seeds from the donor sector, and one could even say none at all from the government," he responds. Even the government-established CSBs really only promote the production of modern varieties by farmers.

This remains, despite Nepal's international commitments. In 1993, when the Convention on Biological Diversity (CBD) came into force, Nepal signed on. Then the International Treaty on Plant Genetic Resources for Food and Agriculture (IT PGRFA) was approved in 2001, and Nepal ratified it in 2007. Both legally binding treaties focus on the conservation, sustainable use and equitable sharing of benefits of biological resources. The CBD covers all biological diversity, and the IT PGRFA focuses more specifically on plants and food security. The latter also recognises the right of farmers "to save, use, exchange and sell farm-saved seed/propagating material."

In 2007, the Nepal government endorsed a National Agro-biodiversity Policy that highlights the importance of conservation for food security, and considers many of Nepal's international commitments mentioned above. However, the policy is yet to be implemented.

Nepal has yet to fulfil its signatory obligations by passing related national legislation, notes Kamalesh Adhikari, author of a report on farmers' rights in Nepal and currently writing his PhD thesis on seed bank governance at the Australian National University in Canberra. "If you look at our existing laws, selling unregistered seeds is against the law. So in a strictly legal sense, all those seed transactions in the informal sector are in fact illegal," he elaborates over the phone, touching on how farmers' rights are being encroached on in the current seed registration process. Use of the word 'informal' then just becomes a "softer word for illegal," even though farmers have engaged in seed exchange for generations before the 'formal' sector came along.

Farmers can theoretically register their local seeds in the formal sector, but it is practically impossible for them to do so without external support. Registering and releasing seeds can take years, and demands technical knowledge and money — resources that farmers simply do not have. In this environment, community seed banks are the only institutions in the country that target local seed conservation, and incorporate them within a broader interpretation of food security. They have begun to revive the use of local seeds and have created a passage for the introduction of landraces into the formal seed system.

Kachorwa-4, a rice variety, tastes like a native, but looks like a newcomer. Ten years ago, NARC's National Rice Research Centre and LI-BIRD collaborated with the Bara community in an effort to find the perfect union between the popular improved variety Hardinath 1 and the local Dudhisaro. Of the four potential strands that came out of the cross – 4, 5, 11 and 17 – farmers in Kachorwa selected number "4." It had inherited the high yields, short stems, early maturing and anti-lodging traits of one parent, and the flavour, drought- and pest-resistance of the other.

The newborn is yet to be formally registered, but for the last four years Bara's bank has sold two tonnes of Kachorwa-4 seeds to local farmers every year, at a rate of Nepali rupees (NPR) 35 per kilo (US$ 0.36). Of that, NPR 30 goes to the farmer who produced the seed and NPR 5 to the bank. Farmers have also started producing Hardinath 1 and selling it for NPR 35 a kilo, much cheaper than the NPR 50 it sells for in the market.

"I have benefitted a lot from this," Rup Narayan Yadav, former president of the Agriculture Development Conservation Society (ADCS), under which the bank was established, tells me at NARC's research centre in Birgunj. Dressed in a white cotton dhoti, beige kurta, and woollen orange hat, he drove three hours by motorbike to get here. The extra income Yadav makes from seed production funds his son's pharmacy doctoral degree from a university in Pakistan. The seed bank also offers farmers in and around Kachorwa access to local seeds with unique traits.

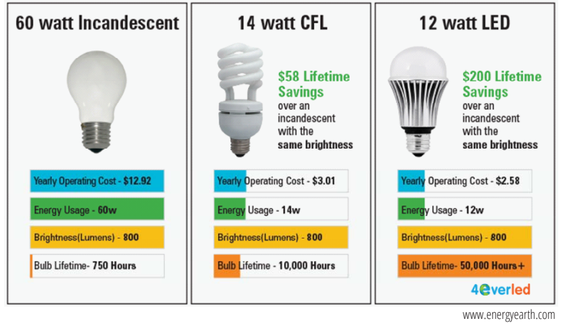
And for less popular seeds, ADCS has designed a sustainable means of conserving them. Five years ago it set up a separate cooperative that provides loans at low interest rates to its nearly 400 members. The catch is that for every loan, farmers have to grow one or two landraces, returning one-and-a-half times the amount of seed taken from the bank. Kumari Krishna of Kachorwa's Ward 2 has twice requested a loan of NPR 10,000 to invest in cloth to sell for a profit. Her friends have been similarly entrepreneurial with businesses in bangles, jewellery, vegetables and livestock.

Yadav also mentions in passing that with their pooled financial resources, the cooperative is planning to invest in a dairy business. The social cohesion that develops around a bank opens many new opportunities for farmers, explains Adhikari who is researching this often overlooked dimension. Seed banks "enhance social relationships, build community trust, contribute to local governance and community institution-building, and strengthen farmer-to-farmer networks." In March 2013, almost 40 farmers representing seed banks across the country gathered in Kachorwa to share their experiences and formalise linkages.

Developments in recent years reveal a gradual recognition on the part of the government of the importance of landrace conservation for long-term food security. A team led by Madan Bhatta, chief of the National Agriculture Genetic Resources Centre had driven all the way from Kathmandu to Kachorwa — a day's worth of travel — to start the process of funnelling seeds from the community seed bank to the national gene bank. The government-run CSB's have also begun to take their conservation mandate seriously, and a new seed regulation published last year introduced a simpler mechanism of landrace registration, which enables farmers to legally sell their seeds, but not to brand or commercialise them.

The original version of this article appeared in *Himal Southasian* in August 2013.

YOUTH ENGAGEMENT IN SUSTAINABILITY (YES NEPAL)



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Led to light

Affordable, environment-friendly bulbs start to flicker in Nepali homes

■ BY **SMRITI MALLAPATY**

KATHMANDU, Nepal – Back in 2008, Bhuwan KC (Khatri Chhetri, a family name) helped to blaze a trail in Nepal, a country that was facing regular blackouts. It involved a simple trade-in of bulbs used in most homes. Dump the jaundiced, energy-hungry incandescent bulb for the gracefully efficient twirl of Compact Fluorescent Lamps (CFLs), went the message of an aptly named campaign, 'Change the Bulb.'

This initiative, organized by Youth Engagement in Sustainability (YES), where Bhuwan, 28, was a project coordinator, benefited from a US$ 15,200 grant from the Asia-Pacific Forum for Environment and Development (APFED). The switch to a new light source made sense to many households, as load-shedding saw residents go without power anywhere from a couple of hours to 10 or more a day. CFLs had some obvious selling points: they consumed one-fifth the power of incandescent bulbs and lasted 10 times longer.

YES estimated that replacing one million incandescent bulbs with CFLs could reduce peak load-shedding by one-and-a-half hours, KC revealed. But then there was the prohibitive cost for the consumer to shoulder. A CFL, at the time, cost the consumer 10 times more in a market saturated with incandescent lights. A way out, YES argued, was to spread the benefits of such an investment.

But, towards the end of YES's campaign in early 2010, global concerns emerged over the hazards of mercury encased in CFL bulbs. The use of CFLs were particularly troubling in Nepal, known for its unmanaged waste disposal. Each bulb, it was revealed, contained an average 4 mg of the poisonous substance — compared to 500 mg in a traditional thermometer — threatening health and environment when cracked open. To date, the government has assessed — but not implemented — options to safely collect and dispose of spent CFLs.

"Many people asked us questions about the risk of mercury contamination," recalls KC, who now runs his own for-profit social enterprise — Ecoprise — that also sells lighting products. So YES dimmed its efforts down to its final flicker in early 2011.

This shift away from CFLs was affirmed, globally, in January 2013. That month, the international community agreed to a legally-binding treaty — the Minamata Convention on Mercury — to control emissions of the hazardous heavy metal. Countries endorsing this treaty commit to phasing out the manufacture, import and export of CFLs by 2020.

Light-emitting diode (LED) bulbs and lamps have begun to glow in the wake of this shift away from CFLs. An assured longer lifespan, absence of mercury, higher energy efficiency and potential for further streamlining have made them popular in the global lighting market. Plus, the lamps have become much more affordable.

It is little wonder why LEDs have been making waves in the market. They use almost half the energy of CFLs, last at least five times longer and have the option of repair. According to a 2012 study by the global consulting firm McKinsey & Company, between 2011 and 2012, the unit price of LEDs dropped from 13.36 to 10.55 EUR, a figure that is expected to tumble to as low as 2.81 EUR by 2020. "In some countries, the price of LED lamps is expected to become competitive with CFLs as early as 2015, which will further speed up the transition from CFLs to LEDs," asserts the report.

It also projects that by 2020 over 70 per cent of homes will use LEDs for illumination. It is a remarkable jump when compared with the current picture, some 13 per cent today. Conversely, the market shares of CFLs and incandescent lights are expected to drop from 27 and 22 per cent in 2012, to 11 and 2 per cent in 2020, respectively. With China and Japan taking the lead, Asian consumers have been singled out to dominate the LED lighting market.

"Philips was a pioneer in mercury tubes and CFLs, but they have recently stopped research on CFLs and are only focusing on LEDs," says Diwakar Bista, assistant professor at Kathmandu University (KU), who is leading a research project on LED lighting in Nepal. "Most of the reputed institutions working on lighting see no scope anywhere except in LEDs."

But more research and development to assess and reduce the environmental and health impacts of LEDs is required, reveals a study published in December 2012 in the journal Environmental Science and Technology. In it, scientists measure and compare the metal content of three bulbs — incandescent, CFL and LED — categorising the former as non-hazardous and the latter two as hazardous.

CFLs and LEDs have higher amounts of metals like aluminium, copper, gold, lead, silver, and zinc, which can be toxic to humans. Some of these metals are only available in limited and fast-depleting reserves. The paper suggests, however, that "LED bulb technology is relatively new and can be expected to evolve, if properly guided, to be competitive in terms of resource and toxicity potential. In contrast, CFLs are less feasible as a sustainable alternative due to their considerably high resource depletion and toxicity potential and more established development history."

In terms of growth potential, LEDs are like the grandchildren of CFLs. Bista even ventures to bet that LEDs can be designed with no metal-containing components.

But such global advances are not filtering into Nepal's halls of power. The government is still warm to the idea that CFLs are the answer to keeping the country out of darkness.

After completing a pilot, where 765,000 of the twisted lights were distributed in Kathmandu, either for free or through a 'buy one, get one free' scheme, the Nepal Electricity Authority (NEA) announced plans in 2010 to distribute another million twirls. That effort received US$ 2 million in funds from the Manila-based Asian Development Bank (ADB). By then, the government had eliminated the 13 per cent tax and 15 per cent custom duties on CFLs. The NEA–ADB project has since shrunk to US$ 1.2 million for 750,000 CFLs, which have yet to be installed in houses across the Tarai, in southern Nepal.

"Consumers are only just learning the energy benefits of CFLs, so to phase out their use now will be very difficult," reveals Bodha Raj Dhakal, NEA project manager.

To amplify its faith in these bulbs, the NEA continues to advertise CFLs on a large signboard outside its central building near a busy, four-lane highway of traffic in Kathmandu.

And on the occasion that the government has shown an interest towards LEDs, it appears to be lukewarm at best. This is seen in a project to install about 800 solar street lights in Kathmandu that use LEDs, and exemptions on tax and custom duties for LEDs used in solar lighting systems through the Alternative Energy Promotion Centre's subsidy scheme. "LED is a technology that is still being tested and still very expensive," says Dhakal, in defence of such a policy of emphasizing CFLs.

But in the last few years, the efforts of entrepreneurs and researchers like Bista have significantly reduced the cost of LEDs in Nepal. They have also laid out standards to maintain the quality of products available in the market.

"Back in 2006, LEDs for household lighting was almost an impossible concept, because a small 1-Watt LED system could cost up to (Nepali) rupees 1,500 (about US$ 15)," notes Bista.

But, since then, China's market has grown, offering cheaper alternatives to importing lamps from Europe and America.

Bista's team at Kathmandu University recently partnered with the Norwegian Foundation for Scientific and Industrial Research (SINTEF) Energy Research, and a local Nepali company, Altitude Innovation, to, among other things, design and manufacture LED lamps better-suited to Nepal. It is being funded by the Norwegian Agency for Development Cooperation (NORAD).

The lamps were designed to confront an unreliable power supply, fluctuating voltage and frequencies, while serving consumers who prefer cooler over warmer lights, and are very cost conscious. "If I sell the same bulb in Europe, they don't mind paying 20 Euros for that bulb, but it is difficult to sell that bulb here for even NPR 300 (US$ 3.09)," reveals Bista.

The blueprints were sent to a manufacturer in China, who worked on most of the parts and returned them to Nepal for assembly and sale. Last year, Altitude Innovation sold 3-Watt bulbs for NPR 300–350, down from NPR 650. Bista holds ambitions to cut the price by another half within the next year, which would bring it on par with CFLs.

KU also plans to launch a new curriculum on lighting technology, in collaboration with Ethiopia's Bahir Dar University and the Helsinki University of Technology's Lighting Laboratory in Finland.

Ecoprise has similar plans to cut the price of LEDs by collaborating with a Korean company, says KC, who has almost forgotten his previous pro-CFL crusade. "Based on the technological solutions available back then, CFLs were good, now LEDs are good, maybe tomorrow a new lighting better than LEDs will come along," admits the former trail blazer.

But Nepal cannot afford to keep turning off and on to the latest trends without first considering the environmental and economic burdens of changing its bulbs.

The original version of this article appeared in Republica in July 2013.

Reclaiming the high ground

Community forestry spreads its roots in Nepal

BY **SMRITI MALLAPATY**

KATHMANDU and CHAUBAS, Nepal – For Netra Bahadur Kunwar, a forester and local from Chaubas, a village in Kabhrepalanchok District, just east of Kathmandu, the parting visit by the last team leader of the Nepal-Australia Community Forestry Project (NACFP) is still etched in his memory. "We were walking through the dense pine forests when he pulled out his wallet, took out all his cash, and threw the money on the nest of needles below our feet," recalls Netra. "He said that we had been given chickens that could lay golden flowers, but had neglected to pick our blossoms. He was right."

We are seated on a wooden bench, narrowly set against one of three establishments — all dark and bare — that make up Chaubas bazaar. We face the rain and the slippery, red-soiled road that brought me here. Several buses, loaded with people, heave back and forth, before heading downhill. They will wobble over boulders, past buses on the opposite side surrendering to the rough track and unloading their passengers, who will make steadier steps uphill.

We're somewhere between the crest of pine trees and the ridgeline marks, 2,000 metres above sea level. The 18 kilometres down to the nearest town of Dolalghat takes two hours to reach, the same amount of time as the 65-kilometre journey from there to Kathmandu. There is no electricity here.

Three decades ago, instead of a crowd of slim poles, there were shrubs and grasses dispersed across the mostly barren hills. That is what Tenzing Norgay and Edmund Hillary would have seen in the early 1950s on their ascent past Chaubas to the peak of Mount Everest, Netra tells me over a plate of kheer, sweet rice pudding seasoned with pepper. Netra is known here as 'thulo bhai,' or 'big younger brother.'

In 1978, growing concerns over the degrading slopes led to a major effort by Nepal's Department of Forests (DoF), backed by Australian technical and funding support, to reforest over 20,000 hectares of land across Kabhrepalanchok and adjacent Sindhupalchok district with various species of pine. A few years later, the transition to community forestry began as the plantations were later handed over to local community forest user groups (CFUGs) to nurture and use.

Community forestry is a forest governance model in which local communities manage and, sometimes, even communally own, forest resources. The extent of community ownership and rights to use the forest for commercial and non-commercial purposes varies from country to country. In Nepal, community forests

are designated for development, conservation, and utilization in the community's interest, short of the land being fully owned by them. For years, communities have strictly controlled the consumption and distribution of the maturing trees — generally used for firewood, leaf-litter and lumber.

Forests support agriculture-dependent communities in many ways. The majority of families in Nepal still collect firewood for cooking and heating. Fallen leaves are fed to livestock, or used for their bedding, later composted and applied as fertiliser. Timber is cut and shaped into ploughs, yokes and handles for small tools, or built into houses, cattle sheds and schools. And sometimes, villagers forage through the growth for food, spices, healing material, or sellable resins.

"We went from not having any accessible firewood, to paying one or two rupees per basket-load, to free collection twice a year," explains Netra. But when it came time to thinning the forests and harvesting trees beyond their subsistence needs, various internal and external barriers continued to get in the way. It resulted in billions of rupees worth of timber growing old and stagnant.

On a bench under the shade of pine and broadleaf trees in Kathmandu's Ratna Park, community forest and forage technician Khadga Kharel from Chaubas recounts the early planting days. He was about 17 when the planting began. "We started by fencing off nurseries with barbed wire," he tells me. And the reaction was immediate: few people were worried about no longer being able to let their cows and livestock graze on the open grounds. Most were eager to get a fast-growing source of firewood to ease the constant pinch. After all, they were villagers who had to walk for hours just to find twigs and branches, or would burn dried cow-dung instead. "These days, we have gas, kerosene, biogas, and other forms of alternative energy. But back then we had nothing. Even in Kathmandu, they used to buy firewood with which to cook. Stoves were rare," says Kharel.

The community dug and planted saplings of pine chosen for their hardiness — the native species Pinus Roxburghii for lower elevations, Pinus Wallichiana on higher ground, and the exotic Pinus Patula in between (also known as Mexican weeping pine).

Most of Nepal's forest loss took place around the late 19th and early 20th century. Among the causes of deforestation were government policies. Farmers received land tax breaks if they converted forestland into cultivable cropland, which incentivised felling. Also, many forests in the Tarai, in southern Nepal, were later cleared for timber sale to India. It opened up land for grain production. Profiting from it all were the large families of the ruling Rana clan, who owned the land.

Competition between the two land uses — forestry versus agriculture — eventually reached a stalemate. Deforestation within designated forest boundaries, however, continued. Over 60 years ago, the Department of Forests was established to strengthen central state management of forests, at the exclusion of locals. Around that time, under the changed political context following the 1950 democratic movement, feudally controlled forests were handed over to the state. That remained the case until a series of legislation, policies and plans enacted in the 1970s gradually decentralised management, first to local panchayats — which were village, district, zonal and national assemblies set up as part of a party-less and hierarchical system of governance under monarchic leadership — and then to community user groups.

"Earlier conservation efforts took a command-and-control approach. It put people outside of the forest for the sake of conservation, blocking their traditional rights," explains Ek Raj Sigdel, environment specialist for the Poverty-Environment Initiative (PEI), an effort led by the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP) that seeks to integrate environmental and poverty reduction drivers into local planning and policy. "Then the government realised that they did not have the manpower and financial resources to maintain that approach." Hence, they started looking to communities for forest protection. The 1993 Forest Act legally recognized the autonomy of CFUGs over the management and marketing of forest products.

A common but unsubstantiated fear around this time was of widespread and catastrophic deforestation across the mid-hills. In many cases, communities were given heavily degraded land for which tree plantations were considered the obvious solution to reversing any further environmental degradation. Later on, natural forests were also entrusted to communities.

Over the years, community forestry has gained global recognition as a successful model for forest conservation, with Nepal at the forefront. "Nepal has come a long way in the last 35 years," says Yam Malla, Nepal country representative for the International Union for Conservation of Nature (IUCN). He offers a pertinent comparison: by the same measure that Thailand's airline industry is miles ahead of Nepal's; Nepal's community forestry far surpasses Thailand's. Many countries have tried to replicate Nepal's model.

According to the latest forest inventory conducted in 1996, almost 40 per cent of Nepal (about six million hectares) is covered in forest and shrub, with an annual deforestation rate of 1.7 per cent. Ideally, the government would have their forest resource area maintained at 40 per cent. Community forests take up a significant 28 per cent of the forested area in Nepal, involving half of the rural population, and a fifth of the country's terrain. Most community forests are in the central hills, where the quality of green cover has visibly improved.

Over 2 million households in almost 18,000 CFUGs manage more than 1.6 million hectares of forestland. Surplus forest produce is sold within or outside the community. And from that extra income, CFUGs have built schools, laid roads and drawn electricity. More than a third of all CFUG expenses go to community development projects, and another third to forest development.

That community forestry has contributed to forest growth and met the essential needs of communities who host them is well-documented. But with the priority placed on protection, communities have not been able to capitalise on the growing potential of their maturing forests.

"Before, we didn't have forests and we focused on conservation and protection," points out Suvas Devkota, executive director of the Federation of Community Forestry Users, Nepal (FECOFUN), a formal network of user groups from across the country that advocates for their rights. "Now we have forests, but their sustainable management and commercialisation has not been highlighted enough."

The 2005 Global Forest Resources Assessment by the Food and Agriculture Organization of the United Nations (FAO) distinguishes between forests primarily designated for 'conservation' of biodiversity; 'protection' of soil and water, control against avalanches and other environmental services functions; wood and fibre 'production'; and the provision of 'social services' like recreation and education. Yet, distinctions often get blurred in the discourse, and the FAO designations do not easily translate into official forest categories in Nepal.

"Where the whole 'community forestry' (approach) went wrong is that there was too much emphasis on conservation and re-establishing of forest cover – for whatever reason – and they looked less into the economic aspects," says Bernhard Mohns, senior programme officer at the Centre for People and Forests (RECOFTC) based in Thailand, who disagrees with conserving forests for conservation's sake (a few dark-green environmental groups in Nepal today still support this view). "I am a strong believer that forests have to be utilised, and if you want to keep forests, then you have to use them," insists Mohns over the phone from Bangkok. "Pure conservation is something I think a country like Nepal, with its land pressure, can simply not afford."

Making that transition would mean stepping away from passive protection to active silviculture — where trees

are cut to an extent that maximises forest productivity, maintains forest health, and brings in windfall profits.

Silviculture management plans designed for plantations in Kabhrepalanchok set a planting, felling and clearing timeline in a way that farmers who seasonally prune and pick maize would have been familiar with. Initially, when the project started, 1,600 saplings were squeezed into one hectare of land. Every five years a few hundred of the less sturdy adolescents were cut, clearing area for the healthier trees to spread their roots, access moisture and sunlight, and grow in girth. Trees are like children, explains Kharel, "as they grow you need to give them more space. You give them a bed — then a bed is not enough. You give them a room — then a room is not enough. Then you give them a study-room." After about 40 years, the last few hundred trees are felled to begin a new cycle of growth.

Sometimes the plantation is opened up to let indigenous broadleaves mix in — the pioneer pines create a moist and sheltered environment to nurse them. Farmers favour broadleaves because pine litter makes for a poor fertiliser, and animals find the needles too prickly to sit on and too acidic to chew. "They are not a people's tree," says Mohns, of pine.

But pine poles are easy to commercialise. They grow fast and the timber is popular for low-strength, cosmetic purposes — on exterior facades and interior decoration. Even with what the communities need for lodging, four-fifths of the timber produced from the plantations in Sindhupalchok and Kabhrepalanchok can be surplus goods.

Timber is further valuable because the demand from neighbouring India and China is continuously increasing. "The cost of timber in Kathmandu is higher than the cost of timber in my city here in Brisbane," marvels Don Gilmour, forestry expert from Australia, who has published several papers and books on Nepal's community forestry experience. "There are millions of dollars sitting around in the hills, within 50 kilometres of Kathmandu, and a lot of communities could benefit from the economic advantage of getting that commercialised." One study estimated the annual production potential to be 120,000 cubic metres, sold at over a billion rupees every year for twenty years — enough to add an extra 25,000 Nepali rupees (NPR) (US$ 250) to each household's annual earnings, almost half the average national per capita income.

The community's apprehension got in the way, however, over sending their tree-children off to faraway lands. "They felt affection for them and could not cut them down," explains Kharel in Ratna Park.

This emotional attachment compounded fears of losing their forests yet again. Many believed that "once you open the forest for commercial utilisation, you may actually go back to the old situation where all the forests were destroyed," explains IUCN's Malla. He recounts an eye-opening exchange with a user group. Ten trees were growing on two square metres of land. "Why can't you harvest five trees out of the ten?" Malla had asked the community. "No sir, we can't, that would be devastating. Let us only harvest two," they responded.

Popular opinion equated forests with conservation. "They believed cutting down trees was a crime. Trees were to be grown and sustained," says Dil Bahadur Khatri, a forestry and ecosystem services specialist at ForestAction Nepal, a research-focused civil society organisation.

It is a sentiment shared by Resham Bahadur Dangi, joint secretary at the Ministry of Forest and Soil Conservation (MoFSC). That is the reason why plantations up north have not been harvested to their full potential, he observes in his spacious Kathmandu office. But, has the government also set any barriers on logging? "In cutting trees, there is no governmental barrier, because the government has given the resource to communities to manage and use," he says with confidence, revealing either a true or trained obliviousness. "Have you ever seen the government intervene in felling trees in community forests? If it is all written in their operational plan...why should they have

to ask the foresters whether they should cut the grass or not?" [emphasis added]. Good questions. For which there are many good answers.

Legal registration is an integral part of handing over forestland to local communities. To register as a legal entity, CFUGs have to formulate a constitution and operational plan that specifies how the community will protect their forests, utilise and sell its products, and punish violators. Once approved by the District Forest Office (DFO), CFUGs have full sovereignty — short of land ownership — over the forests handed over to them. But the government continues to impose explicit and implicit restrictions to the commercial sale of timber from community forests, recently even venturing to reclaim their relinquished rights.

The first challenge for communities comes as early as in the operational plan approval. The volume of timber that a user group is allowed to harvest every year — known as the annual allowable cut — is determined by forest growth estimates, which are already conservatively defined. The DFO then sets how much of that annual production can be cut — sometimes 75 per cent of healthy stands, and less for frailer forests. There is much room for interpretation here. For example, as ForestAction's Khatri explains to me, Sal trees can grow at "about 5 to 10 per cent a year, but the government estimates 1 to 3 (per cent growth). And from that increment, they say you can only harvest 50 per cent — that too the DFO reduces considerably. When I was working in Okhaldunga, one community developed a guideline allowing them to cut 1000 cubic feet per year. The District Forest Office reduced it to 300."

Then in March 2012, the government introduced further checks by allowing only 60 per cent of the approved allowable cut to be logged for commercial purposes. "Looking at the state of the forests here, we should be cutting down trees based on the action plan itself," admits forester Lok Bahadur Kunwar stationed in Chaubas, "but we are obliged to work based on the dictates of the forest department." The government also imposed a tax of 40 per cent on all forest products sold by CFUGs as far back as 2003.

Some knots also form informally. Many government ministries, departments and agencies "put various barriers that make the whole local commercialisation a tangle of bureaucratic nightmares," says Gilmour over the phone from Brisbane. Legally speaking, communities have no obligation to seek permission from the DFO for what has already been approved in their operational plans, but reality is often different. A 2012 paper co-authored by Khatri on barriers to earning income from community forests tallied 24 visits to the district office that members of one CFUG in the southern district of Kapilvastu had to make to harvest a season's trees, including NPR 8000 in technical assistance fees. From tree-marking, to cutting, auctioning, transporting and selling, without a DFO representative's presence and approval at every step, the process stumbles. And often only stunted or fallen trees are marked for removal.

Since early 2012, communities don't just have to get permission from the district, but also from the regional forest office. For Chaubas, this is over 100 kilometres away in Hetauda. No surprise, then, that regional representatives never came to monitor, and several CFUGs did not get to cut any trees for commercial sale this year.

"I don't need to ask anyone anything to sell corn or rice," Kharel points out. But given all the required running around to sell trees, "it is better that the trees just stay where they are," he says, defeated.

Every so often, there is a government hurdle so constricting that no tree can be formally axed. On World Environment Day, June 5, 1999, former prime minister Krishna Prasad Bhattarai made a public appeal to resist cutting standing trees. But his words were later twisted into a blanket ban on felling living trees in community forests.

Occasionally, accounts of illegal logging will raid the media, and the government will respond by ramming through a national ban instead of identifying and addressing the problem at its source. This happened in 2010 following increased reports of smuggled goods from valuable forests in the southern plains.

"Massive deforestation in the Terai" the BBC broadcast; "Forest user groups misusing rights: Govt" headlined the national daily Republica; and The Himalayan Times led with, "Worst deforestation in three decades!" based on a report by the previous Parliamentary Committee on Natural Resources and Means, which found that almost 83,000 hectares of forests had been encroached on. The study faulted a nexus of forest officials, politicians and privileged local individuals, but there is still disagreement as to who are the key culprits. Some, like IUCN's Malla, see these numbers as applying to the plains, but not to the hills, where, Malla claims, "less than one per cent, or less than 0.5 per cent" of community forests have been subject to illegal logging. Contributing to this is an open border with India, where there are stricter logging regulations and higher timber prices.

"Not all communities have done well. Because of them, communities that have done a good job are also penalised," bemoans Lok Bahadur Kunwar, secretary of the Fagarkhola CFUG in Chaubas. In spite of this lack of evidence, towards the end of 2010, the MoFSC proposed a bill of amendments to the 1993 Forest Act, to recover some of the authority it had vested in communities. It required that communities 'share' the responsibility of implementing their operational plans with forest officials and split all external sales of forest products with the government. Many groups, including ForestAction and FECOFUN, lobbied against these changes, but with the dissolution of Nepal's parliament in 2012, the bill was put on hold.

"While governments are often prepared to give away degraded forest to communities, they frequently try to regain control (by introducing taxes and other measures) when it is realized that the forests have become valuable assets after the communities have spent several decades in restoring them to a productive condition," explains Gilmour in a 2011 discussion paper on the challenges in commercialising community forest products worldwide.

A misguided environmentalist agenda took hold in 2011 when the government, under then Forest Minister Deepak Bohara's tenure, announced a logging freeze for the whole of 2011, to celebrate the International Year of Forests. The price of timber in that period spiked from NPR 1200 to 5000 per cubic feet, noted ForestAction's Khatri. "People with a conservative mindset like Deepak Bohara will say that they have done a lot for conservation — but this is an illusion." In Khatri's view, the forest department measures its progress by the number of forests it has protected, not by the number of families it has supported through tree sales.

The department's mindset is a residue of British-Indian-style forestry education that emphasises conservation of natural forests, explains FECOFUN's Devkota. "There is no socialisation of the forest." Indeed, Nepal's DoF and many of its forest policies were modelled directly on British-Indian practices and the Indian Forest Service. "This model in turn stemmed from the training and ethos of the Imperial Forestry School at Dehradun and Oxford," explains a synthesis report of the UK's forest projects in Nepal during the 1990s. "Over time, Nepal's forestry administration began to grow, fostering a highly disciplined semi-military forest service with rigid hierarchical structures, centralised institutions, timber oriented and technically minded professionals." To this day, curriculums in most of Nepal's colleges teach a Dehradun-style curriculum, using books published by the newly named Forest Research Institute.

Even if the DoF did venture to manage the forests more actively, it lacks the human and financial resources to do so. In Chaubas for example, only four of the eight forest guard posts are filled. Less than a fifth of the 7,500 staff at the DoF are technicians. Only three per cent of the MoFSC's total budget in 2010 was spent on management. And the Community Forestry Division's NPR 18 million annual allocation, if distributed evenly across all CFUGs,

would leave each only NPR 1000. "Forest officials cannot participate in all activities such as meetings, assemblies, to silvicultural practices and marketing of forest products that CFUGs undertake," describes a 2010 paper critical of the proposed Forest Act amendment, co-written by Khatri. "The limited capacity of the government to provide the needed services and putting controlling provisions against CFUGs to limit their autonomy will eventually hinder CFUGs from being active and innovative." This was evident in Chaubas.

In 1996, four separate user groups in Chaubas — Chapani Kuwa, Fagar Khola, Dharapani Hile and Rachhama — formed the first community-run sawmill in the country, with DoF assistance and funding from the NACFP. The Chaubas–Bhumlu Sawmill Enterprise hoped to maximise on a steady supply of feed. But government bans and taxes described earlier, as well as contributions claimed by Maoist groups during the civil conflict, precarious road access, and a general absence of market savvy among community members, forced the mill to shut down in 2006. It barely processed double its annual maximum processing capacity of 35,000 cubic feet in eight years of operation. Most years it ran at a loss.

The mill today is layered in a film of sawdust. Logs of Chilaune tree, Utis (alder), and Painyu (wild Himalayan cherry) from private forestland wait to be trimmed and dried. Slimmed of any branching limbs, their wide, sturdy chests will be sawed at NPR 60 per cubic feet, on diesel-generated power.

Without regular thinning, the forests in Chaubas have grown overstocked and stagnant. The more congested the trees, the slower their growth. A 2001 study of the area published in the Journal of Forest and Livelihood found that the rate of increase in tree diameter drastically declined from one centimetre a year until the age of six, to 0.2 centimetres by the tenth year — an estimated annual loss worth NPR 20,000. "Timber's value is in its hardwood, not its sapwood. The larger its girth, the more hardwood there is inside," explains the government's Dangi.

Documented commercial sales of pine from Kabhre's community forests have declined from 72,000 cubic feet in 2008 to 23,000 in 2012, and this year maybe only 40 per cent of that will be traded. Meanwhile, pine sales from private land have increased from 8,000 to 51,000 cubic feet in the same period. Last year, CFUGs in Kabhre sold just over 4 million worth of forest products, making each household a hundred rupees richer (incomparable with the 25,000 estimated potential mentioned earlier from the pine plantations alone).

A three-decade review of community forestry in Nepal published in 2013 by the MoFSC identified a national annual CFUG income of 4 billion between 2010 and 2011, averaging out to 290,000 per CFUG. But last year's figures prove to be a much lower half billion, equivalent to 31,000 per CFUG.

"It is not that community user groups have not benefited from the forests, they have benefited a lot, but they could gain many times more if we did scientific forest management," articulates FECOFUN's Devkota.

The "time has passed" for the commercialisation of plantations in Sindhupalchok and Kabhrepalanchok, says Dangi. "Forestry is a science. Its biological growth depends on how best you intervene during the development period."

"We have got a lot of plantations now that are getting to a stage in life where they will no longer grow productively. A lot of them are subject to fire and wind damage. They get moribund and stop growing productively," adds a well-informed source in the forestry sector on the dense monoculture in the two districts. "It did have very significant commercial value, which has been wasted." Additionally, there have not been any hydrological benefits seen in the 25 years of forest plantation. That forests contribute to increased dry-season water flow in wells, springs and streams is a common misconception — indeed, the opposite is often the case. A 2013 study in the Ecohydrology journal co-authored by Gilmour found that practices like excessive removal of leaves and grassy herbs from undergrowth and constant heaving through of cattle-hooves, have prevented water from filtering through the soil. "Simply planting trees in degraded landscapes is not sufficient in itself to restore watershed hydrological functioning," the paper notes.

And yet, how best to transition from protection to commercialisation of community forests is still an open question. Some say that communities just don't have that shrewdness for capturing profits, and worry about what cultivating a market sense would do to their conservation incentives. A few have started experimenting with new modalities, like in Chaubas.

With support from UNDP's Micro-Enterprise Development Programme, locals hope to renovate and upgrade their machinery, then lease out up to half of their business to a private entrepreneur that will breathe new life into the sawmill. "Apparently even this sawdust has a market," remarks Netra.

Some practitioners in the sector have even started to question — in private — whether the institutional model of community forestry is at all conducive to commercialisation, or whether it needs a complete overhaul. For IUCN's Malla, what used to be a defensive comeback — 'Why can't community forest users manage forests for commercial purposes?' — has turned into a research question. "I am basically trying to question my own assumptions."

But FECOFUN is resistant to any talk of restructuring. Devkota argues that the key to sustainable forest management is to ensure CFUG autonomy, and equip communities with the necessary technical silvicultural skills to maintain healthily harvestable woodland. "If you are sick, the doctor checks you before prescribing treatment — stool, X-ray, MRI. The same tests and technical understanding is needed for jungles — surveys, analysis, modelling."

Moving forward, ForestAction's Khatri insists on a middle ground. Without proactive efforts by the government to change the way they work, and FECOFUN's willingness to try out new frameworks, "the risk of things staying the same is high...The way things are going, I don't think a lot of change will happen," he admits.

The original version of this article appeared in Himal Southasian in August 2013.

KYRGYZSTAN

Mountain of troubles

Central Asia's abundance of water is not clean and not set to last

■ BY **ALMA UZBEKOVA**

KARA-CHII, Kyrgyzstan – In this remote mountainous corner of northern Kyrgyzstan, some 3,000 meters above sea level, the story of water is a tale of plenty and scarcity. The details are everywhere for Mayram Urustemova, a resident of the impoverished village of Kara-chii. To the right, a 30-minute walk away, the On-Archa River flows by. To the left is an irrigation ditch. Crisscrossing the centre of this village of 1,300 are drains.

Spring throws up more reminders of water troubles. Then, ground water flows are so strong that they flood the streets, making almost 80 per cent of the small, adobe-walled houses uninhabitable. "But despite all this water abundance, the biggest problem for our residents is the lack of clean and safe drinking water," laments Mayram, a mother of four children.

That means a heavy burden for this community's vulnerable – women and children. They have to walk long distances to and from the river, carrying large containers and buckets to fetch the water, which is crucial for their livelihood, but still is not safe for drinking.

Such a reality has made a Kyrgyz proverb – "Akkan suuda aram jok (in running water there is no evil)" – meaningless. "In our case, it is quite the contrary," says Mayram. "In the upstream villages people tend to build their sheep yards and toilets right on the river bank and all the sewage flows towards our village, located downstream. Besides, higher in the mountains there is a gold mining enterprise, which also contaminates the river with chemical wastes."

Yet, her village of livestock farmers is considered slightly better off compared to others, where women and children have to fetch water from the dirty irrigation ditches next to their houses. "People get sick more often now; there are new illnesses that we even haven't heard about before," says Mayram. "We believe that they are caused by deteriorating environment and poor water quality. The worst thing is that in the 21st Century our children are born into and grow up in mountainous areas without clean water."

Kara-Chii, in the Naryn region, is just one of the 1,200 villages in Kyrgyzstan without sufficient access to clean drinking water. In rural areas, nearly 60 per cent of the people fetch water from unprotected surface sources. The health ministry estimates that nearly two out of the 5.5 million people in this land-locked country have no access to clean water.

This has contributed to about 40,000 cases of waterborne diseases annually, with nearly 80 per cent of the infected being children under 14 years old. Every year, nearly 300 of these children die from such illnesses.

The problem faced in Kyrgyzstan has been compounded by the dilapidated and, in some places, destroyed water supply infrastructure system – a major problem on a

national scale. And it is not alone. The same situation exists in other former Soviet republics of Central Asia. In Tajikistan, for example, more than half of the population of 8 million do not have access to drinking water.

But the region is faced with other threats that deprive the people of Central Asia of clean drinking water. Foremost are the environmental hazards caused by the depletion and pollution of surface and ground water as a result of natural and anthropogenic causes. In other words, people contaminate the waters by discharging wastes and sewage, overgrazing pastures in sanitation zones, while nature contributes to further deterioration by natural disasters such as landslides, torrents and soil erosion.

In addition to the unsettled problems of waste disposal, particularly mining waste, there are many large, dangerous dumps of pesticides and chemicals in the region. Uranium tailing dumps – the radioactive legacy of the Soviet military-industrial complex – remain a serious threat to water resources in Central Asia.

An equally troubling issue is the looming threat of water shortages. Experts predict that in 20-30 years, Central Asia might suffer a shortage of water resources, which will inevitably threaten food and energy security.

A water shortage, at first sight, seems improbable. After all, this is a terrain surrounded by several thousand small and large glaciers. This concentration of ice in the mountains of Tien Shan and Pamir feed all the region's rivers. The Tien Shan stretches across Kyrgyzstan, the Xinjian Uyghur Autonomous Region of China, Kazakhstan and Uzbekistan. While the Pamir mountain range covers parts of Tajikistan, Afghanistan and Pakistan.

If any country were to face a water crisis, it would certainly not be Kyrgyzstan and Tajikistan, considered to be 'water towers of Central Asia.' The title arises from the fact that most of the glaciers are situated in these countries and about 80 per cent of water resources of the region flow from there. Here, the head waters of two major rivers, the Syrdarya and the Amudarya, originate. They help to form the unique ecosystem of the Aral Sea and connect five countries of Central Asia and Afghanistan with their trans-boundary waters.

However, experts continue to forecast water shortages. They consider such a prospect stemming from three main factors: global warming, population growth in the region, and the irrational use of available water resources. The region's population, for instance, is expected to hit 80 million by 2030, from the current 60 million. The prediction of a warming planet could accelerate the melting of glaciers, adding to what has already been witnessed in the last 50 years where the glaciers have decreased by more than 25 per cent, according to research by the International Fund for Saving the Aral Sea (IFAS), an NGO working on joint regional projects to preserve the Aral Sea.

For the citizens of Central Asia, natural disasters in the future could offer more bad news. A region known for arid conditions of scarce rainfall, extremely low humidity, high evaporation rates and excessive solar radiation could get worse. Climate change and rising temperatures, together with decreasing precipitation, will lead to a further increase in aridity. The mountain ecosystems of the region are even more vulnerable to climate change due to increasing anthropogenic pressure, resulting in the accumulation of atmospheric moisture. The degradation of pastures, deforestation and soil erosion are expected to lead to a reduction in vegetation cover, which serve twin roles as to protect soil and retain water.

In recent years, droughts and water shortages have become more frequent in Central Asia. They have affected the volume of water in reservoirs, which play a crucial role in ensuring energy and food security in the region. Adding to this is what the fifth assessment report of the Global Environmental Outlook (GEO-5), developed by the United Nations Environment Programme (UNEP), highlighted as one of the major environmental problems in Central Asia; the siltation of the majority of 250 of the region's reservoirs, resulting in a reduction in their ability to serve the needs of irrigation and hydropower.

For example, over the last 30 years, the usable storage of the Nurek reservoir in Tajikistan decreased by 30 per cent. In Kyrgyzstan, the Uch-Kurgan reservoir on the Naryn River is silted up to 99 per cent, and the height of the water in this reservoir is only one meter. According to recent studies by the Institute of Water Problems (IWP), a government organisation based in Bishkek, the capital city, the news is just as bad in the Toktogul Reservoir, one of the largest and most strategically important reservoirs in Central Asia. The rate of silting in that reservoir has reached 500 million cubic meters during the past 40 years, at the current water level of 11.3 billion cubic meters.

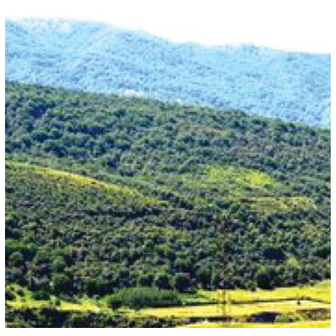
According to Valentin Shilo, a researcher at IWP, de-siltation works for such reservoirs demand huge funds. Rather than dealing with consequences, it is more cost-effective to mitigate siltation by strengthening the river banks and planting trees on slopes, as vegetation is the best barrier for sediment, he says.

Shilo also warns that Central Asia is experiencing an increased runoff and a lengthened growing season, but there is little reason to rejoice. "According to the law of 'cyclicity' in nature, a large drain should always be followed by a decline," he says. "That's why we now need a clear and transparent water policy with three main objectives: providing water, saving water in household and industrial use, and introducing modern efficient technology in irrigation for agriculture. First and foremost, we must move from a ditch irrigation system to drip irrigation."

Old attitudes need to be changed, too. After all, people have gotten used to considering water as an inexhaustible gift from above, and they are surprised when questions are raised about its cost. Don't we need infrastructure and personnel in order to get water, to accumulate it, to deliver it to the field and into the house, and to produce energy? It's time to change the traditional view of water as an inexhaustible and free resource and to develop a culture of frugality.

What is more, in the negotiation process at the regional level, water resources are considered only for their economic and political implications. Little attention is paid to their ecological value. Thus, constructive dialogues on water issues is prevented by the ingrained belief that water use in the region is a situation in which one country's gain is inevitably a loss for the other.

If we do not change the current practice of water management at the local, national and regional levels, the vulnerability of water resources in Central Asia and the lack of coordination between the states of the region in water use may jeopardize both energy and food security for all countries. In Central Asia, there is already one major victim of this unreasonable attitude towards water – the disappearing Aral Sea. Do we need new environmental disasters?



Uprooting a heritage

World's largest natural walnut forest loses ground on Central Asian slopes

■ BY **ALMA UZBEKOVA**

KARA-ALMA VILLAGE, Kyrgyzstan – "A few years ago those hills were covered by dense forests. (But) look how settlements have extended their borders. And people keep going higher, clearing up forested slopes for new houses. Do you see those bare hollows on the surface, looking like ugly scars? They are vivid signs of degradation."

These are the words of a despondent Luidmila Abdrasakova, a forest ranger of 'Urumbash,' a forest located some 2,000 meters above sea level – a vibrant stretch of green in the dusty and dry Central Asian landscape.

She points a finger at what is chewing away at this once resplendent scene – the unrestricted grazing of livestock. As the population in forest areas increases, so does the number of livestock, especially goats – the main enemies of trees. "People invest in livestock, calling it 'live bank,' because they feel that is their safest economic option," adds Luidmila.

The scars on the mountain's slopes are also testament to an equally worrying development. Local communities have over-harvested highly valuable fruit and nut trees, breaching the legally imposed ban for cutting. Felled in the process are walnut trees, a unique heritage of the mountain's green canopy. "These ancient forests have stood here for thousands of years, but are now rapidly losing the battle against human recklessness," laments Luidmila, a mother in her late 40s, who lives in Djalal-Abad city and travels an hour daily to her forestry unit office in the Kara-Alma village.

They are words that strike a chord as we stand on the top of a hill and take in the magnificent scenery of the largest naturally growing walnut forests in the world. The walnut forests in south Kyrgyzstan, in Djalal-Abad and its bordering provinces, account for 80 per cent of the 44.5 thousand hectares of walnut trees spread across the country. According to some surveys, these walnut trees have roots going back nearly 2,000 years.

It is hard to believe that this unique ecosystem is now facing serious environmental threats. The unsustainable use of forest resources, which drives forest degradation, leading to soil erosion, deforestation and loss of biodiversity, has been the main cause.

Climate change cannot be ignored, either. Its impact, essentially a warmer forest, has resulted in larger swarms of insects, the destruction of large swathes of undergrowth and entire ecosystems and species shifting to higher altitudes. Compounding this have been frequent droughts, melting of glaciers and permafrost and forest wildfires that are hard to control.

This development has resulted in a new appreciation of forests. As high altitude forests (90 per cent of the forests lie at altitudes between 700 to 3,600 meters above sea level), they fulfil about 150 ecological functions and are vital

for mountain ecosystems and people, providing a wide range of goods and services. The forests inhale carbon, acting as "a sponge" by absorbing roughly ¼ of human emissions of carbon dioxide. Forest products of wood, fruits, nuts and non-forest timber products of medicinal herbs and mushrooms also make up a significant portion of income for local communities adjacent to the forests. Additionally, the ecosystem goods and services of Kyrgyz forests are crucial not only for the economy of Kyrgyzstan, but the whole region of Central Asia, as it regulates water resources vital to irrigated farming in low-land countries.

Consequently, protecting the forests has emerged as a litmus test of state authority. After all, the forests are state-owned in Kyrgyzstan and are part of the State Forest Fund, which is managed by the specialised state-run authority called the Division for Forest Ecosystem Management. Established in 1947 following the end of World War II, the current institutional structure has regional and local level branches based on enterprising principles. These "Leskhoz" (forest enterprise) are empowered with unlimited authority in administrative, legal enforcement and monitoring functions.

Yet, that authority has also exposed the "Leskhoz" to charges of corruption and stubborn resistance against any attempts at restructure and reform. Those familiar with the workings of these forest enterprises are not surprised by their bad report cards. Limited funding has contributed to poor motivation as well as the potential for corruption. Wages for Leskhoz workers (US$ 50-55) are well below the average wages of public sector employees (US$ 100-150). Moreover, Leskhoz budgets are funded by income from lease arrangements as well as by grant allocations from environmental user fees that are pooled at territorial levels.

Thus, when the management of resources is in the hands of state-run forestry units, and leasing of the wild forest is the only form of benefit sharing, the motivation for conservation is low. Forest users lack incentives to protect the forests and everyone tries to take as much as possible.

The parts of the walnut forests that are leased to the local forest users bear this out. "The legislation stipulates that the users are required to take care of the forests in return for benefits. Nevertheless, the users refuse to pay for the goods they receive from the natural growth forest, referring to their lack of ownership over them," says Aitkul Burkhanov, head of the Kyrgyz Association of Forest and Land Users, a local non-governmental organisation (NGO). "According to them, as these are natural growth stands, they do not need investment. Under such a management scheme, the forests have no real master to tend to them, and remain at high risk."

The villagers who make up the bulk of forest users feel they are justified. Since they are denied full land entitlement, they argue that family well-being comes first, seeing as the government hardly supports their livelihoods and creates little motivation for poor communities to take care of the forests. "The term of the lease agreement is just one year. There is no point in making investments, as there is no guarantee that the Leskhoz will extend the contract next year," says a resident of the Kara-Alma village, who prefers to remain anonymous. "I have to either grease somebody's palm, or by all means make maximum profit within one season to earn a living."

These opinions demonstrate that the government's forest management policy focuses on preserving and increasing the amount of forest cover by imposing legal bans. Brushed aside are other conservation options, such as developing the relationship between forests and the surrounding ecosystem and community, including the pressuring of the community to utilise forests as a productive asset.

Another shortcoming in forestry legislation and management practices is obvious, too: the existing environmental legislation and different national programmes are ecologically oriented, overlooking the socio-economic aspects of conservation and not recognizing forest user rights, including women. In other words, the current forestry legislation lacks gender sensitivity. Consequently, women remain secondary to

men at the decision-making level, for management and benefit-sharing of natural resources in the forestry sector.

Due to the lack of economic opportunity in rural areas, there has been a massive labour migration to urban centres and further afield, such as to neighbouring Russia and Kazakhstan. Data from the Ministry of Youth and Migration estimates that the migrants account for some 650,000 people. While women make up a significant portion of this outflow, the number of female-headed households is on the rise as well, increasing the burden of managing household activities. Shockingly, the increasing trend of female-headed households has not resulted in space for greater female participation in forest resource management, even at the institutional level. Currently, only a handful of women are in management positions.

Luidmila Abrazakova, director of Urumbash State forestry unit, Djalal-Abad region, is the only female head of forestry union in Kyrgyzstan. "In [the] forestry sector, women are not recognized as managers. People believe that management of forest resources is purely man's business," she says. "At work I meet people daily with frowns on their faces quietly asking, 'Why is this woman here? It is not her place,' and my 30 years of experience are in vain. That's why I have to prove my competency constantly and work twice as hard as any of my other male colleagues."

"But no matter how hard I work, at various instances in administrative offices, like in the tax office, I encounter scepticism and others' reluctance to deal with me under the excuse of 'How can I deal with a woman in this business?'" she adds. "Sometimes they create obstacles on purpose. In Bishkek (the capital city) they keep saying that 'gender issues are being resolved, gender equity mechanisms are being integrated…' but in reality at the local level, no change is foreseen whatsoever."

One of the main reasons preventing women from active participation in forest resources management is the stigma shaped by a traditional patriarchal belief. The higher women rise, the stronger the stigma's impact.

The on-going forest conservation debate has also touched on the question of agro-forestry. As the forests of Central Asia are unique due to the large canopy of walnut trees, expert opinion is divided on whether it is good to consider agro-forestry as a conservation option.

In some quarters, agro-forestry – with its multiple potential of fixing soil quality and providing additional incomes for livelihood and food crops for improved food security – has been welcome. Its adherents argue that it will help stall degradation and soil erosion.

Yet, despite its high potential, certain conditions come in the way of expanding the agro-forestry practice. These are the lack of regulatory mechanisms and incentives, and poor inter-sectoral co-ordination. These obstacles are coupled with other serious difficulties restraining agro-forestry development – limited understanding and acceptance of agro-forestry benefits and reluctance to invest in forests, as they are considered "long-term projects" that make people "wait for years to get profitable yields."

For now however, the Regional Environmental Centre for Central Asia (CAREC), a regional NGO which works in five countries of Central Asia, believes that it is necessary to establish community groups at village levels to undertake action that will shift user attitudes towards a more "give-and- take" principle.

According to CAREC, it is necessary to work out implementation and enforcement frameworks and relevant mechanisms which invite wider engagement of local communities and marginalised groups (including women), in management processes. Hence, this should increase, their responsibility in forest sector development.

This is rooted in a project CAREC started in 2012 to introduce the concept of Payment for Ecosystem Services (PES) in Uzbekistan, with the support of the Asia Pacific Forum for Environment and Development (APFED), a division of the United Nations Environment Programme (UNEP). The aim of the initiative is to protect the biodiversity of local mountain ecosystems through integration of the concept of rewards for ecosystem services, to provide a basis to replicate this practice both nationally and regionally.

The PES mechanism was developed and tested in the pilot area in Ugam-Chatkal National Park, located in the West Tien Shan Mountains, a one-hour drive to the west from Tashkent, the capital of Uzbekistan. PES offers incentives to local villages in exchange for ecological services. For instance, the agreement between the national park authorities and farmers association of Brichmulla and Chimgan villages (located in the territory of the Ugam-Chatkal National Park), stipulates that farmers are to plant 1,000 trees on a four-hectare area, while the park allocates 50 hectares of forest pastures to them for livestock grazing purposes. The costs of seedlings for reforestation are shared equally between the parties: farmers must add 500 seedlings to 500 provided by the National Park management. To ensure sustainable use of the pastures, limitations on the number of livestock are agreed upon, using a special formula.

According to CAREC, the PES mechanism has proved its efficiency as an innovative tool for promoting conservation without compromising the well-being of local communities, and is currently being replicated in other Central Asian countries.

Never has our arid region been more in need of forests and never have the forests been under greater pressure than they are today. The benefits of introducing innovative practices bridging economic interests of poor communities and sustainable use of forest resources is becoming apparent. A start has been made for creating more and more environmentally sensitive forest areas in Central Asia.

From commitment to cash

Central Asian countries explore routes to a green economy

BY **ALMA UZBEKOVA**

BISHKEK, Kyrgyzstan – Today, colour codes dominate panel discussions on the modern economy in Central Asia. In one corner are the environmentalists, who claim that public anxiety is rising in response to scientific confirmation of environmental deterioration. For them, the region's development is not possible without turning the "brown economy," to "green."

In the other corner are the economists, arguing back on the need for immediate reforms, saying that a transition to green economy requires changes in strategies and the application of new technologies and management approaches. These changes require new skills, expertise and ways of thinking that are lacking in existing institutions.

Listen longer and the pros and cons of the debate reveal more: opinions on the subject can be divided into three positions. Those with a leftist persuasion say that it isn't economically easy to be green. They believe that use of a green economic model can slow down the process of development of the already poor countries in the region. They say that environmental risks will impact prices, a key component of the green economy. After all, attempts to shift the focus from economic interests of the people to the interests of ecology would increase the cost of production. They argue, as a consequence, prices will spike and further the growth of poverty.

No wonder the leftists are convinced that the concept of a green economy was invented and promoted by a group of developed countries in order to foster trade protectionism in the global market. The practice of which would deprive developing countries of access to the marketplace, since they would be required to meet "green quotas" and new product certification standards. In addition, given the current economic situation of the Central Asian countries, "total greening" is not possible in the foreseeable future as it requires huge domestic capital expenditures, as well as foreign investment. The current budget of these countries cannot even cover current expenses. It is difficult for countries in the region to find investors for the development of existing industries. Besides the high cost, there are other factors: the lack of skilled personnel, lack of experience in introducing and implementing green technologies, and the presence of corruption, according to local researchers.

Those with a rightist persuasion say that the modern world must adopt the following principle: "What is economically effective is the one that is safe for the environment." They say that the "brown" economic model has become obsolete and will rapidly result in an inevitable economic decline due to the depletion of natural capital against irreversible environmental degradation.

For them, environmental problems of the region will only increase. Changing climate will result in the reduction



of resources, including primarily water resources, which will lead to a reduction in the volume of production, food shortages, and reduction of state revenues that go to social programs and infrastructure development. New green technologies based on resource saving, on the contrary, lead not only to the preservation of natural resources but also to the creation of new jobs. This means economic growth and sustainable development for society.

Between these two persuasions are the centrists. This group agrees with the leftists that business today is not sufficiently motivated to voluntarily introduce green technology into its production processes. For example, the cost of coal or other hydrocarbon resources is cheaper than green alternatives because these industries are favoured with government subsidy programs. This makes the introduction of renewable energy expensive and unprofitable. Neither the tax system nor tariffs and legislative mechanisms are focused on the development of green technologies, they argue. That is why the current environment remains unfavourable for green business in Central Asia.

At the same time, the centrists concede that, at the global level, green economy is steadily making headway. If the countries in the region want to develop and become active players in the global market, governments need to adjust their policies towards greening in order to meet the market requirements of the future. On the face of it, that appears to be the case across Central Asia. Most of the governments have declared their commitment to the concept of green economy. However, there are glaring shortcomings. Most noticeable: their political statements have not been converted into action.

According to Ismail Dairov, director of the Regional Mountain Centre for Central Asia (RMCCA), a body set up by an intergovernmental commission in Central Asia, Kazakhstan is the undisputed leader on green economy in the region. The international program "Green Bridge," developed and implemented by the country, contains not only specific objectives, funding sources, and tools to assess the progress of its implementation, but also offers partnership to other countries in Europe, Asia and the Pacific region on development of a green economy. This



initiative of Kazakhstan has received global recognition, as evidenced by the fact that it was included in the final document "The Future We Want" during the World Summit on Sustainable Development, Rio +20, held in Brazil in 2012.

Why does a country where rapid economic growth is financed by coal, oil and gas, switch to low-carbon technologies by investing huge amounts of money into such technologies?

"Image and investment attractiveness," says Dairov. "The government of Kazakhstan has set an ambitious goal - to be among the 50 most developed countries of the world by 2050. Today, understanding of environmental problems is growing at the global level; the developed countries are on the path of transition from quantitative growth strategies to strategies focused on quality of life, including the quality of the environment. The world community faces the challenge of reducing greenhouse gas emissions and shifting the economy to low-carbon development. Non-compliance with new international standards and regulations could affect the political future of a country's image and reduce its investment attractiveness."

Calculations made by the Kazakh government also favour the greening of the economy. According to them, a green economy has the potential to improve energy efficiency in the country by 40-60 per cent, reduce water consumption by 50 per cent and reduce industrial waste by 30 billion tonnes. At the same time, the Kazakh government predicts the emergence of huge opportunities in green industry, including organic agriculture, eco-tourism, energy from renewable sources and the prospect for the formation of a fishing industry with a turnover of a billion dollars per year. As a result the Government of Kazakhstan is now ready to invest in the development of a green economy in order to receive dividends in the future. Kazakhstan's President Nursultan Nazarbayev revealed this at a session of the United Nations General Assembly in New York.

As for the other countries of Central Asia, the development of a green economy is discussed only in narrow areas, on the basis of current economic priorities. For countries

such as Tajikistan, Kyrgyzstan and Uzbekistan, the first priority issues are trans-boundary water resources, energy and irrigation. Perhaps the reason lies in the fact that these countries have transition economies and therefore have not yet reached a level of stability to transfer their entire complex economy onto a new green track.

For example, the Kyrgyz government has identified three areas for green development of the country – water, energy and organic farming. Some steps at the legislative level are already being taken – the government approved the National Strategy for Sustainable Development until 2017, and the law "on the energy efficiency of buildings" was adopted. In addition, major projects for the construction of new power plants are attracting new investments. Yet, to talk about a large-scale low-carbon reconstruction of the Kyrgyz economy is not realistic.

In fact, green initiatives in Kyrgyzstan today are being implemented only as separate business projects or with the support of international organizations, because there are no government support or incentive programs. For example, the Agency of Development Initiatives (ADI), a Kyrgyz non-governmental organisation that is a network of rural women self-help groups, is stepping up a private partnership project to supply organic valerian from Kyrgyzstan to Europe. Two years into the partnership with the Willmar Schwabe, a German-based pharmaceutical company, ADI is working to increase production in a bid to keep up with the growing demand for the herb.

"Last year our self-help groups managed to collect seven tonnes of valerian, and this year we are planning to provide 52 tonnes," says ADI coordinator Aida Jamangulova. "We need to involve more and more villagers and extend the planted area in order to create a stable supply base for our clients, the pharmaceutical companies. That means more self-help groups will be mobilized and trained. So this initiative targets two urgent problems in rural areas – unemployment and poverty." In 2012 ADI mobilized 46 farmers and created seven self-help groups for valerian growing. The following year, the numbers swelled to 300 households in eight villages engaged in this new rural business.

Sonungul Jyltyrova, in her early 50s, was among the first women of the self-help groups to get involved in valerian cultivation. She lives in the remote village of Bozuchuk in the mountain forests of the northern Issyk-Kul region. Traditionally, livestock and potatoes had been the main source of income for local villagers, but limited pastures and low prices persuaded Sonungul and colleagues from ADI to look for alternative income-generating options.

They managed to find assistance through the German Agency for International Cooperation (GIZ), which facilitated cooperation with the pharmaceutical company. For women groups, the project means stable and secure incomes, and the demand for medicinal herbs is growing. After all, Willmar Schwabe alone is willing to purchase up to 100 tonnes of dried or 400 tonnes of raw valerian annually, and there are more European pharmaceutical companies interested in Kyrgyzstan's herbs.

According to Vilhelm Schmid of Willmar Schwabe, there are two main reasons for this. "We'd made a chemical analysis of local valerian samples in our laboratory in Germany and the results showed that their quality fully meets the high criteria and requirements of European pharmaceutical companies," he says. "The local valerian is ecologically clean, which is very important for medicine production. We believe that this is thanks to the unique mountain ecosystem of the Issyk-Kul region, and the fact that it is grown by small-scale farmers who do not use chemicals and pesticides, thus keeping the soil organic."

But though these green jobs open up new perspectives for poor rural communities, there is a risk that such business partnerships will not last long, as self-help groups are struggling to meet the growing demands of the European pharmaceutical companies. "We do all the work by hand, and that limits our possibilities. We need small-scale farming machinery, but we cannot afford it," says Sonungul. "If our government could support us through special leasing programmes and low-interest credits, then it would be a benefit, because more jobs would be created with more revenue for the state budget. Thus the government could be an enabler and we could be the doers."

The example of the ADI experience clearly demonstrates the current situation of green initiatives in Kyrgyzstan. On the one hand, it is possible to see that green initiatives open up new possibilities for addressing socio-economic problems in poor rural areas. However, it is clear that without government support and programs, there is a significant risk that green projects will not be implemented, despite the fact that a partnership of state and local initiatives promises considerable mutual benefit.

In the world today, investors talk with increasing frequency about a new kind of investment in the emerging field of "green" technologies. In Europe and the United States, hundreds of millions of dollars are being invested in the development of such new technologies. Export of these technologies to developing countries is growing. For the Central Asian countries, this means new investments. However, in addition to creating a favourable investment climate, another condition is required – governments should have a solid understanding that green growth is not a choice, but the only possible model for the development of the national economy.

CHINA

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Drained till dry

Uncertain flows of China's second longest river

BY **WANG YAN**

WUHAI, China – Fifty-year-old Kang Yintang, a local villager in Wuhai, Inner Mongolia, has spent his entire life on the banks of the Yellow River, the second longest waterway in China. To Kang, the gorgeous yet unpredictable river has been noticeably tamer in recent decades, unlike the years of his childhood. It is a change that has left its mark on the farming life for his family and neighbours. Most stark: a steady decline of the environment.

"The mushrooming chemical and mining industries have consumed excessive water and increased pollution, causing constant crop death," Kang tells NewsChina. "The corn in our field has withered and blackened in the last two years. This year, we were forced to completely stop farming." Now, to make ends meet, both Kang and his wife work at a local factory.

These are revelations that bring into sharp relief what the Yellow River means today. Historically, it was known as China's "mother river," and its basin was the birthplace of ancient Chinese civilizations. The terrain it flows through was known in early Chinese history as the most prosperous region. However, frequent devastating floods and river course changes caused by the continual elevation of the riverbed have made it extremely wild and problematic, often putting human lives under threat. Today, the river has acquired notoriety for having the highest silt content of any waterway in the world.

Since the 1960s, thanks to considerable efforts including the strengthening of levees and the construction of dozens of large hydropower projects along the river, flooding has been controlled. However, due to rapid, unrestrained economic development, the river's unprecedentedly calm surface belies the new and worrying problems brought on by overexploitation. At 5,464 kilometres in length, the Yellow River contains only two per cent of China's water resources, yet provides water for 12 per cent of China's 1.3 billion people. It irrigates 15 per cent of its farmland and generates about 14 per cent of its GDP.

"The river basin lacks water resources, and the water supply currently drawn from the river is beyond its capacity," says Chen Xiaojiang, director of the Yellow River Conservancy Commission (YRCC) of the Ministry of Water Resources. The river runs through seven provinces and two autonomous regions and empties into the Bohai Bay on the coast of east China's Shandong Province. In 1972, it failed for the first time to reach the sea, and flow interruptions have regularly been observed since 1987. The annual frequency of "dry days" reached a peak of 226 days for a 704-kilometer section of river in Shandong in 1997.

In 1998, the National Development and Reform Commission (NDRC) – formerly the State Development Planning Commission and the Ministry of Water Resources – issued annual water-use quotas and a distribution scheme for the river. These management policies determined total water withdrawals on the basis

of hydrology, the need for sediment transport and other ecological factors. It established annual provincial water withdrawals, including a seasonal distribution plan for greater withdrawals in the rainy season.

With the authorization of the State Council, YRCC acts as the sole administrator for the allocation of the Yellow River water supply to the nine provinces and autonomous regions through which it flows. In March 1999, the commission issued the first water withdrawal quota directive and started the water withdrawal control plan for the whole basin. This policy was extended from the main Yellow River to its tributaries in 2006.

According to information provided to NewsChina by YRCC, the river's annual water resources that can be tapped is 58 billion cubic meters and 37 billion cubic meters are allocated to the nine provinces and autonomous regions, and the remaining 21 billion are earmarked to wash away silt in the river. The quota for each province and autonomous region is based on their population size, economic structure and water demand. A trade in water-use rights between various sectors has sprung up in some provinces.

Implementation of these policies has ensured uninterrupted flow of the river to the sea for 14 consecutive years since 2000. The water resource and ecological health of the whole basin has benefited, too. Ecosystem integrity and biological diversity have improved greatly.

Despite the apparent achievements of the water allocation policies, overexploitation of water resources has made the Yellow River lose its momentum and a significant proportion of its water capacity.

China's initiative to develop its western regions propelled the exploration of the untouched abundant energy and mineral resources along the upper and middle sections of the river, and demand for water to sustain these industries has kept increasing. According to YRCC, "most of the nine provinces have reached the ceiling of their respective water allocation quotas, thus water shortages are the major bottleneck for social sustainable development for the whole river basin." Different stakeholders all want more water to ensure daily production – hydropower dams want water to generate electricity, the energy and mining industries want water to maximize production, farmers want water for irrigation, and cities need water for daily living.

According to hydropower records, water levels of the Yellow River were only 60 per cent of normal in 2008. Even at such a critical juncture, in that year alone, 600 million cubic meters of water was diverted to Beijing, Hebei and Shandong Provinces to mitigate a drought and further to ensure adequate water supplies for the 2008 Olympic Games. An extra 70 million cubic meters was diverted to the city of Qingdao, where the sailing events were held.

The Yellow River's water shortage problems is exacerbated at its very source on the Qinghai-Tibetan plateau. The declining rainfall and the melting of Tibetan glaciers caused by global warming could make the situation worse. Wang Yongchen, founder of environmental non-governmental organization Green Earth Volunteer, has personally visited the headwaters of the Yellow River in Qinghai. According to Wang, the river's source has been constantly receding since 2009. "This year the source has receded to over 3.5 meters away from its original geographical landmark," Wang, who recently returned from her fourth visit to the region, tells NewsChina.

Cui Sheng, an environmentalist from Henan Province told NewsChina that desertification caused by permafrost destruction on the Qinghai Plateau is spreading, a significant threat to the existence of a number of great rivers, not only the Yellow River.
More importantly, the out-dated allocation plan, which was originally based on the provincial water consumption requirements of the late 1980s, does no longer fit current economic conditions. For example, the status of the Ningxia Hui Autonomous Region and the Inner Mongolia Autonomous Region as agriculture-focused regions meant that the plan set forth in 1999 focused on irrigation water consumption. Nowadays, aside from agriculture, the two regions, which contain 800 kilometres of the Yellow River, are the two fastest developing regions in the high water-consuming coal-to-chemicals industry. Thus, for the past few years, the two regions had to resort to trading water-use rights between the mining industry and agriculture in order to meet their needs.

"The plan is out-dated," said Qi Pu, senior engineer at YRCC told NewsChina during a phone interview. "The conflicts of interests among different provinces are getting more severe, and it is difficult to resolve them at the moment."

Over the past two decades, numerous fast-developing cities have sprung up along the Yellow River, like Wuhai, a resourceful industrial city that developed fast in the middle section of the river. And like most rivers in China, the Yellow River suffers from the scourge of water pollution. In 2007, YRCC released a water quality survey that graded 33.8 per cent of the river system at "level 5," deeming it unfit for drinking, aquaculture, agriculture, and even industrial use.

Zhang Qing from Water Resource Protection Bureau of YRCC told NewsChina that in 2006, the central authorities had begun to place more emphasis on pollution control, and that this, together with the water allocation programme, had helped to improve the situation. Since 2009, on the river's mainstream, the total length of the river with water quality level 4 and 5 reduced to 29.4 per cent. Despite the effects of pollution control measures, Zhang also admitted that it was difficult for YRCC to monitor individual enterprises and prevent them from polluting the river.
"At present, for the whole drainage area, the two most polluted river sections are from Ningxia to Inner Mongolia, where the mining industry is concentrated, and the intersection region among Shaanxi, Shanxi and Henan provinces, which is also an area rich in coal and energy resources," said Zhang Qing.

The most recently reported industrial water pollution issue along the Yellow River concerns the large petrochemical complex in Baotou, Inner Mongolia. The plant, owned by the State-owned Shenhua Group and initially scheduled to begin commercial production in late 2011, is part of a high-profile project to produce polyethylene and polypropylene from coal. Without obtaining the requisite permits to release waste water into the Yellow River from YRCC, the plant has been pouring waste into the river for the past two years. Most affected, consequently, are many local fishermen, who have been forced to shoulder huge financial losses. Following an inspection in June, YRCC issued a notice to the company requiring it to stop operations and make arrangements for the treatment of its waste water.

"We only have the right to monitor enterprises that release waste water directly into the mainstream of the Yellow River," said Zhang Qing, adding that even this limited power, granted by China's Water Law, is rarely respected by enterprises. "People regard the monitoring of and punishment for river pollution as the responsibility of the environmental department." Indeed, YRCC only acts as a water quality monitor. Once pollution is identified at source, it is authorized only to make recommendations to local government or environment departments, but has no executive right.

The responsibility of monitoring individual waste water releases lies with the department of water resources, while the environmental department deals with management of water pollution – a complicated bureaucratic situation that has posed obstacles for water pollution control along the entire length of the river. On 2 September 2013, the Shenhua Baotou plant announced the launch of second phase of its project. So far, there has been no feedback from any sources on the results of the management of the plants waste water. According to China Business Journal, the plant might have diverted the release of its waste water to a local water treatment plant in Baotou.

"Similar cases have been identified, and our responsibility is to stop the enterprise from releasing waste water into the Yellow River 'directly,'" said Zhang. "We are not responsible for its internal management of waste water treatment."

High hopes

Sanjiangyuan Reserve, home to China's 'water tower,' thrives on local guardians

BY **WANG YAN**

YUSHU, China – Our pickup truck left Qumahe town to traverse along a dirt road towards Cuochi, a village 230 kilometres to the west. Cuochi is the heartland of the Sanjiangyuan National Nature Reserve (SNNR), a sprawling alpine grassland, 4,000 meters above sea level.

The scenery was breath-taking and full of surprises for a Han-Chinese city-dweller like me. The first of them: wild animals appeared more numerous than people in this desolate green region. Herds of Tibetan gazelle raised their graceful heads to peer with interest at our passing vehicle before continuing to graze. Tibetan wild asses, known locally as kiang, stood proud and motionless along some stretches. Elsewhere, they were brown smudges in the distant horizon.

Luo Sa, a 30-year-old Cuochi local and my driver, turned his head. "Nowadays the animals are not as scared of people as they were in the 1980s and 1990s," he said. "Then, hunting was rife and all wildlife fled at the sound of an engine."

Like most local people living in this vast and remote region, Luo Sa used to hunt and eat local fauna. Now, he educates outsiders like me about the spectacular fauna inhabiting his area. How times have changed!

Sanjiangyuan, or "Source of Three Rivers," is where the Yellow, Yangtze and Mekong rivers originate. It is a vast area of some 366,000 square kilometres and dominates the southeast corner of Qinghai Province.

Apart from its status as "China's water tower," the SNNR's glaciers are also the source of major waterways in countries across Southeast Asia – from Myanmar to Vietnam – providing drinking water to tens of millions of people. The rich turf and ample freshwater supply, as well as its remoteness from the human realm, have made Sanjiangyuan one of the world's most diverse ecosystems. It is home to rare and unique species such as the Tibetan antelope, Tibetan wild ass, argali sheep, Tibetan gazelle, red fox, Tibetan fox, wolves, black wild yak and musk deer.

In 2003, the SNNR was made a national nature preserve covering an area about the size of Germany. At the time, the central government invested 7.5 billion yuan (US$ 1.2bn) to preserve the full ecosystem with all its flora and fauna, and to maintain the livelihood of the diffuse Tibetan communities living within its borders.

Studies have shown that in the last decade, enhanced enforcement of wildlife protection in Qinghai Province has increased the breeding populations of both Tibetan gazelles and kiang. With this increasing prey base, the number of sightings of snow leopards, one of the world's rarest carnivores, has also increased.

Biodiversity research conducted in August 2012 by the Sanjiangyuan Reserve Administration, Centre of Nature and Society at Peking University and the Shanshui Conservation Centre reported sightings of seven snow leopards during a twenty-day field study in the SNNR. Recordings also revealed a jump in the number of wild blue sheep, another major food source for snow leopards, to some 20 individuals per square kilometre.

However, the scars of the 1980s and early 1990s, when many wild animals were hunted to the brink of extinction, will take decades to heal. The Tibetan antelope, or chiru, in particular, suffered from intensive poaching to feed the underground demand for bush meat, wool and traditional Chinese medicine markets. Wool from the chiru is highly prized, and was smuggled by the ton into India, where it would be woven into expensive shahtoosh shawls. In the 1990s, the chiru almost went extinct as a result of poaching.

As our vehicle bounced toward Cuochi, we crossed the expansive Lematan range, where a motorcyclist, wrapped in a heavy coat, flagged us down. The motorcyclist, 50-year-old Qiong Zhe, told us he was a patrolman from the Chiru Brigade, an anti-poaching outfit charged with protecting chiru in the areas around Lechi village, a short drive from Cuochi.

Tanned and weathered, Qiong tucked his hands into his armpits to protect against frostbite and informed us about his work. That day, his team of 50 rangers, all of whom were volunteers from local villages, had poachers on their minds. Such work was in addition to their usual responsibilities, herding their family livestock.

Qiong and his team are responsible for going after poachers or prospectors either on motorcycle or horseback. They also perform the role of conservationists, conducting a monthly head count of local chiru and reporting their findings to village officials. The latter passes the information to zoologists. The top figure reached so far, according to Qiong, was 800 head of chiru.

"I like wild animals, and Tibetan Buddhism teaches us that every life is equal, thus we need to protect them," said Qiong. "We started this initiative in 2010 influenced by our neighbouring village – Cuochi."

According to Gazong Cairang, Lechi's village chief, the whole Lematan range, an area of some 717,587 square feet of grazing pasture, has been set aside for the exclusive use of chiru. "Lechi is the traditional habitat for chiru," he told me. "After seeing Cuochi's achievements in protecting wildlife, we recognized our responsibility to protect them too."

The Qinghai provincial government has named both Cuochi and Lechi as model villages for community-based environmental conservation and major contributors to zoological research. But, as locals will readily explain, part of their motivation to protect the local wildlife is spiritual, rather than scientific. During the Cultural Revolution, the Tibetan Buddhist monasteries and the resident priests came under withering attack, with local religious beliefs and associated culture almost completely eradicated. Still reeling from this shock, in 1985 locals faced an unprecedented blizzard that killed most of their livestock and ruined many hectares of pasture. Many families, facing starvation, turned to hunting to feed themselves.

A Tibetan Buddhist revival was a contributing factor to the decline of hunting. A Rinpoche, or high-ranking lama, arrived in Cuochi and Lechi to preach compassion for all life and respect for the mountains and rivers that nurtured it. The involvement of local monasteries or monks in environmental protection, while often omitted from official media reports on the SNNR, is crucial to the conservation effort.

Cuochi village banned hunting in 1988 "in the interests of karma," and set up its own community laws for the punishment of poachers. "Even before the government drive to confiscate all guns and rifles in early 2000, the villagers had already stopped hunting," said Ga Ma, Cuochi's Communist Party Secretary.

According to Gama, Cuochi's conservation drive began with concern for declining wild yak populations caused by interbreeding with domesticated yak, resulting in robust and valuable hybrids. In 2004, Tashi Dorjie – or Zhaduo as he is commonly known – an ethnic Tibetan born in Cuochi and founder of the Snowland Great Rivers Environmental Protection Association (SGREPA), helped his home village to set up the Wild Yak Brigade anti-poaching initiative.

Tusong, Cuochi's village head, told me that an initial team of 56 volunteers has since grown to over 200. "Four times a year, they set off to count the wildlife within our village area of about 2,000 square kilometers, keep track of animal movements, record weather conditions and observe the mountain glaciers" said Tusong. "Generally, the patrol takes a whole day and requires a 20-kilometer motorcycle or horseback ride."

"We used to have frequent heavy storms, even droughts in the previous decade, but after we started the protection program, we noticed the grass grew better and the livestock seemed healthier," Gama told me. "We will continue to attain a benign cycle. Now wild yaks and chiru are not afraid of human beings or vehicles, even of car horns!"

Under the seven-year-long first phase of the SNNR plan, the Qinghai provincial government also adopted so-called "eco-migration" policies in the name of easing human pressure on natural resources, specifically the overgrazing of pastures.

Since 2005, a total of 50,000 people, mostly ethnic Tibetans, were relocated from their original pastureland in the area to suburban areas of nearby population centres. Different from similar plans in other parts of China, however, where locals have effectively been forced from their ancestral homes, eco-migration in this remote region is, at least officially, entirely voluntary. Thus, while some families have chosen to relocate, a significant community of nomads has remained on their pastureland. In Cuochi, for example, out of 301 families in 2005, only 43 families have moved to Golmud and other cities.

Gama said Cuochi has also refused government demands that they fence off private pastures. Households continue to use their own traditional winter and summer pastures, and the village has also reserved common grazing land for use in emergencies.

"The reduction of livestock is not a good thing for pastureland. Without yak and sheep droppings, or regular trampling, there is not enough nutrition for the grass to grow," said Ouyao, a SGREPA project manager. "Eco-migration has encouraged the departure of most of our young people and children. I fear they could cut their ties with the land, the livestock, and never return."

"All the traditions have been lost, and I expect that in no more than 20 to 30 years, if there are people herding, they will not be local Tibetans, but outsiders hired by big companies or rich investors," he continued.

"Things are interconnected," Zhaduo remarked in our interview. "Modern lifestyles and eco-migration drove more youngsters away to study, so there are not enough people to herd sheep. That's why most households only raise yaks."

UNEP GEO 5 report states "the exclusion of local communities from many state and privately protected areas along with a failure to fully acknowledge their role in safeguarding biodiversity remains a challenge to real progress."

Due to its achievements, Cuochi became a pilot region for a new protection model, entitled "Agreement Protection," in 2005. It is promoted by environmental non-governmental organisations, including Conservation International and the Shan Shui Conservation Centre, with endorsement from SNNR Administration, a government-backed authority.

According to the groundbreaking agreement, the SNNR Administration signed a two-year renewable contract with Cuochi village. It outlines that responsibility for the protection and monitoring of wildlife falls within the

responsibilities of the local villagers, with the associated bodies responsible for providing scientific guidance and financial support.

So far, the new model has operated smoothly, with patrols now equipped with cameras, binoculars, and professional outdoor clothing and equipment to deal with the harsh terrain. Detailed and scientific records are now habitually presented to local administrators.

"This is indeed not an issue of money, but authority," Zhaduo told me in his office in Xining, the provincial capital. "The spontaneous protection by the community is the most cost-effective method of conservation, since the people who live on the land know it the best."

"So long as these people are willing to guard their own living homeland, once they are endowed with power and capability, they will do a great job. The locals here are the main protectors of the environment. So when we started conservation work on the plateau, the most important thing was to involve them," he continued.

Wang Xiaoyi, a sociologist from the Chinese Academy of Social Sciences, has publicly endorsed Agreement Protection as a viable alternative to existing conservation initiatives. The latter have resulted in the decimation of ethnic communities followed by widespread environmental degradation.

"This might be a very meaningful new attempt ignited by environmental NGOs," he said. "However, protection of the SNNR is a very complicated issue. Without a sound comprehensive regional and village-level framework, its effect in some areas is limited."

My curiosity about the spread of these community-based conservation initiatives took me to Yunta, a village on the banks of the Yangtze, where a similar scheme has just gotten underway.

When I arrived on a gloomy afternoon in mid-February, local Dang Wen was preparing for his monthly patrol. Thanks to the cultivation of a local caterpillar fungus (Cordyceps), a popular and valuable component in traditional Chinese medicine, local villagers are relatively well off. They can earn average annual incomes of 100,000 to 150,000 yuan (US$16,000 to 24,000). Located in a valley and surrounded by rocky cliffs and alpine forests, the territory is rich in blue sheep, bear, deer, and snow leopards.

"We spend two days each month in the mountain valleys to see if there is illegal deforestation or poaching going on, as well as collecting garbage," said Dang Wen. "Our monitoring records have been kept updated since October 2012, and we pass the results on to the Shanshui Conservation Centre."

Yunta's villagers, according to the superior Haxiu Township head Xi Ran, have always had a strong affection for local wildlife. The village has already sent a prospecting outfit from the Guizhou Province Non-ferrous Metal Bureau packing, despite the company's presence being approved by the hugely powerful national Bureau of Land and Resources.

"We are thankful for the clean water, fresh air and everything else nature has bestowed upon us," said Dang Wen. "I have no plans to leave my home village and I hope my children will stay in this beautiful paradise instead of going to the big city to make money."
George Schaller, a renowned biologist and veteran of the Tibetan plateau remarked in his book Tibet Wild (published in 2012): "It has become axiomatic that conservation can be successful only if local communities are fully involved in planning and implementing management efforts. Indeed, rangelands lend themselves well to long-term conservation as long as the approach is adaptive and flexible, and pastoralists can remain mobile. Other countries, such as the US, Australia, and many African countries, have degraded their rangelands extensively through indifference, negligence, imperfect scientific information, and lack of suitable policies."

Schaller continues: "We can learn from their mistakes and should apply any relevant knowledge here, and initiative the largely responsibility of Chinese scientists in cooperation with provincial and local officials and with community leaders."

Conservation on the Tibetan plateau, one of China's most vulnerable ecosystems, has become a major concern for governments at all levels. Despite this, there are rumours that the government is about to pour another 100,000 billion yuan (US$16 bn) into the region. Little wonder that questions have been raised about how, precisely, this money will be spent.

Mining, sand extraction, road construction and tourism development are all encroaching on the habitats of wild animals, as well as contributing to deforestation and receding water resources.

Locals are aware that, while they are currently able to fight off destructive enterprises, their power is limited by China's top-down development strategy, putting the future survival of these regions at the mercy of Beijing policymakers. "Can you tell me what would happen if mining or prospecting in these regions was endorsed by the central or provincial government, rather than by private companies?" Dang Wen asked me. "We couldn't stop them. What would we do?"

Communities on the Tibetan plateau, in particular, fear mining, which is as rich in mineral wealth as it is in wildlife. Zhaduo told me that there are over 100 mines in the Sanjiangyuan region, including some joint ventures with Canadian mining company Inter-Citic Minerals Inc., located only 12 kilometres upstream from the SNNR Core Zone. Inner Mongolia, formerly a pristine steppe populated almost entirely by herding communities, has now been eviscerated by similar profusions of opencast mining and sprawling urban developments.

I had no answer for Dang Wen. I was reluctant to raise other examples where community-based conservation has been shunted aside in favour of industrial and commercial development. The Evenki trapping communities in the northeast came to mind. So I simply offered a silent hope that community-based protection efforts such as his, rather than the entreaties of State-backed mining conglomerates, would make their voices heard in the corridors of power.

PHOTOS: ACEF CHINA

Environmental champions

Chinese lawyers take the stand for victims of industrial waste

BY **WANG YANI**

BEIJING, China – In battling powerful polluters in China, one environmental lawyer has found strength in numbers. It is a strategy that has enabled Zeng Xiangbing to make waves in his quest to aid the victims of industrial waste.

The case that has propelled Zeng to national attention grew out of a dispute pitting two villagers – Yu Dinghai and Wei Kaizu – against Dashen Chemical, a sulphuric acid production and phosphate mining company. Yu and Wei had been arrested in September 2012 and charged with blackmailing the company.

The fate of the villagers had not gone unnoticed by environmental activists. Green groups had taken to the Internet soon after, urging the Zhongxiang City Court in Hubei Province, in central China, to release the two villagers. Yu and Wei, after all, were not isolated victims of a company located near their village, Liuchong, in that province on the eastern edges of central China. They were two of a large number of local victims who had suffered from the company's pollutants.

"We were not just fighting for an individual case – we volunteered to defend [Yu and Wei] for the sake of protecting any victims of pollution in China who may someday be framed by their polluters," says Zeng, a Wuhan-based environmental activist and Yu and Wei's defence counsel. It was, in one way, a typical case that the lawyer in his late 40s has made a career out of. He had by then defended disadvantaged farmers whose land had been polluted and who felt hopeless in their struggle against local industry and government officials.

In early April 2013, Zeng went to Liuchong Village to examine the environmental damage caused by Dashen Chemical. Local villagers blamed the chemical plant, which had been in operation for over a decade, for their withered crops, dying trees, polluted water and declining health. Each day, trucks leave the factory to dump the industrial by-product of phosphate fertilizer, which contains carcinogenic chemicals like arsenic and cadmium, onto a heap of ash in the nearby river valley.

Since 2010, farmers affected by the pollution have assembled to protest at the Dashen factory gates, and have even made several trips to Beijing to petition the central authorities. Facing pressure from the provincial government, Dashen Chemical finally agreed to compensate affected farmers. In August 2011, Wei and Yu, both in their early 50s, became the first two farmers to be compensated for lost livestock and crop failures due to the pollution.

However, that small triumph did not calm the victims. When other villagers failed to receive compensation from the factory as promised, the protests continued. According to Yao Chengying, wife of Wei Kaizu, the local

government was caught off guard by the community's anger. Their immediate reaction was to arrest Wei and Yu, accusing them of blackmailing Dashen Chemical. That move, Yao believes, was meant to send a warning to the other protesting farmers. The villagers also sniffed out another motive for the two men to be framed – the local government owns a stake in Dashen Chemical, and had caved in to appease the company's management.

But when Zeng heard about the case, he realized that it could set a benchmark in the world of legal environmental affairs nationwide. "If the two are not properly defended and do not win their freedom, it will be difficult to encourage pollution victims to speak up in the future," Zeng explained.

And then he set his sights on a novel strategy to wage a legal battle with the polluter. Zeng soon enlisted the participation and support of more than twenty lawyers from seven different provinces, forming a pro bono legal counsel coalition to assist in the Zhongxiang case. "Polluters tend to be powerful and aggressive, which makes most lawyers unwilling to get involved in environmental lawsuits," Zeng noted. "Although there are only a small number of experienced environmental lawyers in China, it is now necessary to combine their individual efforts and establish a network to protect civil rights."

In Zeng's opinion, in addition to the provision of mutual support, a national network would be better equipped to circumvent pressure from local governments or judiciary. "Since I am a local lawyer in Hubei, if the Hubei Provincial Department of Justice pressures me or prohibits me from taking part in a certain lawsuit, I could ask lawyer friends from other provinces to take the case."

The Zhongxiang case, the first such brief taken on by the coalition, became the subject of a forum in Beijing in 2013, where non-governmental organisations (NGO), campaigning for a better environment, and lawyers gathered to discuss possible approaches to the issue.

Yu and Wei's cases were opened in Zhongxiang City Court on 26 and 27 April 2013, respectively. Two months later, no verdict was delivered. "We predict the Zhongxiang City Court will find them guilty. Nevertheless, we will continue to appeal, and I firmly believe the final result will be 'not guilty,'" said Zeng. That proved correct. After four months, the Zhongxiang City Court ordered the withdrawal of the lawsuit and the two accused were released after being jailed for 300 days.

The Zhongxiang case, however, was not Zeng's first attempt at filing an environmental public interest lawsuit. In 2011, he represented Friends of Nature, a well-known Chinese environmental NGO, in filing a lawsuit against Luliang Chemical Industry, a company accused of dumping more than 5,000 metric tons of highly toxic chromium waste in three townships of Qujing, in southwest China's Yunnan Province. The case was regarded as a landmark suit, since according to the Civil Procedure Law at the time, social groups without government accreditation could not independently file environmental litigation in the public interest.

Such cases reveal the environmental price that has been paid for three decades of rapid economic development in China. It has left much of the nation's countryside – the source of China's food supply – contaminated with toxic chemicals, and 80 per cent more Chinese people suffer from cancer than 30 years ago. Emissions from factories are often blamed for particular cancers among residents in affected areas and "cancer villages" have become a widely reported phenomenon in recent years.

As environmental pollution incidents have become more numerous and complex over the past two decades, so have the environmental disputes dealt with by the legal system. This has also seen the emergence of professional legal aid organizations providing aid to people and communities harmed by pollution across the country.

In 1998, Wang Canfa, a professor at the China University of Political Science and Law, established the Beijing-based Center for Legal Assistance to Pollution Victims (CLAPV), the first of its kind. The centre has handled more than 280 cases, and Wang was included in TIME magazine's "Heroes of the Environment" list in 2007.

Aside from NGO-sponsored legal assistance, since mid-2000 there has been a continued acceleration in the implementation of government-sponsored legal aid programs for environmental lawsuits. The All-China Environment Federation (ACEF), affiliated with the Ministry of Environmental Protection, was set up in 2005 to provide legal aid to victims of pollution and offers training to volunteer environmental lawyers. It received financial support from the Chinese government and occasional funding from organizations such as the United Nations Environment Programme (UNEP) through the Asia-Pacific Forum for Environmental Development (APFED) Showcase Programme.
According to Ma Yong, Vice Director of the environmental legal service center under ACEF's : "A three-day training program for environmental lawyers has been held twice every year since 2006 in different parts of the country, and so far a total of 233 lawyers have undergone training." Lawyers from various provinces in China have, subsequently, formed a large network with the necessary training to work pro bono on environmental pollution lawsuits.

ACEF receives an average of 200 complaints every year, and so far it has taken on 560 cases with 298 resolved either through mediation or lawsuits. Since Ma's resources are limited, he gives priority to cases that have "caused severe damage to locals' health, widespread pollution in the region or even mass unrest," sending "suggestion letters" to local governments or environmental protection departments in less serious cases.

Zhao Jingwei, a lawyer with Yingke Law Firm in Beijing, seeks to cooperate with ACEF in providing pro bono services to victims of pollution. In late 2011, he represented 107 fishermen from Hebei Province who filed a lawsuit against ConocoPhillips, the U.S. Energy company involved in the devastating 2011 Bohai Bay oil spill.

According to Zhao Jingwei, after ACEF receives a complaint from pollution victims and decides to sue the polluter, the organization will ask for his help or the help of other volunteer lawyers. He then begins the lengthy process of evidence collection and accreditation, before filing the lawsuit. Zhao said that environmental lawsuits can take years to be resolved, sometimes being postponed indefinitely.

Zhou Ke, a professor at the law school of Beijing's Renmin University, pointed out that placing all hope of solving environmental problems in litigation highlights the failure of the government to address environmental problems with administrative measures.

But Zhao Jingwei remains optimistic: "The participation of lawyers in environmental public interest lawsuits has gained recognition from the political system, and since 2007, over 90 local environmental protection courts have been established in China."

Zeng's efforts offer ample testimony to such a shift. National awareness of his public interest legal coalition to take on environmental cases – such as the Zhongxiang case – has resulted in growing demand from victims. His group has received more than 10 requests from different parts of the country. They all seek legal help to file public interest cases against polluters.

"The current situation for environmental lawsuits is awkward. On one hand, most lawyers do not want to take environmental law cases, since they are hard to win, rarely lucrative, and in most circumstances attract pressure from the local government," reveals Zeng. "One the other hand, surging numbers of pollution victims are in urgent need of legal aid."

The Zhongxiang case was ground-breaking, he conceded. "The result will be a crucial one for the future of environmental pollution (and) civil rights protection."

TRUE BELIEVERS

Chinese lawyers face heavy odds in the green cause

BY **WANG YAN**

BEIJING, China -- Environmental lawyers who offer pro bono services continue to face financial challenges. They need to cooperate with local green groups for funding which helps to cover basic costs for scientists and lab technicians. Due to the scarcity of funds, these lawyers barely make a living when they take on environmental protection lawsuits.

Zhang Jingjing, former Deputy Director of the China chapter of the Global Network for Public Interest Law (PILnet), a public interest law network, says that China lacks what prevails in the United States. There, U.S.-based environment non-government organisations (NGOs), such as Earth Justice, can turn to a large number of professional lawyers to handle environmental lawsuits.

"But in China, there are hardly any lawyers who work full-time for domestic NGOs. Overall, Chinese NGOs are weak in numbers and influence, and lack funds," says Zhang. "As far as I know, there are only a dozen [environmental] lawyers driven purely by personal idealism who are actively involved in environmental public interest affairs in China."

But that is not the only hurdle in targeting companies polluting the environment. Even getting verdicts in their favour remains difficult, environmental lawyers complain. They feel, likewise, when filing a lawsuit against a local polluter. That climate largely stems from the blatant interference in the judicial process by local officials, many of whom appear set on protecting local industries.

"Environmental public interest lawsuits cannot change the current situation of excessive pollution. Unfortunately, since victims of pollution are unable to file 'private interest' lawsuits, there are more and more of these kinds of lawsuits appearing," says Zeng Xiangbin, champion of the victims affected in the Zhongxiang case. "Anger over unchecked environmental destruction is one of the main sources of rural unrest in China, often causing mass protests against the local government's approval of constructing chemical plants. Ironically, the largest of these protests are often successful."

But, there have been a few glimmers of hope. As more environmental cases caught the public eye, environmental public interest lawsuits began to gain weight in China's justice system. What has helped is a change in China's Civil Procedure Law. Before 2012, the plaintiff had to be someone who could make a case that his or her personal or property rights had been directly damaged by "illegal behaviour," the law stated.

Not anymore, due to years of lobbying by environmental lawyers. The Civil Procedure Law, which was revised and passed on 1 January 2013, has embraced new rules for "public litigation." This means it is easier to file cases involving environmental pollution, violation of consumers' legal rights and other behaviour that damages social and public interests. Legally stipulated bodies and related organisations have, consequently, been given the freedom to file litigation through China's court system.

This official recognition of environmental public interest lawsuits was hailed as a dramatic step forward. But, the limits still on the books of the changed law have riled lawyers in the vanguard for a greener China. "To limit the rights for environmental public interest lawsuits to a single organization is prejudicial towards other social groups, and I would not agree with it," argues Wang Xi, Director of the Environmental and Resources Law Institute at Shanghai Jiao Tong University.

They are views mirrored by other scholars. Xu Xin, law professor at Beijing Institute of Technology, has publicly claimed that legally registered environmental groups and all related public interest organisations should enjoy equal rights to file environmental lawsuits.

MYANMAR

PHOTO: BOOTHE THAIK HTUN

PHOTO: BOOTHE THAIK HTUN

Water woes

Currents flow against a Myanmar lake with rich heritage

■ BY **KHIN SU WAI**

NYAUNGSHWE TOWNSHIP, Myanmar – Sometimes, a poster meant to broadcast a message can result in unintended consequences. That is what happened in Yangon, the former capital of Myanmar, between two groups of youths during a three-day gathering of young people living on the banks of Inle Lake, a sprawling body of freshwater in the shadows of the hills in the Shan State.

The youth had brought a vinyl poster that they thought conveyed their view of the lake that shimmers at the edge of this township in north-eastern Myanmar. It depicted a fisherman standing in his long wooden boat in the lake. Near him was his conical fishing net. In the background were the Shan hills, bearing signs of the lost forests that once covered it. Instead of green trees, the hills had large patches of emptiness.

"I feel sad about the poster you are carrying," said Ko Win Zaw Oo, the leader of the Thu Mitta team one of the estimated 400 such community-based organisations, that have sprouted up in villages bordering the Inle Lake. He said this during a session at the youth camp. It was a sentiment shared by the 50 youth gathered at the Ahtet Laeti monastery, where the group from the Myanmar Youths in Action met their counterparts from Inle Lake youth groups to discuss social activities and shared environmental concerns. No trees on the hills, Ko Win Zaw Oo continued, were the sign of environmental degradation, adding that the image of the fisherman also showed that Inle residents still lived in poverty.

"And how can we solve this? Are we happy as fishermen? Why do we remain in a state of poverty?" he asked, his voice rising with anger. "This is not a good sign and it shows an alarming situation for the livelihood of the Innthar (as the lake's communities are known)."

His concerns have broad implications. They run against the current of how Inle Lake is being promoted as a place known for its livelihood and environment. The reality, though, is different, with the livelihood of the Innthar and the environment of the lake improved little over decades.

For the locals, environmental threats are a growing problem. The lake has been affected by many factors, including pesticides from agriculture, chemical dyes from textile processing factories, excessive siltation from soil erosion, and the dumping of wastes and garbage.

Experts say commercial firms involved in agricultural production on the "floating islands," are the main sources of the water pollution. They compound the problems for the lake because of their excessive use of chemical fertilizers.

Yet, at the same time, the renowned floating islands are also associated with the charm and heritage of the local communities. The locals depend on the floating garden agriculture for their livelihood. Thus, to avoid undoing

PHOTO: BOOTHE THAIK HTUN

these communities ties to the water, environmental experts are exploring ways to persuade the Innthar to continue cultivating without harming the lake's environment.

The lake's troubles can be gauged by the water's acidity levels. The pH level in the central lake is around 9.6; 8.4 to the west; 9.1 to the northeast; and 8.9 and 9.3 in the southern central area, indicates a report by the Myanmar Fisheries Department. Such high pH levels affect the health of those who live on the 116 square kilometer lake, say environmental experts. High levels of dangerous chemicals have also been found in some fish species and vegetables – especially the region's most common crop, tomatoes. They account for two-thirds of the region's agricultural output.

Despite such alarm, farming that depends on chemicals continues unabated. "It is hard to switch to organic farming. The main problem is that most Myanmar consumers always choose low-cost products, and they don't care about organic foods," says Ko Yay Aye, chairman of the Inle Special Development Association (ISDA), a local organisation that promotes environmental activities, including distributing natural fertilisers. "Even when we provide organic fertilizer to farmers, they collect them and then change to chemicals fertilisers."

Tomato farmers from Yay Thar village said that if they don't use chemical fertilizers, their yields would be too low for the market. In one farmer's view, "The effects of the pests and diseases on our crops are very bad; they are very difficult to control." This statement echoes the attitude of many others.

"Most of us have only been farm workers with a daily wage of Kyat 1,500 (US$ 1.60) during the season of farming, which lasts six months," says KoKyaw Than Htay, a floating-garden worker said.

Such farming woes are captured in the award-winning film The Floating Tomatoes, a Myanmar documentary that highlights the steady environmental degradation of Inle Lake. It was directed by Min Htin Ko Ko Gyi, a poet and founder of the Human Rights Human Dignity International Film Festival.

There have been some efforts to help. Leading the way are some international and local non-governmental organisations (NGO) focusing on environmental conservation. Consequently, the Innthar became aware of the environmental problems. But it is not easy to change old habits – the high dependency on chemical fertilizers for their floating gardens.

Such environmental conservation assistance has been appreciated by the locals. "As much as can I see, some NGOs making good effort for us, but some are not. Some NGOs don't understand the livelihood needs of Innthar ," says Inle Lake resident U TheinTun, from Min Chaung village.

"Many NGOs come to Inle. But if they survey the lake, they use two local samples and eight samples from other regions. Their surveys don't reflect the actual situation of the region. That ratio should not be like that," says Ko Yay Aye, the ISDA chairman.

Innthar residents say it is unfair to depict them as contributors to the lake's worsening environment. They point to other factors, such as the growing numbers of new hotels to attract tourists to the lake, and other ethnic groups who live the surrounding hills.

But according to Tun Aung, a representative in the Shan State Assembly, the Innthar hold the responsibility to conserve their native land, and they should understand the role they play.

Given the challenges that have surfaced, a conservation plan for Inle Lake has taken on new urgency. One of the issues in focus is the sharp increase of foreign tourists to Myanmar visiting the lake, revealed in the 118-page report, Inlay Lake Conservation Project: A Plan for the Future, funded by the Government of Norway.

While the increasing number of tourists generates new income, the net benefits to the regional communities may be offset by environmental costs to the lake, the report notes.

Adding to this are new demographic realities. The latest government figures reveal that the lake is being impacted by the effects of a rising local population, which has reached about 200,000 people. The annual dry season, which peaks between March and May, offers the Innthar a regular reminder of the troubles bubbling in the lake that they call home. The most visible are the shrinkage of lake surface area and the decline of native water plants.

PHOTO: BOOTHE THAIK HTUN

Digging in with worms

Tomato farmers weigh benefits of organic farming in Myanmar's Inle Lake region

BY **KHIN SU WAI**

NYAUNGSHWE TOWNSHIP, Myanmar – In an environment where pesticides and chemical fertilisers have long been used on tomato farms, talk of using natural compost generally sounds out of place. But that has not dissuaded some producers who want to inch their way into green farming along the banks of Inle Lake, the second largest lake in the country. They are doing so with "vermicompost" and "vermiliquid" derived from worm farming. Vermicompost and vermiliquid are the end products of earthworms, useful as a substitute to chemical fertiliser.

Among its advocates is the 45-year-old Daw Hnin Hnin Ohn, who established this worm compost program in 2009. Her first steps into worm farming were small, starting with 40,000 worms, which cost her 4.8 million kyats (US$ 4,948). Part of her learning curve included advice from an agricultural expert about improving her worm cast techniques. A worm cast is the pile of soil pushed up from the ground left after an earthworm crawls through it. Different techniques can be applied to its collection and use as an organic nutrient fertiliser.

"My senior said that I should try worm farming because the weather in the Inle Lake area was similar to Chiang Mai (in northern Thailand), where worm farming is a success," revealed Daw Hnin Hnin Ohn, founder of the Shwe Inn-thu women's self-help group. "Then I started a small non-governmental organization group to help the villagers here."

Initially, 20 villages signed up to learn about the worm compost techniques and other related activities. Later, another 20 villages near the project field also expressed interest to produce worm compost. "Therefore, I could say the farmers from 40 villages of Inle Lake took an interest in worm compost," says Daw Hnin Hnin Ohn, from the Inn ethnic community.

The project area promoting the worm compost is spread across four villages – Main Thauk, Thale Oo, Taungchay and Nan Pan – along the eastern side of the lake, which has a 116 square kilometre expanse and lies 880 meters above sea level.

"The small-scale farmers and moderate-scale farmers use the vermiliquid and vermicompost and also show a big interest in worm casts," she said. "They know its benefit well, because they can use not only worm cast in their farming, but also sell the bags of worm cast."

And once they had dug in, the worm compost producers got a taste of rewards. Worm casts were in high demand from paddy, onion and tomato farmers near Inle Lake. Even those having flower gardens and growing dragon fruits were hooked.

"I sold each compost bag for 20,000 kyat (US$ 20) and 500 kyat for each of one litre bottle of vermiliquid. One year I

earned three million kyats (US$ 3,097) from the waste water of worms," said Daw Hnin Hnin Ohn. This waste water is another source of organic fertiliser. "Normally I got 48 worm compost bags every three months. I sell 30-35 bags to others. The ones left I use for my own dragon fruit gardens."

She also realised she could sell each bag for 50,000 kyat (US$ 51) if the vermin-compost bag from her worm farm was nicely packaged like the bags sold in Bangkok.

But tomato farmers who cultivate large areas and aim for high profits have looked askance, rejecting the worm compost option. Farmers from Yay Thar village, one of the lake's over 400 villages, say that if they do not use chemical fertilizers, their yields are too low for the market. Persistent pests and diseases would add to their woes if no chemicals are used, they add.

Daw Hnin Hnin Ohn thinks otherwise. The farmers need to change their old farming practices, she argues. They should know "vermicompost" is richer in many nutrients than compost produced by other methods. In addition, consumers need to know of healthy products.

Like other non-government organisation (NGO) projects, Myanmar Agriculture Services also has distributed the natural compost Dochakin, margosa compost, EM (effective microorganisms) liquid Trigoderma, and information about how to make worm compost techniques to the villagers around Inle Lake. It is part of a push for chemical fertilisers reduction on farms.

But according to U Tin Soe of Shwe Ngar, a local wholesale tomato trading sale centre, there are many factors that dissuade large-scale tomato producers from using natural compost. These factors range from time – if the farmers use it, it will take at least one month to prepare land before planting – to convenience – the compost is not easy to carry.

Speaking of the difficulty of getting Myanmar customers to change their consumer habits, Ko Yay Aye said: "In Thailand, if the King buys a certain product, lots of people would do the same. There is no equivalent in Myanmar to convince people to reduce the use of chemical inputs. I just want to help set a national standard for fruit and vegetables produced with minimal use of chemicals."

"It's hard to succeed in organic farming, because most Myanmar consumers choose lower priced products; they don't care for organic foods," says Ko Yay Aye, the chairman of Inle Special Development Association (ISDA), an NGO planning to produce green products with the help of experts from Israel and Norway.

Dr Tun Aung, representative of the Shan State Assembly's Nyaungshwe 1 Constituency, highlighted that the Innthar, the local community, are responsibile for conserving their native land and they should understand their impacts and roles.

But Daw Hnin Hnin Ohn said that if the NGOs really wants to introduce natural compost and fertilisers to farmers, they need time and patience to change the farmers' old agriculture practices and attitudes.

PHOTOS: BOOTHE THAIK HTUN

PHOTOS: BOOTHE THAIK HTUN

Limited harvest

Organic farming struggles to take root in Myanmar

■ BY **KHIN SU WAI**

YANGON, Myanmar – A cartoon in Kyemon, a government-owned daily newspaper, conveys a sign of the times. It features two women debating the merits of eating vegetables doused with excessive pesticides. One of the women is against such consumption, and informs the other of the dangers posed by chemicals that are ingested when eating vegetables.

Myanmar's media landscape is full of such concerns. News of food safety incidents, including those related to agricultural products, appear regularly in newspapers and on online news sites. This should not be surprising because of the growing public awareness over the excessive use of chemicals in agriculture.

One root problem is the ease with which many chemical fertilisers and pesticides are imported illegally, with instructions often only in foreign languages. The farmers use high quantities of these potentially dangerous chemicals, often risking their own health.

ORGANIC ADVOCATES BATTLE SLOW GROWTH

■ BY **KHIN SU WAI**

There could be seen steady line in the organic farming like before within five months even though there is a bit effort to food safety from the sides of government and the civil societies, such as research on Yangon 'street food (the findings highlight the scale of the city's food hygiene problem: more than one-third of the 150 samples collected were positive for either *Staphylococcus aureas* or *Bacillus cereus*, two common types of bacteria that can lead to food poisoning.), opening regional consumer affair department in each of divisions and states by the government, trying to pass the law relating consumer and trying to meet the standard of AEC (ASEAN Economic Community.)

www.mmtimes.com/index.php/in-depth/7808-organic-advocates-battle-slow-growth.html

Pictures show the organic vegetables and fruits sale at Shan Maw Myae 49 st in Yangon, Picture by Khin Su Wai

This is compounded by the stance of the Ministry of Agriculture and Irrigation, which is responsible for regulating these products. It has been unwilling or unable to enforce existing laws. Consequently, the dangers of incorrect use of pesticides remains a serious threat for growers and consumers alike.

"Food safety incidents can be seen in stories from all over the country," says Daw Than Than Sein, a consultant for Myanmar Organic Agricultural Group (MOAG), set up by the country's fruit, vegetable and flower producers and export associations to promote and monitor organic producers. "It is likely we will see more cases in the future."

And in an effort to avert future cases, the group is encouraging farmers to reconsider pesticide use. "The agriculture sector doesn't have good practices in place for the use of pesticides. To enhance food safety, MOAG is carrying out a programme to issue legal certification to organic growers and promote organic farms to avoid these problems," adds Daw Than Than Sein.

The industry faces a number of challenges, however. Farmers pursuing organic cultivation have expressed concern that large-scale farms using chemical and synthetic fertilisers could contaminate their organic products. Farmers have raised this issue at workshops on the organic vegetable industry. They have also warned that the numbers of illegal agricultural pesticides, black-market fertilisers and falsely labelled organic fertilisers are rising.

However, to move away from chemicals incurs financial losses. Yields from organically cultivated plants are often about half of what a field, pumped with chemicals can produce. In addition, MOAG-certified organic products are normally sold as conventional products because there is no real market for organic products, offering little incentive for farmers to go green.

Yet, in Yangon, the former capital, there is some hope for organic products. City Mart, a supermarket chain, is selling organic vegetables such as carrots, radishes and mustard, as well as fruits, mushrooms and rice.

"Interest from customers in organic products is still limited and mainly comes from the expatriate community," says U Soe Moe Thu, a City Mart director. "We see the market potential of organic products being limited in the near future. Organics are mainly supplied locally and volumes are still inconsistent and low. Once the supply situation improves, sales should pick up. There are a growing number of producers wanting to supply organic foods."

MOAG's certification programmes matter for this market to grow, adds U Soe Moe. The certificates give consumers and retailers confidence that the product is genuinely organic. "The main issue we faced in the past was the lack of a certification body for organic products. We were unwilling to put the products on the shelf just on the basis of the distributor's or supplier's claims that their products were organic."
Even when products are certified, it takes a leap of faith for customers to buy organic, he admitted. "Demand has to pick up first for organic products to be successful. Organic products, by nature, are more expensive and often less presentable. The success of organic products therefore depends mainly on customers who have their mind set on buying organic. This group of customers will remain very small for the time being."

Daw Than Than Sein conceded that organic produce "is still struggling to get a place" in the market. But, she also pointed to MOAG data to show that the number of certified organic farming operations increased more than three-fold in 2013, albeit from an extremely low base.
In 2011, six organic farms, covering 53.89 hectares, were jointly certified by the MOAG and Organic Agriculture Certification Thailand (ACT). Two fertiliser companies who also had organic products were approved by the MOAG. By the end of 2012, there were 20 organic farms in Myanmar.

Industry experts said there could be anywhere from 809.37 hectares to 2,023.42 hectares of organic farms in Myanmar without MOAG certification. Still, organic agriculture is a small relative to neighbouring countries like Thailand or Indonesia, where organic acreage is measured in six-digit figures.

One group that is working outside the MOAG scheme is the Consumer Protection Association (CPA), a non-governmental organisation (NGO) founded by U Ba Oak Khaing, a well-known food and health writer. Chairman U Ba Oak Khaing says his group, which has about 500 members, plans to grow organic mushrooms and paddy.

The CPA has opted not to apply for MOAG certification because the association feels that its organic experts are more than qualified and some were formerly members of the MOAG. The association, which formed in August 2012, plans to open its own organic sales centre for products grown on its 16.1874 hectares of land as a means of developing the organic market.

U Ye Win Thein, Vice Chairman of Bio Supreme, a company with local and Malaysian joint investments involved in sustainable agriculture through Nano technology, is optimistic that demand for organic products will take off in the future. His company distributes Bio Organic Fertiliser, produced with Australian bio-composting technology, to farmers by using cash on delivery, contract farming, and instalment payment methods. The company's main markets are in the Irrawaddy Region, occupying Myanmar's south-western delta, the country's rice bowl. He said the lack of understanding about the potential side effects of chemical pesticides was holding the organic industry back.

"The process of certifying organic producers should be systematic," he said, adding that workshops on organic farming [techniques] are clearly needed.

For everyone along the production chain, however, organic farming has the potential to bring high dividends. U Sein Wing Hlaing, chairman of the Myanmar Paddy Producers Association, an NGO, said that he realized this while on a study tour in Taiwan.

"They have organic farms of 500 acres, even up to 1,000 acres, in Taiwan," he said. "Buyers from Japan pay US$ 2,000 a tonne. The products are certified by organisations from both Japan and Taiwan."

But similar set-ups here would require significant changes to Myanmar's irrigation systems, he said.

"If you want to plant organic paddy, in most cases you would need to change the irrigation system. For example, if one farmer uses chemicals and he uses the same water source as another farmer, then the second farmer is going to have trouble cultivating organically," he said. Despite these challenges, some are still finding ways to make organic agriculture work.

Daw Theint Theint, a rice producer and trader who started selling "Thabarwa" brand rice in 2000 – a popular grain bought by those who want organic products – has found an increase in demand for organic food. She applied to the MOAG for organic certification in 2009 and received it in 2012. The rice is grown on her own fields in Irrawady Region's Labutta Township and sold at City Mart and Ocean Supermarkets.

"This year I've expanded to 1,000 acres," she said. "I'm lucky that my land is alluvial soil because it means I don't need to rely on irrigation and I can guarantee that my product is organic."

VIETNAM

Green energy

Oil-free water pumps stir hope in Vietnam's mountainous provinces

BY **TRAN THI THUY BINH**

NGHIA TAM COMMUNE, Vietnam – Tran Thanh Ca and Khuong Dinh Vac are still basking in the good fortune that came their way in 2008. Their household was chosen that year to benefit from an innovative water pump installed in a spring that flows through this village, which is nestled in the mountainous Yen Bai Province in northeast Vietnam.

"The pump has provided water for our field," says Vac, the 65-year-old female farmer, who lives in a small house on a hill. "We have been the first household to use it here".

The steel water pump – better known here as the "spiral one" – looks like the traditional bamboo water wheel. Yet, it has additional features, such as plastic spiral pipes. Since its installation, water has been transferred from the spring to their nearby rice and corn fields. Its power even pushes water up to a new pond about 10 metres higher than the spring.

"I dug the pond to raise fish after the pump was installed," says Ca, the husband. "I have never thought that I could raise fish at home."

Yen Bai is an ideal place for such a venture, given the array of springs and rivers that rush down its slopes. However, fields along rivers and springs are normally 5-12 meters higher than the banks. That has posed a constant problem for farmers to water their fields.

It explains why Yen Bai has been dependent on the seasonal rains to cultivate nearly one-third of its 77,000 hectares of agricultural land for rice and corn. But uncertain weather patterns have imposed added burdens on the farmers who make a living off rain-fed fields, according to the Yen Bai Water Resources Department (WRD), since the recorded rainfall is 1,500-2,200 mm per year.

"With the water power of the spring, the pump can run automatically day by day without fuel," says Vu Dinh Phien, the designer of the water pump and Vice Director of the Centre of Agricultural Engineering and Rural Industry (CAERI), a government research centre. "Its capacity of 100-150 m3/day provides enough water for watering and aquaculture farming."

Because of its effectiveness, Yen Bai Science and Technology Association (STA) has cooperated with CAERI to implement a US$ 15,000 project funded by the Vietnam Union of Science and Technology Associations (VUSTA) and Yen Bai Science and Technology Department (STD). According to Yen Bai STA, the project has supported 9,000 households to run pumps from 2008 to 2011 in three poor communes (Nghia Tan, Binh Thuan and Minh An).

The new spiral pump has two main advantages over the traditional wheel. First, the height of water it can pump is four times higher than its diameter (2.5 metres). By contrast, the height of pumping water pressed by the traditional wheel is equal to the diameter of the wheel. Second, its operational lifetime is longer.

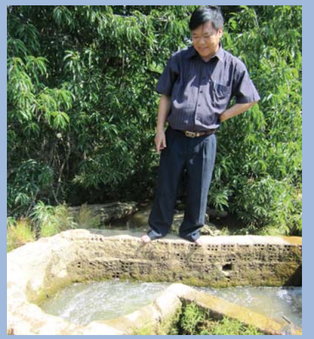
Fuel-free water pumps

Yen Bai is an agricultural-based province located in the northern part of northern-central Vietnam. The province covers an area of 6899.5 square kilometres and as of 2012 it had a population of 765,688 people. There are about 30 ethnic minorities

Yen Bai has had a lot of springs and rivers. It is estimated that there are at least one river or spring with the length of 1 - 1.75km in one km2 of nature land. However, because of the mountainous areas, fields along rivers and spring are normally 5-12 meters higher than the banks and that's why watering for fields is very difficult. Yen Bai has had 77,000 hectares of agricultural land and 28% of which were totally depended on rainfall. However, it has been not abundant. Its rainfall is recorded only about 1,500 – 2,200mm per year (18-20% for watering) but vapour is higher, according to the latest report of Yen Bai Water Resources Department (WRD).

Kon Tum is located inland in the Central Highlands region of Vietnam, near the borders with Laos and Cambodia. The province covers an area of 96,765 sq km and as of 2009 it had a population of 432,865 people. There are about 25 ethnic minorities.

In the report of Kon Tum Water Resources Department, mountains and hills cover two per five its area and that's why there are a lot of big upstream rivers. For example, Se San River covers three-fourths natural square of the province with a network of springs and dense branches and water falls for water resources projects.



"Each bamboo water wheel was often used for only one year and was often destroyed when the floods came," says Vac, a farmer. Her first spiral water pump, on the other hand, has continued to work well for eight years.

Its benefits are appreciated beyond just that. It is very useful for farmers during floods, which are forecasted to increase in Yen Bai, according to Yen Bai WRD. It has also saved fuel and labour for farmers.

That is echoed by Ha Thi Chin, who comes from an ethnic minority. Before having the pump, she would spend US$ 1 for electricity and US$ 2 for petrol to water her fields which is next to the spring. "In 2000, we bought water pipes costing US$ 242 (VND 5,000,000) to take water from our neighbour's pond, which was located 200 meters far away my house," says Chin, a slim, young mother of three children. "We depended on their mood and they sometimes refused."

Everything has changed now. She and her husband do not need to wake up early to place pipes and pay bills for petrol or electricity. The water pump has ensured a regular flow of water to the field and the fish pond. "We paid an extra US$ 121 to buy it but we are pleased," says Chin. "We can even water our tea hill."

Such accounts have been confirmed in a survey by CAERI. A household would save US$ 65 (VND 1,350,000) per month if it used the water pump.

The environment also profits. After all, the spiral pump does not run on fuel, ensuring zero carbon emissions. "The spiral water pump is run by water power, a clean energy, and that's why it does not cause environmental pollution," says Nguyen Xuan Truong, Vice Director of STD.

"With the water pump, there have been more trees, more crops that create more income for farmers and protect land from being eroded," says Luong Thanh Nghi, former Director of Yen Bai STD. "And then farmers reduced activities that destroy the landscape."

"Although its scale was small and project investment was not high, its effectiveness has been highly recognised," says Do Xuan Hoi, Director of Yen Bai STD. "The model can be replicated in areas where it is difficult to develop focused water resources."

Consequently, many mountainous provinces with springs, such as Tuyen Quang, Ha Giang, Lai Chau and Lao Cai, in northern Vietnam, have been identified as ideal places for the spiral pumps.

Micro-hydro offers similar rewards, as Nguyen Tien Thuan, a coffee farmer, knows. He has been using a zero-fuel, water-powered turbine since 2005. The 70-kilo turbine was made by his neighbour, Tran Dinh Huan, who owns a five-hectare coffee farm in Kon Tum province, which is about 1,250 kilometers from Yen Bai.

It paid off during a severe drought in 2010 and 2011. Then, thousands of hectares of rice, coffee, and industrial crops went without water. However, Thuan's three hectare coffee fields were spared because "our upstream spring is never dry."

Like the pump in Yen Bai, this turbine was also set up in a spring. However, it requires a small waterfall with a height difference of one to two metres.

During its nine-year operation, the pump has saved about US$ 9,000, says Thuan. "Before the pump was operating, I needed to employ two workers who were paid about US$ 290 for 15 working days," adds the 63-year-old. "I also bought 720 litres of diesel to run a traditional water pump per season."

Now, instead of spending on fuel and labour, he has only to pay US$ 48 (VND 1,000,000) per year to maintain the pump. That has reduced the budget for fuel and labour by 96 per cent. The cost of maintenance has gone down by four per cent.

Indeed, it was economics that pushed Tran Dinh Huan to look for such an energy alternative that now benefits Thuan, too. He was inspired to seek a micro-hydro solution following troubles in 2005. "I realised that my employees were cutting down their working time," said Huan, who had to spend time away from his fields due to his day job as the manager of the Sa Thay Education Unit, a district-level government education management office. "I was worried whether my crops were sufficiently watered."

It took two years for him to transform his own hydraulic generator into a turbine water pump. His efforts were finally recognised by a patent issued by the National Office of Intellectual Property of Vietnam. In the following year, it received the third place award at a Kon Tum Technology Innovation Contest organized by the Kon Tum Science and Technology Association (STA). Because of these achievements, in 2009, Huan received funds to introduce his product at the largest national technology event – TECHMART.

"Its advantage is to be activated by height difference in the small waterfall or springs," says Nguyen Thanh Cao, president of Kon Tum STA. "It could save fuel expenses of about VND 1,000,000 (US$ 48.3) for watering one hectare. It is very suitable to place in mountainous areas or farms of rubber, coffee and pepper that do not need to be watered daily."

The success of this turbine pump is reflected in the many orders placed for it by farm owners. Trinh Xuan Than, a farm owner who lives in Binh Phuoc, 323 kilometers far from Huan's location, found the turbine water pump on the Internet and has been using it since June 2013.

"I am very pleased because 11 hectares of rubber, peanut and pepper trees are watered as much as needed," reveals the 45-year-old. Before buying the turbine water pump, he used to water his farm once a week in the dry season.

His investment has helped him to cut costs elsewhere, too. He saved US$ 308 (VND 6,375,000) in fuel costs in one year. The pump's ability to find alternative power has ensured affordable lighting in his house. Prior to that, he had to use diesel for his domestic lighting needs because his farm was located far from the national power grid. "Now I can save at least US$ 375 (VND 7,756,250) for producing electricity per year," he says. "I also provide electricity for three neighbours and they pay me US$ 4.8 USD (VND 100,000) per week."

Although the economic and environmental benefits of these two kinds of water pumps are clear, they have still not been introduced across the country. High investment costs is the first hurdle coming in the way of such green-friendly solutions. "It is difficult to expand the model because its price is high," says Vu Van Vuong, Chief of the Science Management Unit under Ha Giang STD. Ha Giang STD bought six spiral pumps for US$ 14,500.

The average price of a spiral pump is about US$ 966, four times higher than Yen Bai's average annual income among its poor, an estimated US$ 242 per person. Although the price of a turbine water pump is lower, about US$ 483, there are construction and installation expenses that add to the bill. One buyer invested US$ 1,932 to build small cement dams.

What is more, the turbine water pump has not been welcomed by farm owners who have had multiple choices. "I cannot persuade others to buy the turbine pump because they can buy inexpensive state electricity," says Thuan. "If I were connected to the national power grid, I would not have bought the pump."

Apart from the high costs, poor communication is also a challenge in spreading the word about the pump. In Yen Bai and Kon Tum, the distance between offices of the provincial STA and WRD is often short. However, senior officers of WRD have never been interested in these innovative pumps approved by STA. "I have never heard about the pump," says Le Thanh Ha, Vice Manager of the Flood Protection Unit (Kon Tum WRD). His colleges in Yen Bai WRD were also not informed.

"Communication is our weakness," says Phan Huy Cuong, Manager of the Administration Unit in the Yen Bai STA. "We have not had funds to promote the model and that's why its adoption was not as high as our expectation."

It is a reality that undermines a national priority. In 2009, Vietnam issued a decree to support environmental protection activities. According to the list of activities to be subsidised, the spiral pump and turbine pump were considered important carbon mitigation technologies. It meant that the research and application of two pumps were to be supported by government offices. However, WRDs of northern and central provinces in Vietnam have not been interested in developing small-scale, clean water resources. "Reservoirs and dams are the best irrigation solutions to adapt to climate change in mountainous areas," says Nguyen Thi Hien, an officer of the Agricultural Watering Unit of Yen Bai WRD. It is the reason why Yen Bai WRD has not counted small-scale clean water resources in the list of mitigation solutions in its annual report. The story is the same for Kon Tum and Dak Lak WRD.

Absent, too, was a provincial budget for small-scale water resources. And the likes of Huan and Phien did not receive any funds directly for their personal efforts to show how successful their products could be.

"I invested US$ 19324 (VND 40,000,000) to develop the turbine pump individually," says Huan. Without the strong support from sponsors, the designer of the turbine water pump limited his efforts to displaying his product on a commercial trademark website and transferring the technology to all the individuals who have asked for it. "The technology is so simple that I can instruct them on how to make their own product," he adds.

Since there was no feedback from engineering companies or government offices, Huan saw no reason in improving his innovation. "I created this product and no one helped me to advertise it," says an exasperated Huan. "I do not want to improve it more."

Conversely, the designer of the spiral pump chose to develop the product through cooperation with a local organisation. From 2008 to 2010, CAERI cooperated with Yen Bai STA to fundraise US$ 15,000 successfully from Yen Bai STD and VUSTA. Thanks to the financial support, nine pumps were placed in three poor communes (Nghia Tan, Binh Thuan and Minh An) and their owners covered only a small amount of the costs. "The first pump of Mr. Ca was free of charge because it is the first experiment," says Pham Van Ro, an engineering expert. "The other households paid 15 per cent of the cost and 85 per cent was subsidised."

In 2010, CAERI and its partners won a competition on Vietnam Innovation Day (VID), hosted by World Bank Vietnam. "We applied for the competition, and then got the grant of US$ 29,493 to set up another 18 pumps and train farmers in three mountainous communes," says Vu Dinh Phien, the 75-year-old designer. The three-year project ended successfully in June 2013.

"Application of the water pump without petrol in three communes enabled farmers to water their fields and farms," says Phan Huy Toan, a monitoring and evaluation expert at the World Bank. "These fields experience shortages of water even though they were near the spring."

To cut costs, most parts of the pump were produced in Yen Bai, while CAERI was based in Hanoi. "Most of the materials were bought into Yen Bai city and then produced in a small workshop in Nghia Tan," says Phien, who also transferred the technology to local people. "Ca and six workers were trained to produce pumps, and 30 farmers were trained to produce and run the pump."

The success of their 2012 workshop led project implementers to realize the importance of communication, though lacked the budget to fully develop a strategy. "We received a lot of orders from individuals and organisations from the southern, central and the northern mountainous areas," revealed Phien, about the outcome of the workshop. "Hong Ha Company (from the private sector) even committed to producing the pump at a discount of up to 50 per cent in 2014."

Money from trees

Communities get raw deal for protecting Vietnam's forests in carbon trade

BY **TRAN THI THUY BINH**

LUC NGAN, Vietnam – The lychee trees are a prized possession of a middle-aged couple from the San Chi ethnic minority. Hoang Van Thiet and Lam Thi Tien have a field full of them, some 500 trees that cover one hectare in Hot Village, Kien Lao commune in the Luc Ngan District of Vietnam's Bac Giang Province. It is a hilly terrain in the northeast of the country, where roads leading to the villages are largely brown, sandy paths.

The couple is enjoying a windfall from the harvest of the small, sweet fruits. The demand has been driven by the Chinese market, which has helped to increase the lychee export price from 20,000 Vietnam Dong (VND) to 30,000 VND (US$ 1 – 1.5) per kilogram. "We have earned about 200 million VND a year (about US$ 10,000 per year)," says Lam Thu Tien, a slender 50-year-old.

The couple also owns 1.2 hectares of reforested land, another prospective source of income. "We know there is carbon in the garden and forest," adds the husband, Hoang Van Thiet. "We can sell the carbon if the project of scientists succeeds."

He was referring to a promise of fortunes that loomed five years ago, when his and 29 other households in Kien Lao were informed about a planned carbon trading project. This sustainable community forestry and poverty reduction initiative was being advanced by a group of scientists affiliated with the Vietnamese Ministry of Agriculture and Rural Development (MARD).

"They measured the amount of carbon in lychee, acacia and pine trees," recalls Thiet. "They said more money could have been earned if we followed their guidance and they were able to persuade rich countries to purchase our carbon successfully."

Such views were shaped by the findings of the MARD final evaluation report, which was not publicly disclosed.. According to the report, Sustainable community forestry and poverty reduction in Vietnam—Linking natural resource accounting of ecosystem services to carbon financial markets, carbon had become a tradable commodity. Local communities were taught that the commodity is "created" through the long-term sequestration of carbon dioxide in growing biomass in previously non-forested or degraded forest areas, and in new agricultural management practices, such as no-till farming, whereby the quantity of soil carbon increases over longer periods of time.

The targeting of the Luc Ngan District, in fact, is a reflection of how green it has become. In the past (prior to the end of the Vietnam War in 1975), the region used to be mainly bare land. Following land-use and land-cover changes however, lychees, acacias, pines and other trees have taken root over 464 hectares. The growth of these gardens and forests has stored carbon in trees and soil. "Trees in Luc Ngan district have removed tonnes of carbon dioxide from the atmosphere through sequstration associated

with stored and growing biomass," says Dr. Do Xuan Lan, a leader of the Department of Science, Technology and Environment of the MARD. "The additional and permanent carbon sequestration in gardens and forests has created an ecosystem service linked to the global greenhouse effect."

To push ahead, scientists tapped funds from the Asia-Pacific Forum for Environment and Development (APFED) Showcase Programme, which works out of the United Nations Environment Programme's (UNEP) Bangkok office. They measured and monitored changes of carbon stocks in acacia, pine and lychee trees in Kien Lao for 13 months between 2008 and 2009.

"We mapped carbon stocks and the additional amount every year," says Dr. Do Xuan Lan. "We expected to see between 100 & 250 tCO2 (tonnes of carbon dioxide) traded under this project by farmers living in Luc Ngan District."

His team had drawn inspiration from the Chicago Climate Exchange (CCX), the largest active voluntary carbon market in the United States. At CCX, carbon credits can be traded among its members who commit to reducing greenhouse gas (GHG) emissions.

Dr. Lan and his colleagues expected that the Kien Lao model could be applied not only in Luc Ngan district but also in other provinces with similar conditions. If successful, it could link rural poor/ smallholders in Vietnam to the global greenhouse gas market systems on scales sufficient to substantively increase local incomes and reduce GHGs in the atmosphere.

That was why Dr. Lan also considered implementing a five-year follow-up project to establish a proven natural resources accounting market chain, linking the carbon sequestered on the farms and community lands in Kien Lao Commune to the international carbon markets.

"At the end of the five-year project, farm families in the targeted communities will have received their first carbon payments. This will open the door for the participation of millions of others," says Dr. Lan. "Within a decade, this type of transaction – the payment for ecosystem services involving carbon sequestration – will be commonplace in Asia."

The idea quickly convinced the local authority and community to participate actively in an agro-forestry programme to maintain lychee and reforestation areas. "30 households [were] trained with sustainable farming techniques such as planting pineapple, and soybean for soil protection barriers," says Ly Hong Xoan, Vice President of Kien Lao People's Committee. "They applied these techniques to their gardens strictly."

Until 2011, Vietnamese experts and policy makers still believed that the forest carbon trade had promising potential, given Vietnam's forest cover of 16.2 million hectares, in the words of Nguyen Tuan Phu, the former director of the Economics Department in the Prime Minister's Office.

Apart from Bac Giang, several small-scale projects for a voluntary carbon market were pursued, such as one in Cao Phong, in Hoa Binh province, some 76 kilometers from Hanoi, in northern Vietnam.

The central government weighed in with the support of international organizations. Vietnam became a UN-REDD Programme pilot country to prepare for REDD+ (Reducing Emissions from Deforestation and Forest Degradation) in 2009. The UN-REDD Programme was expected to support capacity building in Vietnam to benefit from payments flowing from the results of reducing GHG emissions.

In fact, the Programme's communication materials of the first phase (2009 - 2012), portrayed REDD+ mainly as "a source of income or benefits" to communities and local people, said Dr. Nguyen Quang Tan, the Vietnam country coordinator of the Center for People and Forests (RECOFTC), an international non-governmental organisation that promotes the roles of communities in protecting and developing forests in Asia and the Pacific.

Communities and local people had been identified to play a very important role in the implementation of REDD+ in Vietnam, because they directly manage 28 per cent of forest and perennial tree areas, according to MARD. Moreover, local people are also employed for forest protection and reforestation by State Forest Enterprises and forest management units (which manage about 47 per cent of the forest area).

Therefore, a two-year communications programme was carried out in two pilot districts – Lam Ha and Di Linh, Lam Dong Province. It reached "an impressive number of people," and not just in the two pilot districts but also in all "forestry provinces" that had 20,000 hectares of forest or above, according to a RECOFTC report, "Assessing the Effectiveness of Training and Awareness Raising Activities of the UN-REDD Programme in Vietnam."

"Most people interviewed during the assessment expressed an improved understanding on climate change and REDD+ issues," said Dr. Tan, the main author of the report. "There was a strong coverage of communes and villages in two pilot districts."

Yet, there was one major hurdle: the uncertain connection involving the CCX and Green Climate Fund. That is why trust in the carbon trading scheme has been much lower than it was five years ago, according to Dr. Vu Tan Phuong, Director of Department of Training and International Cooperation, Vietnamese Academy of Forest Science (VAFS).

Through colleagues at Michigan State University, United States, the Director of the Kien Lao project learned that the voluntary carbon market had not opened its doors for carbon credits originating from outside USA. "CCX has had complicated procedures with its unattractive carbon price and domestic market target," said Dr. Lan. "CCX is considered as the most open voluntary market and European markets are even more difficult."

That was not the only setback in Vietnam's hopes to make money from its trees. High financial and technical standards of carbon markets also emerged as barriers for carbon investors in Vietnam. "It is extremely difficult and out of reach to trade carbon credits in the Clean Development Mechanism (CDM) market," says Nguyen Tuan Phu, a Senior Expert. "Do not expect to be recognized internationally."

Meanwhile, carbon trade in the forestry sector has been risky. "First, it is the risk of forest fires and forest conversion," explained Dr. Vu Tan Phuong. "Second, the mitigation of greenhouse gas emissions is temporary."

Most of the existing forest plantation projects have had short business cycles, from seven to eight years or 10-12 years, and then the trees would be cut, he adds. Besides, planted trees have mainly supplied raw material for the pulp and paper industry. That is why it would not reduce emissions for the long term.

Red tape also hampers this initiative. "Restrictive legislation, bureaucratic procedures and permit systems" with high service fees have also contributed to the low interest of forestry investors, says Dr. Phuong, who was involved in a CDM afforestation project in Cao Phong, Hoa Binh province. The project was evaluated to be able to trade about 4,000 carbon credits. However, if they were sold, all kinds of expenses (from writing and evaluation and approval to verification of the project) would account for 15-20 per cent of the total budget. "Trade in carbon credits incurs huge transaction costs because carbon needs to be re-assessed every five years," said Dr. Phuong.

There was similar despair about selling carbon credits through the Green Climate Fund, in the opinion of Nguyen Tuan Phu, the former director. He cites the lack of progress over its operational mechanism and conditions to select



members. Dr. Phuong shares this sentiment; "The technical requirements (for example, the baselines and reference emissions levels) of REDD are not clear ," adding that "REDD has opened a new trend in carbon trade. However, this new mechanism is still in the pilot phase and not yet mainstreamed."

Consequently, other suggestions have emerged. At the National Inception Workshop of the UN-REDD Vietnam Phase II Programme, held in October 2013, several international organisations recommended that Vietnam should implement REDD+, towards alternative solutions if the sale of carbon credits is not as successful as projected. "We should work on REDD+ readiness so that the efforts are worthwhile, even without REDD+ revenues," said Akiko Inoguchi of the Food and Agriculture Organization of the United Nations (FAO). "We hope that REDD+ will happen but we can't be certain."

For now, Vietnam can take some comfort in its effort to embark on the carbon-trading road. It has been one of the first of 56 UN-REDD partner countries to start implementing a second phase, with financial support from the Government of Norway of US$30 million. Phase II also is focusing on benefits in the six pilot provinces of Bac Can, Binh Thuan, Ca Mau, Ha Tinh, Lam Dong and Lao Cai. These benefits include: focusing on completing the establishment of required capacities and provide technical assistance to build up the emerging REDD+ implementation framework and building essential capacity for REDD+ in national institutions and key stakeholder groups in Vietnam. The country is expected to benefit from future results-based payments for REDD+ and undertake transformational changes in the forestry sector.

Promoting the role of communities in implementing REDD has continued with UN and the Government of Vietnam. "Its success will depend on many others, including civil society organisations, communities and the private sector," said Pratibha Mehta, Vietnam's UN Resident Coordinator.

To that end, the forest allocation process for communities and local people should be accelerated because clear ownership is often the motivation for them to protect forests and increase their commitments. "Forests with ineffective management or under the management of people's committees in the communes should be shared with local people," suggested Dr. Pham Thu Thuy, scientist at the Center for International Forestry Research (CIFOR), an international research centre that conducts studies on the use and management of forests in developing countries, based in Vietnam. "Local people are yearning to own forests in a lot of areas. If only employed, they would only do their jobs without high responsibility and with no personal involvement."
To help locals, their rights to the forests are being highlighted. An owner, for example, is allowed to log five per cent of his forest. A mechanism to implement these rights should be developed from the national to the local levels, says Dr. Tan. "A vice head of a village in Son La province would like to cut one tree. He asked for the permission and then was advised to meet the District's People's Committee. When he met a representative of the district's authority, he was asked to request permission from the forest management unit. Finally, he decided to cut the tree without permission."

This problem is partly rooted in the limited space offered for local communities to participate in forest management. Many people have not yet benefited from the UN-REDD Programme due to a lack of clear selection criteria and mechanisms to support community participation. "The procedure to select community representatives from the commune, district to national level should be clarified," said Dr. Thuy, who has worked with local people for many years. "In fact, in many areas, village leaders do not represent the local people's voice."

Therefore, the CIFOR scientist proposed to establish a long-term procedure to train community representatives from the commune to national levels. Part of its focus: to secure opinions of local people. "Which standards will be considered to evaluate whether the consultation process is complete or not? How would they report at higher levels? How could they be listened to? If not, what would happen?" were questions Dr. Thuy said need answers.

It would be a useful first step to deal with issues that continue to surface in the communities drawn to the carbon-trading venture. "In Lam Dong Province, after five years of implementing Phase I, a number of local people and leaders in the communes and villages questioned why there was no money," says Dr. Tan. "From the beginning, we should speak out that there would not be any money for quite some time." Money is not growing on trees just quite yet.

FREEZE OF CARBON TRUST




Luc Ngan District, Bac Giang Province is located 120 km northeast of Hanoi, Vietnam. It covers an area of 101.728km2 and as of 2012, its population is about 215,000. There are about 8 ethnic minorities.

In addition to the reforestation activities in the district, the area has undergone extensive land use change in the last fifteen to twenty years. Agricultural lands have been converted to lychee gardens throughout the district and province. Lychee is its speciality fruit.

While there remain large tracts of irrigated rice as well as some cassava, soybean, and maize cultivation, the landscape of Luc Ngan is dominated by Lychee gardens, in response to market mechanism as well as favourable geographic and climatic conditions. The current land use and land cover landscape, much of which has transitioned from annual crops (cassava, soybean, and maize) and bare land to permanent tree stands (Lychee, Lychee mixed with annual crops such as soybean and cassava, and forest plantations), now stores more carbon in biomass than it did under earlier conditions. This additional long-term carbon storage in Lychee gardens and reforestation areas provide an ecosystem service with respect to global greenhouse gases. The trees in Luc Ngan district have removed tons of carbon dioxide from the atmosphere through sequestration associated with stored and growing biomass.

Forest economy

Vietnamese forest guardians earn tidy sum

■ BY **TRAN THI THUY BINH**

DA LAT, Vietnam – So Ao K Lam recalls what it was like 10 years ago. The 18-year-old enjoyed the childhood pleasure of walking through the woods that were an hour's drive from Da Lat, in the hilly Central Highlands region of Vietnam. But now, this forest offers more than a fun-filled excursion under its green canopy. So Ao K Lam is given money to enter it.

This arrangement to patrol the forest and get paid is offering a new source of income for So Ao K Lam, who had to give up school when she was in seventh grade due to its distance from her home. The same financial offer also benefits her relatives, who belong to the Da Chais Commune in the Lac Duong District, in Lam Dong. Da Chais is about 30 kilometres from Da Lat.

They now earn 850,000 Vietnamese Dong (US$42) per month. And their annual income of 10 million Vietnamese Dong (VND), paid quarterly by the Da Chais Forest Management Station, a local government department, is roughly equal to 39 per cent of the local average income of the district.

"Every month, depending on the season, I visit the forest from one to two days," says So Ao K Lam. "I am responsible for detecting illegal actions such as illegal logging, farming or burning for making charcoal....and then reporting to the rangers."

Extra income from forest protection – known here as "green money" – has brought about many changes in her family. The income has helped pay for rice and chemical fertiliser to grow coffee trees. They have also not been hungry and even their meals include more dishes. Furthermore, her family has earned more respect from their neighbours.

"Because of protecting the forest, it's easy to borrow money because we have money to pay at the end of each quarter;" says So Ao K Hong, the mother of So Ao K Lam. "Income from coffee production has been enough to pay for our daily food."

Apart from this family that hails from one of Vietnam's ethnic minorities – the Cil – there are 374 other Da Chais households who protect the forest's 8,906 hectares. With the help of Da Chais households, the Da Nhim Upstream Protection Forest Management Unit has also managed forest protection households of five more communes, protecting a total of 27,462 hectares. "Each household has protected 29 hectares," says Trinh Minh Tu, Vice Manager of the Da Nhim Upstream Protection Forest Management Unit. "The average annual income of each household is about VND 10.2 million (500 USD)."

Protecting forests through this initiative offers a windfall for these poor ethnic communities. After all, Lac Duong is a district with extensive forest cover – nearly 88 per cent is a protected mountainous area and all logging activities

are illegal and the 2,500 forest protection households maintain a vigil over 80,000 hectares (about 63 per cent of the district's forests). "Forest protection created a stable income for local people, especially for ethnic minorities," says Nguyen Duy Hai, Chairman of Lac Duong People's Committee.

Along with Lac Duong's forest protection households, there are more than 7,500 households in Lam Dong Province, 78 per cent of whom are ethnic minorities. Each household has been paid VND 10.5-12 million per year, according to Lam Dong's People Committee. This income has helped lift at least 15 per cent of those involved out of poverty, according to the Ministry of Agriculture and Rural Development (MARD).

"Money has been transferred to local people," says Pham Thu Thuy, a scientist at the Centre for International Forestry Research (CIFOR) based in Vietnam, an international research centre that conducts studies on the use and management of forests in developing countries.

This model, dubbed the Payment for Forest Environmental Service (PFES), has been implemented in 31 provinces out of Vietnam's 64 provinces, according to the Forest Protection and Development Fund (FPDF).

PFES uses a tool kit – forest environmental service (FES) – to build fees for stakeholders or buyers from ecosystem services needed to pay for providers. "FES has measured the forest value and from that, calculated how much buyers should pay," says Luong Van Ngu, Deputy Director of the Department of Natural Resources and Environment in Lam Dong.

Based on the program, each buyer who uses electricity, water or visits the area as a tourist has to pay the FES fee. Water and electricity utilities and tourism operators have been responsible for transferring FES funds for organisations and individuals who have managed and protected watersheds through the FPDF from the national level to the local level.

The groundwork was set a decade ago, with the 2004 revision of the Forest Development and Protection Law, which mentioned the role of FES. It created the legal framework to establish PFES. Five years later, Lam Dong and Son La Provinces were selected as the first pilot FES projects. The successful two-year implementation of the PFES policy gave birth to the national PFES Decree 99. It was officially approved on 24 September 2010 by Vietnam's Prime Minister Nguyen Tan Dung.

CIFOR has recognised Vietnam as the first Asian country to build a legal framework for PFES implementation from the central to local levels. PFES got the interest and great support from the government and related ministries. A total of 20 legal documents have been issued in different formats, such as the decree signed by the Prime Minister, a circular and MARD decisions. Five of them have guided the legal procedure on how to establish, organise and manage FPDFs at central and provincial levels. A further 11 documents have provided general guidelines for implementing PFES.

Useful in this regard was the watershed protection service, which covered soil conservation, erosion control, reduction of sedimentation of lakes, rivers and streams and water regulation for production and society. According to an August 2013 report, Payment of Forest Environmental Services in Vietnam – from policy to practice, published by CIFOR, two of its features were particularly relevant: real experiments to improve PFES mechanism and experiences to conduct REDD+ in Vietnam .

In addition, the experiences from implementing PFES helped Vietnam to prepare for the Reducing Emissions from Deforestation and Forest Degradation (REDD) Programme. "The legal framework provided important lessons for similar mechanisms such as REDD," says Adrian Enright, an author of several studies on benefit-sharing systems and REDD and a REDD advisor for Vietnam's "Poverty and Sustainable Development Impacts of REDD Architecture" project.

The five documents that serve as pillars of the FPDF have built a good system to manage PFES revenues at all levels. Currently, with the exception of the Vietnam FPDF under the management of MARD, 31 local authorities of the total 61 provinces and cities have established their FPDFs. In particular, several funds at the commune and district levels were opened.

"Several provinces have established a system of FPDF at provincial and district levels (e.g. in Son La Province)," says Pham Hong Luong, Deputy Director of FPDF. "Several provinces even actively established FPDF at the commune level (e.g. in Quang Tri Province)."

Up to now, FPDFs have signed 247 PFES contracts with hydropower facilities, municipal water supply companies, and ecotourism operators (the buyers of the environmental services). The funds are used to pay for local people to protect forests, according to Thuy, a PFES expert for eight years.

Such success is borne out on the balance sheets. The latest PFDF report reveals that Vietnam has generated considerable revenue, approximately 1,000 billion VND per year (over US$ 47.6 million) since 2011. Of that, 98 per cent have been from hydropower facilities, two per cent from municipal water supply companies and 0.1 per cent from tourism operators, according to CIFOR. "This is a very big, long-term and sustainable financial resource for forest protection in comparison with the central budget of forestry investments up to VND 1,200 billions (US$ 57.14 millions)," says MARD Vice Minister Ha Cong Tuan.

Additionally, revenues in 2012 slashed nearly 50 per cent of the state budget for forest protection and development. "In 2012, the system of FPDFs from the central to provincial level have received VND 1,171 billion (US$ 55.48 million) (including debts in 2011)," says Luong. "This amount is equivalent to state investment budget of 1,210 billions of VND for protecting and developing forests."

Apart from revenues earned directly through PFES, Vietnam has also received substantial financial support from international development agencies such as German International Cooperation (GIZ), Winrock International (WI), an international NGO based in the United States that works for the empowerment of disadvantaged people, and the Asian Development Bank (ADB). "The total fund from bilateral and multilateral donors is at least US$4-5 million," says Thuy.

"PFES created an independent financing mechanism which was separate from the state budget, to cover expenses for forest protection and development," says Luong Dinh Ngu, Deputy Director of Lam Dong Department of Natural Resources and Environment. Another official described Vietnam's "socialised forestry" programme as a "breakthrough."

Yet, there are challenges for the PFES to overcome.

Foremost is the issue of a fee to satisfy both buyers and sellers of environmental services. The 2010 decree stipulates a fixed fee for hydropower facilities (20 VND/kWh), for municipal water supply companies (40 VND/m3) and tourism operators (from 1-2% of the total revenue). However, these fees seem "unclear," reveals Vo Minh Tham, Deputy Director of Lam Dong FPDF. While PFES fees have been fixed, there has been a steady rise in the electricity price over the past four years. The latest FPDF report showed that the electricity price of 2012 had risen by 61.46 per cent since 2008.

Furthermore, 95 per cent of households interviewed by CIFOR claimed that they had not been paid as much as they worked, according to Thuy. "I expected to get up to VND 4 million (about US$190) per quarter (an increase of 37 per cent)," said Ko Sa Ha Hon, the head of Da Sar 1 village, Lac Duong District, Lam Dong Province. "I often rode motorbikes for patrolling in the woods and that's why I spent a lot of money on petrol and replacing tires."

Meanwhile, the buyers of the environmental services in the research samples of CIFOR have reportedly been uncomfortable and reluctant to pay fixed fees.

That arises from some confusion. Small and medium hydropower plants said that the PFES fee was not added in the price of their power trade contracts with Vietnam Electricity (EVN). From 2011 to 2012, these enterprises did not include the fees in the electricity production price. That's why they refused to pay, or instead requested an exemption or a delay for the payment. Therefore, it's difficult to achieve the expected local PFES revenues, according to Pham Hong Luong, FPDF Deputy Director.

In addition, a number of tourism operators have played two roles, as service users and forest guards of a national park. They have the fees but received nothing in return for protecting the forests. "They feel they are being treated unfairly, as they were not being paid for patrolling the forest," says Thuy. Furthermore, due to the unclear regulation on which groups of tourism operators should pay, it has become difficult to charge PFES fees from several tourism companies.

According to CIFOR's representative in Vietnam, to solve these challenges, service users and providers should discuss and then sign a payment agreement. "The figures of current PFES fees are not based on scientific evidence," says Thuy. "I think that willingness to pay should be assessed, including the payment forms."

The CIFOR scientist also pointed out three other lapses. It is the absence of a monitoring and evaluation system, a mechanism for receiving feedback from citizens and a mechanism for sharing benefits equitably, efficiently and effectively. "The monitoring legal framework is in the early stages and there are no specific instructions," says the PFES expert. "Circular 20 of MARD is quite general and does not provide clear instructions on how to evaluate the quality of forests and biodiversity."

In practice, it has been very difficult to examine a forest area and its quality and, until now, there has not been consensus of accurate forest data. Apart from Lam Dong Province, most of the remaining forests have not been properly surveyed to identify exact boundaries and areas of each forest owner, each household and each individual who has been allocated forests to protect. "The biggest challenge now is to identify boundaries and forest owners as well as to evaluate protection contracts," says the representative of Yen Bai FPDF. This explains the slow disbursement process from FPDFs to PFES providers, with only 46 per cent dispensed from the total fund.

Even at the national level, there are gaps in forest data. When MARD announced that 19,792 hectares of forests were cut to make way for constructing a hydropower plant, the Ministry of Industry and Trade gave a different figure, which was 2.6 times (50,930 ha) higher.

"Measuring forest area and assessing forest quality is difficult by only visiting forests," says Le Quang Huy, Vice President of the National Assembly Committee for Science, Technology and Environment. "Satellite images should be applied for assessment."

FOREST AND THE TREES

Lam Dong is a province located in the Central Highlands region of Vietnam. Its capital is Dalat or the love city, the very famous tourism destination in Vietnam. Lam Dong – one of the two pioneer PFES provinces has had about 617,000 hectares of forests with the provincial coverage of 63%. Most of forests have been in the upstream of rivers and streams.

Local community involvement has also been evaluated. Only the village heads for instance, have been engaged in such activities. These leaders have not conveyed local people's opinions well because of individual benefits in some cases, CIFOR's research revealed.

For example, regarding the PFES payment mechanism, several village heads said that the same amount of PFES should be divided to avoid conflicts. It means that all service providers would be paid equally, regardless of economic and social conditions, legalities and forest management status. However, when CIFOR staff interviewed local people, they did not agree. "An effective process of supervising and reporting local opinions should be established with the aim to ensure that questions and doubts of local people would be identified and resolved promptly," Thuy proposed.

Finally, the current benefit-sharing mechanism does not relate to forest quality. Instead it considers local aspirations and local definitions of fairness, according to CIFOR. In a 2013 report, the research group argued that this approach had not benefited forest quality – one of the main goals of PFES.

Currently the payments are based on the size of forests, i.e. the total payments from environmental service users (after deducting a management fee and reserve fund percentage). These are divided by the total forest area. Consequently, an area with high quality forests could receive less funds than areas with degraded forests. And that could pave the way for deforestation in areas with high quality forests.

"We are at the stage of 'whoever enjoyed the service, had to be paid.' However, in the future, to ensure equity, we need to do 'how much you got, how much you paid,'" says Ngu, the leader of Lam Dong Nature Resources and Environment. Ngu is referring to his belief that it is necessary to change policy in the future. Currently, consumers pay a fixed fee, no matter what their rate of use. Future policy should require payments be based on the amount of consumption.

PHILIPPINES

PHOTOS: FELINO CHINO GASTON

Under fire

Charcoal making still rampant in the Philippines' dwindling mangroves

■ BY **FELINO 'CHINO' GASTON**

BATARAZA, The Philippines – The sounds of chainsaws portray the hum of industry deep within the canopy of the mangrove forest. I shift my backpack nervously and look to my companion, trailing me in the muddy track behind. He cocks his head towards the direction of the sound. "Chainsaws," he says nonchalantly, giving a brief shrug.

I then notice the bulge in his waist, right under his right arm. My escort was a policeman who had shed his uniform so as not to scare off the people with whom I wanted to talk. He told me later it (the gun) was our insurance, in case the people we were seeking proved to be hostile to journalists.

Leading the way was our guide, who whistled slightly at us. She was a small woman whose family had been living off the mangroves for generations. She ignored the rest of our conversation about the chainsaws and indicated that we should hurry.

A few minutes into the forest, we come upon a man carefully arranging freshly cut mangrove logs by the river bank. The logs from mangrove species are huge, with most spanning a good foot in diameter. Mangrove trees of such size, I am told, are well over a century old.

Nearer to the muddy track, a large, beehive-shaped kiln made of earth was quietly releasing a small and steady wisp of smoke. Inside the kiln, the logs of mangroves were slowly being turned into charcoal by the carefully controlled fire within. Nearby, two small outriggers were anchored near the river bank.

Our guide introduced us to the man near the kiln, and he motioned to the logs as a place to sit. My security escort was impassive, refusing to give up the high ground. He stayed on the path, his eyes darting about like a nervous deer. I obliged the charcoal maker and scrambled down the bank to the pile of mangrove logs.

While I sit atop a log, the man tells me his name is Charlis and that he has been cutting down mangroves for a living all his life. When the logs are cut to a more manageable size, they build an earthen kiln around the pile of logs and slowly burn the wood for three weeks.

Charlis cannot be more than 30 years old, but looks gaunt from years of toiling in the forest. His clothes are in tatters, and he walks barefoot in the deep mud. Yet, he wears a wide toothy smile that never seems to leave his face.

With a family of six to feed, Charlis has no choice but to make as much charcoal as he can. A single sack of charcoal earns him less than one US dollar at the local charcoal buyer outpost.

If he is lucky, the three weeks spent tending to the kiln would yield around 20 sacks of charcoal. Broken down, that adds up to less than a dollar a day to spend for food, education and the health needs of his family.

The work is back breaking. But for Charlis, and many more like him, there is no choice. "I sometimes think this is no longer a way to make a living, but rather just another way to die," he admits, despondently.

He tells me he is mired in debt because of this. He owes the charcoal buyer several months' worth of work from all the advances he has taken out. "If there was another way to make a living, I don't think I shall be doing this anymore," he says.

I ask him if he knew that he was breaking the law by what he was doing. He cracks a big smile and nods in affirmation. "I know it is illegal," he admits. "But I hope people understand why we have to do this. It may be against the laws of men, but perhaps it is not against the law of God."

Such a view, in a sense, is one of many reasons behind the rapid destruction of mangroves in the Philippines. There was a time when the Philippines had almost 500,000 hectares of mangroves. But population growth, expansion of tourism services and illegal trade in mangrove resources has cut down that figure dramatically.

At present, the Department of Environment and Natural Resources (DENR) estimates that there are only 115,000 hectares of mangroves left across this archipelago. More than half of the remaining mangroves can be found in the province of Palawan, a sliver of land found in the west central part of the Philippine Archipelago. Its natural wealth is now being tapped by the government to promote ecotourism.

The province's thrust to promote tourism has generated unprecedented environmental awareness. This is visible at the Puerto Princesa Underground River National Park. Foreign and local tourists arrive in groups at the drop-off point. A whole armada of outriggers manned by local residents wait for their turn to ferry the visitors to the world-famous tourist destination.

While waiting for their boat ride, some of the tourists stop by the many souvenir shops owned and manned by former fishermen and charcoal makers. The residents tell me they earn enough to make ends meet. If there are more tourists, they usually earn more money. However, the tourist trade is not life-changing, they complain. Many barely earn enough to put their kids through school.

To further augment their income, both parents usually have to work. The women end up selling souvenirs or food while the men serve as boat crews.

But groups like the Environmental Legal Assistance Center (ELAC) believe ecotourism should not be the only means for conservation.

Gerthie Anda, a lawyer and ELAC's founder, says that while ecotourism generates work for locals and draws awareness to the value of natural resources, social issues should be simultaneously addressed. "If they do not benefit from ecotourism the problem of poverty will still be there and that creates pressure on the resource base," she says. "(It will be so) especially if enforcement is weak, so poor people will still be there as well as corruption."

Anda argues that local executives should already use the benefits of the growing tourist trade to invest in other income generating projects.

She points to the development of other industries like agriculture and fisheries as vital to ensure sustainability of the tourism-dependent local economy. This ensures future generations will not be dependent only on the resource base of the province.

The DENR has already warned that Palawan's tourist destinations were nearing a saturation point. The environment can only take so many tourists before it will no longer be profitable for people in the tourism business. Many already believe there is danger in relying too much on tourism to run the local economy.

In 2001, Palawan's tourism took a nosedive after foreign and local tourists were kidnapped by Islamic extremists in the high-end Dos Palmas Island Resort. It took years for the local tourism to recover. Many businesses had to close shop when the tourists stopped coming.

Despite the concerns over sustainability, Palawan's major tourist attractions have effectively drawn attention to the value of environmental conservation. Here, at least, the mangroves and forests are preserved, not only as a vital part of the ecosystem, but as an income-generating resource.

At the southernmost part of the island, residents are not as fortunate.

People like Charlis continue to depend on the mangroves to make a living. Satellite imagery from the Internet reveals ugly scars along the coastline where charcoal making and debarking activities continue. The DENR claims they have stopped close to 70 per cent of all illegal logging and wildlife trade on the island. But, the many active kilns and cut logs we find in Charlis' village is a sharp contrast to the department's claims.

Juan dela Cruz, chief of the Palawan Provincial Environment and Natural Resources Office, says lack of manpower and mobility hinder efforts to stop the remaining illegal activities. He tells me that reports from the villagers are crucial due to a shortage of personnel to actively monitor areas of concern.

On the way back to his house, Charlis introduces me to his cousin. He refuses to give me his name and eyes me suspiciously. I tell him I am a journalist researching a story on mangroves.

With his fears somewhat allayed, he tells me he was once a member of an environmentalist group seeking to stop charcoal making in the area. "I stopped working for them when the people we sought to stop started killing my companions," he said.

So, while the debate rages about the right balance between economy and environment for Palawan, a simple tourist guide's take on the issue offers some food for thought. It is a refreshing break from the myriad of opinions from experts and local officials. She introduced herself as 'Lady Mangrove', a woman nearing 60 years of age and widely known in these parts as the singing guide of the Mangrove Paddle Tour.

"If we give financial support to the people in the mangrove areas, we should teach them how to utilize the money wisely," she says. "In turn, they will not need to cut down the mangroves, because there is a big demand for mangrove charcoal. It is the best kind of charcoal."

"In some parts of the country, they clear the mangroves for fish ponds," she adds. If this is done, only a few people benefit. It is only the rich who would benefit from the mangroves."

Deep in the ancient mangroves of Palawan, I could not help but feel affinity with the century-old trees that were already thriving on this spot long before the Spanish Colonists arrived in the 1500s. Somehow, a part of me recognized the twisted maze of roots and army of silent behemoths reaching up into the sky.

Yes, our ancient forebears had been here, partaking of the bounty and security offered by the heart of this forest. Maybe this is why people who visit this ancient place come out more determined to preserve the forest for future generations. You just feel this place is important to mankind without fully understanding why.

Lady Mangrove seems to read my thoughts and launches into her trademark song. The melody is haunting, and her voice sincere in its rawness. I pick out some of the lyrics in the middle of my mangrove daydreaming.

Let us take care of the sea and earth's bounty.
From the mangroves, help for the poor will come.
Many thanks to our friends for your visit.
You are welcome wherever you are from.
In the coming years, we hope you come back.
And we shall be always here, waiting for your return.

Blowing up the coast

Poverty drives Filipino fishermen to blast fishing

BY **FELINO 'CHINO' GASTON**

QUEZON PROVINCE, The Philippines – The fishing village on the rocky coast of this province in central Philippines looks like any other. Roosters announce the advent of dawn, and small fishing boats, bobbing in the low tide, return to shore filled with their night's catch.

A group of women pick shells on the exposed mudflats, while along the beach, a short distance away, children make their way to school.

It is here that the man they call 'Kapitan' can be found. He usually sits under the shade of a makeshift veranda, drinking the local brew made from fermented sugarcane juice, they call lambanog, and surveying the scene around him. Sometimes it is after he has been out fishing during the early hours like the other fishermen; sometimes not.

He is not a willing talker, this man of around 50 with thick calloused hands and leathery skin on his sun-darkened face. He is wearing an old tattered shirt and sandals long past their usefulness.

It took a long time to convince him to string me along one of his fishing trips. But, there was a reason for his reluctance, bordering on suspicions. Kapitan, you see, uses explosives to catch fish, a highly dangerous and destructive practice banned in almost all countries.

However, he finally conceded. This followed a long exchange where I had to agree to strict conditions he set. Secrecy was at its heart: I was to keep identities secret and was to refrain from mentioning the locality along Quezon's coast. That, he stressed, would prevent reprisals on his village.

The next day, I took a boat to meet Kapitan a few kilometres off the coast. Most of the men on his boat covered their faces. One man showed me the stash of explosives at the bow of the boat. He told me the explosives were ammonium-based fertiliser they buy from a supplier at 120 pesos (roughly US$ 3) apiece.

The Kapitan and three other men jumped into the glassy waters of the emerald sea. From the boat I could see the corals 30 feet down on the seabed. The men started snorkelling around the boats. They were looking for schools of fish among the corals underneath. It was hard work. The men spent the better part of an hour searching the reef for any sign of fish.

When someone spotted a school of fish, he waved at the boat. The pilot acted fast and rushed to the spot. The man in the water pointed excitedly at a spot over the reef. Then another, with the explosives, quickly ignited the fuse and launched the bottle into the air. It hit the water and sank quickly.

The water erupted with a muted roar, sending spray all over us. There was a mad dash for the plastic tubes connected to an air compressor and the nets used to scoop the dead fish.

I tried to follow the men as far down into the water as I could. Dead fish littered the reef below me some 20 feet down. The divers worked quickly, the plastic tubes clenched in their mouths, trailing air bubbles wherever they went. A few of the stricken fish floated past me, some were still alive, vainly trying to swim away.

Incredibly, another boat arrived near the area and other men jumped into the water to partake in the frenzy. There was no fighting underwater, just a mad race to scoop up as many fish as they could, before the current carried them into the deep.

My boatman later told me the other fishermen were allowed to dive for the fish even if they did not chip in to buy the explosives. They were, after all, members of the same village.

The Kapitan used two explosives that day for his catch – a crate full of fish. It earned the fishermen 2,000 pesos (US$ 50). They divided the earnings into five portions: four went to the men on this trip, while one went to the owner of the boat and to reimburse the money used to buy fuel and the explosives.

The men caught just enough fish for their needs. And the Kapitan was left with more firepower for his next foray, since he did not use all his explosives.

Data coming from the Bureau of Fisheries and Aquatic Resources (BFAR) puts that morning's adventure into context. It suggests that blast fishing, along with other destructive fishing methods like "muro-ami," has destroyed over 70 per cent of the fisheries within 15 square kilometres of the Philippine coastline.

Unfortunately, this was also where people like Kapitan make a living. Bigger boats, which can stand up to the heavy seas, require money, something beyond reach for the traditional fishermen in the country.

"It wasn't always like this," Kapitan revealed, as we share a glass of lukewarm lambanog later that afternoon. He explained that the smaller fishermen were finding it difficult to catch fish over the last ten years, ever since the big fishing vessels started trawling the coastal waters.

According to Philippines law, the big trawling vessels cannot fish within 15 kilometres of the coast. But with inadequate resources, the local BFAR personnel have been unable to enforce the law.

The trawlers also allegedly use big dragnets to scoop fish off the bottom of the ocean, another violation of Philippines law.

The men in the village blamed the big businessmen who own the trawlers for their plight. Blast fishing, they said, was the only way to catch enough fish to feed their families and send their children to school. Kapitan knew that what he was doing was illegal, but admitted he was willing to risk going to jail rather than see his family starve. Besides, he reasoned, fishing was the only thing he knew how to do.

BFAR's challenge to monitor and stop all forms of illegal fishing remains daunting. The agency has been hampered by a lack of funds to provide all towns in the country with functioning patrol boats to be able to police the municipal waters.

Another feature of the law states that arrests and prosecution of violators fall within the jurisdiction of the local government unit. Some people within the agency told me that this clipped the police power of the BFAR, which was necessary to fully neutralize the violators.

A high ranking BFAR official, speaking on condition of anonymity, revealed another impediment: a problem with corrupt coastal patrol personnel.

Such abuse was not lost on Kapitan and some of his companions. They told me that the local mayor in their town owned some of the big trawlers that have virtually wiped out all the fish in their municipal waters.

This dire situation, hardly surprisingly, has drawn global green groups into the mix. The Worldwide Wildlife Fund (WWF) has repeatedly warned the government of the dangers of blast fishing.

Gregg Yan, the communications manager for the WWF in the Philippines, says blast fishing destroys not only the juvenile fish but other marine animals, vital for the health of the coral reef.

He says there was a direct correlation between healthy coral reefs and fish stocks in any given area. The more coral reefs were destroyed, he argues, the less fish there was to catch.

Over 100 kilometres west of Quezon Province, in Batangas Province, once a hotbed for blast fishing, the WWF's efforts to eliminate blast fishing have met some success. Cooperating with a real estate developer, the WWF has given former blast fishermen a new lease of life by providing them with alternative livelihoods, like fish farming and turning some of them into sea rangers.

Yan says that this is a model of how big business can benefit conservation efforts. The real estate developers get access to a pristine marine environment that enhances the value of its property, while the fishermen get enough fish to catch to provide for their families.

But Yan admits one cannot rely on the private sector exclusively. The government needs to take note of WWF's success in Batangas Province, he says.

Kapitan told me he was willing to go back to traditional fishing methods when the time was right. He had grown tired, he admitted, of always being hunted by the law.

Clogged city

Poor solid waste management linked to Metro Manila floods

BY **FELINO 'CHINO' GASTON**

PASIG CITY, The Philippines – The stench from the river flowing through city that bears its name is overwhelming. It worsens as I make my way down a flight of concrete steps from the road to the river's east bank. That takes me through a tunnel, of sorts, with the crush of a slum on either side.

At the bottom of the steps, garbage is strewn all over the thin stretch of soil right at the river's edge. And across the river, the houses of informal settlers cram the riverbank.

A woman named Ruby is washing her children's clothes by the water's edge. She uses water from a hose snaking through the maze of houses above us. And with hardly a hint of concern she, at one point, pours the detergent-laden bucket water into the river.

"Everyone else does it," she admitted, unmindful of how the water had plastered her oversized T- shirt unto her heavily built torso. She has long hair tied into a bun and hips endowed with the girth of childbirth. Just then, her two sons poke their heads through the doorway.

Ruby's husband brought her here from the province of Quezon, hundreds of kilometres south of Metro Manila. Though the province is rich in natural resources like fish and forest products, her husband could not find work and they migrated to the metropolis with dreams of making a better future for their children. Her husband earns around 350 pesos (less than US$ 10) a day doing manual labour at a construction site. I peek inside the small room they call their house and see her husband sprawled on a woven mat, apparently exhausted from work.

She tells me that they had to come to Metro Manila so that her husband can find work. But with their meagre income, there wasn't enough money to buy a decent house. That's why they were forced to settle on the banks of the Pasig River, the main artery snaking through Metro Manila that begins in the upper tributaries near the mountains of San Mateo and gains strength from the runoff from the lake Laguna De Bay.

Ruby confesses that it was convenient to use the river as a dumping ground for all their garbage and sewage. During the night, she chucks plastic bags full of garbage into the river, since there really wasn't a garbage dump in the community of which to speak.

A journey through her community demonstrates this clearly. I see piles of garbage along the street. A dog sifts through the garbage looking for food, scattering the refuse all over the street. A resident approaches me as I am taking a photo. She demands to know when the garbage will be picked up. I shrug my shoulders and say I don't know.

This is a situation the Philippines cannot afford to ignore. With a population of over 90 million, the country ranks second among the most populous nations in Southeast

Asia. Yet, most people reside within highly urbanized areas, where access to adequate housing and basic public services remain a problem for the marginalized.

As a result, whole communities of informal settlers have, for decades, occupied the banks of major waterways snaking through the metropolis, their refuse taxing an already burdened ecosystem coping with industrial waste and siltation from the denuded upland forests. The Metro Manila Development Authority (MMDA), working hand-in-hand with the Department of Interior and Local Government, is among the government agencies tasked to relocate the informal settlers and clear the waterways of Metro Manila.

When the riverbanks and waterways are cleared, dredging and widening projects can proceed unimpeded. It will be a tough task, though. One doesn't have to go far to see the sheer volume of garbage being pulled out of the water by the agency in an effort to clean the waterways. Tons of plastics and other non-biodegradable materials are lifted daily from a flood control gate that the agency operates, as well as the various estuaries running through the major cities.

The garbage comes from the estimated 104,000 families living along the waterways that have virtually killed the major rivers of Metro Manila, they say. During the rainy seasons, the streets of the metropolis are flooded. The small estuaries that are supposed to help drain the runoff quickly overflow as they are blocked with garbage.

Rey Lunas, of the MMDA's planning office, says garbage from these informal settlers have caused severe accretion of the riverbed running through Metro Manila. Because the rivers are shallow, the capacity of the waterways to hold the water during monsoon season has been diminished.

Residents like Ruby live in the 'flood danger zone' as earlier identified by the government.

When typhoon Ondoy, in 2009, and subsequent storms, in 2012, slammed across the congested cityscape, they inundated large parts of Metro Manila, causing billions of dollars in damage and claiming lives of hundreds. Ironically, most of the dead were residents living along the waterways, a thought not lost on people like Ruby. "If I had a choice, I would not live here. But there is no place to go," she explains, helplessly.

Part of the problem is the local government's inability to implement a sustainable solid waste management program. Metro Manila is made up of 17 independent local government units with varying compliance to basic environmental laws.

A testament to this shortcoming is the steadily growing landfills, where most of the garbage from Metro Manila is dumped. It has become a veritable mountain of plastics mixed with decomposing organic waste.

Lunas explains that the informal settler areas along the river are a haphazard collection of houses with no formal layout or planning, making garbage collection almost impossible.

The MMDA has already started relocating informal settlers, like Ruby, outside of Metro Manila, offering them alternative accommodation in low-cost housing communities. There, they have decent houses and are far away from the perils of the river, at the very least.

The government has allocated 50 billion pesos (over US$ 1 billion) to build houses for the families that will be displaced.

Yet, challenges remain. Some residents refuse to leave their current areas despite the obvious danger from flooding. It is also taking time to properly process the affected residents.

And some say the solution of alternative housing does not address the real root of the problem. Ruby and her family chose to live in Metro Manila because there was work. Outside the metropolis, there are few jobs for poor families.

PHOTO: FELINO CHINO GASTON

The challenge for the government is to give the relocated families a reason to stay within their new communities.

Lunas says everything is a work in progress. The government is starting to build settlements nearer the metropolis to reduce transportation expenses of the displaced residents. There have also been efforts made to settle residents in apartment-type buildings on government-owned land inside Metro Manila. The government is also open to proposals that the residents themselves put forward to address the loss of opportunities brought about by the relocation.

In the meantime, Ruby carries out her daily chores right at the river's edge. She excuses herself from our interview as her kids have to get dressed for school. With their income, there won't be enough money to send her three children all the way through high school, much less, college.

The government relocation program has yet to contact her family, but she says she can wait. After all, the river was good to them this year and did not overflow its banks.

She hopes her children can have a better future than hers, ending the hand-to-mouth existence she and her husband have to endure. She is confident that one day, her children will leave this place and stay where there is grass and a solid roof overhead, far away from the water's edge.

INDONESIA

End of the road

For cleaner air, Jakarta targets exhaust-spewing public transport

BY **MASRUR JAMALUDDIN**

JAKARTA, Indonesia – Indonesia's sprawling capital is often described as an exhaust-filled maze. Such an unhealthy attribute stems from the transportation options for its nearly 13 million citizens to travel through its traffic-clogged streets. Besides poor public buses and private cars, there is a favourite fixture down any road – the Bajaj taxi, a carbon-spitting three-wheeler.

The Bajaj was imported from India nearly 40 years ago. And its need for oil to sputter through Jakarta's streets hardly mattered during the early decades. But, that view has changed after research revealed that greenhouse gas (GHG) emissions from transportation accounted for a 33 per cent increase in carbon pollution in the capital's atmosphere. To curb it, the fossil-fuel dependent Bajaj has been targeted. Enter the "Blue Sky Program", as a result. Under this arrangement, the old three-wheelers are being scrapped, with over 1,000 already junked in the last two years. Replacing them, are green-friendly three-wheelers, which can run on natural gas.

The initiative is being driven by the local administration that governs Jakarta. The latter is prompting the "Blue Sky Program" vehicles as one among a series of measures to help Indonesia meet its commitment to achieve its GHG emission targets by 2020. But there are still bumps on the road to get there – such as the limited number of natural gas stations in the capital for the new Bajaj.

In an interview, Rusman Sagala, Head of Climate Change Mitigation Strategy at the Badan Pengelola Lingkungan Hidup Daerah Provinsi DKI Jakarta, or the Jakarta Province Environmental Management Agency, reveals the successes and the roadblocks:

Masrur Jamaluddin: How have you implemented the Jakarta administration's policy of targeting the greenhouse effect and reducing global warming?
Rusman Sagala: We have already implemented a lot of programmes in Jakarta. One of our top priority programmes in climate change mitigation is the "Blue Sky Program". This programme aims to contain the greenhouse effect.

First, we are focusing on the transportation sector. We encourage cars to use natural gas instead of petrol. This is an effort to create zero emissions. Second, we are also trying to limit the use of private cars in the city. For example, we have a car-free day campaign on the weekends. This programme has been successful in reducing some of the air pollution in Jakarta. Third, we are encouraging households to convert from using gasoline to using natural gas. So, households in Jakarta are shifting away from gasoline.

Then, we are also focusing on waste management. We will apply technology on waste management. For example, we plan to build a power plant that will produce energy from methane gas extracted from citizen's waste. We did it in a landfill in Bantar Gebang, about 32 kilometres east of Jakarta. And in homes, we have begun a composting domestic waste movement and are encouraging people to digging bio-respiration-wells in their neighbourhoods.

We are also expanding public parks as green areas to absorb more pollutants. At this moment, we only have 10 per cent of open spaces. According to the local law, we should have at least 30 per cent. We will work closely together with the private sector to create more open spaces.

MJ: What are the obstacles?
RS: We face a lot of challenges. The biggest challenge for us is how to change people's attitudes and behaviour. But we have to be persistent, educating our citizens. We want to make this as a good habit, so our citizens will understand what is happening in their neighbourhoods and take more responsibility. So our priorities are to keep educating people about this issue and involve them in real action.

MJ: Can you tell us about the Bajaj elimination program?
RS: Yes, we are really concerned about the air pollution by vehicles, especially the Bajaj. If they use petrol (fossil fuel) they add to the city's air pollution, so we have begun a program of replacing the old Bajaj with the new blue-Bajaj, which runs on gas. Gradually, all the old Bajaj vehicles will be replaced by this blue-Bajaj. Though, not only for the Bajaj, because we're also encouraging all vehicles in public transportation to use gas, since it is eco-friendly.

MJ: What about the Bus Rapid Transit (BRT) programme?
RS: In the future, all of the Trans Jakarta buses will use gas, instead of petrol. We will build more gas stations, because our biggest problem now in the "fuel conversion programme" is the lack of gas fuel stations. We also plan to provide bigger buses so we can carry more people and minimise the use of private cars.

MJ: Are you optimistic that Jakarta will reduce GHG emission by 30 per cent in 2030?
RS: Yes. We should be optimistic, because if we are not, we will fail. In each province in Indonesia we have an obligation to aim to meet the local targets on reducing emissions. We have created a programme to monitor the achievement year by year.

In 2013, we also did a comprehensive evaluation of our climate change mitigation programs. Since 2012, we have a local law that manages the "emission reducing" programme and its implementation. This local law is called Law Number 131 (year 2012) on Local Action Plan on Climate Change Mitigation. Jakarta's Environmental Management Body has the responsibility to implement that local law. But, in the field, separate bodies, like the transportation body, mining body, and waste management body share the implementation and enforcement of the law.

MJ: Do you have some ideas to accelerate the implementation of the local law?
RS: We used some initiatives from the governor and the governor's law to remove some of the obstacles that had come in the way of implementing the law. We also built intensive coordination with the central government to solve some problems that were connected to central government authorization. But the most important thing is we created some tools to evaluate the climate change mitigation programmes every year and pursue development in the next year's action programmes.

MJ: Actually, what is the biggest contributor of air pollution and the GHG effect in Jakarta?
RS: Jakarta's Environmental Management Body studied the most dominant pollutants that contribute to the GHG effect in Jakarta. We have also created a local action plan, which is an implementation of the governor's law on environmental issue. From the research we found that the biggest contributor was energy consumption, which has reached 33 per cent. It is followed by the transportation sector, which is also around 30 per cent. And waste is in third place. Those three sectors are our main targets in climate change mitigation. We also have a shortage of green public spaces in Jakarta, contributing to an increase in the GHG effect.

JM: So what are your concerns regarding the transportation sector?
RS: Yes, I have to admit that we need to move fast to reach our target, but we face cultural and behavioural problems. Now, most Jakarta citizens are using private cars and motorcycles, instead of public transportation. I agree that our transportation system is very bad, but we are on an improvement path. We need public support for using public transportation, so we can reduce the emissions by increasing public participation. But, for sure, we have a commitment to reach our goals in each sector based on measurable targets.

From oil to water

Micro-hydro success story lights new path in Indonesia

■ BY **MASRUR JAMALUDDIN**

SUKAHARJA VILLAGE, Indonesia – The search for cheaper, alternative sources of power in Indonesia has prompted interest in the many rivers that flow through Southeast Asia's largest archipelago. Even small rivers are being eyed by experts and local communities that are drawn to renewable energy sources as a path away from the country's costly and polluting conventional energy sources, such as oil and coal.

The shoemakers of Sukaharja village, nestled on the slopes of the Salak Mountain in West Java, are enjoying the benefits of this shift. For years, they had depended on conventional sources of fuel. The dependency proved expensive and high energy bills undermined their profits. They also had to endure the erratic power supply from the national grid – sudden blackouts. But not anymore!

They are crediting electricity from a micro-hydro plant for their change of fortune. Built in 2009 by tapping the Cibinong River, the plant has enabled the shoemakers to continue with their trade unimpeded – even through the night – and at very little cost. It generates 5.5 kilowatt hours (kwh) from a total capacity of 20 kwh.

Advocates of green energy are using the success story of this village – initially a pilot project for renewable energy – to shape public policy.

Other achievements have also helped this case, such as villages benefiting from micro-hydropower, saving around US$ 33,000 per year on their fossil fuel bills. In the village of Cipayung, 150,000 tonnes of carbon emissions have been slashed, say experts.

In an interview, Maxensius Tri Sambodo, Energy Expert at the Lembaga Ilmu Pengetahuan Indonesia (LIPI), or the Indonesian Institute of Sciences, reveals the transformation:

Masrur Jamaluddin: Do you think the Government of Indonesia is paying serious attention to developing renewable energy, particularly in terms of climate change mitigation?
Maxensius Tri Sambodo: Renewable energy like hydropower, for example, is playing a big role in reducing the greenhouse effect and climate change mitigation. So far, coal and oil still dominate the energy generation in Indonesia, but they release a lot of emissions. Yet, at the same time, we know that green energy like hydropower has zero emissions – no emissions at all. And it is not difficult to find water in many places in remote areas in Indonesia. Actually, water has been used in Indonesia as an energy source for a long time. So what we need to do is offer a new technology to make use of this resource. We are encouraging the government to help facilitate this initiative, such as developing alternative energy like micro-hydropower.

MJ: Do you believe that micro-hydropower is a good answer to deal with climate change and global warming?
MTS: Yes, of course. By using micro-hydropower we can reduce the use of oil and coal as energy sources, so automatically we are participating in reducing emissions. Micro-hydropower is also an instrument to educate people to protect water catchments. They also have to be concerned about the water quality in order to keep the power stations running. So, it not only has a climate change perspective, but also other environmental dimensions. I believe micro-hydropower is playing a strategic role.

MJ: How big is the potential for micro-hydropower development in Indonesia?
MTS: It's very big. In many places in West Java, for example, we have a lot of rivers offering big potential to develop micro-hydropower. But unfortunately, local governments are not interested to optimise its potential. We need them to do some feasibility studies and then initiate the micro-hydropower programme. This kind of energy is very suitable to supply electricity for people in remote areas.

MJ: What are the challenges that have come in the way of having more micro-hydropower in Indonesia?
MTS: The first challenge is about the role of government in terms of creating good regulations and endorsement. Micro-hydropower needs a specified area like a river and land around the river, which is a government's domain. Government also needs to regulate the land use strictly. We often see people building houses near the river, which is bad. The second challenge is about how to maintain the micro-hydropower plant and how to sustain the project. In some cases, plants can only operate for about three to four months. The public can't manage the operation of plants and sustain projects properly, (and) they forget that we invested a lot of money building plants for them. So we really need people to maintain projects seriously, and encourage them to use the electricity to increase their economy and productivity. So renewable energy can make a big contribution towards poverty eradication, like what we see here in this village. Many villagers are using the electricity to make shoes. It is increasing their income.

Big stink

Tackling waste at the source is being tried to end Jakarta's garbage problem

BY **MASRUR JAMALUDDIN**

JAKARTA, Indonesia – Everyday, an estimated 2,000 tonnes of waste are tossed into the waterways that flow through this sprawling megapolis. So, when the rains sweep through the Indonesian capital, the clogged rivers overflow, flooding large swathes of the city. The worst affected people are those living in the crowded poverty belts.

But the river as a dump site is only part of Jakarta's waste problem. The city's Sanitation Department is struggling to manage a much larger share of garbage meant for landfills. Some estimate that such garbage amounts to 7,000 tonnes of waste every day – and increasing.

To deal with the problem, the local government has turned to reducing the garbage at its source through a pilot project. Under it, select local communities are being roped into helping manage their own waste. They are encouraged to sort out their garbage, with organic waste being used as compost for vegetable plots in homes than being thrown away as before.

A 2013 local government law has helped, in part, to stimulate change in households. It is also being used by the authorities to encourage the private sector to play its part in waste management. As a result, a "business to business" model has begun to take root, with private companies managing their own waste or turning to others in the private sector making a business out of refuse. Those who have signed up are shopping centres, hotels and residents of apartments.

In an interview, Unu Nurdin, head of the Jakarta Department of City Cleaning, reveals the tough challenge at hand:

Masrur Jamaluddin: What is the crucial problem about waste management in Jakarta?
Unu Nurdin: One of our critical problems is building temporary waste management areas in each sub-district of Jakarta. As you know, we are a big city with about 13 million citizens. They produce a huge amount of garbage every day. According to our data, Jakarta citizens produce 7,000 to 8,000 tonnes of garbage every day. Not only domestic or household waste, but we also receive some big amount of fruit waste on a business scale.

So (dealing with) temporary waste management, like a small landfill in a sub-district, is very important, before we send all the garbage to the big landfills. We need the small landfills before we can create new technology to manage all the waste properly. You know that each sub-district can produce 140 tons garbage per day. So we hope in the near future to install new technology to help each sub-district manage their waste before they send it to the final landfill.

We are also facing bad behaviour in our society; it is as a big problem. A lot of citizens keep throwing their garbage into the rivers. It includes street food vendors who produce a lot of waste and don't manage their waste properly.

Inside our institution, we have many problems like transportation for example. At this time, most of the trucks that transport garbage to the landfill are old and in bad condition. We hope to replace them with 92 new trucks.

MJ: With that amount of problems, do you think you have good solutions?
UN: There is no instant solution. But now we are on the right track, especially since we passed the "Waste Local Law" in 2013. This law will regulate many things regarding the new concept of waste management in Jakarta.

We will offer rewards and impose fines more strictly, based on this regulation. We are preparing fiscal and non-fiscal incentives for citizens or communities who apply waste management techniques in their neighbourhoods. We will also execute punishment for those who violate the law. We promise to enforce the law more seriously by issuing fines and sanctions. For example, someone who is throwing garbage into the river will be fined about US$ 10 to 50.

MJ: What about violations of the law by companies or business entities?
UN: The fine and the sanctions will be much higher and strict. As you know some industries are creating a lot of waste. But at the same time, this Waste Law also accommodates "business to business" schemes. We offer an opportunity to organisation to make a business deal with companies or business institution like a shopping centre, hotel, or hospital in order to manage their waste. So we don't need to "help" big companies to transport their waste to the landfill. It will reduce our subsidy and we can allocate it to poor people. It would create new business opportunities and at the same time we can maximise our service to low- and middle-income citizens.

MJ: What about increasing public participation? Do you have an idea about that?
UN: I think public participation is increasing. For example, at this moment, we have developed more than 200 spots on the "Reducing-Reusing-Recycling" public participation programme. But still we need to educate the public to pay more attention and be more responsible to tackle the waste problem. Most citizens have a paradigm that waste is the government's responsibility. They keep demanding for us to clean up their waste all the time. That's a problem.

As you know, talking about waste is like talking about a never ending job. It's never finished because as long as we live we keep producing waste. But recently, I found out that public awareness to reduce or control waste is increasing, though the participation is not significant, yet. Some companies are also contributing in educating the public about waste problems. For example, there is a competition for "the cleanest kampong", which is supported by the private sector and the media. But yes, I agree that the hardest job is about changing public perceptions and educating people to be more aware about the waste problem. We need more public participation, indeed.

SRI LANKA

More hunger pains to come

Extreme weather events threatens food security in Sri Lanka

BY **DILRUKSHI HANDUNNETTI**

UNEP ASIA PACIFIC

VAKARAI, Sri Lanka – The coastline of Sri Lanka continues to be a magnet for its people. Nearly a third of the country's 21.2 million people live along 1,585 kilometres of beaches that wrap around this South Asian island. Yet, it is far from ideal, given the impact of drastic weather events on the shoreline.

Such threats, however, mean little to those drawn to the shores washed by the Indian Ocean. The country's northern region, just coming out of a nearly 30-year civil war, offers ample indicators highlighting this unfolding trend. Many landless people (in addition to those who have traditionally inhabited coastal areas) continue to end up at the water's edge in order to eke out a living from a common resource.

This indicates, why Sri Lanka is unlike other South Asian neighbours such as Maldives and Bangladesh. The latter have been more upfront about the problems linked to extreme weather events. Here, on the other hand, warnings about the threats from climate change are treated with a strong dose of scepticism.

So, to catch up with a region preparing to deal with erratic weather patterns, Sri Lanka is finally pushing ahead with steps to draft policies and strategies to help communities adapt to climate change and to build a measure of community resilience. Such efforts are drawing from views of coastal communities in the country's south and east where signs of change have become obvious. These fishing communities feel that their catch has depleted in the past decade or so, eating into their only livelihood.

Among the affected is Sathyapriyan Thanabalan, a 48-year-old fisherman from the Batticaloa District, located along the eastern coast. A fisherman for over three decades, he claims to have supported a family of five without much difficulty for years. "But things have changed now. The catch is less and the varieties too have reduced," he admits. "Now we are looking for alternative modes of income and I undertake other tasks including working as a day labourer, to make ends meet."

The reasons for a decrease in his catch are diverse. Part of the problem, Thanabalan feels, lies in the shift in fishing methods, with larger mechanised boats scooping up more fish stocks than before. Yet, he and his colleagues do not discount an equally troubling development – drastic changes in the ocean over the years, impacting marine resources.

"The catch has reduced, definitely. But high and low tides have also become unpredictable. Even the rains are irregular so we fisher folk find it difficult to continue fishing," says Dayaseeman Vadivethan, a 39-year-old fishing colleague of Thanabalan. "In the past few months, several fishing boats perished in the high seas due to 'freaky' weather. We used to understand weather and were able to predict changes and prepare for them but not anymore."

It is a view echoed on the other side of the island, too. "There is a strong depletion of fish stock. We used to sell specific species, popular among buyers, but we cannot find them anymore. It is a daily struggle," claimed Gunapala de Silva, a fisherman from Hikkaduwa, a popular tourist destination in southern Sri Lanka.

Consequently, due to a drop in the traditional income source, and without an attractive and legitimate alternative, some of the fishermen have been forced to survive by other means. That includes resorting to illegal practices such as coral mining and sand extraction, both of which are prohibited under the country's coast conservation laws.

Their concerns, in fact, have broader implications given the dietary habits across the country. After all, it is not only those people living close to the sea who survive largely on fish and rice, with fish being the main protein supplement. Sri Lankans, according to health ministry sources, absorb their protein largely from the consumption of fish, a practice that has remained unchanged despite the increasing consumption of meat products, easily available in the market. "This is natural for an island with a history of fishing. People consume what they can have access to," the official explained.

While there is focus on rising sea levels and impacts on certain livelihoods, experts feel that Sri Lankans are yet to understand the gravity of the situation – food wise. With fishing and farming communities trying to come to terms with an increase in extreme weather events, Sri Lanka is likely to face threats relating to both food production and food security, according to Sri Lankan experts.

That is why W. L. Sumathipala, the former head of Sri Lanka's Climate Change Secretariat, is arguing for a more comprehensive response. Sri Lankan's need to go beyond the fear of rising sea levels to seriously consider other climate-related concerns such as food security and livelihoods, he warns. "We need to consider serious adaptation measures."

According to him, a survey on perceptions on climate change was conducted for the Ministry of Environment and Renewable Energy. Its findings were fed into drafting the National Climate Change Adaptation Policy for Sri Lanka, which was released in November 2010. "Food security was identified as one of the key areas of focus. Sri Lanka needs logical conclusions and rational answers to our present and future problems," said Sumathipala.

The National Climate Change Adaptation Strategy, recognised food security as a key priority for Sri Lanka. "We need to consider major increases in food productivity and promote crop varieties that could withstand extreme weather. There will be a shortage of our key source of protein – fish – besides the immediate impact on the production of our staple – rice," admitted a concerned Sumathipala.

"Food security could be threatened in multiple ways. It will reduce productivity both in the agriculture and fisheries sectors, contributing to increasing levels of malnutrition," warns Nalaka Gunawardene, a science writer and communication specialist.

The Global Hunger Index (GHI), released in October 2013, reflects the wisdom of such warnings. While the number of hungry people had dropped in India – one of the most populated countries in the world – Sri Lanka is lagging behind, together with fast-developing Bangladesh, China and Pakistan. Sri Lanka was slotted 43 and was considered a country with "serious" levels of hunger.

An earlier warning came from the Food and Agriculture Organization of the United Nations (FAO), in a 2009 survey. It highlighted that by 2080 agricultural output in developing countries may be reduced by 20 per cent due to climate change, and that low crop yields in recent years may result in food shortages for 28 countries, including Sri Lanka.

Yet, according to Hemantha Withanage, executive director of the Colombo-based Centre for Environmental Justice (CEJ), a local non-governmental organisation, the links are not yet understood. "There needs to be enough room in our policy practices to support community resilience. They have daily battles in grappling with the issues," says Withanage.

Sri Lanka's national strategy documents have already identified possible climate change impacts. They include changes in rainfall patterns, increasing intensity and frequency of droughts and floods, extreme rainfall events increasing soil erosion, rising temperatures affecting crop and livestock yields, and rising sea levels causing salt water intrusion into coastal lands, degrading soil quality and rendering lands unsuitable for most crops.

Turn Down the Heat, a World Bank report released in June 2013 to coincide with World Environment Day, sought to assess climate risks around the world, warning of different scenarios for different regions in the world. The report set out various scenarios for the region.

But for countries such as Sri Lanka, a multitude of other climate concerns loom on the horizon. The annual north-east monsoon, for one, is likely to bring less rain during the months of November through April by 2050, says Christina Shanthi de Silva of the Department of Agricultural Engineering at the Open University in Colombo. "The impact will be borne by key rice-producing areas in the region. Rainfall increase in the wet zone will bring other issues of infrastructure damage, loss of livelihoods and question the coping capacity of communities," says de Silva, who has researched rainfall patterns. "In Sri Lanka, the dry zone will become drier and the wet zone wetter, impacting on the seasonal balance."

What is more, food and crop security will not be only a Sri Lankan problem. It is likely to emerge as a serious concern for the entire of South Asia, according to Srinat Dixit of the National Initiative on Climate Resilient Agriculture, a government-backed entity based in Hyderabad. He predicts a reduction in pre-monsoonal crop yields, making the region rely more on winter crops. "Bangladesh, India, Nepal and Afghanistan top the Climate Vulnerability Index and our regional food security is severely threatened."

It is a scenario Ahamud Hassan, a director at the Dhaka-based Centre for Environmental and Geographic Information Services, a local think tank considers "an unavoidable eventuality" in about 35 years. Hassan, who has studied impacts of climate change particularly on the coastal communities of Bangladesh, is of the view that the region's coastal communities will face human safety issues due to rising sea levels and unpredictable seas, drastically altering coastal livelihoods. "But tropical cyclones and storm surges will be more frequent than the threat of sea level rise. Extreme weather is now a regional experience and our food security is under severe threat," he said, adding that extensive flooding will cause hunger in Bangladesh, a country already struggling to feed its people.

Meanwhile, the Intergovernmental Panel on Climate Change (IPCC) in its 2012 report entitled, Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptations – better known as the SREX report, states that the frequency and intensity of rainfall, drought and warm spells have likely increased in some places. The report in its sixth key message states: "A new balance needs to be struck between measures to reduce risk, transfer risk (e.g. through insurance) and effectively prepare for and manage disaster impact in a changing climate."

It adds, in its fifth key message: "High levels of vulnerability, combined with more severe and frequent weather and climate extremes, may result in some places in Asia, such as low-lying islands and coastal areas, being increasingly difficult places in which to live and work," highlighting the need for measures to protect communities at risk, together with their livelihoods.

Sri Lanka, despite strong scepticism, has been looking for some indigenous answers, including crop diversification. A top official from the Ministry of Agriculture said that many experiments had been conducted to develop highly resilient crop varieties, especially rice, due to increasing concerns over food security. "We first concentrated on the staple food," he explained.

"A rice variety known as SRI developed using the System of Rice Intensification (SRI) is cultivated using traditional knowledge and harvesting practices. It contains high nutritional value and is easy to cultivate, once the field is well prepared," he revealed. "SRI rice is able to withstand many an extreme weather conditions and a multitude of diseases and pests."

Cultivated using organic fertiliser and requiring 50 per cent less water, the system seeks to maximise paddy yields. The first year is spent shifting from chemical to organic cultivation and during the second phase of three years, the organic cycle is completed, he explained. Sri Lanka, he added, had some 2,000 traditional rice varieties, and similarly to SRI some of them able to withstand extreme weather conditions and resist a multitude of diseases and pests.

"Nearly 34 per cent of the island's cultivated area is covered with rice fields and we wanted to introduce high yielding varieties," he said.

But there are some experts, such as Srinat Dixit, head of the National Initiative on Climate Resilient Agriculture of the Indian Council of Agricultural Research, who harbour misgivings about the success rate of such varieties. "While the System of Rice Intensification appears to provide an answer for an impending food crisis such as in Sri Lanka, soil conditions being dynamic as much as climate, what is considered ideal for today may not be so for tomorrow," he notes. "Changing conditions will change the level of success in crop production and their resilience."

Meanwhile, for those living along Sri Lanka's coast, government assistance has become paramount to survive. The answers to the immediate concerns should include better government assistance, insurance schemes such as those introduced in Bangladesh and India, in addition to introducing new crop varieties and techniques of fishing, says Edirimuni Peduru Silva, a 60-year-old fisherman from the southern coastal town of Galle.

As the debate on the viability of such a move continues, nutritionists warn that a significant decrease in the intake of fish, the island's key source of protein, may result in increased levels of malnutrition and, for the older generations, reduced immunity and longevity.

"It is a vicious circle. Practical answers are necessary for farming and fishing communities that are not only livelihood-focused. Despite producing the island's staple food and its main source of protein, it is these communities that are most at risk, when it comes to food security," warns Withanage of CEJ.

PRACTICAL ACTION (SRI LANKA)

PRACTICAL ACTION (SRI LANKA)

Glimmer of hope

A glowing model for a bio-energy future brightens Sri Lankan lives

■ BY **DILRUKSHI HANDUNNETTI**

GURUGODA, Sri Lanka – This small, isolated village in north-western Sri Lanka bears the outward signs of a dry zone hamlet. It is caked by dust and plagued by water scarcity. In addition, Gurugoda's villagers have had to endure other daunting threats from their immediate surroundings – wild elephants.

But that is not all. The villagers, who make a living from farming and as hired labourers, have long been deprived of electricity from the country's national grid. This has added to their woes of low incomes and poverty.

Today, however, there is a glimmer of hope for these villagers. They have lights at night. This is the result of this village being chosen in 2006 for a special pilot project to explore alternative energy sources. Help came courtesy of Practical Action, a non-governmental organization that has specialised in community-based solutions, with the support of the Asia-Pacific Forum for Environment and Development (APFED) Showcase, operating out of the Bangkok office of the United Nations Environment Programme (UNEP).

This community-driven initiative facilitated the local community to operate and manage a biofuel plant, enabling them to meet their basic energy needs and successfully reduce poverty.

Besides the biofuel plant, the community was mobilised to cultivate jatropha, a flowering plant known for its resistence to drought and disease. Besides being an additional source of income as a cash crop, the plant is being tapped for another benefit – its seeds are a known source of biodiesel and are being used in the operation of the biofuel plant.

"When we asked for electricity, we were told the cost would be in the region of four million rupees (US$ 30,530) for a rural electrification initiative and it was not possible to connect us to the national grid. We had no electricity for many years," says 59-year-old, Dissanayake Sumanathilaka, the proud owner of a house now electrified by biodiesel generator, which is owned and managed by the community.

Prior to the generator, he and the other villagers used kerosene lamps to illuminate their modest homes, draining their already limited incomes. "Our children had to study at night, using unsafe lamps. We were a village denied," noted one villager.

It is little wonder why the prospect of change saw some 68 families become actively engaged in growing and tending jatropha plants. As the community was assisted to meet their own energy demands, villagers were encouraged to cultivate and supply the seeds to the oil-processing centre for biofuel generation, which became an initiative on its own.

Jatropha, is not an indigenous plant to this South Asian island. It was introduced about 500 years ago. That, however, was not the only reason why the villagers initially resisted the idea of growing jatropha in their midst. Opposition to the initiative was also shaped by the people's beliefs about the plant, itself. The locals had avoided growing jatropha in areas where food crops were grown.

"We used to believe that around the jatropha trees, other crops cannot be grown. Also, we thought it caused soil quality to erode," Sugathadasa Banda, a 60-year-old villager, recalled. But that belief is all history, and now the villagers know that each plant has the potential of producing about 4 to 10 kilogrammes of seeds per year in the dry zone area. Initially, 7,800 jatropha plants were planted as natural fencing by 25 families – with the potential to produce 28-70 tonnes of seeds per year.

The villagers felt energised by the idea that they could be self-reliant, instead of waiting for the government to provide them with electricity. The crop has the capacity to generate five litres of biodiesel per batch, requiring about 25 kilograms of oil-bearing seeds. Each batch takes about two hours to process, a task performed by the community. This volume, according to them, is sufficient for the community to meet their basic daily energy needs.

Currently, the energy-generation plant in Gurugoda consists of a turbine, bridge rectifier, battery bank, control panel, ballast, single-phase inverter and an alarm system. Designed and manufactured locally, the maintenance of the system does not take much effort, says Rohitha Ananda, Practical Action's Project Manager. "The community has to only fill battery water," he adds, which is provided free-of-charge by the National Engineering Research and Development Centre (NERDC), affiliated with the Ministry of Technology and Research. The alternative energy produced by the turbine is converted into a direct current by the rectifiers and stored in the battery bank, and thereafter distributed among the houses.

However, the system still places restrictions on the electrical and electronic equipment people are able to maintain. "Refrigerators, electric cookers and heaters that consume a lot of electricity cannot yet be used. We are a long way off from being energy sufficient, but for us who were denied, this is a true lifeline," said 30-year-old Samanmali Perera, who believes that the initiative should be further developed in order to be of much better use to the Gurugoda community.

The biggest drawback that prevents the programme from becoming financially viable is the cost of production, which is thrice the regular unit generation cost. The high cost of chemicals, including methanol, sulphuric acid and sodium hydroxide, make the cost of generation thrice the price of a litre of diesel. For this, it has been suggested that the initiative be further developed to medium or large scale.

Meanwhile, both the cultivators and collectors of jatropha seeds are earning an additional income. There are several by-products such as glycerine, soap, and organic manure, produced by the waste material, an aspect that has delighted the women in the community. They are mostly involved in collecting seeds, rather than in its cultivation. In the process, they have been able to churn out the new products that they can sell within the community and outside.

Nearly eight years later, Gurugoda has become, albeit the shortcomings, an example for others to follow. Considered a replicable model, it has become a learning centre where the public is encouraged to visit and learn about the multiple socio-economic impacts of a locally and well-designed initiative.

As people say, a tree that they once shunned has changed their entire lives, provided them with electricity and offered new sources of income. Despite a few shortcomings, it is an initiative that makes the community eternally proud – and energy proud.

TRIED AND TESTED

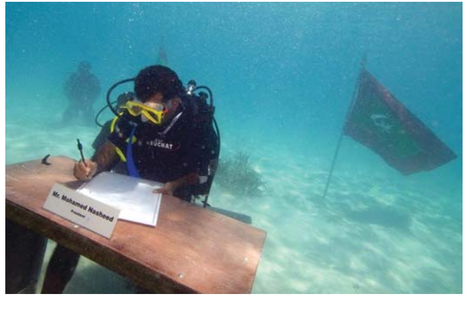
A model of bio-energy makes its mark

BY **DILRUKSHI HANDUNNETTI**

The Gurugoda initiative commenced in 2007, at a time when there was global concern over an impending energy crisis, say Namiz Musafer, project head of the implementing agency, Practical Action, a local NGO.

"Following a desk study on the global status on liquid biofuel, we designed a programme with a strong community-based approach. After experimenting with a number of seeds, jatropha was chosen," he says. "Scientific crop cultivation was introduced early. The programme involved conversion of seeds into oil using a locally manufactured oil expeller and transformation of extracted oil to biodiesel using a locally manufactured plant. The generated diesel was to be utilized for hand tractors, water pumping and operating a wind turbine for power generation."

There was an initial hitch, though. The generation cost of a single unit was 300 rupees (US$ 2.29), compared to hydro power, which was around 110 rupees (US$ 0.83). That challenged the notion that sustainability requires a better economic model. "Yet, this was technically and socially viable. To make it economically viable, it needed to be developed as a medium- or large-scale initiative. Generation of bio-energy is both viable and replicable," notes Musafer.



Sinking feeling

Maldives struggles to stay above water

BY **DILRUKSHI HANDUNNETTI**

MALE, The Maldives – It is a doom's day scenario that would make most people sit up. A predicted one-metre increase in sea level by 2100 could see 85 per cent of the planet's landmass submerged. Its no wonder that in places like the Maldives, such dire predictions are hard to ignore. The warnings stoke fear in the lives of the people who live on this necklace of islands in the Indian Ocean.

These resplendent islands, among the world's most picturesque, have been dealing with issues of physical safety for the past eight years. The concerns are divided between the fates of the 1,192 islands – some inhabited and some not – that make up the Maldives and the lives of nearly 400,000 inhabitants.

Successive Maldivian governments have strived to have their archipelago listed as a priority concern in the pecking order of global climate change debates. Some who wielded power in Malé, the capital, sought international attention through eye-catching means to make their case of a small island nation that could be submerged. The most innovative of these leaders was Mohamed Nasheed, former president and reputed climate warrior. He held the world's first and only underwater meeting of his cabinet in 2009, a move that prompted the government in landlocked Nepal, on the other side of the Indian sub-continent, to hold a similar meeting at the foothills of the Himalayas – to highlight its own climate-related concerns.

Nasheed, who was ousted from power in a coup in 2013 and was defeated in a subsequent presidential election, is still held in high regard by Maldivians for his stunt. The meeting was held ahead of the United Nations Climate Summit, in Copenhagen, Denmark in 2009. The islanders credit him for striking a different path – by promoting clean energy, sound waste management and a carbon neutral economy – without the traditional rhetoric, coupled with bashing the West.

But this moment of Maldives's arrival on the global stage of climate change diplomacy would be hard for others to ignore, too. After all, the coral islands, with their powdery white beaches, shallow turquoise blue waters and breath-taking expanse of coral reefs, attract some 600,000 tourists annually. The tourists are pampered on islands with a ground surface no higher than three metres along some stretches. 80 per cent of the land area lies just a metre above sea level, making the Maldives the flattest country on Earth, followed by the equally climate-threatened Kiribati in the Pacific Ocean.

The fate of the coral islands was well documented by the World Bank in its 2012 report, titled Turn Down the Heat, which identified Maldives as the world's leading candidate of small islands vulnerable to rising sea levels.

"What adds to this vulnerability is the lack of topography. Maldives is highly vulnerable to rising sea levels and coastal flooding," notes Shauna Aminath, who heads the youth wing of the Maldivian Democratic Party (MDP). "Mohamed Nasheed changed the climate debate and put Maldives on the international map, not as an exotic chain of islands, not as victims, but as resilient people who will tackle the problem through policy and practice. We now need to see action: renewable energy plans, solid waste management and islands of great resilience."

Maldivian Government statistics indicate that 191 out of the 358 inhabited islands have fewer than 5,000 people, with one third of its total population living in Malé, situated on the North Malé Atoll. Approximately 105,000 people reside within these 5.8 square kilometres, making it one of the most densely populated islands in the world.

Views on the existence of climate change are drastically shifting, and unlike in places where climate scepticism is the rage, Maldivians are strong believers of climate change, not doubting for a moment that their islands are being severely inundated. There is general acceptance of the strong possibility that many islands will be wiped out by 2100.

For the average Maldivian, climate vulnerability is something to live with. Inundation, sea level rise, loss of livelihoods and physical safety are not of academic interest – they are real and are the daily challenges. Instead of complaining, Maldivians have learned to adapt and build communities with strong resilience, in keeping with government policies.

Take the case of Nasim Abdul Hamza, who at 50 years of age is classified as a senior citizen by Maldivian standards. He has been a fish exporter for over three decades. The business was handed down to him by his father, who was a prosperous fish trader.

"We noticed that a number of fish species we used to catch have disappeared from our seas, including ornamental fish," he says. "This is our main livelihood and it is the key source of protein. It's alarming."

For Maldives, depleting fish stocks would mean a considerable reduction of the country's second key source of income – fish exports. Some 40 per cent of the population is engaged in fishing and canning of fish. But the slow disappearance of islands at an annual rate of 0.8-1.6 mm rise in sea levels – something climatologists confirm as being a reality in the Maldives since the 1950s – causes extensive land inundation.

"It is a serious challenge for us. A small rise can mean a big change for these tiny islands," says Mariam Ahmed Siddique, a teacher based in the Maldivian capital. "It affects our industries – both tourism and fish exports – in a serious manner. We may experience flooding from waves, generated by storms. Most of the inhabited islands experience annual floods. In 2007, it led to the evacuation of over 1,600 people from their homes and damaged their properties. That was a serious impact we suffered."

Similar views are echoed by Thaleef Ahmed, a travel operator, working from Colombo, the Sri Lankan capital, and Mumbai, the Indian heartland of finance. "There is the issue of physical safety that tourists worry about. Ecosystems are lost which also puts off tourists coming here, looking for adventures in the sea," he says. "We have the world's most scenic beaches but safety will soon threaten the resorts-based tourism industry."

The coastal infrastructure is of great importance to the Maldives, with its five airports and 128 harbours concentrated along coastlines. The country's two international airports – critical components of the tourism sector – lie within 50 metres of the coastline.

The average Maldivian also worries about the scarcity of freshwater resources. While 87 per cent of the population's drinking water needs are met by the collection of rainwater, groundwater is still required for non-drinking purposes. Since groundwater aquifers are shallow, high extraction increases the vulnerability to saltwater inundation.

But the people – though faulting successive administrations for not focusing on coastal protection measures – now feel that the policy focus introduced first by former president Mohamed Abdul Gayoom and enhanced by Mohamed Nasheed should be used to serve twin purposes. They were to ensure the islands' continuity and its two main industries – tourism and fish exports.

This explains why the Maldivian Ministry of Home Affairs, Housing and Environment sounds resilient, revealing it has identified potential measures to help the country adapt to rising seas. These include protecting groundwater and increasing rainwater harvesting, in addition to increasing the elevation of critical infrastructure.

That marks a shift from a more drastic measure that had been contemplated. Migration was considered as a solution by Nasheed in 2008. He famously announced the country's interest in buying a new homeland, a costly option in many ways, but something Maldivians feel strongly about.

Besides, Maldives was the first country to declare its intention to become carbon-neutral by 2019 – a strong policy thrust that is now being practically tried out – in addition to developing climate resilience on 10 islands. The development of 100 resilient islands, ambitious by any standard, was undertaken by the Maldivian government in recognition of the need to reduce global emissions. This is done despite Maldives being an insignificant contributor to global emissions, like all other small island nations.

"It is a policy approach and it matters to be conscious and play our own role," notes Thoriq Hamid, head of Transparency Maldives, an anti-corruption agency committed to good governance.

"The threats to our physical safety are well known. Our livelihoods and food security are threatened," notes Salem Mehmood, a businessman from Hulhumalé. "As a coastal nation, we consume fish. It's part of our culture and cuisine. Soon there will be no fish, or only fish that cannot be consumed. Then the fishermen will have to get into tourism, which is not an option."

Mariyam Shakeela, the former Maldivian Minister of Environment and Energy, warns that the climate change predictions for Maldives would include windstorms, heavy rainfall, drought, sea swells and storm surges. "Climate hazards are expected to be aggravated by climate change effects, increasing the risks of flooding and coastal erosion and the vulnerability of 44 per cent of settlements and 70 per cent of the critical infrastructure, all located within 100 metres from the shore line," Shakeela noted. She said the government has made elaborate plans to face the islands' unknown future with resilience. Climate change risks were factored into all development planning with a strong focus on better land use and clean energy.

The Seventh National Development Plan adopted a policy of identifying 10 safer islands, which were to become future refuges for people displaced as a result of climate change. These islands are expected to contain high-cost infrastructure, such as sea walls and desalination plants and even artificial islands, similar to Hulhumalé in the Malé Atoll.

To augment the policy thrust with sound practical programming, scientific surveys have been undertaken, also beating the gloom and doom projections for the islands of beauty.

A 9-month study conducted by the Regional Integrated Multi-Hazard Early Warning System (RIMES), looked into developing a model that is able to interpret future climatic change scenarios for the Maldives. The new projections are to be considered in development planning at national and local levels.

Going public with that view is Govindarajalu Srinivasan, Technical Advisor for climate applications and research at the Bangkok-based RIMES. The existing global

climate change models (GCCMs), which are the most important tools for the study of climate change and to make projections, are unable to provide descriptions on a regional scale, he says.

The RIMES research also confirmed that Maldives was experiencing an increase in sea surface temperature and rainfall variations, posing serious future climate risks.

Among the softer measures is the integration of climate change risks into Resilient Island Planning in the Maldives Programme. The Programme deals with working with nature to increase resilience including coastal afforestation, replenishing of natural ridges, climate proofing drainage, coral reef propagation, mangrove planting and beach nourishment. The choice will lie with the communities as to what measures should be adopted as they deem fit.

"They are to be our survival islands," said Muhamed Siddique, a Maldivian public servant who feels, despite the extreme weather events, the islands are on the correct path, policy and programme wise.

In the words of Hamza Jasmin, a community worker, "We are a resilient people. While others cry over climate change impacts, we are focused on solutions – for the islands' safety, food security and our people's livelihoods."

UNDERWATER HERO

Former president still campaigns to save his country

BY **DILRUKSHI HANDUNNETTI**

During his term as the Maldivian President, Mohamed Nasheed succeeded in drawing global attention to the threats from climate change faced by his country. That was when he held an unprecedented underwater cabinet meeting. This crusader has not stopped in his efforts to save his country from sinking into the Indian Ocean, even after his stint in government ended. Maldives needs to plan carefully for the next decade, he says.

"Extreme weather events have occurred in a way that our islands have been rendered unsafe," he explains in an office in the Maldivian capital, Malé "Many see the beauty of the coral islands but still, we are a long way from convincing the world we need support."

"But reaching for assistance does not mean that we have no policies and programmes in place. We proposed a carbon-neutral economy by 2019 and I hope we work towards it, ideological though it may sound," Nasheed insists.

He regards climate-proofing of islands as a necessity to ensure the safety of the people. National plans should factor in climate change as "it is our absolute reality and priority," he says.

BANGLADESH

Tiger, tiger

The human-tiger conflict brings counties to rage in Bangladesh's Sundarbans area

BY **NUSRAT KHAN**

Nusrat: Good morning friends. I am Nusrat, welcoming you all on this beautiful morning in Dhaka. You are listening Radio Today FM 89.6… Last week I went to the Sundarbans, the furthest area of Shatkhira in southern Bangladesh. I was far away from the urban life of Dhaka when I got down from the bus in the morning. Many people were in the tea stalls of the market areas of Munshigonj (as dawn broke). So, holding a cup of tea, I also started to chat with the villagers. Tiger, human, attack, slaughter – these words may sound frightening to us, but the life of these villagers are very much associated with them. Yes, why does this conflict exist between humans and tigers? We started our journey in search of the response.

~ Background noise… baby crying ~

Nusrat: Hello Sir, I am coming from Dhaka to work on a report. I heard that tigers often arrive here in the village from the Sundarbans forest. So, you all live here, right? Can you tell me the reason of the appearance of tigers in this locality?
I was talking with one villager named Rahamat. He was around 70 years old, with black and white hair, fully bearded face. He wore a grey coloured shirt with lungi.

Villager-1: The problem of the tigers is when they do not have food, when there is scarcity of resources in the forest they come here. This is exactly the same with humans. If there is not enough food in the forest, how would they survive? Thus, tigers come out of the forest to attack people. When they attack they also kill them. Tigers are also killed many times by the villagers for their defence. Often tigers appeared in this village, too.

Nusrat: Were they ever killed in mass-beatings?
I have asked the question to another villager named Shahjahan. He seemed very talkative person with lots of experiences. His teeth were dark in colour due to regular tobacco chewing.

Villager-2: Yes, there were so many cases of deaths of tigers in mass-beating.

Nusrat: But why do so many tigers come to this village? Are there any significant reasons for this?
Villager 1: The main reason is the slaughter of deer from the Sundarbans forest. Everyday around 20 to 50 deer are killed by the hunters and illegal traffickers. If these are not stopped, how can the Sundarbans forest be preserved?
Villager 2: Sometimes tigers arrive during sleep. They may be seen lying in my backyard. Sometimes they can be found even in the kitchen. There are many such incidents. Tigers attack the homeowner when he tries to enter the kitchen. This way tigers keep messing around.

Nusrat: I believe that the villagers are aware of the fact that the number of total tigers has been reduced to a great extent. Don't you know that?

Villager 1: We know that, but the reduction of trees seems to be more alarming to us. We can see some trees in the front but there are miles of empty spaces inside the forest.

Nusrat: Why is that?
Another villager named Golam, from that same gathering in the tea stall shared his experience of human tiger conflict. He looked very casual with the attire of Fatua and a checked lungi. He wiped his face with his towel and removed sweat from his face.

Villager 3: It should be investigated by the government to find who are responsible for this reduction of trees.

Nusrat: Is there anyone among you who was attacked by tigers?
Villager 3: Yes, I was once attacked by the tigers when I went to the forest with three other people at Kolagachiya, inside of the Sundarbans.

Nusrat: When did it happen?
Villager 3: It has been around 10 to 15 years. We were attacked at the dawn. One of us was killed and others escaped at that time. Later we went to the forest again by boat and retrieved the dead body. I was so shocked that I could not talk for a long time after that incident.
Villager 4: He was very scared after witnessing the attacked dead body, and was really traumatized after that.

This person was sitting in a relaxed way outside the tea stall near that gathering. He was wearing a sky-blue shirt with checked lungi. After lightening a cigarette, he started his story.

Nusrat: So, one of your companions was attacked by tiger?
Villager 3: Yes, his name was Girendro. Girendro died, Shurjo and I are still alive.

Nusrat: And you went there to catch fish along with him?
Villager 3: Yes, we went to catch fish through a canal. I was carrying the fishing net and just about to throw it. At that very moment a tiger attacked Girendro from behind. He fell into the mud and the tiger grabbed him. I was also slightly injured and fell down. I was left but Girendro was taken away by the tiger.

Nusrat: I was just wondering, do you still go to catch fish in the forest even after witnessing such an unpleasant incident?

Vilager 3: No, I never went there after that.
Villager 4: We often experience such unwanted situations. You know, a tiger appeared near the market place of Harinagar during night at Aghorchandra Mandal's place (a villager of that village). Two people actually died.

Nusrat: How many years ago?
Villager 4: It has been around three to four years back. Two people were heading towards the market place. Suddenly, a tiger attacked them from one side, but they managed to escape. After that the tiger tried to hide at Aghorchandra's father-in-law's room. Once the villagers realized that the tiger was hiding under the bed of Aghorchandra's father-in-law, they went there to attack the tiger with torches. That tiger attacked Aghorchandra's father-in-law. Villagers wanted to trap the tiger by throwing a net around that room. But the tiger escaped by a small hole in the net. Later, the villagers strangled the tiger to death, once it was found on a tamarind tree.

~ Background music ~

Nusrat (Monologue): I was mesmerized while learning about their encounters with tigers in that tea stall. I could actually feel the presence of tigers around me. Right at that moment, a 22 years old young man, Jalil (wearing a green t-shirt and jeans), suddenly said that his father was also killed by a tiger and it was his mother who was managing this tea stall. She had raised her children with great difficulty. Suddenly, I realized how difficult it is to live with this fear of tiger all the time. Thus, I asked that women, Jalil's mother, how she survived this long period of life with an utter rage for tigers?

Nusrat: Hello Madam… so your husband was killed in a tiger attack?
Jalil's mother (a woman with a blue dress and a scarf on her head): Jalil was one and a half years old and my daughter was only a one month old baby. Their father went to the jungle with many people to cut wood, leaving me at home. He was attacked by a tiger and brought back home dead by his fellow wood cutters after three days. But they did not tell us that he was killed by a tiger; rather, they said that he was suppressed under a tree. They lied to us.

~ Sad music in background ~

I moved to my parents' place. I could not see my husband's face. When he was buried my brothers and father did not attend the funeral. They were angry because of the lie. It has been 20 years since he died in tiger attack.

Jalil: It is even more than 20 years!
Jalil's mother: I have taken care of my children for many years, now they are grown up and also married.

Nusrat: Your life must have been very hard at your parents' place ever since?
Jalil's mother: Of course. I had to suffer a lot.

Nusrat: Do you ever feel angry with tigers for that?
Jalil's mother: I decided since then that even though my son abandons me I would not let him go to the forest. He will work or do business here but never go to the forest. I am angry with the forest because I lost my husband. There are numerous other incidents of tiger attacks.

Nusrat: I have heard of a village of the widows where the tiger victims reside.
Villager 5: (Samsuddin, a middle aged person with a very casual rural look appeared with his experiences.) That is in Golakhali in the Sundarbans forest.

Nusrat: Do you know that place?
Villager 5: Yes, I do.

Nusrat: Could you take me there?
Villager 5: If the road is not muddy I can take you there; we can also go by a trawler. I will let you know if the road is dry. They live on the other side of river. Some of them live in this side too.

Nusrat: Okay, then let us go to that place now.

~ background music ~

Nusrat (Monologue): After that I started my journey toward my destination along with Jalil. While going from Dhaka to Shatkhira, I only knew that the relatives of the tiger victims reside in a place named Gabura. Before reaching number 9 Shuragram I came to know from that tea stall that not only in Gabura or Golakhali, but the families of tiger victims reside in all villages near this place. These villages are called "Baghbidhobapolli" (i.e. tiger widows' village). All the families mourn their loss of dear ones. And there I was informed that around 20 days ago a guy named Younus was attacked by a tiger while collecting honey, and he never returned. Where is the family of Younus? How are they surviving? Immediately, I went to his place to investigate.

Younus's wife: When I heard the news of Younus's disappearance I went with my small children.

Nusrat: Did you go inside the forest to search for him?
Wife: No, I just went down the street at the side of the river. We could not go because it was scary. Robbers could come. I had a brother accompanying me, also the boatmen searched for Younus. They saw the tiger attack Younus by pulling his shoulders and disappearing. They could not see him again.

Nusrat: Everyone witnessed that incident?
Wife: Yes, everyone! They also found his blood in three different places, little drops of blood.

Nusrat: Who accompanied Younus? Did you know everyone?

Wife: Around two to three people went with him. Salam, Bokul and Khokon were there.

Nusrat (to a villager): Were you there when the attack took place on Mr.Younus?
Villager: I was there. Three of us were already there, because at first I was the navigator.

Nusrat: Where did you go?
Villager: Dingimari at Bhaluka

Nusrat: Did you go inside the Sundarbans?
Villager: There was only a two hand distance between the tiger and the boat. The tiger could catch me if it wanted, but it did not. All three of us left our boat to a safer distance. We were standing aloof. In the meantime my middle brother came down. Someone else followed him. We cut a branch of a Goran tree to use as a shelter above our head. While cutting wood I heard a weird noise. I looked back and saw a tiger attacking my middle brother. My brother fell down with the sudden attack. In no time we saw that the tiger was biting my brother's neck.

Nusrat: The tiger?
Villager: We were seven people in total. One was dead and six of us were left. Two of us did not want to go inside the village. We went in and found three spots of blood. Then our leader said, if we intend to retrieve the dead body we need two more people. If anything wrong happens who would protect us? Thus, we came back with fear. On the next morning we searched for the dead body again, but could not find anything. We could not even try properly because of the lack of manpower. We could not do anything with four people anyway. Also when you try to retrieve a body from a tiger, it gets crazy and can attack you very easily as well.

Nusrat: So, you did not go there because of the fear?
Villager: Yes, due to that fear. We could not go in front of a tiger with only four people. We contacted the authority after two days… They believed our experience about tiger. The chairman suggested (we) file a police report in the police station to receive an amount of 125,000 taka (US$ 1,500) from the government. Now we are trying to get this money for his wife. Without the dead body it is hard to convince them about the attack. But we really had this experience even though we could not bring back the dead body.

Nusrat (Monologue): We started our return journey from Gabura after listening to the story of utter disappointment of Younus's family… Why are these people often attacked by tigers? Why do tigers often arrive at the locality? When is it possible for the end of this human-tiger conflict? With all these questions in mind, I went to the forest officer of the forest division of Khulna, Mr. Jahiruddin. I asked him why this human-tiger conflict is so high in Shatkhira range. Moreover, why are the tigers often killed in mass-beatings? What are the responsibilities of the forest division for the safety of tigers and how are their duties performed?
Jahiruddin: In last two years one or two tigers came to this locality. We sent one of them back to the forest after tranquilizing it. A year before that another tiger was killed in a mass-beating. But now the people understand that the forest division is capable enough to tranquilize the tigers and send them back to the forest. We also performed some local awareness meetings. Thus, the people do not want to kill tigers any more, they inform us instead. If we are informed, we go to that place and take care of the situation. Another thing being done by the government to reduce the tiger-human conflict (is) giving money to the families of tiger victim before. Our current government has taken this initiative since 2010. According to this initiative if someone is hurt or injured by tigers he or she will get fifty thousand taka (US$ 700) from the government, and if someone dies by the attack of tigers his or her family will receive one hundred thousand taka (US$ 1,200).

Nusrat: So, would Younus' family also obtain that amount as compensation?
Jahiruddin: Since there are tigers in the Sundarbans, if you go near them, it is very possible that they will attack you. In a survey report we found that seven woodcutters were killed by tigers. The reason for this was the tigress had her cubs. If anyone tries to go near a tigress with her cubs she will naturally try to protect them. For this reason we saw the conflict. People say, and in many surveys it has been revealed, that there is scarcity of food in Sundarbans. But, we believe that this is not true. For example, there are deer, pigs, monkeys, fish, crabs etc. Tigers eat them all. Though more studies are needed, we know that there are around (150,000) deer in the Sundarbans. If we assume that the total number of tigers is 300 or 300 plus it should be sufficient. In the survey of 2004, the total number of tigers was 440.

Nusrat: When did the survey of deer take place?
Jahiruddin: It has been a long time. We should perform another survey soon. But our tiger population should not be affected by this. But even if the relative abundance of tigers started to reduce, we will take necessary action. And in all our camps our current project is running with the assistance of European Union. A massive change in the guarding system has occurred. Previously we used to guard the forest by boats guided by forest guards, but there were no database. Now, we have started MIST (management information system) patrol, a GPS-based patrolling system. By this we can monitor all our guards, starting from the range officer to the camp officers, with the help of GPS. Therefore, we can always observe where they are patrolling. We will also be able to determine if some places need more patrolling and if some have it in abundance.

We know the tigers of the Sundarbans forest mainly eat deer. Also they eat the pigs. A survey should be done of these animals. Moreover, if you consider the change of habitat, I would say with the change of climate we did not observe any major change in the forest. Rather the findings of our survey in 2010, with the assistance of MIST forest service, revealed that the health of Sundarbans had actually developed to 60 per cent of its area. It has improved. But there are discrepancies in the periphery due to the increase in population. People who depend on Sundarbans do not want to use Sundarbans any more due to this population increase. The human-tiger conflict exists since tigers often eat people. We are reducing this conflict by initiating the incentives for the tiger victims by a donation of one hundred thousand taka or fifty thousand taka as I said earlier. Additionally, people used to believe that the forest division is not capable enough to tackle the matters related to tigers. But now the forest division has gained that capacity.

Nusrat: I have heard that in those localities the villagers do not immediately get the necessary equipment to tranquilize tigers. Thus, they tend to kill tigers in mass-beating, something like that?
Jahiruddin: Something like that happened around two years ago. After that such things never happened. We think if our capacities are built-up it would be possible to solve the problems of the local people with us and to reduce the human-tiger conflict as well.

Nusrat (Monologue): We are still looking forward for seeing the local level initiative, necessary steps to protect tigers, although many promises have already been made. At the local level, tigers are still being slaughtered when they try to enter into the locality, and people are also not getting adequate security when they enter the forest.

Cultivating crabs

An alternative livelihood wins the day in cyclone-prone Bangladesh

BY **NUSRAT KHAN**

SHYAMNAGAR, Bangladesh – "Now I can feed my family without thinking of death," says Rahmat, a fisherman from this village in a southern part of Bangladesh "Crab fattening (has) become a solution to live with the change of climate nowadays."

The 45-year-old's sentiment reflects how things have changed since May 2009, when the powerful cyclone Aila swept through this terrain, leaving a trail of devastation in its wake. Rahmat, a father of five children, felt the impact personally. The disaster destroyed his home and his livelihood as a farmer and fisherman. His monthly income at the time was 30,000 taka (US$ 350).

In rebuilding his life, he has embraced a new source of income: cultivating crabs. This shift – and the reason for his optimism – was made possible due to the promotion of a crab -fattening programme in the Sundarbans, the largest single mangrove forest in the world, close to where Rahmat now lives. The country's Centre for Coastal Environmental Conservation (CCEC) launched the US$ 295,000 project to fatten crabs in bamboo cages and restore the mangroves in January 2010.

Framed as an "Adaptation to Climate Change", the initiative targeted a clutch of communities near the Bangladesh-India border. It also received support from the Asia-Pacific Forum for Environment and Development (APFED), a small programme housed at the United Nations Environmental Programme's (UNEP) regional arm.

This adaptation strategy to climate change has, consequently, helped reduce disaster risks for the most vulnerable communities living in the high-risk Sundarban coastal zone of Bangladesh, situated at the mouth of Bay of Bengal. People involved in crab harvesting, marketing and exporting now have an escape from natural disaster risks through protecting river bank erosion. In addition, they are benefiting from the water crabs harvested by the crab collectors.

Evidence of crab fattening on a commercial scale is visible here. This includes a green buffer zone that spreads over five kilometres along the Sundarbans coast, protecting riverbank erosion and tidal surges. This measure ensures the safety and livelihood security of the 150 Sundarbans stakeholders.

Elsewhere, crab fattening activities, both via bamboo cages and open mud fattening, are carried by 50 crab harvesters and crab associations. The latter collect and release the crabs from the Sundarbans' rivers and canals.

The project has created Community Conserved Areas (CCA) – a buffer zone outside the polder embankment of the Bangladesh Water Development Board (BWDB) -- for mangrove restoration and plantation. Its aim is to act as a protective barrier against natural disasters. It is further

proof that community-based crab fattening is feasible in context of climate change adaptation in the Bangladesh Sundarbans coastal region.

"The impact of climate change was remarkable in the coastal belt area just after the Aila", says Mowdurur Rahman, director of the CCEC. He added that it resulted in an alternative practice to control increasing salinity, and pointed to the practice of crab fattening as the solution.

The change is appreciated, given how highly vulnerable the terrain is to climate change impacts. Every other year natural disasters such as cyclones affect numerous lives and damages coastal resources. Cyclone Aila in 2009 was just one example. The gradual increasing of salinity is the greatest threat for the region.

As a result, livelihoods, biodiversity, agricultural production, drinking water availability and human health are at risk, especially for women and children. In Bangladesh, the post-disaster management system is insufficient to provide security and comfort to the women and children. This was affirmed after Aila, where the condition became most unfavourable for both women and children.

A major portion of the population depends on the Sundarbans for their livelihood. Agriculture, shrimp farming, day labour, small trades such as fish, shrimp fry are the main income sources. Coupled with these dependecies are other realities, such as population boom, poverty, settlement, resettlement and various infrastructures development causing deforestation and reduction of crop land areas.

Both local livelihoods and biodiversity suffer the consequences of these impacts around the project areas. Shrimp farming is replacing the agriculture activities due to increased salinity, but the government has adopted no such shrimp policy.

Fortunately, the alternative offered by crabs is seen as a relief to the fishing communities. And the increase in salinity is least of the worries now, because crabs can survive in more salinity-prone areas.

The initiative of the CCEC has achieved two goals: making the fishing communities aware of the resources of the Sundarbans and teaching them how to make a living while protecting the environment. The mangrove plantation and regeneration portions of the project are proving effective in protecting the embankment from being breached and river bank erosion. After all, the target area is one of the most vulnerable to climate change.

Climate change is not a curse. It can be managed. The crab fattening practice has proved this point in the coastal area of Bangladesh.

Turf war

Bureaucratic roadblocks slow the flow of Bangladesh's climate funds to needy

BY **NUSRAT KHAN**

DHAKA – The ravages of climate change have turned up the heat on Bangladesh to build a substantial climate fund. Over the last four years, the government has allocated US$ 340 million for such a green reserve -- the Bangladesh Climate Change Trust Fund (BCCTF). The money is meant for climate change risk reduction projects.

But all is not going according to plan, as the money meant to protect communities from the upheavals of nature continues to flow out unevenly. A mixed record of implementing the projects has gotten in the way, says a government official. Due to that, the sustainability of the projects faces challenges.

A typical example of this challenge is a poverty-mitigation government project implemented since 2007 in the Barind zone, in the northwest of the country. The project was financed by the government's climate fund. It was designed to mitigate poverty arising from the impact of extreme climate events.

Initially, the Barind multi-development project "(was) a huge success," states a source from the government's planning commission. But within a few years, the project ran into difficulty due to an extreme drought. The affected communities were poor farmers, who had gained benefits from the initial phase of the project, which provided irrigation pumps at low cost. But, due to the high demand for water during the drought, the groundwater table dropped and a new water scarcity problem became the major problem.

This issue was highlighted by the Poverty Environment and Climate Mainstreaming (PECM), a project of United Nations Development Programme (UNDP). It was part of the 22 environmental, climate and poverty projects that have been followed-up by the PECM. The latter is an initiative under the General Economic Division (GED), a government body which has oversight of all approved projects. It is also the GED to which the government turns for policy suggestions.

Currently, the Barind region's development project is starting its third phase by implementing all of the PECM's recommendations. A priority has been given to environmental effects. Thus, the project is focused on introducing alternative water sources to mitigate the depletion of groundwater.

The need for such interventions has grown, since many previously approved projects end up being unsustainable since they failed to consider the impact of climate change as a priority in the plans. Yet, while the problems of the approved projects have been identified by PECM, a lack of sufficient funds has stalled the solutions drafted by the PECM from being implemented.

Part of the reason for this lies in perceptions. From the very beginning, the environment "is treated as a scientific term among the people," says A.K.M. Mamunur Rashid, national project manager at the UNDP's PECM project. For these reasons, environmental issues are never emphasised when project proposals are submitted. "Environment is no other thing but (a) development issue, everybody should understand that," he says.

In such times, a climate trust fund and climate resilience fund can serve as options to mitigate risk due to climate change. For that, the environment ministry should approve access to the climate fund for on-going projects before approving new project proposals, adds Mamunur Rashid. This could mitigate the risk factor of climate change.

He also added that the climate fund disbursements should also address climate justice, now required by foreign donors before approving their development assistance. But that will require a change from the way the government operates. At present, the money from the climate change fund is distributed by the ministry of environment and forest, shutting out the approval procedure of the planning commission, says Mamunur Rashid. Consequently, approved projects have no relevancy with climate change and the selected projects have no transparency.

A strict monitoring system is badly in need, ensuring transparency and accountability of funds disbursed for projects in the pipeline. Such a mechanism will prevent the common practice of using funds for waste management projects. It also offers hope to funding the welfare of threatened communities and victims of climate change.

A PECM recommendation suggests, furthermore, that a large problem like climate change shouldn't be the responsibility of an individual ministry. This sector should be the responsibility of every government ministry, argues Mamunur Rashid.

Environment is a concern of the development sector. For better transparency of the climate fund, the project selection should be transferred to the planning commission. In addition, the fund disbursements should be the responsibility of the finance ministry. The role of ministry of environment and forests should be to offer technical support in the climate change fund distribution process.

Ending the turf war within the bureaucracy would require a compromise between the ministry of environment and forestry and the finance ministry. Officials from the former may have to take the lead, changing the view that the ministry of environment and forestry state should be the decider, particularly when it comes to the rapid implementation of projects under the climate fund.

Otherwise, monies committed to the climate fund will remain idle. Where is the real advantage of that for Bangladesh?

PALAU

PHOTOS: OCEANIA TELEVISION NETWORK

Tradition takes a knock

Climate change is undermining the old ways of farming in Palau

BY **ROLYNDA JONATHAN**

NGKEKLAU VILLAGE, Palau – Climate change is a global concern that threatens the livelihoods of millions across the Pacific islands.

In the Republic of Palau, an island nation in the North Pacific, it is shaking up traditional knowledge and practices. And that is posing a problem to this country of 20,000 people. After all, Palauans, like most Pacific islanders, rely on the environment and the surrounding ocean to make a living on their 206-square-mile homeland.

In Palau, traditional knowledge and cultural practices have been carried down from generation to generation. These practices and knowledge, which are linked to the natural ecosystem, are crucial to the island's way of life.

Farming and fishing, for example, play a major role in the community, the culture and traditional lifestyle of the Palauan people. However, changing climate conditions have proven that some traditional knowledge and methods may no longer apply.

Take the case of Taro, Palau's staple food. It is one of the most favoured crops in farming, aside from tapioca, bananas and fruit trees. Taro, moreover, is also known as an important form of identity for Palauan women and a vital part of cultural practices. But taro farming has increasingly become vulnerable to the effects of climate change.

Traditional methods of taro farming, which were effective in the past, are not sufficient enough to prevent the effects of climate change – making it difficult for women to plant and cultivate taro. Irrigation systems that are normally built around the taro patch to control water supply to the crops do not protect them from extreme damages caused by salt-water intrusion and extreme heat.

This type of challenge has caused farmers to move their farms inland, away from freshwater sources that provides water supply to the crops.

Unpredictable rainfall patterns and changes in temperature have also affected the growth of taro and other crops. These changes leave crops susceptible to disease leading to low production.

Like farmers, fishermen are also experiencing difficulties with changing climate conditions, prompting a different approach to fishing.

Despite noticing a difference in the climate such as temperature shifts, rainfall patterns and tides, many farmers and fishermen did not initially link these changes to climate change.

About 85 per cent of households in Palau depend on fish and crops such as taro for sustenance, but also as a supplement to their income.

Fishing is an integral part of the Palauan society but most fishermen fish for food and traditional duties, rather than for sale.

Reef fish, if sold in the local fish markets, can earn fishermen anywhere from US$1.40 to US$ 2.00 per pound. Some supply a steady flow of fresh fish to various restaurants catering to tourists for additional income.

Presently, fishermen are required to travel further out into the sea to fish. Near-shore fishing no longer provides an adequate amount of fish catch to sustain families. Local field surveys and reports indicate that fish population has declined over the past decade. Rise in sea temperature could also further impact fish population as it affects Palau's coral reef – home to a number of diverse fish and other marine species.

According to Palau's climate change profile, temperatures, sea level and ocean acidification will continue to rise. The intensity and frequency of extreme rainfall days are also projected to increase. And although tropical storms are projected to decline, more intense storms may occur.

In December 2012, Palau was hit with its first super typhoon in more than 20 years. As a category-5 storm, Typhoon Bopha reduced dozens of homes to rubble, damaged infrastructures and temporarily shut electricity and water. It also destroyed agriculture in the hardest hit areas in Northern Babeldaob.

About 400 people displaced from the storm were forced to seek shelter. Those who lost their homes sought temporarily shelter with relatives or in shacks built from debris.

Paulina Takeo of Ngkeklau Village in Ngaraard State, one of the hardest hit states, was 72 years old when the strength of ocean surges churned up by the storm lifted her home from its foundation and dumped it on the streets amongst hundreds of debris. The small wooden house she shared with two young grandchildren was destroyed beyond repair. Like many who lost their homes, Paulina and her family were forced to live in a small shack made from wood and tin salvaged after the storm.

Like many Palauan women her age, Paulina depends on farming for income, sustenance and cultural practices. Storm surges caused flooding that further damaged lands and farms in its path, including Paulina's taro farm. Two years after the storm displaced her family, Paulina returned to farming, earning approximately US$50 a month. In spite of the fact that her taro farm is only minutes from her home, it will take more time and effort to recover from damages sustained from the storm.

Fortunately, the government of Palau provided Paulina and her family with a new two-bedroom concrete house where she now happily resides.

Climate change is undoubtedly impacting every aspect of life. Recognising this crisis, Palau is taking steps to protect and conserve the natural ecosystem and the local way of life through adaptation.

Through adaptive initiatives such as the Pacific Adaptation to Climate Change Project (PACC), Micronesian Challenge and the Micronesian Conservation Trust (MCT), Palau and other Pacific nations continue to promote sustainable development in the face of climate change.

In an interview, Paulina Takeo, a climate change victim, shares her growing awareness about the shifting currents in her environment:

Rolynda Jonathan: Do you know what climate change is?
Paulina Takeo: Yes, from what I've heard it's the change in our climate and environment.

RJ: I understand that you have struggled to manage your taro patch. Have you seen any changes over the years and how have you learned to cope with it?
PT: As I've explained before, the tide today has changed. We used to be able to predict the high tide in order to protect our taro patches from salt-water intrusion. With my taro patch located downhill and near the ocean, I was able to protect my crops, but nowadays I'm unable to do that.

RJ: It seems salt-water intrusion is not the only issue you need to worry about. With your house located by the beach, the ocean surge from Super Typhoon Bopha destroyed your property. With past storms, has this ever been a problem especially with the location of your house?
PT: I don't think so. The tide today is different from when we were kids. In the past, as I said before, high tides were only expected during the fourth and eighth month of the year, but it's so unpredictable today. Sometimes it comes and sometimes it doesn't. We never know. But Bopha was different.

RJ: With what you experienced from Bopha, and with issues of salt-water intrusion affecting your taro patch, have you thought of other ways to adjust to them?
PT: I've thought about moving my home uphill, but my uncle sold the only land we had located uphill long ago. We have no other land and no other way to move uphill. This is the only land we can live in right now.

RJ: Back to the issue of farming, selling your crops and farming, are these the only way you can put food on the table and have money to cover whatever your household expenses?
PT: It is true. We truly depend on our taro farming not only to supplement our income, but for personal consumption. Our children also depend on our crops. Right now, this is our way of making money.

RJ: While you are struggling to maintain your taro patch, you are also faced with the challenge of living in a small hut and depending on assistance to rebuild your house as well as restore what you lost after Typhoon Bopha. This experience must be very difficult for your family.

PT: Our house was literally picked up and moved to the street by ocean surges. Our kitchen was destroyed. Some of what we owned were lost. Some of our things, such as clothes and the television set, were wrapped in plastic, but had been damaged by the ocean water. But we washed our clothes and some of our things and used them again. We had no other choice. Even though my house was not new, I was sad to see it destroyed.

PHOTOS: LIVE AND LEARN ENVIRONMENTAL EDUCATION

Waste management

A green response to poor solid waste management triumphs in Fiji

BY **ROLYNDA JONATHAN**

ROTUMA, Fiji – Solid waste management is a large problem in the Pacific region. In Palau, for instance, 9,000 pounds of waste are produced daily. Fiji sinks under more.

As growing demand for foreign products increase, so does the amount of waste produced annually. The evidence bears this out in the form of canned foods, bottled drinks, plastic bags and packets, and car tires. In the North Pacific, most foreign products are imported from the United States and Asian countries, such as Japan and China.

Remote areas and isolated communities in the region are faced with extreme challenges in dealing with waste management. These range from a lack of services, such as transportation, to properly dispose the waste to the lack of education about waste management.

In some communities, people are less receptive to changing their behaviour in terms of waste management, but others have adjusted well by practicing effective waste management strategies in protecting their environment and creating jobs.

In the remote island of Rotuma, the 12th largest island of Fiji, citizens have affirmed that human behaviour can change.

Through the "Youth Leaders for Waste-wise Communities," an Asian-Pacific Forum for Environment and Development (APFED) showcase project, communities implemented successful waste management initiatives after years of poor waste practices. The project began in 2008 and is focused on youth from the Hapmak and Motusa, two communities spread across the island's seven districts.

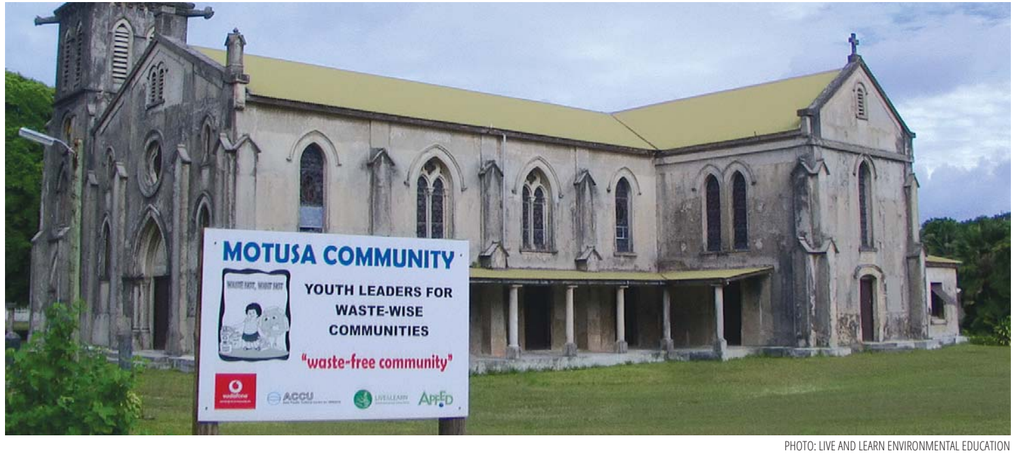


PHOTO: LIVE AND LEARN ENVIRONMENTAL EDUCATION

In an interview, John Morris of Live & Learn Environmental Education, an Australian-based international organisation that promotes sustainability by mobilising communities and facilitating partnerships, reveals the story of change:

Rolynda Jonathan: This project must have been challenging to implement, given that human behaviour and perspectives cannot be easily changed?
John Morris: The changing of the perspectives of people is really something not easy to actually do, as people have their own thoughts, and have been brought up in different ways. And to actually educate them on waste and waste management is a big issue – is a big deal. I say we actually need to sit down carefully with the community involved and actually go through with the community the things that need to be done. Simple things: getting them to understand the facts about rubbish- waste and how it affects the environment. I think once people see these things they get to understand the value of waste management.

RJ: What is biggest issue in terms of solid waste management and why was the island of Rotuma in need of a project like this?
JM: Waste in Rotuma right now, generally speaking, is a problem because there is no dumping site that is designated for Rotuma to dump all their waste inside. The other problem that we have in Rotuma is that there's no sorting of the waste. Everything is dumped together. We have metal, plastics and every other kind of waste, biodegradable waste all dumped together in the same pit. So basically each family has their own pit that they have behind the house and they just dump all their rubbish inside.

RJ: Were the people of Rotuma open to the idea of change and to deal with their waste management issues?
JM: People are very receptive. People were very tolerant actually, and they took on the project without much hassle… or you know they took it on with ease. So I'd say that the youth in Rotuma – when I say the youth I like to stress here not only the youth were involved. We had the elders who were involved. These children here, they actually made things happen. It's the whole community at large that actually got this project moving and got this project to where it is now.

RJ: How has the community improved in terms of awareness and in implementing this project into their daily lives?
JM: The use of plastic bags for one of the communities -- the Hampak community -- they have stopped the use of plastic bags all together in the shops. So basically people go to the shop now with their shopping bags. The other community of Motusa, what they're doing there is with the sewing machines that that have been provided to the community. They have actually sold (these sewn) shopping bags, so it is decreasing the amount of plastics in the environment. And I think it's a big achievement. These pilot projects, I think these pilot sites if they are carried forward to include more pilot sites around Fiji not just in the some particular areas – it will be really beneficial to this project as a whole.

PHOTO: THE MARSHALL ISLANDS DROUGHT ASSESSMENT TEAM

Stricken by drought

Limited freshwater sources pose challenges for the Marshall Islands

BY **ROLYNDA JONATHAN**

MALOELAP ATOLL, Marshall Islands – Residents of the Marshall Islands depend heavily on rainwater catchments to provide water for their daily needs. It stems from the sliver of land they live on. The islands comprise two parallel chains of 29 low-lying coral atolls and five coral islands with a population of about 52,634.

In some areas, concrete rainwater catchments were introduced during World War II and are still being used today. Due to the low elevation of the atolls and islands, the primary source of freshwater is rain. The locals rely on water catchments, roof runoff or groundwater through wells for their water needs. Outer islands such as Maloelap Atoll rely almost entirely on catchments and groundwater wells.

Beginning in 2012, northern atolls in this small North Pacific island nation suffered heavily from a devastating drought, a disaster that island residents are still dealing with today. Agriculture was severely destroyed by the parched conditions. It resulted in fruits trees that residents depend on for food, such as bananas and breadfruit, withering. Farming became nearly impossible.

Affected, consequently, were more than 6,000 people across the northern atolls of the Marshall Islands. In addition to food insecurity, they had to endure a lack of water resources. Health problems also emerged as a result of the prolonged dry season, which lasted for more than a year. It triggered memories of the last time the Marshall Islands was hit with such a severe drought, in late 2007.

Zerish Kaious, a 30-year-old, was among many in the Maloelap Atoll who experienced loss of crops and insufficient water supply. She and her family survived the best way they could by boiling water and saving food for their children until aid arrived. She could also not depend on the coconut palms, which had been a steady source of income for her family.

Lack of resources and the distance of the islands from the nation's capital, Majuro, hindered the relief operations. By end of May, a machine that converts saltwater to freshwater and bottles of fresh water were delivered, helping to alleviate the problem.

By early 2014, rainfall began increasing on the Marshall Islands, providing much needed water to replenish the land and groundwater aquifers. The wet weather also helped households in the outer islands, including Maloelap Atoll, collect rainwater through catchments, each of which could store up to 1,500 gallons of water.

In an interview, Zerish Kaious talks about living through the drought:

PHOTO: THE MARSHALL ISLANDS DROUGHT ASSESSMENT TEAM

Rolynda Jonathan: How did you manage after the drought hit?
Zerish Kaious: When the drought hit the islands from October or November, it was pretty much difficult for us. The rain didn't come and so our tanks ran empty. Our children needed water and we struggled to clean our wells so we could get water for cooking and drinking. We couldn't get coconuts because it was dry and the coconuts kept falling off. Our food crops kept on failing because it was dry.

RJ: Without immediate help in the beginning and with limited resources, how was the family able to cook, provide drinking water and bathe?
ZK: Although our water tanks were empty, we had no choice but to continue using our wells. We would clean and use it, but not for long because it wasn't good. We then began boiling the water in order to use it.

RJ: What about food, was it hard to put food on the table every day?
ZK: We tried to get food from the good crops, but it was difficult. The breadfruit, for instance, would not reach its full size. We bought food from the stores, but it's also hard for us. We couldn't produce enough copra because of the drought. My lands have plenty of coconut trees but unfortunately we are only able to produce one sack. So we had to conserve as much of what we had for our children.