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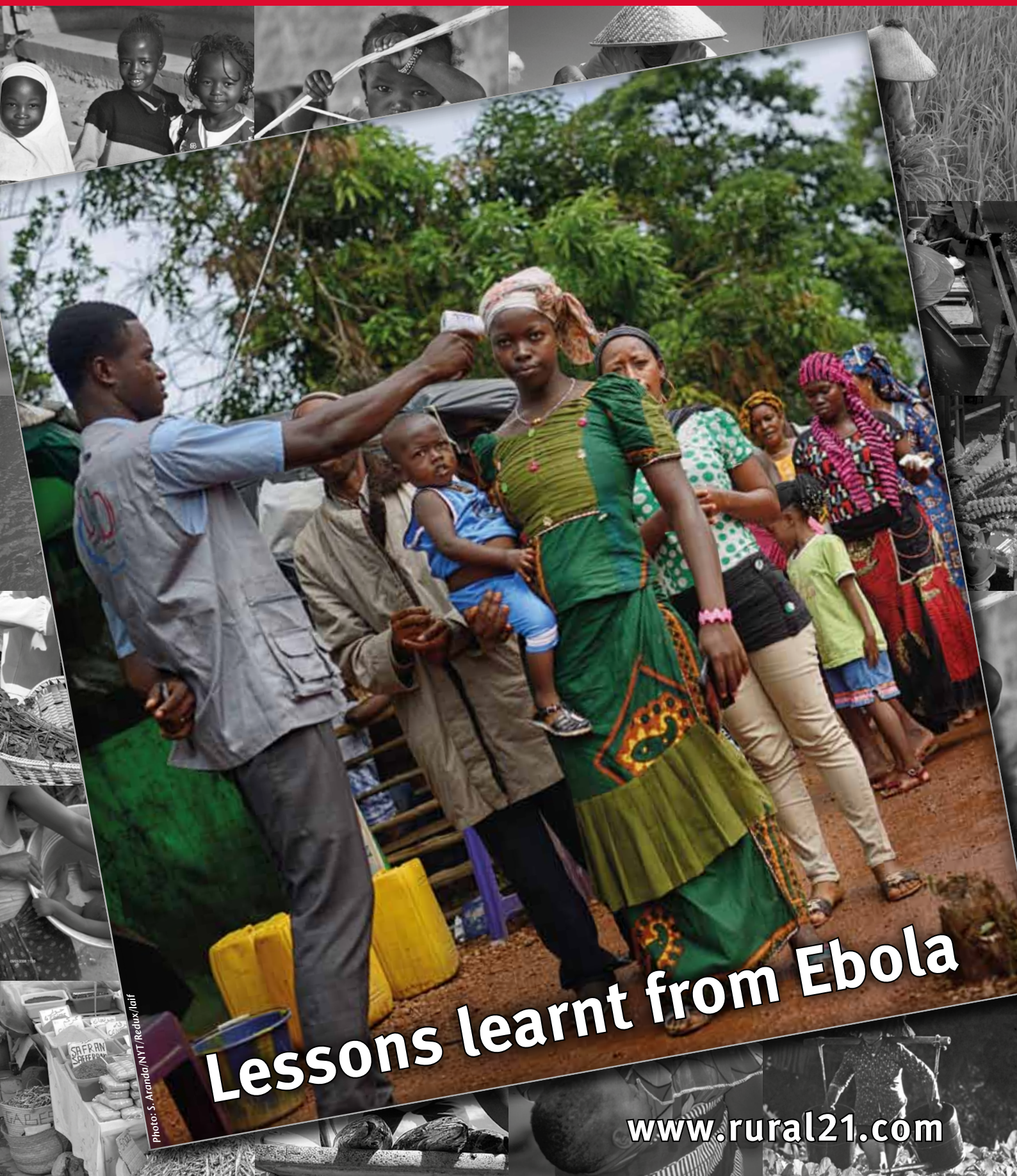

Lessons learnt from Ebola

Photo: S. Aranda/NYT/Redux/laif

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Editorial

Dear Reader,

It is now nearly two years ago that a two-year-old boy in Guinea called Emile caught the deadly Ebola virus and died. In next to no time the disease then spread to the neighbouring countries of Sierra Leone and Liberia. But although dozens of people were dying of Ebola in these three West African states month after month and the relief organisation Médecins Sans Frontières – one of the first organisations to provide local assistance – had long sounded the alarm, the World Health Organization (WHO) saw no need for action for a long time. Only in August 2014 did this UN authority bring itself to declare developments a "public health emergency of international concern", giving the go-ahead for long overdue help from the international community.

In September 2015, Liberia was officially declared free of the deadly virus, followed by Sierra Leone in November. This status can be reckoned with for Guinea in the near future, once the country has confirmed that 42 days have passed with no new cases of the virus reported. Then the toll could stay at the level of the 25,601 infected persons and 11,300 deaths officially reported by the WHO for the three countries (status: 9th December 2015) – the true number of victims is thought to be considerably higher. How could the crisis assume such dramatic proportions? Reluctance to act on the part of the WHO is certainly one of the chief reasons.

There are a wide range of assumptions regarding the motives for this reticence. Was the organisation attempting not to repeat issuing a warning too early and too emphatically, as had been the case with the outbreak of SARS in 2003, and avoid being accused of overreacting? Did it delay the declaration of an emergency for so long in order not to snub the governments of the countries concerned? The organisation admits failures, and in October 2015, it announced a reform of its "work in outbreaks and emergencies with health and humanitarian consequences". It denies that politics came into play in the decisions it took at the time.

It is certain that national governments played down the situation for too long as well – for reasons of political expediency, but also because of ignorance. There had been no incidences of Ebola in Guinea before, which is why the Health Ministry initially failed to properly assess the case of little Emile and only notified the organisation Médecins sans Frontières of the outbreak of an unidentified disease three months later. Also, the fragile health systems in the three countries, two of which had emerged from protracted civil wars just a few years before, were hopelessly overwhelmed by the situation, given poor equipment, a severe lack of medical staff and insufficient diagnostics. This raises a further issue. Where does the money go that has been flowing from bilateral and international aid into the health sectors of these countries?

The authors in this edition give accounts of their analyses on Ebola outbreak and response, but also of their personal experiences during their work in the countries concerned. Lieutenant Colonel Christian Janke of the German Federal Army's Medical Corps headed German humanitarian emergency relief in Liberia and questions whether awareness of the lessons learnt is really sufficient to ensure that a crisis of similar magnitude can be better mastered in the future. Jochen Moninger, Country Director of Welthungerhilfe in Sierra Leone, gives details of how the Ebola outbreak impacted on the life and livelihoods of the rural population, but also on the country's health system and its economy. Dominique Burgeon of the Emergency and Rehabilitation Division at the United Nations Food and Agriculture Organization (FAO) demonstrates the measures taken so far to mitigate the negative economic effects for the population in the countries affected and what is required to strengthen the resilience of poor rural households. The African Union's Director of Social Affairs, Olawale Maiyegun reports on his organisation's involvement in crisis response and its demands on the national governments and the international community regarding recovery and preventing another such crisis. And Sophie Harman of the UK's Queen Mary University of London asks why the health systems in the affected countries failed so miserably despite foreign aid totalling billions.

In spite of a dynamic of its own, the Ebola epidemic is symptomatic of the health situation that the rural poor are in. According to Dr Matthias Vennemann, far too little consideration is given to their specific health hazards when rural development projects are implemented. And last but not least, years of neglecting poverty-related diseases in research and development has also contributed to the present situation, as Maximilian Geigenmüller of Deutsche Stiftung Weltbevölkerung reveals.

We wish you inspired reading.

Silvia Richter

Partner institutions of Rural 21:

BMZ Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung

DLG

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Photo: Bioeconomy Council

Photo: D. Pilar/Welthungerhilfe

Photo: S. Kägi/Helvetas Swiss Intercooperation

Photo: A. Sharma

Fresh thinking for integrated landscape management

Land use is one of the key sectors in achieving global climate and sustainability goals. On the fringe of the World Climate Summit, stakeholders from different land-use sectors met in Paris, France, early in December at the Third Global Landscapes Forum to share knowledge and to find pathways towards sustainable land use. The event was organised by the Center for International Forestry Research (CIFOR) and a consortium of partners who presented their initiatives on the panel and at thematic pavilions at the two-day meeting. In more than 30 plenary sessions and discussion forums, some 3,000 participants discussed four key areas related to an integrated land management approach: 'Landscape restoration', 'Rights and tenure', 'Finance and trade' and ‚Achieving climate and sustainable development goals'.

Who is under obligation to invest?

"Actually, we know what we have to do. Only doing it is difficult," said Laura Tuck, Vice President for Sustainable Management at the World Bank, welcoming the participants of the opening plenary with words heard at many an event. The same applies to the facts that are supposed to call for action. According to the UN Food and Agriculture Organization (FAO), one third of all agricultural landscapes are degraded, and this amount grows by an annual twelve million hectares. If climate change is not halted, its impacts could push a further 100 million people into poverty by 2030, a World Bank survey states. Even though they are largely the result of people fleeing from crises, the migration streams of the past months have given a taste of what happens when the natural habitats of humans are destroyed. And the impacts above all affect the smallholders in the developing countries, whose survival depends directly on the natural resources. None of this is new. Neither is the fact that the measures needed cannot be taken without massive investments. So where should the money come from?

"Shall the money come from rich donor countries? Yes. Will it? No," answered Ngozi Okonjo-Iweala, an economist and former Minister of Finance of Nigeria, drily. Quoting a recent report of the New Climate Economy Project, she said that 250 billion US dollars a year was necessary for landscape conservation and restoration measures in developing countries in order to "increase rural productivity, resilience and mitigation simultaneously." But a mere 25 billion was in fact made available, with 60 per cent coming from domestic budgets. Without levering more private investment, long-term support required for sustainable land management cannot be raised, Ngozi Okonjo-Iweala is convinced. But here, de-risking measures were also needed, for investors had to have security if they were to commit to the long-term investments associated with land use, she stated.

Linking smallholders, companies and the environment

Representatives of the private sector describing their motives to co-operate with smallholders at the forum also focused on triple win. Many companies had long realised that the conventional supply chain model had become obsolete. This was for a very simple reason, as Pascal de Petrini, Executive Vice-President Strategic Resource Cycles at Danone, explained: "If the farmers aren't resilient, our future will also be at stake. We depend on sustainable agriculture and clean water cycles." 140,000 farmers from 40 countries annually supply the company with 7.5 million litres of milk, and 80 per cent of them are smallholders. The Mars corporation procures its more than 100 raw materials from around one million farmers in 50 countries. "If farmers are not successful, they will try to do something else, and this is not good for our business," said Mars' chief sustainability officer Barry Parkin. Together, the two companies founded the Livelihoods Fund for Family Farming early this year. The Fund is to implement projects that will restore the environment and put degraded ecosystems back on track while improving the productivity, incomes and living conditions of small farmers in developing countries.

At the event, in addition to Veolia, the Swiss fragrances and flavours company Firmenich officially joined the Fund. Why is this family enterprise opting for partnerships with the suppliers? "In 50 years' time, we still want to be sure that we can have specialties such as cardamom or agarwood in our range of articles," said Dominique Roques, head of naturals sourcing at Firmenich.

Small is good, upscaling is better

There are a wide range of examples of successful soil restoration at local level. However, to have an impact on climate change adaptation and mitigation and transform the current food system to more sustainability, a territorial approach is needed. But how can large-scale soil restoration really be achieved, especially in a smallholder farming context in the Global South, where some of the most severe issues with land degradation are experienced? For Ravi Prabhu, Deputy Director General of the International Center for Research in Agroforestry (ICRAF), there are two ways: the 'hard way', which means actively rehabilitating billions of hectares, or the 'easy way' – removing the problems that smallholders have in management. "We are sitting here and planning for the people, setting out from the assumption that all poor smallholders are passive. Let's include them in our plans and share decision-making with them!" However, smallholders were interested neither in restoration nor in the issue of greenhouse gas emissions. "If they are to take appropriate measures, they have to see clear benefits," Prabhu maintained.

Opening plenary of the Global Landscapes Forum 2015.
P. Valbuena for CIFOR

What may sound good in theory is not quite so easy in practice, said Andrew Wardell, Senior Manager of Research Capacity and Partnership Development at CIFOR. How is knowledge formulated in a language that is understandable for smallholders in remote areas? "I am not certain if we already know this", Wardell said. "It is clear that all necessary transformation processes will be knowledge-intensive and that the capacity of knowledge generating must be increased", maintained Patrick Caron, Director of Research and Strategy at the French Agricultural Research Center for International Development (CIRAD). Stefan Schmitz, head of Division Rural Development and Food Security at the German Federal Ministry for Economic Cooperation and Development, believes that large-scale land restoration will only be feasible if the soil aspect is mainstreamed in research, education and vocational systems. Concluding the round, Wardell stressed the need to address the "fundamental problem of land appropriation", referring to the surveys of the LandMatrix initiative according to which, between 2000 and 2014, nearly 32 million hectares of land was appropriated world-wide – with South Sudan, the Democratic Republic of the Congo, Papua New Guinea, the Republic of Congo and Indonesia being the chief target countries. Crops were only grown on 2.7 million hectares. "Is this investment or speculation?" Wardell asked hypothetically.

"Log forests financially instead of physically"

In addition to the discussion forums, a multitude of new initiatives were officially launched in the context of a "Launchpad". For example, representatives of the African Union and the New Partnership for Africa's Development (NEPAD) presented the African Resilient Landscapes Initiative, which commits to bring an estimated 100 million hectares of degraded and deforested land under restoration in Africa by 2030. Fourteen African countries have declared their commitment and are to receive investments of one billion USD from the World Bank and another 600 million USD in private sector investment over the next 15 years. While small, the Nakau Programme, the "first and only Pacific Islands regional 'Payment for Ecosystem Services' (PES) programme for rainforest & mangrove protection", is no less ambitious. The Pacific island nations are suffering considerably from the impact of climate change. Only last May, for example, Cyclone Pam wrought immense destruction in the island of Vanuatu, resulting in this small state losing 65 per cent of its GDP, as Thomas Laken, Minister for Climate Change of Vanuatu, reported. Eighty per cent of the 200,000 inhabitants live in rural areas, and the natural resources, and especially forests, are extremely important for their livelihoods. But it is these resources that are particularly threatened. A major share of the indigenous people live in remote places far away from markets, infrastructure and communication. Often, the only way for them to earn a livelihood is to sign contracts with logging companies or clear forests for agriculture. The initiators of the Nakau Programme – owned by the charities Live&Learn and Ekos – seek to protect the forest by helping indigenous landowners sell carbon offsets, thus generating income for rural communities. In addition, people can find employment as forest rangers or in new activities such as nurseries or bee-keeping. Thus over 6,500 hectares of forests in Vanuatu, Fiji and the Solomon Islands is to be placed under long-term protection, and 65,000 tons of greenhouse gas emissions is to be avoided each year. Certification will be carried out in accordance with Plan Vivo Foundation's international standard. "The programme can help the people to log their forests financially instead of physically", said Robbie Henderson, one of the trustees of the Nakau Programme. *(sri)*

Definitions

"The little sustainable landscapes book", which was presented in Paris as part of the "Launchpad", provides the following definitions:

Landscape: a socio-ecological system that consists of natural and/or human-modified ecosystems, and which is influenced by distinct ecological, historical, economic and socio-cultural processes and activities.

Landscape approach: a conceptual framework whereby stakeholders in a landscape aim to reconcile competing social, economic and environmental objectives. It seeks to move away from the often unsustainable sectoral approach to land management. It aims to ensure the realisation of local level needs and action (i.e. the interests of different stakeholders within the landscape), while also considering goals and outcomes important to stakeholders outside the landscape, such as national governments or the international community.

Making bioeconomy work for sustainable development

Over the last five years, notions of bioeconomy have gained momentum world-wide. According to the Bioeconomy Council of the German Government, 45 countries around the world have now adopted bioeconomy strategies as part of their economic innovation agendas. The Global Bioeconomy Summit, held for the first time by the German Bioeconomy Council in Berlin/Germany, in November 2015, aimed to concentrate the different experiences gathered so far.

Modelling on the cycle of nature

"We must fundamentally change the way we produce, consume and live", warned Janez Potocnic, a member of the International Resources Panel of the UN Environment Programme (UNEP), in his keynote. Already, 60 per cent of ecosystems world-wide was degraded or unsustainably used; it was certain that carrying on as usual would burst the margins of the planetary boundaries. Potocnic pointed to global population growth – there is an annual increase of 83 million people – and the fact that by 2040, around three billion people would have risen from the lower class to the middle class – with corresponding changes in their consumption habits. Responsible consumption and production, as called for in SDG 12 and based on a circular economy following the example of nature, was the only way forward, he maintained. This would require changes in tax policy and subsidy practice as well as in public procurement and investments – not a simple task given the complexity of life, he conceded.

Change the unsustainable food system

In his video message, Jeffrey Sachs, Director of the Earth Institute at Columbia University, also set out from the recently adopted Sustainable Development Goals to explain the global challenges that humanity is facing and where bioeconomy is to make a contribution. First of all, there are the closely interlinked SDGs 1 – "end poverty in all its forms everywhere" – and SDG 2 – "end hunger, achieve food security and improved nutrition and promote sustainable agriculture". Sachs reminded the meeting that 70 per cent of those who are still trapped in extreme poverty make their living as smallholder farmers. "We need a clear understanding of rural poverty and pathways to lead smallholders out of it," he maintained, referring to the close interaction between agriculture und environmental threats. Not only was agriculture the single largest anthropogenic cause of greenhouse gas (GHG) emissions owing to energy consumption, nitrogen fertiliser use, large-scale methane emissions from livestock, land degradation and CO_2 emissions from land use change, to name just a few. The sector was also the number one user of freshwater and number one cause of habitat destruction. Summing up, Sachs stated that "the World food system itself is not sustainable". Efforts had to be made to feed the planet and to shift to more sufficient foodstuff, with all of this based on sustainable farming systems that simultaneously had to become more resilient. For climate change and environmental losses were increasingly resulting in agricultural losses – through mega floods and mega storms that were very likely to increase in the future.

Does it really have to be a chicken egg?

A wealth of options to make food systems more sustainable through innovations were presented at the event. As a "good American", Jack Bobo, a former member of staff of the US Department of Agriculture and Senior Vice President of the biotechnology company Intrexon, showed the participants how to redesign a burger. Wheat, vegetables and beef could be produced more efficiently with clever technologies, and cheese could also be supplied from non-animal-based dairy products. Bobo demonstrated why this could make sense using the example of eggs, 75 billion of which are eaten each year in the USA. This requires 12 billion kilos of animal feed. Out of the 74 billion eggs, only 14 billion are shelled, with the rest being used in food processing. "Usually, we don't even know if food contains eggs", said Bobo, and referred to companies producing plant-based egg products. New solutions had to be found to produce not only plants but also bacteria or fish more efficiently. Here, Bobo stressed the first genetically modified salmon which was given approval in the USA in late November 2015. This fish grows to its normal size in half the time and consumes 25 per cent less feed than conventional salmon. "If we extrapolate this to animal production as a whole, it reveals a huge impact," Bobo maintains.

Examples coming from e.g. China, India, South Africa, Europe and Brazil demonstrated the wide range of bio-based technical solutions – from plant and animal genome sequencing and genomics-assisted breeding through biotech-assisted cosmetics and drug development and cross-laminated timber as a cement substitute in house building to the use of bioenergy and biofuels. Here, the positive environmental effects of bioeconomy and their potential to create jobs were referred to again and again. For example, Brazil started replacing gasoline by ethanol in the 1970s. "Since 2003, Brazil's use of sugarcane ethanol has avoided 242 million tons of carbon dioxide emissions," Glaucia Mendes Souza of the SCOPE Program for Bioenergy & Sustainability maintained. In addition, through waste recycling, the demand for chemical fertilisers was lowered, land use was improved through crop rotation between sugar cycles, and pollution levels were reduced. "The country's sugarcane industry has created 4.2 million jobs, and it accounts for twelve per cent of national GDP," Mendes Souza said.

Concrete examples were presented on over 60 posters during the conference in Berlin.
Photo: Bioeconomy Council

What are the knowledge requirements?

However, despite all the positive examples, it must not be forgotten that bioeconomy is neither a panacea nor, as such, inherently sustainable. This was again and again stressed by representatives of various NGOs in the course of the conference. Especially with a view to small-scale farmers, the effects had to be well-balanced. Or, as Luis Almagro, Secretary General of the Organization of American States, put it: "Sometimes bioeconomy moves forward, but nature and rights move backward." This concern was shared by Christine Chemnitz, head of the International Agricultural Policy Department at the Heinrich Boell Foundation. "With so much enthusiasm about all these new technologies, are we not forgetting what small farmers really need? And how does knowledge that has been generated reach these farmers?" Chemnitz asked. "Instead of solving problems in a very traditional way – by looking for technical solutions – we should think about our knowledge systems in an innovative manner. We need decentralised and inclusive knowledge systems, and small farmers have to be part of them." Chemnitz held that the core issue had to be what people needed, and not what technology offered. Here, the SDGs and the human rights system had to serve as a framework.

A new perception of agriculture

With a view to the prospects that could emerge for smallholders in Africa, Detlef Virchow of the Center for Development Research of the University of Bonn/Germany presented his research programme on a biomass-based value web. Here, one first of all had to understand that bioeconomy also implies the perception of agriculture changes: The production of food and some by-products is no longer centre-stage, but rather the production of biomass. For farmers, this means that they have to become more flexible and consider the different markets. Am I producing for the energy market? Or for the feed market? "This makes the situation both for smallholders and for processors much more complex, although it can simultaneously offer opportunities to stimulate increasing co-operation between farmers and small and medium enterprises," Virchow maintained.

A further aim was to put a zero waste concept into practice. Therefore, it was no longer enough to focus on individual value chains. Rather, the whole system had to be considered – a web approach. Crops could flow into several value chains, and farmers had to reflect on who they were producing for. In addition, Virchow presented initial results of the five-year research programme run in the Sudanian Savannah in Ghana and Nigeria and in the East African highlands in Ethiopia. The conclusion he draws is that biomass has the potential to improve food security of small-scale farmers and the rural poor in Africa but needs adequate institutional settings and an adequate economic framework. Without the latter, the food security of small-scale farmers would be threatened. In the case of weak governances, there had to be external control, Virchow said. And, first and foremost, sustainable bioeconomy was not possible without food and nutrition security.

The way forward

The final communiqué of the Summit – "Making Bioeconomy work for sustainable development" – calls for a more systematic approach to implement bioeconomy than so far and defines five cornerstones in this context:

- use renewable resources, ensure food security and protect the ecosystem;
- make bioeconomy's contributions towards the SDGs measurable,
- promote international economic and scientific collaboration;
- bring mutual learning forward with the involvement of the private sector and society;
- consider bioeconomy as a whole as an essential part in the negotiations for COP 21, the SDGs and trade.

In the final session, Klaus Töpfer, Executive Director of the Institute for Advanced Sustainability Studies (IASS) in Potsdam/Germany, called on the organisers to inform society in time and involve civil society in agenda-setting. Otherwise, the concept of bioeconomy would threaten to fall into the same trap as that of biotechnology. With a view to the urbanisation processes in Africa, he demanded a greater focus on sustainability in cities. "We must consider what we can do to close circle economies in the cities," Töpfer said. These also had to be at the centre of the debate on climate engineering. And one thing must not be forgotten in any activity: "If we do not solve the problem of the uneven distribution of wealth, we will not have a peaceful world." *(sri)*

Photo: J. Boethling

What went wrong in Ebola response?

Nobody can tell what the outcome of the recent Ebola epidemic would have looked like had national governments and international organisations responded more swiftly and appropriately. The large number of analyses on organisational, institutional and operative weaknesses ought to at least help avoid a second disaster of such magnitude. But can they really?

Two years after the latest Ebola outbreak in West Africa claimed its first victim, reports on the deadly disease have subsided. In September 2015, WHO declared Liberia free of Ebola, followed by Sierra Leone in November. It looks as though the three countries most affected by the epidemic – Guinea, Liberia und Sierra Leone – are on the road to recovery. So is there any point in further discussing the topic?

In the opinion of Joanne Liu, President of the organisation Médecins Sans Frontières (MSF), there certainly is. For in a BBC interview in October 2015, Liu maintained that some of the factors responsible for the failure of Ebola response still persisted, referring to weak health care systems, communities and their not understanding the disease, and International Health regulations, ... "for which we are still not meeting the minimum requirements."

But let's first of all recap on what happened in the Ebola crisis (also see the diagram on page 9). On the 26th December 2013, a little boy in Guinea became infected with Ebola, and died two days later. The disease initially remained undetected, for Ebola had hitherto been unknown in this country. On the 30th March 2014, Ebola was confirmed in Liberia. In late March 2014, MSF declared that the spread of the epidemic was 'unprecedented'. On the 26th May, the Government of Sierra Leone officially declared an Ebola outbreak. Towards the end of June, Médecins Sans Frontières again warned that Ebola was 'out of control', stressing that on its own, it could no longer cope with the situation because too many people were becoming infected in too many regions.

However, nothing happened: It was not before August 2014, when the first cases of Ebola were diagnosed in the USA and Europe, that the international community woke up. In mid-August, the WHO declared Ebola a 'public health emergency of international concern'. But it took international actors well into the autumn to launch large-scale measures. The Peace and Security Committee of the African Union initiated its response initiative ASEOWA (see pages 20–22), the UN Secretary General together with WHO set up the Public Health Mission UNMEER, and many donor governments and the European Union pledged financial, material, human and political support. Several philanthropic foundations also offered contributions. By this time, however, the number of cases had long assumed dramatic proportions, with more than 6,300 people dying alone in the last four months of 2014, a figure set to grow to over 11,300 by the (initial) "official" end of the epidemic.

THE EBOLA VIRUS

Disease outbreak in West Africa

December 28th, 2013: Two-year-old Guinean boy dies two days after catching the disease.

March 14th, 2014: Guinean Ministry of Health gives Médecins Sans Frontières alert of "unidentified" disease.

March 21st, 2014: Laboratory tests confirm Ebola in Guinea.

March 30th, 2014: Ebola is confirmed in Liberia.

March 31st, 2014: Médecins Sans Frontières warns that epidemic's spread is "unprecedented."

August 6th, 2014: Liberia declares state of emergency.

August 8th, 2014: WHO declares Ebola a "public health emergency of international concern."

October 31st, 2014: China announces plan to send 480 military health staff to West Africa.

November 2014: Liberia declares end of state of emergency.

December 9th, 2014: Doctors go on strike in Sierra Leone, demanding better pay and support.

July 10th, 2015: International Ebola Recovery Conference is held at New York/USA.

July 31st, 2015: UNMEER closes.

Mortalities*

May 26th, 2014: Government of Sierra Leone officially declares an Ebola outbreak; WHO sends teams to the country.

June 21st, 2014: MSF warns that Ebola is "out of control" and calls for "massive deployment of resources."

July 31st, 2014: Sierra Leone declares state of emergency.

September 5th, 2014: European Union commits 140 million euros.

September 8th, 2014: UK announces plans to build Ebola treatment centre in Sierra Leone, and a month later says it will send 750 troops to Sierra Leone.

September 18th, 2014: UN Security Council declares the outbreak "a threat to peace."

September 19th, 2014: The UN Mission for Ebola Emergency Response (UNMEER) is established.

September 26th, 2014: Cuban government announces plans to send 300 doctors and nurses to West Africa.

Early 2015: First Ebola vaccine clinical trials begin in West Africa.

May 9th, 2015: WHO declares Liberia free of Ebola virus transmission. (New cases are confirmed in late June and early July).

September 3rd, 2015: WHO declares end of Ebola outbreak in Liberia.

November 7th, 2015: WHO declares end of Ebola outbreak in Sierra Leone.

* Official statistics started in March 2014; Source: World Health Organization, Médécins Sans Frontières, Centers for Disease Control

Bad marks for the health systems

Over the last few months, numerous studies have addressed the weaknesses of world-wide Ebola response. In their Working Paper "The Ebola response in West Africa: exposing the politics and culture of international aid", Marc DuBois, Caitlin Wake and their colleagues of the Humanitarian Policy Group (HPG) at the UK's Overseas Development Institute (ODI) attempt to perform an analysis of the underlying systemic flaws. As part of this analysis, they have examined the state of the health systems in the three countries concerned prior to the crisis, finding that there were an insufficient number of healthcare workers, and that these were poorly trained, that there were low levels of access to health facilities, and that funding was insufficient. In Sierra Leone and Liberia, this state of affairs had also resulted from the protracted civil wars. In addition, there were poor infection prevention and control (IPC) measures and a widespread lack of confidence among the population in the health system. The three Ebola-affected countries belong to the countries with some of the lowest health spending in the word; none of these countries is anywhere near the minimum of one health care worker for every 439 people recommended by the World Health Organization. The inadequate numbers of beds, staff, protective equipment, disinfectant and basic medical supplies and the poor infrastructure with which the already small number of hospitals had to muddle through became acutely apparent during the Ebola outbreak. Many patients could be only insufficiently treated or had to be sent home again by hospitals and health centres owing to insufficient capacities. In addition, the laboratories could not meet the demand for case testing, resulting in delays in diagnosis and an increased likelihood of transmission. Insufficient equipment levels had dire consequences – and not only for the patients. According to WHO figures from May 2015, 881 doctors and nurses contracted Ebola while working in the three countries, 512 of whom died.

A further weakness revealed by the HGI paper is the framing of the Ebola outbreak as a health crisis without considering the humanitarian crisis going hand in hand with it. By concentrating on Ebola-related health services, the treatment of other important diseases such as malaria or HIV/AIDS as well as vaccination programmes or caring for pregnant women and young mothers was neglected. Furthermore, the predominance of top-down communication, particularly in the early stages of the intervention, had a negative impact. "Much communication intended to fight Ebola in fact had the opposite effect. Some messages were inaccurate, while others created inaccurate perceptions," the authors wrote, explaining that the mainly bad news had led to many patients being reluctant to consult the health centres and preferring to rely on their families or traditional healers. Insights on these aspects are also contained in the contributions on Liberia and Sierra Leone (pages 12–15 and 16–19).

In a recent publication in *The Lancet*, Professor Suerie Moon and her team from the Independent Panel on the Global Response to Ebola of the Harvard Global Health Institute and the London School of Hygiene & Tropical Medicine described the reforms needed to mend the fragile global system for outbreak prevention and response, and above all to prevent future disasters. For this purpose, they carefully examined the individual phases of Ebola outbreak and response. In their analysis, they arrive at the conclusion that "major reforms are both warranted and feasible". In this context, they also severely criticise the WHO's crisis response, as is reflected in their ten recommendations (see Box on page 11).

Reasons to be optimistic?

So both the analyses of shortcomings and recommendations for action are there. Strengthening health systems in Africa assumes a central role in this context, as was also recently demonstrated at the 8th World Health Summit in Berlin/Germany. However, not everyone is convinced that things will be so straightforward. For example, with regard to the more than 500 healthcare workers who died working with Ebola patients in West Africa, MSF President Liu warns: "To replace this human resources workforce, it will take years. We know how long it takes to train a doctor, how long it takes to train a nurse, that will not happen overnight. We would like to think that the systems will be strengthened, but unless there are doctors or nurses, people who will run a hospital or a clinic, you will not strengthen the healthcare system."

Many of the more than 15,000 Ebola survivors in Liberia, Sierra Leone and Guinea are still ostracised because they are held to be contagious. In addition, they frequently suffer from severe health complaints that are also referred to as the post-Ebola syndrome. These complaints range from pain in the joints and headaches, vision disorders and inflammations of the eye, through hearing problems and spells of dizziness to insomnia, depressions and posttraumatic stress syndrome.

In October 2015, a paper published in the *New England Journal of Medicine* demonstrated that men who have survived an Ebola attack still carry elements of the virus in their seminal fluid for at least three months. The researchers had examined samples of semen from 93 Ebola survivors in Sierra Leone. Among all men who had still had the disease just three months before, the genetic material of the Ebola viruses was contained in the samples. In the group with a period of four to six months after the disease, this was the case with just under two thirds of the men, and with just over a quarter of them after a period of seven to nine months. The authors write that the detection of Ebola genetic material need not imply that infectious viruses are still there, although this is not ruled out. "These results come at a crucial time and remind us that even in times of a steadily dropping number of Ebola cases, survivors and their families continue to fight the impacts of the disease", said WHO Special Representative for the Ebola

Response Bruce Aylward. It is still not clear whether women have become infected via seminal fluid containing viruses; neither has any certainty been established over whether women patients surviving an Ebola infection can reckon with impacts when they become pregnant and whether this can result in malformations of the foetus.

In September 2015, WHO officially declared Liberia free of Ebola. Two months later, the country reported three confirmed cases of Ebola – a fifteen-year-old boy, his eight-year old brother and his father. The fifteen-year-old died on the 23rd November.

Silvia Richter

"We failed. This must not be allowed to happen again"

Walter Lindner, Ebola Commissioner for the Federal Republic of Germany.

"Ebola will not be over as long as there are no drugs and vaccines against it"

Dr med. Tankred Stöbe, President of Médecins Sans Frontières Germany until May 2015.

"Ebola will not be gone in any country until it is gone from every country"

David Nabarro, the UN Secretary-General's Special Envoy on Ebola.

Recommendations for preventing and responding to major disease outbreaks

- All countries need a minimum level of core capacity to detect, report, and respond rapidly to outbreaks. The global community must agree on a clear strategy to ensure that governments invest domestically in building such capacities and mobilise adequate external support to supplement efforts in poorer countries. This plan must be supported by a transparent central system for tracking and monitoring the results of these resource flows.
- WHO should promote early reporting of outbreaks by commending countries that rapidly and publicly share information, while publishing lists of countries that delay reporting. Funders should create economic incentives for early reporting by committing to disburse emergency funds rapidly to assist countries when outbreaks strike and compensating for economic losses that might result.
- A dedicated centre for outbreak response with strong technical capacity, a protected budget, and clear lines of accountability should be created at WHO, governed by a separate Board.
- A transparent and politically protected WHO Standing Emergency Committee should be delegated with the responsibility for declaring public health emergencies.
- An independent UN Accountability Commission should be created to do system-wide assessments of world-wide responses to major disease outbreaks.
- Governments, the scientific research community, industry, and non-governmental organisations must begin to develop a framework of norms and rules operating both during and between outbreaks to enable and accelerate research, govern the conduct of research, and ensure access to the benefits of research.
- Research funders should establish a world-wide research and development financing facility for outbreak-relevant drugs, vaccines, diagnostics, and non-pharmaceutical supplies (such as personal protective equipment) when commercial incentives are not appropriate.
- The creation of a Global Health Committee is recommended as part of the UN Security Council to expedite high-level leadership and systematically elevate political attention to health issues, recognising health as essential to human security.
- Decisive, time-bound governance reforms will be needed to rebuild trust in WHO in view of its failings during the Ebola epidemic. With respect to outbreak response, WHO should focus on four core functions: supporting national capacity building through technical advice; rapid early response and assessment of outbreaks (including potential emergency declarations); establishing technical norms, standards, and guidance; and convening the global community to set goals, mobilise resources, and negotiate rules. Beyond outbreaks, WHO should maintain its broad definition of health but substantially scale back its expansive range of activities to focus on core functions (to be defined through a process launched by the WHO Executive Board).
- The Executive Board should mandate good governance reforms, including establishing a freedom of information policy, an Inspector General's office, and human resource management reform, all to be implemented by an Interim Deputy for Managerial Reform by July 2017. In exchange for successful reforms, governments should finance most of the budget with untied funds in a new deal for a more focused WHO. Finally, member states should insist on a Director-General with the character and capacity to challenge even the most powerful governments when necessary to protect public health.

Source: Moon et al., 2015: *Will Ebola change the game? Ten essential reforms before the next pandemic.* Executive summary, abridged.

The paper can be publicly accessed at: ➤ **www.thelancet.com**

Between ignorance, misperception and dilemma

A staff member of the German Ebola Treatment Unit in Monrovia in February 2015.
Photo: C. Janke

In the debate over Ebola crisis management, there is much mention of "lessons learnt". But is awareness of the mistakes that have been made really a guarantee that things are going to work out better next time? An analysis of German humanitarian emergency relief in Liberia and the significance of the human factor.

In clinical medicine, the term "crisis" tends to be perceived differently from its colloquial use. Here, it lacks the almost exclusively negative, apocalyptic connotation it bears in everyday language. Instead, the high development potential during a crisis is recognised, and the probability of attaining a new equilibrium as a result is understood both as a risk and an opportunity. Given the 11,299 deaths (status: 08.11.15), the disrupted families, the suffering of the survivors, the many orphans, the compromised health system and the medium- to long-term psychological, economic and political consequences of the Ebola outbreak in West Africa, which is not over yet, it above all appears to be a disaster the impact of which has still not been fully comprehended and hence a crisis, in the conventional sense of the term, that rumbles on. Why did international support take so long to come, and why was it performed so cumbersomely and hesitantly? Why did an outbreak of such magnitude hit almost everyone involved in an unprepared state? Why were the scarce resources allocated with so little thought given to actual needs for such a long time? Why was common sense, rationality, frequently the first or at least the second victim of the outbreak? Answering these questions above all requires an analysis of misguided perceptions, assumptions and models. This article sets out from German humanitarian emergency relief in Liberia during the outbreak of Ebola in 2014/15, and thus from the lessons learnt in a close call that the German relief mission encountered within the crisis itself. For by the time the Ebola Treatment Unit (ETU) of the German Red Cross (DRK) and Federal Army Joint Support Mission was officially opened at the SKD Stadium in Monrovia on the 23rd December 2014, three months had already gone by since the mission had been assigned by the German Defence Minister. There are reasons for this time requirement. But none of them put the fact into perspective that taking three months to make an "emergency response operation" operational is wholly unacceptable and far too long. At any rate, on the day the ETU was opened, 1,440 ETU beds were available in Liberia, but, fortunately, there were now only 66 Ebola patients. The mission was about to be operationally terminated even before it had properly started working.

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"Essentially, all models are wrong, but some are useful"

1,440 ETU beds for 66 Ebola patients? In a country whose health sector lacks just about everything? Obviously, in a particular field of outbreak management, what is known as case management, massive overcapacities had developed that were not corrected. But how could this have happened? As a rule, decision-making under uncertainty is based on explicit model assumptions. Not only were decisions concerning the distribution of scarce resources taken on the basis of these models, but cross-border traffic and, in some cases, even people's civil rights were restricted. A model published by the Centers for Disease Control and Prevention of the US Department of Health & Human Services in September 2014 forecast 1.4 million incidents of Ebola in Liberia and Sierra Leone for mid-January 2015 as an extreme case and a doubling of cases every 15 to 20 days (Meltzer M. I., 2014). In retrospect, it is known that no such horror scenario occurred. Should the inadequate models now be blamed for the failures in allocation? Is the attempt to mathematically establish and forecast such complex developments a vain effort in any case?

It is true that the vast majority of models did not do justice to the complexity of events. For example, the epidemiologists underestimated the distinct effect of behavioural adaptation among key groups of the population (burial rites, no-touch policy). Perhaps an anthropologist should have helped the epidemiologists with modelling. What makes things even more complicated is that, as a rule, attempts at modelling take place far away from

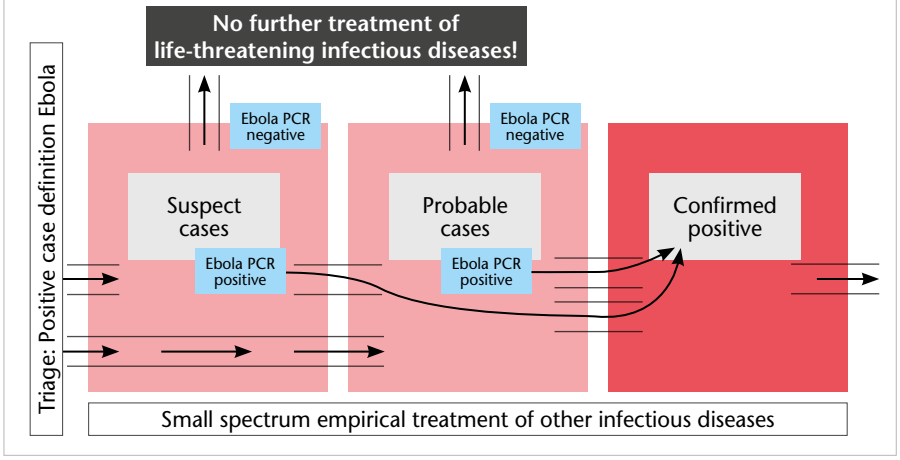
the epicentre, at universities in the Western world, which means that immediate "situational awareness" of outbreak events goes lost. Even so, effective outbreak management is inconceivable without suitable epidemiological models. The methods required for this purpose and specialist know-how in the areas concerned are scattered among a wide range of subject fields. Here, innovative field epidemiologists without reservations towards other fields of science concerned are needed.

The obviously uncritical adoption of the models by the decision-makers or their reluctance to adequately and immediately respond to clear discrepancies between theory and practice was at least just as problematic. Other NGOs and GOs in the immediate vicinity of the still incomplete German facilities commenced operation although the numbers of incidents were successively dropping. Whereas the dynamics of events would have necessitated a daily review of one's own options to act, the "inertia of masses" as well as a partly inflexible central steering of Germany's relief mission resulted in a delay of the required adaptive efforts. But by New Year's Eve 2014 at the latest, as things stood, and following talks with national and international co-ordinators of Liberian outbreak management, it had become unequivocally clear that in its classical configuration, Germany's Ebola Treatment Unit was not going to admit a single patient.

Disaster ethics between ignorance and dilemma

What would be even worse for a relief mission than its mere irrelevance would be violate the principle to "do not harm", the "primum non nocere" of medical ethics. Just how easily one can fail to meet this requirement becomes apparent if one sets out from two relatively self-evident premises. First, Ebola patients ought to be treated in an isolation treatment unit. Second, non-Ebola patients should not be treated in such a unit. The illustration shows the standardised layout of an isolation treatment unit. This is the configuration that was also used during the latest outbreak in Guinea, Sierra Leone and Liberia.

The standardised layout of an isolation treatment unit



An isolation treatment unit of this kind provides neither for individual nor for sex-specific isolation. Suspected cases are initially merely allocated either to the "Suspect Cases Area" or the "Probable Case Area", depending on their assumed risk of infection. As soon as the infection is confirmed via molecular biology virus identification, patients are transferred to the "Confirmed Positives Area". In each of these areas, the non-Ebola patient bears a relevant, albeit differently high risk of coming into contact with the virus and becoming infected within the treatment unit. In September and October 2014, when most of the international organisations were intensifying their relief activities in West Africa, and Germany's humanitarian mission was conducting its first explorative exercise in Monrovia, one was precisely at the apex of the outbreak curve. At this stage, a suspected case showing fever and other symptoms giving rise to suspecting Ebola (in accordance with the WHO case definition) in an ETU bore a high probability of really being infected. Up to nine out of ten suspected patients were subsequently confirmed by laboratory analysis; so, conversely, one out of every ten patients was in the wrong treatment unit – in other words, in one of the most dangerous places in the world. The only acceptable justification for this is the crisis situation itself with its blatant lack of all necessary medical resources.

By January 2015, the incidence of the disease in Liberia had dropped radically. But as a result, nine non-Ebola patients were now among the ten suspected patients admitted to the ETUs. The Ebola case definition adopted by the WHO circumscribes a complex of symptoms that occurs with a high probability when the disease is contracted. However, the probability of a symptom (or a symptom complex) occurring in Ebola is not identical with the probability of a patient showing this symptom complex having contracted Ebola. In the three countries most strongly affected, this meant that the overwhelming majority of the patients in the ETUs were now suffering from other diseases while being at risk for an Ebola virus infection in the treatment units. It therefore became more and more irrational for a patient with symptoms typical of Ebola to consult an ETU. Large numbers of suspected patients fled Monrovia, and the epidemiological need to isolate, if possible, all suspected patients was severely compromised. Outbreak management in the field of Ebola case management was now in crisis itself.

During the first few days of 2015, the officials of the German isolation unit in Monrovia, the planning of which had obviously missed the mark, sought to devise a strategy for their excellently trained and highly motivated Liberian and German specialists

and for their sophisticated isolation treatment unit after all. Now, internally, the issue of comprehensively optimising Ebola case management was considered for the first time. No longer were suspected patients to be separated merely corresponding to their risk of infection, but at the same time according to the probability of their chance of not being infected. In addition to the three Suspect, Probable and Confirmed Positives Areas described above, two further separate isolation areas, an Unlikely Cases Area and a Confirmed Negatives Area were required. But since there was an abundance of conventional ETUs in the immediate vicinity of the German one, the German relief mission was able to concentrate on the complementary share, which consisted of merely three isolation areas – a Suspect Cases Area (already existent), an Unlikely Cases Area and a Confirmed Negatives Area.

The German Ebola Treatment Unit with its three isolation areas

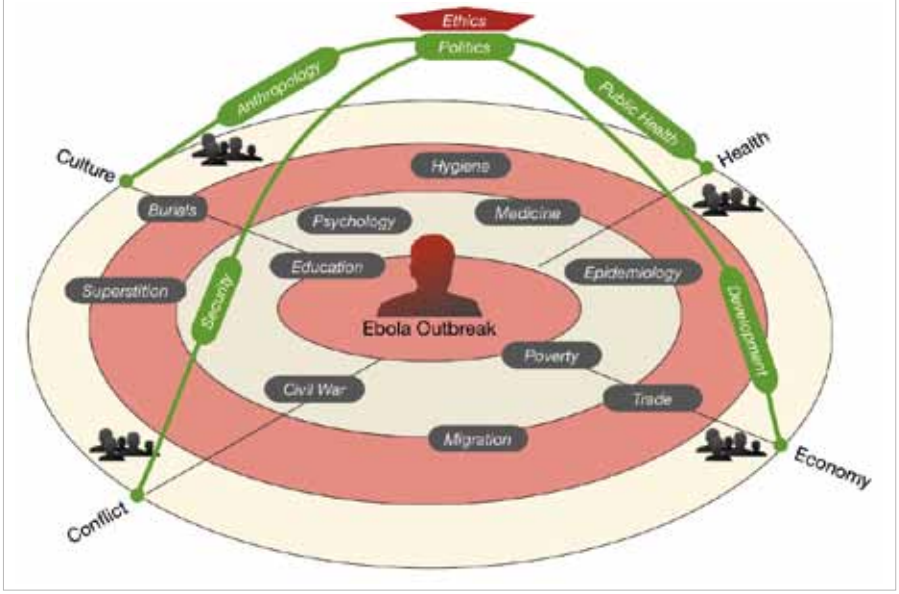
The ultimate objective was to avoid Ebola infections within the treatment unit at all costs. This is why the patients' freedom of movement in the Suspect Cases Area was confined to the space of the approx. 2 x 3 m individual treatment compartment for the short period up to the submission of the first laboratory result (4 to 12hs). Patients testing Ebola-positive were transferred to a conventional ETU, while those with negative results were immediately brought to the separate Unlikely Cases Area. Although an Ebola infection was not ruled out with absolute certainty with these patients, the risk of infectiousness for fellow patients was already approaching zero. Seventy-two hours after admission, with a negative lab result, Ebola could be ruled out with certainty, and transfer to the Confirmed Negatives Area was authorised. Here, the world now changed for the patients and those treating them. Much more time could be devoted to the individual patients, since staff no longer had to work in full protective gear. But above all, it was now possible to diagnose other diseases and offer causal treatment as well. This new type of Ebola isolation facility was referred to as a "Severe Infection Temporary Treatment Unit" (SITTU). Relatively straightforward adjustments in terms of infrastructure and procedural organisation effectively warded off a serious ethical and epidemiological problem.

From sympathetic introspections to affect heuristics

In the course of efforts to learn from the many shortcomings, wrong decisions and close calls in Ebola outbreak management, it has become clear that the "pathophysiology" cannot really be comprehended in its entirety if the phenomenon of "anxiety" is not addressed as an irrationality factor. In its largely unreflective and stymying variant of "German angst", it affected all levels of decision-making and considerably hampered effective outbreak management.

In this sense, in addition to the fact that it would have been epidemiologically ineffective and given a corresponding ethical appraisal, the option of forming a military cordon around the entire region affected in West Africa, a gigantic "cordon sanitaire" which was accepted as a map exercise, also reflected helplessness and anxiety among the decision-makers that was only difficult to conceal by doing things merely for the sake of doing things. The same applies to the West Point disaster. In the wake of rioting and looting of an Ebola treatment unit, the Liberian government decided on the 19th September 2014 to cordon off this township in the capital and prescribe a mass quarantine for its 75,000 inhabitants that was maintained with the aid of firearms for eleven days. All these measures can only be understood when patterns going beyond pure rationality are used to explain them. By no means was this an African phenomenon. On the contrary, it was apparently possible for the factor of "angst" to emancipate itself more and more from the true risk it related to the further away one was from the epicentre. German marines operating in "Ebola Full Personal Protective Equipment" in the context of their refugee mission in the Mediterranean mission are just as much of an example of this phenomenon as is a policeman belonging to the German Ebola relief mission in Liberia who was officially forbidden to enter any public building in his Federal State in Germany for 21 days after his return from the mission. As soon as one focuses on the irrationalities of Ebola outbreak management, it becomes clear that beyond "German angst", further psychological factors must have played a significant role. Obviously, there is a huge gap between evidence and policy in this context.

The Ebola outbreak – a multidimensional web of influential factors



For instance, from this angle, having another look at the issue of why it took so long for Western countries to show any response, despite reports of thousands of infected persons and given a steeply rising epidemiological curve, the treatise by Professor of Psychology Paul Slovic on Mother Theresa's "If I look at mass, I will never act…" offers a useful explanation. Other insights given by "affect heuristics", such as the apparent need for decision-makers to achieve zero risk at almost any cost, the zero risk bias, would also provide a credible explanation of many a seemingly incomprehensible Ebola management strategy

One example here is the refitting of a German Airbus, which cost ten million euros. The Airbus was meant to ferry Ebola patients in need of intensive care during the flight. Without commenting on the probability of such a patient surviving, it has to be noted that this Airbus was again completely restored to its original condition after precisely zero mission flights. Only in a world with an abundance of resources would one not have to check such a constellation for the above-mentioned irrationality factors.

Lessons learnt?

None of the phenomena described here can be fully eliminated from crisis management, even if the underlying mechanisms are largely known. What remains is the above-mentioned gap between evidence and policy, or theory and practice. The global crises of the 21st century are characterised by an unprecedented complexity, proximity and dynamics, and in this regard, the 2014/15 Ebola outbreak in West Africa was certainly not an exception. Even though insights and analyses exist, we have every reason for concern that on the next occasion, we will again stumble over the tripwires described and analysed above.

For references, see: ➤ **www.rural21.com**

Giving more attention to Global Health Security

"What if an outbreak occurs in a devastated Central African country where there is no local healthcare? What if the security situation were so bad that we could not send in international experts to advise and assist in containing the outbreak? What if infected people start to flee into cities, to neighbouring countries and eventually out of the region?"

Gro Harlem Brundtland, Norway's former Prime Minister and Secretary-General of the WHO in "International health emergencies in failed states" in 2013

When the World Health Organisation (WHO) declared a "public health emergency of international concern" in August 2014 in view of the regionally unchecked spread of Ebola, this came as no surprise internationally. What was indeed far more spectacular was the UN Security Council's declaration of the 18.09.2014 referring to the outbreak as a "threat to peace", urging the UN member states to take swift and determined action. This request initially went unheeded and had no major consequences. Up to today, many global security players, including NATO, have not deemed any significant operative activities necessary. In Germany, too, following the UNSC declaration, it took another month for the Minister of Defence to decide to launch a Federal Army military support mission on the 23.09.2014: in a subsidiary capacity as the junior partner of the German Red Cross (DRK) and, in the absence of a correspondingly trained and equipped army corps, supported by a volunteer contingent. Since then, queries about the role of the armed forces in an outbreak of viral haemorrhagic fever have never really silenced. Even NGOs, which are traditionally wary of co-operating with the armed forces, ostentatiously and urgently called for the involvement of the military in this concrete case. Whereas the fact that conflicts create a health emergency situation has already been described by politicians such as Gro Harlem Brundtland, the UN Security Council focused on the opposite causal chain of events: a severely compromised health system becoming a "threat for peace". Both perspectives can be substantiated with a wealth of evidence and precedence, constituting the field of Global Health Security. Thus health topics are stripped of their seemingly "soft" image and increasingly shift into the security context, where more attention and more resources are traditionally available. "Health in all policies" would be the next logical step. And to avoid any misunderstandings here, conventional armed forces really are only supposed to provide subsidiary support. "Security forces" with the ability to globally support professional outbreak management by no means have to be armed forces. With its initiative for a civil "white helmet" corps, the German Federal Government has embarked on an interesting, innovative and hopefully supranational approach.

Following the declaration of the state of emergency in Sierra Leone, control measures came into effect along all major roads.
Photo: D. Pilar/Welthungerhilfe

The Ebola crisis and its effects on rural Sierra Leone

The Ebola epidemic had severe impacts on rural livelihoods, especially in those villages where many victims were infected by the disease. But also in the country as a whole, measures to mitigate the spread of the disease, such as restrictions on movements, trade and gatherings, led to temporary closures of rural markets and to recession in both the formal and informal economic sector. Nevertheless, pro-active measures have mitigated the worst livelihood effects of the crisis, and people are again hopeful for the future.

Epidemiologists locate the origins of the outbreak of Ebola in West Africa in the transmission from bats to human beings in the rural settlements along the Guinean Rainforest, a high biodiversity belt in the Mano River Union between Sierra Leone, Guinea, Liberia and Côte d'Ivoire. A rural population increase of two per cent annually and increasing economic exploitation of natural resources such as iron ore, diamonds, gold and land has sent settlements encroaching into formerly untouched natural reserves and animal habitats. Local authorities, often influenced by international investors and the dream of a prosperous future, rarely integrate environmental protection and management in their development planning, and the increasing human-animal interaction in fragmented landscapes with high deforestation rates could lead to the discovery of new zoonotic viruses. In the case of Ebola, fruit bats thrive in such changing environments along forest edges and have large communal roosts in wooded savannahs, tree hollows and, more recently, in buildings under roofs or overhangs.

The Ebola epidemic in West Africa was unprecedented and infected 13,982 people in Sierra Leone, claiming the lives of 3,955 victims. The index-case for Sierra Leone was a traditional healer from the rural chiefdom Kissy of the eastern district Kailahun who participated in a funeral event in Guinea in May 2014. This case alone infected above 30 family members, friends, and health staff who visited or cared about a "normal" woman of their society. The number of cases rapidly increased, and just eight weeks later, the country recorded above 500 cases. Most victims were poor, uneducated population groups in the urban slums and in rural areas. The spread of the disease was facilitated by poor living conditions with lack of sanita-

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tion facilities, poor hygiene and handwashing practices, and by traditional burial rites in which the dead body is honoured with ceremonies where extended families and friends dance around and kiss the dead body. The symptoms of Ebola resemble common local diseases such as malaria and typhoid fever, and initially, the population distrusted the information shared by health workers and NGOs about the nature and consequences of this new killer virus. This remained a serious challenge for curbing new transmissions as people did not report on suspected cases and continued to care for loved ones at home.

The poor country's health system was already weak and totally unprepared for responding to a health crisis of this magnitude. Médecins Sans Frontières (MSF) in Kailahun District and the Red Cross Federation in Kenema District were the first to open Ebola Treatment Units and improve the laboratory testing. The district hospital in Kenema was the first government facility to offer treatment for people infected with the virus. However, in early July no specialist protection equipment was available, the professional knowledge to tackle Ebola was still very limited, and hygiene standards were low. So the hospital itself became a vector of Ebola, which spread to the urban population of Kenema and from there further on to the rest of the country.

The virus was able to move and spread geographically with human beings' commotion and trade due to its long incubation period of 21 days during which an infected person who was not yet symptomatic could travel to other areas and spread the virus. The hesitation in the population to believe Ebola was real caused some infected victims to hide in their homes or even flee treatment centres, thus infecting family members and local caregivers.

"State of (Health) Emergency"

The Government declared a "State of (Health) Emergency" on the 31st of July 2014, hoping to gain control over the spread of the virus. Measures included the prohibition of traditional funeral ceremonies and the conduction of initiation rites by secret societies, closure of local markets and other public meeting points, closure of schools, bans on workshops, business meetings and group gatherings of any kinds, and formulation of local bye-laws to regulate the social interaction of community members and avoid cross-travelling of strangers. Road control measures to restrict travel and trade came into effect with police and military force and checkpoints set up along all major roads, curfews were put in place to restrict travelling times, and both vehicles and passengers required permits to travel within the country.

The proclamation of a state of emergency created further insecurity around the national socio-economic framework conditions, with many foreign investors leaving the country. Fear, uncertainty and frustration started to spread between the villages and urban settlements.

The virus spread unevenly and hit some villages directly and hard with many infected community members – sometimes even entire families were nearly annihilated. In those cases, additional restrictions including village and household quarantining – 'house arrests' – were enforced (see figure on page 18). Quarantine of a village or household lasted a minimum of three weeks, but in many cases, it took about ten weeks until a community was free of Ebola. The number of villages quarantined and directly affected varied from district to district from 14 up to 50 communities. In Southeast Sierra Leone, the Ebola outbreak was defeated within a timeframe of 15 to 25 weeks per district.

The impact on rural livelihoods

Just as the virus spread unevenly across the country, the state of emergency also had diverse effects on the country and people's livelihoods. It is necessary to make distinctions between the national economy and rural income sources, between urban and rural areas, and between those areas affected directly by the virus with a high infection rate and those mainly affected by the mitigating measures.

The economy: The Ebola crisis caused an estimated 13 per cent loss in GDP for 2015. Entrepreneurs paused operations, investment decisions were postponed, and many foreign investors, aid workers and elite Sierra Leoneans left the country. Sierra Leone's exceptional economic growth rates in recent years has been largely driven by export of minerals, a sector dominated by foreign companies, and the investor flight caused a severe drop in GDP. However, the mineral sector is highly mechanised and generates only limited jobs, and sector revenues are not always experienced as direct benefits for the rural population. But the local agriculture markets and farming activities were disrupted, and widespread market insecurity was affecting the main trading centres in the country. Some traders went out of business, while others gained new market advantages. For example, market insecurity affected the cocoa sector – an important source of both export revenues and income for farmers – in both negative and positive ways. During the cocoa harvesting time from September to November 2014, the number of active foreign traders had dropped significantly, and local traders bridged the gap. This allowed farmers to focus on the quality of the product as demand was 'slower'. Production decreased slightly but was compensated by higher prices for better quality.

The Ebola response, with its immense international support and funds, also created new jobs. New product supplies, especially hygiene products, were introduced by the local traders, and a campaign of basic health education stabilised many local safety nets.

Agricultural production: The Ebola virus disease (EVD) and the mitigating impacts resulted in less agricultural outputs than expected in many parts of the country. The planting season in the spring of 2014 occurred

late because of late rains and coincided with the beginning of the outbreak in the Southeast. Local bye-laws imposed restrictions on movement and bans on group labour, agricultural inputs were not accessible due to trade restrictions, and people were afraid to work under the rain and contract any illness that would confuse them with Ebola patients. Villages with EVD victims were put under quarantine with no opportunity to access their farms to weed, scare animals away or harvest their fields – nationwide three-day lockdowns in August and September had similar negative impacts on agricultural work.

Rural families predominantly active in subsistence farming of the directly affected communities experienced poorer harvests of key crops such as rice, cassava, beans and groundnuts. Many households were forced to consume some of their seeds instead of stocking them for the new planting season. It appears that many households have cultivated both a lesser quantity and range of crops during the rains in 2015, and key crops may be in short supply even after the next harvests to come.

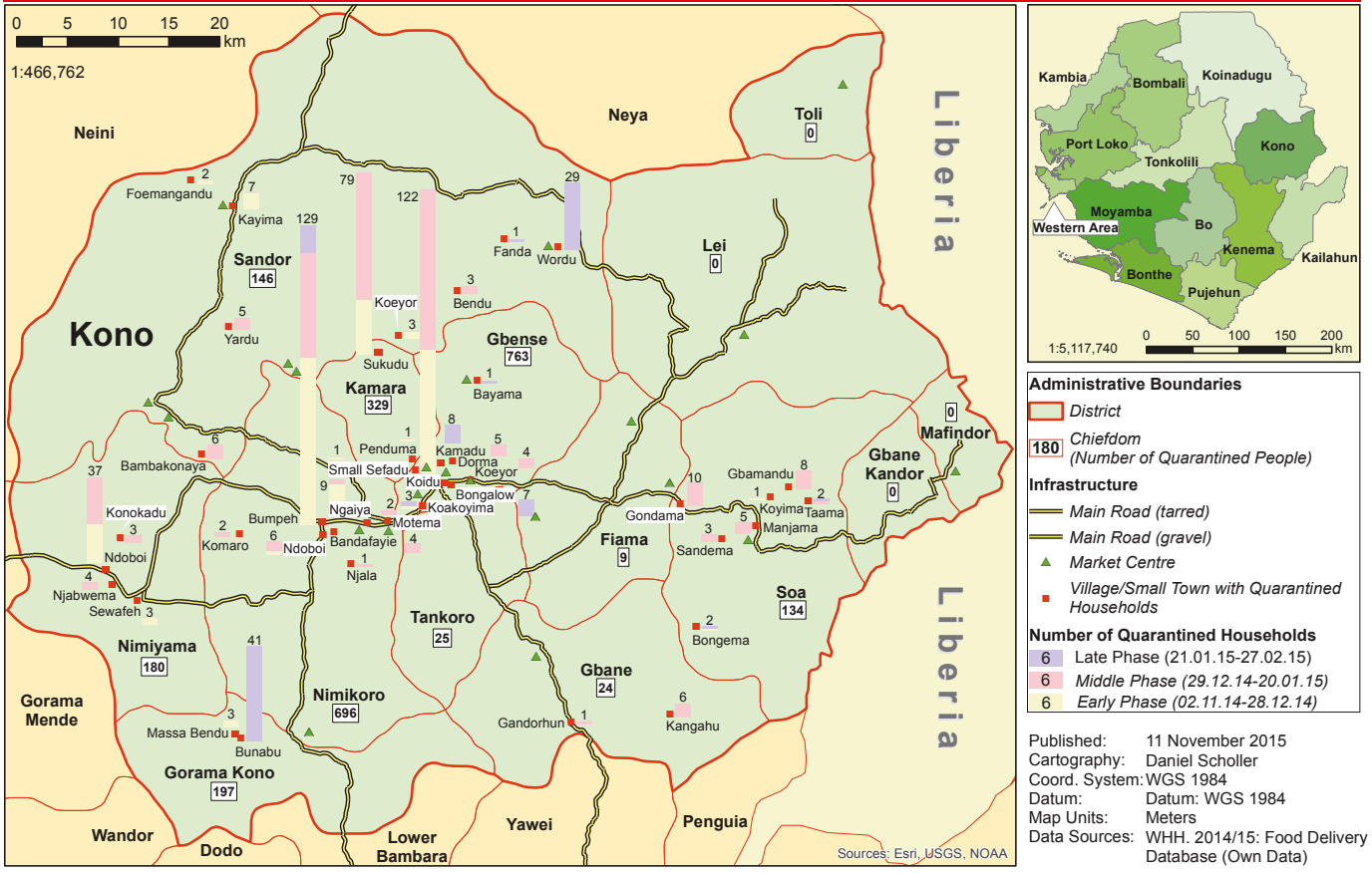
Local agriculture markets were closed.
Photo: D. Pilar/Welthungerhilfe

Household income: The majority of the rural population depend on sale of agricultural products and on petty trading of goods such as condiments, slippers, soap, etc. – many have limited access to bigger markets and limited opportunities for off-farm income sources, and cash income is very low. Poor harvests and restrictions on market activity caused rural families to lose small but important income sources normally used to invest in their farming and for expenditures on health, education, etc. However, people with higher dependency on markets and people in urban and peri-urban areas who are making a living entirely from trading or in the service sector (catering, entertainment, etc.) experienced serious constraints on their livelihoods.

The 'village economy' proved to be fairly resilient and adaptable, and rural people were able to compensate for the drop in regular income sources. Especially women engaged more in casual labour in the village such as groundnut harvesting and palm oil processing, but it appears that the traditional system of mutual labour exchange became 'monetarised' – where women would normally offer assistance to each other for the provision of a meal during the work, they were now paid in food to take home.

With the lifting of travel bans, the rural economy began to pick up again, and the rural population now report improved earning power, al-

Quarantined households in Kono District



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Cartography: Daniel Scholler
Coord. System: WGS 1984
Datum: Datum: WGS 1984
Map Units: Meters
Data Sources: WHH. 2014/15: Food Delivery Database (Own Data)

though some still rely on loans or remittances. However, many consumed their seeds and savings, and while this allowed them to feed their households during the outbreak, large numbers of households are now left with exhausted social safety nets and reduced investment capacity.

Consumption of bush meat and collection of wild foods and medicines: Bush meat is an important source of animal protein in rural Sierra Leone, but was officially condemned during the outbreak given the risk of animal-human transmission of Ebola. Many households stopped or reduced the consumption of bush meat, but it was still traded although under nicknames and on a lower scale. Rural households commonly rely on wild foods such as roots and tubers but also on wild fruits and green during periods of food scarcity, and they regularly collect wild medicines such as plants, herbs and barks for the treatment of common illnesses such as malaria, worms, dysentery and skin diseases. But the Ebola sensitisation clouded the collection of 'coping foods' from the forest and medicinal plants with ambiguity – some people were afraid to enter the forest for fear of contact with wild animals, and in some areas, the local authorities imposed local bye-laws and restrictions on who could enter the forest and for what purpose. The use of wild medicines appeared to continue to some extent during the Ebola outbreak, while the formal health system was overburdened with the Ebola response and the rural population – who already have only limited access to healthcare – were afraid to get near the health facilities.

Hygiene practices: Some hygiene practices may have actually improved thanks to the fear of Ebola. Many households have put additional measures in place such as more regular changing of stored drinking water, boiling or purifying drinking water, washing kitchen utensils with soap and less sharing of them with other people and households. Hand-washing with soap or ashes has likely also improved with hand-washing facilities put in place in front of communal facilities and even private households all over the country. Some rural communities also constructed fences around their water sources and guarded the water wells and boring holes in response to the widespread rumour that water sources were poisoned to deliberately increase the number of Ebola cases and thus attract more 'Ebola response money' for the government from the international donors.

Health systems: The Ebola outbreak had wider negative impacts on public health. The health system was overburdened, people were afraid of going near health facilities, and thus many other diseases also went untreated, child mortality increased, not least as people were afraid to enter the health facilities. Immunisation programmes for children for polio, measles, etc. were halted during the outbreak, but reactivated with mass vaccination campaigns in April 2015. During the Ebola Response, the hygiene standards of rural health care centres – known as peripheral health units – have been considerably increased. Many practitioners from hygienists through nurses to burial teams have been technically trained and now constitute an enhanced human resource for rural healthcare. In the post-Ebola transition phase, significant donor and government resources will be dedicated to upscaling service delivery and establishing an integrated disease management programme.

Social stigmatisation: The virus can be found in the male semen for more than six months after an Ebola survivor has been released from medical treatment. Survivors remain a potential reservoir for a resurge of the disease, and cases of infected female partners have already contributed to a stigmatisation of Ebola survivors by their host communities. During the outbreak, survivors who returned to their villages were sometimes confronted with stigmatisation. But gradually, as the Ebola response made donor programmes and funds available to victims of the disease, being a former Ebola patient became more accepted and sometimes so 'lucrative' that even fake survivors started to present themselves. Survivors may need hard-to-get specialist services as they suffer health issues like eye problems (uveitis), joint pain, headaches and psycho-traumatic experiences. But awareness-raising and livelihood campaigns that support the reintegration of survivors now also concentrate on the relatives of victims, especially 'Ebola orphans' – children who lost their parents during the outbreak – in acknowledgement of the fact that both those directly affected by the virus and communities broadly have borne the burden of the Ebola crisis on their livelihoods and on their minds.

Summing up ...

The state of emergency still lingers over the country, but restrictions have gradually been lifted throughout 2015. Schools reopened in May, and in August, people could gather in public, dance in the nightclubs and hail a motorbike taxi at night-time again. One year after the crisis, the local economy is gradually getting back on its feet, and people are patiently rebuilding their livelihoods.

The severity of the Ebola crisis was experienced across the country, and the array of consequences and impacts on Sierra Leone's social and economic fabric is not yet fully understood. Villages affected with a high number of cases suffered the direct experience of deaths, quarantines, food shortages and social trauma, whereas communities without EVD cases strained with the effects on restrictions on movement, trade and agriculture. Despite the effects on the national economy, the government managed to balance the market insecurity and restrictions well and to avoid civil unrest in rural areas by facilitating the transport of essential goods such as food. The rural subsistence-based population proved its remarkable resilience and ability to cope throughout a crisis posing a number of constraints on their livelihoods and causing widespread public uncertainty and apathy. An already poor population has now been left even more vulnerable, but is slowly regaining optimism for the future.

***Dominique Burgeon**, speaking here at the Third UN World Conference on Disaster Risk Reduction in Sendai, Japan, in March 2015, is Director of the Emergency and Rehabilitation Division of the United Nations Food and Agriculture Organization.*
Photo: FAO

Safeguard livelihoods, strengthen resilience

In the summer of 2014, the UN Food and Agriculture Organization (FAO) launched a programme in response to the Ebola disease outbreak in West Africa. We asked Dominique Burgeon, Director of the FAO Emergency and Rehabilitation Division, about initial results.

Rural 21: ***Mr Burgeon, have the fears over the impact that the Ebola outbreak has had on food security in the region materialised?***
Dominique Burgeon: FAO, together with WFP and governments of the region, conducted a rapid assessment of the impact that the Ebola Virus Disease (EVD) outbreak has had on agriculture and food security in the three hardest-hit countries. The findings of the rapid assessment indicated that the EVD outbreak resulted in a serious shock to the agriculture and food sectors. Lack of access to food caused by the outbreak's impact on household incomes has had the most negative effect on food security. In the areas affected, markets, agricultural and livestock sectors and sources of income such as agricultural labour, small shops and hunting and selling bushmeat have suffered most from Ebola. In Guinea and Sierra Leone, price levels are similar to those of a normal year. In Liberia, rice prices are higher than usual. Trade activities have declined significantly in all three countries, particularly in quarantined districts.

The outbreak of EVD in the major production and transhumance areas has resulted in the closure of borders and livestock markets and confinement of goods and persons. All these factors have led to a decline in the purchasing power of the stakeholders in the agriculture sector and a drop in sales of livestock products (eggs, meat, manure, etc.), with a negative impact on farmers' income.

According to this assessment, crop production in Guinea has dropped sharply, particularly in affected areas. National rice production, the main food staple for Guinea's population, fell by four per cent in 2014. Production has been affected by the drop in agricultural exports. For example, potato exports to Senegal fell by 91 per cent from August 2013 to August 2014.

In Liberia, the epidemic has severely depressed production in the agriculture and forestry sector, which accounts for about one quarter of GDP and half of the country's workforce. In November 2014, about 630,000 people, or 14 per cent of the population, were estimated to be severely food insecure, with the EVD impacts accounting for 170,000 people. The disruption of agricultural activity reduced the supply of agricultural commodities and substantially increased their prices. The prices of rice and cassava increased by 41 and 63 per cent respectively.

The agricultural sector in Sierra Leone, which accounts for around 41 per cent of GDP, was also hit by the epidemic. About 450,000 people, or 7.5 per cent of the population, are estimated to be severely food insecure as of December 2014. Aggregate food crop production decreased by five per cent compared to production in 2013.

The FAO launched its Regional Response Programme in summer 2014; 90,000 households that are affected or at risk are to benefit from the measure. Can you already draw an initial balance?
Thanks to the funds received, FAO has provided assistance to 36,000 households in Guinea, Liberia and Sierra Leone. Crucial activities comprise community campaigns to help stop the spread of the disease and increase understanding and awareness among affected and at-risk populations, including rural communities who rely on bushmeat as a source of livelihood and food; strengthening savings and loan schemes, particularly those involving women; and the provision of in-kind or financial support to vulnerable households to safeguard livelihoods and incomes.

How have the activities related to the provision of bushmeat alternative gone down with the population? What is your long-term forecast for success?
The FAO multidisciplinary mission to Guinea in November 2014 highlighted the progressive implementation of adaptation strategies to withstand the loss of income caused by the ban on selling bushmeat and the seizures that went with it. Some women who usually make a living from trading meat have been able to convert to selling other prod-

ucts such as dried fish, or market gardening. These alternative strategies to bushmeat are adapted to the local context and seem to be accepted by the rural population. They therefore have every chance of being successful.

Setting up safety nets is a long-term objective. Where do you think it poses the biggest challenges?
One important challenge is likely to be that of strengthening the governments' institutional and administrative capacity to design and manage effective safety nets for the most vulnerable segments of the population in the region. This will not be easy because the Ebola epidemic overwhelmed the institutions and public sectors of Guinea, Liberia and Sierra Leone.

Another challenge connected to governance will consist of securing funds to set up and maintain national safety nets. This could be problematic as the economies of the three countries are still struggling to get back on track. In the first stage of recovery, donor assistance will be critical in meeting governments' financial gaps.

Governments will also face the challenge to define target populations. When a big portion of the population is below the poverty line, and the differences in income among poor households are minimal, there will be a need for cost-effective and easy-to-implement methods to identify the poorest and most food-insecure households.

The provision of assistance could be further complicated by the inaccessibility of those rural areas poorly served by the road network. During the rainy season, the roads that provide access to these places regularly become impassable.

FAO is ready to assist the governments in the region especially with regard to the design of safety nets targeting the subsistence farmers still facing the negative repercussions of the agricultural shortfalls caused by the Ebola outbreak.

One of the items in the Response Programme is the strengthening of co-ordination at regional and national level. What has been achieved in this area?
FAO played an important co-ordinating role at subregional level, particularly through the formulation of a regional Ebola response programme, food security monitoring and participation in surveys and analyses within the countries, resource mobilisation and technical support, and co-ordination with regional humanitarian partners based in Dakar, Senegal.

At national level, interagency co-ordination was key to responding to the epidemic and materialised through the establishment of UNMEER, the UN Mission for Ebola Emergency Response. In the area of food security, FAO and the World Food Program co-ordinated their efforts to respond to the negative impact of the disease on the agricultural sector and on food security. FAO co-operated with other UN agencies and government institutions in the frame of social mobilisation, training and awareness raising activities, using FAO networks of extension services and animal health workers.

What options are there to link rehabilitation and development?
The FAO approach is to build resilience and capacity of vulnerable households, families and communities and systems to face the adverse impact of Ebola and other emerging crises as well as to recover and adapt in a sustainable manner. This can be done by ensuring pro-poor growth through investments in social protection programmes and establishing a long-term risk reduction strategy that reduces vulnerability and builds the resilience of communities to future outbreaks.

How can the population's resilience be strengthened in the medium and above all in the long term?
Strengthening the resilience of poor rural households and their livelihoods to Ebola and other disease shocks requires enhancing the capacity of the rural poor to manage the risks they face and lowering their level of exposure and vulnerability. Designing strategies to increase resilience may include the following actions:

- gaining a better understanding of disease drivers and working at the interface between human and animal health;
- investing in social protection programmes;
- developing alternative strategies to bushmeat;
- improving sustainability in agricultural practices.

FAO estimated a total of 30 million US dollars for the Regional Response Programme. Has this money been raised?
Given the adverse impact of EVD outbreak on the agricultural and livestock sectors and food security and the livelihood conditions of the affected population, in January 2015, FAO revised the funding requirements in order to scale up response activities in the most affected and at-risk countries and appealed for a total of 42.5 million USD to provide direct assistance to 170,000 vulnerable households in Guinea, Liberia and Sierra Leone and at-risk countries.

So far, FAO has been able to mobilise resources for a total amount of nearly 11.9 million US dollars (equivalent to 28 per cent of the appealed amount). In addition to this funding, FAO has received the support of the United States Agency for International Development under the Emerging Pandemic Threats (EPT-2) and Global Health Security Agenda (GHSA) global programme to conduct studies in twelve countries in East, West and Central Africa to identify potential carriers of Ebola and Ebola-like viruses, and shed light on the possible role of livestock, if any, in transmitting the disease. The programme supports a great amount of capacity building in laboratory diagnostics, surveillance and value chains analysis, and helps countries develop risk mitigation strategies.

Demonstrating solidarity in Africa

The mandate of the African Union Support to Ebola in West Africa (ASEOWA) ends on the 31st December 2015. Dr Olawale Maiyegun, Director of the Department of Social Affairs of the African Union Commission, on experiences gained, lessons learnt and strategies needed.

Dr Olawale Maiyegun, *Director of the African Union Commission's Department of Social Affairs, chairing an ASEOWA meeting.*
Photo: ASEOWA

Rural 21: ***Dr Maiyegun, the African Union has played a key role in Ebola response right from the start. What are the most important experiences from this period – also with a view to future crisis management?***

Dr Olawale Maiyegun: A speedy response and deployment for the urgently needed human resources for health was paramount. The African Union Support to Ebola Outbreak in West Africa (ASEOWA) was established following the Peace & Security Mandate of August 19th 2015 and deployed to Liberia by September 15th. By October, ASEOWA had been deployed to all three affected countries. This is unprecedented. Once a surge was decided in November 2014 to increase the number of ASEOWA volunteers from the initial 100, it took less than a month to have close to 855 volunteers working in all three affected countries. The African Union Commission (AUC) moved rapidly from Lagos through Addis Ababa, Kinshasa and Nairobi to mobilise health workers, all within a month, to recruit and deploy volunteers from Nigeria, Ethiopia, Democratic Republic of the Congo and Kenya. In addition, ASEOWA recruited hundreds of local volunteers within the three affected countries.

What was the role of the volunteers?

The volunteers came from a very wide range of areas. They included doctors, nurses, epidemiologists, data managers, lab scientists and technicians, public health officers, social workers, psycho-social experts, community mobilisers, communications workers and survivors of Ebola. They came from 18 African countries with different backgrounds and cultures. Within a very short time, ASEOWA was able to blend them to work and deliver as a team. The mission was flexible enough to deploy its teams to where they were needed the most, and to support the people's priorities. For example, it worked with national authorities to restore critical Maternal Newborn and Child Health (MNCH) care and other medical services in vital health care centres. ASEOWA also co-operated with local organisations to help revitalise hospitals and support strained medical capacities in an infection free environment. All this cost only a fraction of spending on other aid interventions.

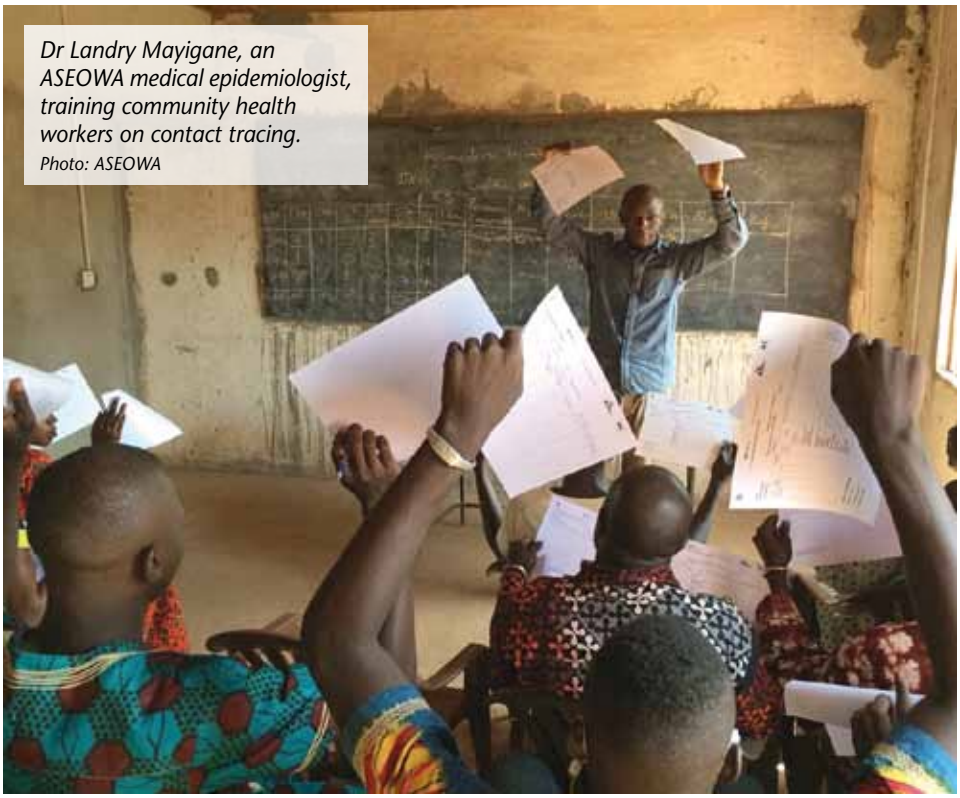
How exactly were the volunteers involved in activities on the ground?

One principle of ASEOWA's concept of operations is that the AU will support but not dictate to the affected countries. Hence, the volunteers were placed at the disposal of the countries to support and to supplement their health workers, who had been badly depleted by the Ebola outbreak. ASEOWA worked within the National Incident Management set up by each of the affected countries. The teams are deployed on the ground by the government Ebola incident management to support the following six pillars of the response as adopted by the countries: case management; logistics management; surveillance and contact tracing; communication and information; social mobilisation; and psychosocial care. ASEOWA leadership and volunteers' credibility inspired trust in the affected population – from national leadership to communities – which provided entry into national coordination structures. As a result, ASEOWA volunteers were deployed to the hottest Ebola spots and were instrumental to the drastic reduction in new Ebola cases by February 2015.

How did co-operation between the various actors work out?

The theatre of operation in the three affected countries was like a war zone among the international respondents. Though co-ordination on the field was a nightmare, particularly with some actors whose defining characteristic is not to be co-ordinated, ASEOWA liaised and collaborated well with the United Nations, the World Health Organization, the US Centers for Disease Control, Médecins Sans Frontières, the Red Cross and other organisations, as well as with Cubans and Chinese, with whom we managed and worked together inside Ebola Treatment Units in the affected countries. However, AU's ASEOWA has been the central coordinator for Africa's response. For example, daily coordination meetings were held in the AU's headquarters in Addis Ababa, bringing together Member States, development partners, UN and humanitarian agencies, and interdepartmental participation from within the AUC. ASEOWA was also in charge of co-ordination between medical, logistic and other emergency experts. Here, there was one very crucial aspect. ASEOWA was conceived in the spirit of African solidarity and supported by the African Union's convening power, political leverage, its continental reach, and its networks in all regions of Africa, including its 6th region, the diaspora. Technical expertise came from 18 member

states, the NGO African Humanitarian Action (AHA), the Economic Community of West African States (ECOWAS), Africans in the diaspora, as well as from the Ebola-affected countries. The volunteers promptly responded to the call of the AUC for help.



Dr Landry Mayigane, an ASEOWA medical epidemiologist, training community health workers on contact tracing.
Photo: ASEOWA

What has the role of the African private sector been in this context?

ASEOWA received financial and technical support from many partner countries and organisations. Nevertheless, through the Africa Against Ebola Solidarity Trust (AAEST) it set up, the African private sector remains the single largest financial contributor to the AU's Ebola response. In addition, the sector leveraged its assets and technology for the use of ASEOWA. For example, through the SMS short code campaign, the private sector mobilised not only financial resources for ASEOWA but also ordinary Africans to participate in the fight against Ebola. Indeed, by joining forces with the Commission and with its commitment to support the Africa Centers for Disease Control and Prevention, the private sector has also demonstrated the true spirit of African Solidarity – "Africa helping Africa".

Let's have a look at the future. How will the African Union assist the affected countries – or the region as a whole – in recovery and in preventing another such crisis?

A major lesson learnt from the Ebola outbreak is the need for the AU to put in place a medium- to long-term programme to build Africa's capacity to deal with public health emergencies and threats in the future. Disease surveillance, detection, emergency preparedness for health and natural disasters and response are vital. Therefore, capacities and systems most needed to prevent, detect and respond to public health threats must be reinforced in order to ensure that in the medium to long term, African countries attain and possess all International Health Regulations capacities and systems. It is in this context that the AUC fast-tracked the establishment of the Africa Centers for Disease Control and Prevention (Africa CDC). The recruitments of its initial staff have been completed, and its structures are being put in place. The CDC will be fully functioning in January 2016, after its formal inauguration.

In which areas is the CDC to become active?

The CDC is to support Member States in health emergencies response, particularly with regard to those emergencies which have been declared a public health emergency of international concern, as well as in promotion and disease prevention through strengthening of health systems, by addressing communicable and non-communicable diseases, environmental health and neglected tropical diseases (NTDs). This includes the establishment of early warning and response surveillance platforms to address all health emergencies in a timely and effective manner, thus supporting public health emergency preparedness and response. In addition, it is to promote partnership and collaboration among Member States to address emerging and endemic diseases and public health emergencies and harmonise disease control and prevention policies and the surveillance systems in Member States. Also, it is to support Member States in capacity building in public health through medium- and long-term field epidemiological and laboratory training programmes. The Africa CDC will partner with the WHO and other relevant stakeholders to assist AU Member States in addressing gaps in International Health Regulations compliance, complementing one another and ensuring effectiveness.

What else is planned?

The AU is also working with its Member States to facilitate the provision of urgently needed human resources in various fields (not just in health) to the affected countries to assist their recovery. Nigeria for example, through its Technical Aid Corps (TAC) Volunteer Programme, is offering Sierra Leone and Liberia teachers, engineers and medical staff, among others. More than 500 health professionals of different disciplines are required for the recovery of these countries. AU Member States are therefore encouraged to contribute through secondment of health professionals, as well as training of local health professionals. Generally speaking, the African Union will continue to assist affected countries in resources mobilisation.

What are the biggest obstacles to action?
One major obstacle is the availability of financial resources. Regrettably, notwithstanding the promises already made, partners' resources are neither predictable nor assured. This is closely linked to a certain level of donor fatigue. For example, the G8 collectively fulfilled critical commitments to health in Africa — including its 60 billion USD pledge for AIDS, tuberculosis and malaria in 2007–2012. The recent financial crisis, however, has resulted in a decline in international investments, exposed the insecurity of this funding and jeopardised the sustainability of recent health gains. Similarly, the Global Fund to Fight HIV/AIDS, Tuberculosis & Malaria could not meet its 15 billion USD replenishment target in 2013, and there is no guarantee that it will meet its next target in 2015.

Inadequate human resources, at least in the short run pending the recruitment and training of new ones replacing those lost to Ebola, certainly pose a further problem. And last but not least, there is the huge external debt and poverty aggravation in the countries affected.

So what do you expect from the international community?
In addition to strengthening of the global health security, above all the provision of financial resources in a timely and predictable manner by bridging short- and medium-term financial gaps through financial contributions. Furthermore, we would appreciate debt cancellation for the three countries. This has been a call by the AU since September 2014, and is based on the study by the UN Economic Commission for Africa. Although the latter's results are clear, there has been silence on the part of the Paris and London Clubs of creditors.

And what is the role of governments in the affected countries?
They have to scrupulously implement the recovery plans they themselves have drawn up. In the immediate term, the three countries should ensure the provision of health infrastructure, equipment, medicines and supplies, the refurbishment of existing clinics, hospitals, laboratories and, where necessary, the construction of new facilities, as well as the provision of critical medical equipment and sustainable medicine and supplies. Moreover, they need to implement the Mano River Maternal Health Response on "Building Resilience and Supporting Recovery through Integrated and Strengthened Human Resources for Health including Midwifery" as major contributions to resilience building and strengthening health systems.

What is this programme about?
For 2015, it is estimated that more than 1.1 million women in Guinea, Sierra Leone and Liberia will be pregnant. Those pregnant women who need treatment or are about to deliver are often too scared to attend health centres, or facilities are no longer able to provide essential routine and emergency maternal and newborn care services because the Ebola crisis has diverted critical resources away from pregnant women. In addition, it is estimated that more than 1.3 million women will need family planning services. Internalising the importance of the essential health services in the fight against the spread of the virus, including sexual reproductive health services, and the importance of initiating activities that strengthen cross-border co-ordination and co-operation highlighted in an overview of needs and requirements undertaken by the Global Ebola Response Committee, the United Nations Population Fund (UNFPA) worked with the governments of the three affected countries and the Mano River Union Secretariat to develop a global proposal and plan of action aimed at showing the appropriateness of a comprehensive approach for curbing the impact of the EVD outbreak on Reproductive Health services: the Mano River Midwifery Response (MRMR).

The MRMR is a phased programme targeting to build resilient health systems with a focus on establishing a strong midwifery workforce placed primarily in health centres, organised in midwife-led units with strong links to the communities and to referral facilities. It is in line with the report "Recovering from Ebola crisis", which was a contribution to the efforts by the Governments of Guinea, Liberia and Sierra Leone to design their National Recovery Plans. Therefore, it is also in line with these National Recovery Plans. The first phase of the MRMR is funded by the Government of Japan and directed to contribute to a reduction in maternal and newborn mortality and morbidity in selected border areas of Guinea, Liberia and Sierra Leone (Guinea: Gueckedou and Macenta prefectures; Liberia: Lofa county; Sierra Leone: Kailahun district).

So what are the next steps for the AU?
The AU Assembly and the Peace and Security Council have requested the Commission to review the AU Humanitarian Policy Framework with a view to developing a comprehensive disaster management protocol and filling all existing gaps in the co-ordination of the Commission's responses to disasters and emergencies. The Commission is currently undertaking this review. Summing up, the African Union, the Regional Economic Communities and national governments are strengthening their capacities to respond to emergencies and disasters. Models for emergency response teams, emergency medical teams, among others, are being tested in various crisis theatres. The ASEOWA model provides a working template and guidelines for emergency responders in Africa, and perhaps in other continents.

Ebola awareness campain in Grand Cape Mount county, Liberia.
Photo: ASEOWA

In small-scale farming, humans are in especially close contact with animals, increasing the risk of zoonotic diseases being transmitted.
Photo: J. Boethling

Rural development – the underestimated health hazard?

Rural development and food security once again top the list of priorities for German and international development policy. However, interventions in these fields involve numerous potential health hazards. The author describes some of these in the following article.

The promotion of agriculture and fishing has a key role to play in global strategies to combat hunger and poverty. Yet it is often forgotten that this can involve a whole range of specific risks to people's health and lives. For example, local, regional or global epidemics often occur in places where people and animals live close together or come into close contact. Agricultural irrigation systems readily become sources of infection with neglected tropical diseases (NTDs) and malaria. The use of antibiotics in agriculture and fish farming contributes to the mounting resistance of pathogens to antibiotics used to treat communicable diseases in humans and animals. Simply producing more food can also lead to the further spread of obesity and with this an increase in non-communicable diseases.

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Food safety has to be taken into account within agricultural value chains. There are also many ways in which working in farming can endanger health. All these risks must be considered when planning and implementing cooperation projects in rural development. Preventing or reducing these risks should be an integral component of such projects from the outset.

When man and beast come into contact ...

Weak governments, run-down healthcare systems, specific cultural practices, a belated and initially only half-hearted response from the international community, and a lack of biomedical resources to prevent and treat Ebola – all these contributed to the most recent outbreak of the epidemic in West Africa. 28,500 people in Liberia, Guinea and Sierra Leone have contracted Ebola since December 2013; 11,300 have died. But there is another important factor that should not be overlooked when considering this epidemic: Ebola is a zoonotic disease, an infectious disease that can be transmitted from animals to humans. Although AIDS is not actually a zoonotic disease, all known HI viruses come originally from apes. The further people advance into the wilderness to clear the land for rural development, the closer they come to the virus, perhaps an undiscovered one as yet, that could spark the next deadly pandemic. There was never any danger of that in the case of Ebola, on account of its means of transmission. The world – with the exception of those people affected in West Africa – was lucky this time.

SARS and MERS are also zoonotic diseases. The SARS virus – SARS stands for severe acute respiratory syndrome – that in 2002 and 2003 at first rightly caused global panic, but was then rapidly brought under control worldwide using traditional public health measures, i.e. case finding and isolation – had its origin in civet cats, which are eaten as a delicacy in parts of China.

MERS – properly MERS-CoV (Middle East respiratory syndrome coronavirus) – is a virus first identified in Saudi Arabia in 2012. People suffering from MERS-CoV exhibit flu-like symptoms. To date WHO has been notified of 1,400 cases of MERS-CoV – mainly on the Arabian Peninsula. Of these, 40 per cent have died. More and more studies point to the fact that dromedaries are the source of the human zoonotic infections. As yet there are no indications of continuous transmission of the MERS virus from person to person in the general population.

The Spanish flu of 1918 to 1920, the most deadly pandemic of the 20th century – besides HIV/AIDS – with its death toll of up to 50 million, was likewise a zoonotic disease. The process by which flu viruses are transmitted between humans and animals, that is to say mainly between birds, pigs and humans, is as dynamic and complex as the mutations that the flu viruses can undergo in passing through these various species. Transmission takes place anywhere that humans and animals come into close contact – therefore including and particularly in small-scale farming. That is why – according to leading experts in this field – it is a question not of "if" but only of "when" a new flu virus originating in the animal kingdom starts to make its way round the world. This virus could be as deadly as the one that once caused Spanish flu.

Irrigation and man-made tropical diseases

"Throughout the tropical world, in Africa, Asia and Latin America, the construction of water impoundments, for irrigation and other purposes, in areas of endemic water-related diseases, has inexorably intensified community levels of infection, and also created new areas of transmission", – so commented JM Hunter, the distinguished American tropical medicine specialist, in a groundbreaking publication right back in 1982. He was referring here in particular to diseases transmissible through mosquitos, other insects or small creatures – known as vectors – in combination with water, such as malaria, lymphatic filariasis, onchocerciasis and especially schistosomiasis (see page 27). While malaria is often fatal, particularly in children, the other three conditions, which are now included in the neglected tropical diseases, lead if untreated to chronic illness and severe disability. Even then, Hunter warned of a lamentable lack of cooperation between the agriculture and health sectors and called for urgent remedial action.

Then, in 1992, a comprehensive monograph for many regions of Africa, Asia and Latin America published by the World Health Organization showed, country by country, how, because of these NTDs and malaria, agricultural irrigation programmes in the previous decades had led to a deterioration in the health of hundreds of thousands, or even millions, of people who settled near these programmes. The report referred particularly to the negative health impacts of small earth dams built in Africa in their thousands in the 1970s and 1980s to irrigate the fields or as animal watering places.

Staff of GTZ, the German agency for technical cooperation, reported specific experience of this in German development cooperation programmes in Mali in the 1980s. They found that in the area surrounding agricultural irrigation projects the prevalence of schistosomiasis was six times higher than in places without irrigation.

Impregnated mosquito nets are a good protection against infection with malaria.
Photo: J. Boethling

Because the prevalence of schistosomiasis around natural water sources was three times lower than at artificially created ones, they concluded that schistosomiasis in Mali during the 1980s was essentially a man-made health problem. In addition, a more recent cost-benefit analysis by the World Bank relating to an agricultural irrigation project in Ethiopia found that almost a third of the project's benefit in terms of enhanced production and household incomes was cancelled out by its health costs – including the increased number of cases of malaria and schistosomiasis and the resulting days of sickness. That is why the report recommends that such programmes should only be carried out in areas where malaria and schistosomiasis are rare or can be easily controlled. The latter is now in principle the case everywhere – unlike in the 1970s and 1980s. Simple, proven and cost-effective methods to achieve this are available (see page 27).

Antibiotic resistance

The World Health Organization recently declared the worldwide rise in pathogen resistance to the antibiotics currently available to treat infectious diseases to be one of the greatest global health challenges of our time. Improper and excessive use of antibiotics in healthcare worldwide is contributing significantly to the development of this resistance. However, at the same time there is no question that the use of antibiotics in farming – whether to maintain the health of livestock or as an aid in fattening – drastically encourages the spread of resistant bacteria. This is particularly the case in places where there is little state regulation of the market in antibiotics and other pharmaceuticals.

More food, obesity and non-communicable diseases

However sensible the aim of increasing yields is as part of rural development programmes to tackle poor productivity, especially in African farming, it must of course come ... ➤

Malaria, schistosomiasis & Co.: The scourge of the "bottom billion"

As a Millennium Development Goal (MDG), the fight against malaria has enjoyed high priority during the last fifteen years both in the countries affected and around the world. Today there are 37 per cent fewer new cases each year than in 2000. In the same period a 60 per cent reduction in the number of deaths has been achieved – thanks to the use of impregnated mosquito nets to prevent infection and to the treatment of sufferers with the combined preparations now commonly available. Despite this, according to figures from the World Health Organization (WHO), of the 214 million people who contract malaria, there are currently still 438,000 deaths every year.

Lymphatic filariasis is also transmitted by mosquitos, but in this case the disease is caused by worms (mainly *Wuchereria bancroftii*). Its larvae block the lymph flow of those infected and causes painful local inflammation. In chronic cases filariasis leads to painful and often grotesque swellings of the limbs, which is why it is also known as elephantiasis. In men the scrotum is often affected as well. People with the disease frequently suffer permanent disability and social exclusion as a result. WHO estimates that approximately 1.23 billion people are currently living in areas where filariasis is rife, 120 million are infected and 40 million suffer from severe disabilities caused by the disease. Yet lymphatic filariasis can be controlled with bed nets and by regular preventive treatment of the whole population (MDA: mass drug administration) with worm medication (such as albendazole). If this treatment is carried out over a number of years the transmission of filariasis can be prevented completely and the disease eliminated. In endemic areas around 33 per cent of the people affected currently receive this preventive therapy on a regular basis.

Onchocerciasis – or **river blindness** – caused by the threadworm (*Onchocerca volvulus*) is widespread in 31 countries in Africa, but endemic foci also exist in Latin America. Transmission of the larvae of threadworms from person to person occurs through a bite from a blackfly. This fly breeds in fast-flowing rivers and streams in remote rural areas with fertile agricultural land. After infection takes place, the worm larvae form nodules in the subcutaneous tissue and develop into adult worms. On reaching sexual maturity the adult females produce new larvae, also known as microfilariae, which migrate through the connective tissue and eventually die. The physical symptoms brought on by the infection include severely itchy scaly or thickened skin and inflammation of the eyes which, left untreated, can lead to blindness. Onchocerciasis is tackled by controlling the blackfly and by preventive mass drug administration with the worm medication ivermectin. According to WHO figures, up to 99 million people in endemic countries – mainly in Africa – are now receiving this therapy on a regular basis, with coverage currently at 76 per cent. WHO estimates that this programme prevents around 40,000 cases of onchocerciasis-related sight loss every year. Some Latin American regions have already succeeded in interrupting the transmission of onchocerciasis and eliminating the disease.

In terms of the disease burden, **schistosomiasis (bilharziasis)** is the most significant tropical disease after malaria. It is caused by infection with blood flukes, worms of the genus Schistosoma, which are transmitted by infected freshwater snails. The water is contaminated by the excretions (faeces and urine) of humans carrying the infection. These parasites penetrate the skin and migrate through the body. The inflammation resulting from Schistosoma eggs mainly damages the intestines and the urogenital system, becomes chronic and is in some cases fatal. Poor hygiene conditions and water-based activities make children particularly vulnerable to infection. Children who have been infected often suffer from malnourishment and therefore frequently lag behind in their physical, intellectual and academic development. A sustained severe attack of schistosomiasis can cause lasting damage such as fibrosis of the liver, bladder cancer and kidney failure. The medication praziquantel is used in mass administration to control schistosomiasis. Figures from WHO show that around 261 million people – mainly in Africa, but also in parts of Asia and Latin America – currently need this preventive treatment on a regular basis; however, only about 14 per cent of these are reached.

These last three conditions are among the so-called neglected tropical diseases (NTDs), the infectious diseases which affect the "bottom billion" in particular: the approximately 1.4 billion people in the world who still have to get by on an income of less than 1.25 dollars per person per day. The World Health Organization includes seventeen quite separate diseases transmissible by bacteria, protozoa, worms and viruses in the NTDs and in 2008 developed a realistic plan to tackle them. The fight against the NTDs gained particular momentum in 2012 as a result of the London Declaration on NTDs. Here the CEOs of 13 drug companies, representatives from governments of countries affected by NTDs, from the United States, the United Kingdom and the Gates Foundation, as well as from the World Bank and WHO, together with numerous other health organisations working all over the world, agreed a common platform to control and, where possible, to eliminate ten NTDs.

At present programmes to tackle NTDs are under way in 74 countries, targeting different diseases according to local epidemiological conditions. The medicines needed for this work are donated to the programmes by the drug companies party to the London Declaration. In 2014 the German Network against Neglected Tropical Diseases (Deutsches Netzwerk gegen vernachlässigte Tropenkrankheiten, DNTDs) was founded by representatives of academia, NGOs and industry. One of its aims is to raise the profile of NTDs in the media, and especially in research and development cooperation. In January 2015 the organisation warned against neglecting the poverty-related diseases and NTDs in the wake of the fight against Ebola.

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Photo: J. Boethling

➤ ... with a health warning. Non-communicable diseases are on the rise in Africa as well. Cardiovascular diseases in particular are often diet-related, and obesity is an important risk factor. Although a third of children in developing countries are small for their age – on account of their malnutrition and the prevalence of infectious diseases – there are now more overweight people living there, purely in terms of numbers, than in countries with higher incomes. For this reason, too, rural development projects designed to increase yields must not focus just on producing more food, but on producing the right food. It is however doubtful whether that alone is enough to make people plan a more balanced diet. That is why additional, evidence-based measures are probably needed to try to influence people's eating habits and lifestyle and encourage them to adopt a healthy diet and way of life.

Risks to food safety

The most significant agricultural sources of food-related illnesses are zoonotic pathogens, bacteria in contaminated water and mycotoxins. Health risks caused by salmonella and campylobacter are especially relevant for food safety in livestock production. These bacteria enter the food production chain from the digestive tract of livestock raised on farms and smallholdings. Contaminated water can also present a risk, for example when inadequately treated wastewater is used to irrigate crops. In addition, food safety in tropical regions is threatened by the frequent occurrence of mycotoxins, poisons produced by moulds. The most prominent example is that of aflatoxin, produced by the fungus *Aspergillus flavus*, which can contaminate maize and nuts, particularly in hot, humid regions. The consumption of foods contaminated with aflatoxins can cause liver damage and even liver cancer.

Work-related health risks in farming

Every year 170,000 farmers, fishermen and agricultural workers worldwide die as a result of their jobs. Working in farming is one of the most dangerous occupations of all. Agricultural machinery presents the greatest dangers, but using agrochemicals and other toxic or allergenic substances is also hazardous. The WHO estimates that worldwide there are up to 5 million cases of pesticide poisoning each year among farm workers and in the rural population, predominantly in developing countries. Infectious diseases transmitted from animals to humans are especially dangerous for those working in agriculture. Smallholders and their families in particular are often exposed unprotected to these infections. There are also health problems caused by noise, vibration, dust and dirt.

Ebola and neglected tropical diseases – the case of Sierra Leone

In the wake of the Ebola epidemic it was feared that the efforts to combat the disease would shift the focus away from other major diseases such as malaria, and especially from the neglected tropical diseases (NTDs). This was indeed initially the case in Sierra Leone. As long ago as 2005 the government set up a national NTD programme in partnership with the US Agency for International Development, whereby 30,000 voluntary community workers helped to organise mass preventive chemotherapy treatment (mass drug administration, MDA) to control schistosomiasis, filariasis, soil transmitted helminths (STH: whipworms, roundworms and hookworms) and river blindness (onchocerciasis) and ensured continuous comprehensive coverage for a number of years. However, with the pressure of the Ebola epidemic all NTD activities had to be halted in 2014. When the epidemic had abated – since the beginning of November the country has officially been free of Ebola – MDA was successfully resumed in 2015. As was recently reported from Sierra Leone, 75 per cent of all communities in endemic regions are now being reached again. In a recently implemented MDA campaign 1.4 million people are said to have received preventive chemotherapy for lymphatic filariasis and STH. As things stand, Sierra Leone could be one of the first African countries to successfully control schistosomiasis and geohelminthiasis and to eliminate lymphatic filariasis and river blindness.

Cooperation projects require a health component

The examples given highlight a number of potential negative consequences for health from development projects promoting agriculture. They are a burning issue for German development policy, which has recently made rural development a top priority as part of the government's special initiative "One World – No Hunger". Therefore, in order to prevent these potentially serious side-effects on human health resulting from rural development cooperation projects, or to mitigate their consequences, it is imperative to:

- actively monitor infectious animal diseases as part of livestock disease information systems and make practical provision for combating epidemics affecting humans and animals (epidemic preparedness);
- ensure that wherever irrigation programmes are carried out infectious tropical diseases are managed appropriately at the same time and brought under control. Of particular importance in this context are schistosomiasis, the filiariases and malaria;
- regulate markets for pharmaceuticals and especially antibiotics for humans and animals in partner countries and monitor the use of antibiotics in animal and fish farming;
- take coherent steps to guarantee the safety of food "from field to fork";
- recognise and prevent work-related health risks (accidents, infections, poisoning) for small-scale farmers and agricultural workers, and in the case of illness make appropriate healthcare provision for the sick people and their families.

In conclusion, it is essential to determine the health risks of programmes to promote rural development at the planning stage as part of a standardised participatory health impact assessment, so that appropriate countermeasures can be taken when a project is implemented.

For references, see: ➤ **www.rural21.com**

Why billions in foreign aid failed to prevent Ebola outbreak

Money spent on health systems of partner countries in the context of international co-operation runs into the billions. Why have the health systems nevertheless failed so miserably in the case of Ebola?

In the wake of nearly every major disaster, a fundraising campaign springs up to provide relief for the affected. And in the wake of nearly every major fundraising campaign, people question, where did the money go? The West African Ebola outbreak is no exception. Over the last year, aid from some of the world's wealthiest donors has poured into the poor, hard-hit countries of Liberia, Sierra Leone, and Guinea. But people should be asking another question – what money was offered to these countries before, not after, the outbreak? And with those dollars, might this epidemic have been prevented in the first place?

Between 2002 and 2013, developed countries and international institutions like the United Nations and the World Health Organization gave over 1.7 billion US dollars in aid to Liberia, Sierra Leone and Guinea. While it's nearly impossible to trace exactly how that money was spent, we don't necessarily need to go to those lengths. Instead, we can track where it was intended to be spent. Most of the aid was donated with strings attached – earmarked for things as detailed as tuberculosis control and HIV testing, examples of what's known as vertical initiatives.

Even aid directed toward improving the general health of a country's citizens was carefully doled out. Of the 1.7 billion USD given in the decade or so before the Ebola outbreak, just 20 million USD was available to train doctors and nurses, and only 87 million USD was dedicated to infectious disease control. Crumbling hospitals and clinics had just 24 million USD to repair their facilities. Health systems are the first line of defence against quick-moving epidemics like Ebola, and when they collapse as easily as they did in 2014, it places the entire world at risk.

Following the money trail also raises uncomfortable questions about how developed countries are allocating aid. While the numbers-driven international health and development community obsesses over technocratic development goals and indicators, hospitals – where they exist – crumble and doctors go unpaid. In so many poor countries we've left the foundation of their health systems to rot.

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In place of funding general health infrastructure, donor agencies and organisations are dictating with increasing specificity where and how the money is spent. In Sierra Leone, for example, nearly 120 million USD in aid over eleven years has helped set up an entire parallel health system to serve HIV and AIDS patients. It can be an efficient way to cope with the deadly virus, but those specialised clinics were not utilised when another disease reared its head.

This is not to let the governments of these West African countries off the hook. Ebola exposed the institutional and leadership weaknesses in the health sector in countries such as Sierra Leone. Rampant per diem culture in the public sector and political patronage have not helped. International donors have long thought that if they spend money on disease-specific priorities, this will free up African states to invest money in health infrastructure. Of course this did not happen, as state actors end up investing their time and resources in meeting internationally-set health targets.

Our singular focus on specific diseases is one of the major reasons why we are where we are in West Africa, but it has been detrimental to health systems in general. The failure of the healthcare infrastructure to cope with Ebola should not be a surprise, and it wasn't for those living and working in the region, many of whom have spent decades decrying neglected hospitals, clinics, and systems.

I'm not proposing that we cut off support for disease-specific programmes nor that development is a zero-sum game. But our limited resources can't ignore the less glamorous but no less urgent areas of clinics, hospitals, and systems. The Ebola outbreak should be a wake-up call to redirect our priorities to commit to invest money and expertise in regional health infrastructure rather than isolated systems. It's a change that needs to happen, but it's one that will require a drastic shift in the way we approach global health and development.

This commentary first appeared on NOVA Next (http://pbs.org/nova/next).

***Maximilian Geigenmüller** is advocacy officer at the Berlin office of DSW – Deutsche Stiftung Weltbevoelkerung.*
Photo: DSW

"We need more money for R&D on diseases of poverty!"

Given the magnitude of the problem, spending on research into poverty-related and neglected tropical diseases is by far not sufficient. Are experiences with the recent Ebola epidemic and the resolutions adopted by this year's G7 Conferences going to bring about changes? An assessment by Maximilian Geigenmüller of Deutsche Stiftung Weltbevoelkerung.

Rural 21: ***Mr Geigenmüller, why is DSW engaging in the issue of research and development on poverty-related and neglected diseases?***

Maximilian Geigenmüller: Sexual and reproductive health and rights form the core of DSW's activities. From here, it is just a small step to the area of communicable diseases such as HIV and AIDS or, for example, the specific threat that a malaria infection poses to expecting mothers. We are concerned with ensuring optimum health conditions. For this is vital to enable people to act as independent, self-determining, free individuals who can make the best of the circumstances they are living in. Now, taking the three top-tier infectious diseases, AIDS, tuberculosis and malaria, as well as the 17 neglected tropical diseases, we are then talking about around two billion people world-wide who are directly affected. A major share of these diseases is avoidable or could be contained with relatively small additional efforts. Unfortunately, however, only very little is being invested here.

Why is this the case?

A major proportion of the people affected or threatened by poverty-related and neglected diseases – PRNDs for short – are among the poorer groups in society in low- and middle-income countries, which means they do not have much purchasing power. Therefore, conventional pharmaceutical industry has relatively little interest in developing new drugs, vaccines or diagnostics for this target group. This market failure is also referred to as the 10:90 gap: only ten per cent of global health research is devoted to the diseases of poverty, which account for 90 per cent of the global disease burden.

But at least the topic of health has once again attracted more political attention this year; the G7 Conference comes to mind here. Does that make you optimistic?

Global health has generally gained more weight in the development and research agenda over the last ten to fifteen years. This is, for example, reflected by the fact that a new malaria vaccine was approved just recently. The agent it is based on "only" works with children, and it has proved effective among a mere third of test persons, but it does represent progress on the way to what could be a comprehensive vaccine. And we do of course welcome the fact that German 2015 G7 presidency has chosen the topic as one of its priorities. In addition, Germany hosted this year's replenishment conference for Gavi, the Vaccine Alliance. This conference was also a great success, with Germany committing 720 million euros to the fund from 2016 to 2020.

Let's stick to the financial aspects. How much money is available for R&D on PRNDs?

Since 2008, the Australian think tank Policy Cures has annually published the G-Finder, a report on tropical disease funding data. According to the G-Finder, just below 3.38 billion US dollars was spent in all on neglected disease R&D in 2014. This may sound like a lot, but if you have a look at the range and the number of patients, it is hardly anything. Just for comparison, alone the pharmaceutical corporation Pfizer spends an annual eight billion US dollars on R&D. Public investments account for around 2.2 billion US dollars of the above-mentioned 3.38 billion, while the rest consists of philanthropic and private financing. The biggest government donor in 2014 was the USA, at 1.53 billion US dollars, while the European Commission came up second, albeit with just 126 million US dollars. With a contribution of 54 million US dollars, Germany was fifth among the public funders.

What exactly is the money used for?

For one thing, national and international research institutes are supported. Second, we very much welcome that the money is also used to fund Product Development Partnerships (PDPs). Over the last four-and-a-half years, Germany's Federal Ministry of Education and Research (BMBF) has supported four of these partnerships with a total of 26 million euros: the Drugs for Neglected Diseases Initiative, which researches the development of new drugs to treat children, the Dengue Vaccine Initiative, the European Vaccine Initiative, which develops vaccines against malaria and other poverty-related diseases, and the Foundation for Innovative New Diagnostics, which works on diagnostics

for several diseases such as tuberculosis, Leishmaniasis and sleeping disease.

Shortly after the G7 Research Ministers Conference, which Germany chaired in October of this year, the Ministry announced a call for a second PDP founding round, for which 50 million euros is to be available for 2016 to 2021. Although we had advocated for a sum of 100 million euros for four years, this still represents almost a doubling of what was available in the first round of funding.

What is special about PDPs?
PDPs are international non-profit organisations that develop drugs, vaccines and diagnostics for PRNDs in co-operation with pharmaceutical companies and public and academic research institutions. They have already been in existence for more than 20 years, and their advantage is that their activities are output-oriented. Allocation of public research funding is justified because they help introducing a product on the market at a low price, which makes it much easier to get that product to the people who need it. Perhaps this is what makes them different from classical university research, where academic interests tend to be at the core, or classical pharmaceutical research, which aims for profit. By performing a networking role and bringing together many stakeholders from various countries and in the countries affected themselves and partly being supported by public funding, the PDPs distribute the risk of a trial run not being successful among a relatively large number of actors.

Who are the biggest PDP supporters?
Philanthropic and aid agency funders provide the vast majority of PDP funding, with the Gates Foundation in the lead. In Europe, the United Kingdom is very active, supporting PDPs with 200 million euros in research funding over five years. In addition, together with the Gates Foundation, the UK government recently launched a research and care fund to combat malaria and other infectious diseases that is supported with 1.5 billion euros. While the German activities tend to be very positive, they appear inappropriate given Germany's economic clout and its significance as a centre of research.

Can the recent Ebola outbreak give a boost to R&D funding?
If any good is to come of this horrible epidemic, it is to show that infectious diseases are not static but develop relatively dynamically and in a globalised world can also affect the industrialised countries. One example here is tuberculosis, which we long believed to have eradicated; now we are witnessing a sort of comeback in Europe, albeit not of an alarming magnitude. In the course of climate change, controlling vectors, such as those of malaria, will certainly also have to be considered.

How are the worst affected countries contributing to disease eradication?
In many low- and middle-income countries, the research budgets are simply too small. Nevertheless, the potential of institutions there should not be underestimated. Often, as in the case of the Uganda Virus Research Institute, they are now international research hubs to which, for instance, many international scientists take part in research and development. Making use of the research potential in these countries and building capacities is one of the objectives being pursued by PDPs.

So the countries affected are very much interested in PDPs?
Yes, they are. And interest has been growing. This is despite R&D trials being such a long-term effort with often uncertain outcomes – there is no guarantee that an agent that is going through a clinical trial will actually work in the end. There are, however, really good examples of various PDPs that have developed new drugs from the so-called "low-hanging fruits" within a short period. Regarding tropical and poverty-related diseases, new drugs need not mean that vaccination or therapies are developed for the very first time; in many instances, the aim can also be to create more consumer-friendly therapies. For example, a "classic" tuberculosis therapy is very complicated and entails severe side-effects. Now, if a patient in an African country with a weak or non-existent social security system cannot go to work for six months owing to the therapy, there is a considerable danger of him or her dropping out of therapy before it is finished. Such premature therapy termination is one of the factors that led to the emergence of multi-resistant tuberculosis. So often, new, better, cheaper and more consumer-friendly therapies need to be developed that reach people better, for example oral vaccination instead of injections, or medications which require no cold chain.

What do you expect of German and international politics in this respect?
Purely in terms of R&D concerning poverty-related diseases, we want German politicians to clearly commit to providing more PRND R&D funding. We are fully aware that this is not an issue that is as easily communicated to a broader population as for example fighting hunger and building hospitals – but developing new and better health products for the poor is equally important. We mustn't forget that, each year, these diseases kill 6.5 million people and severely inhibit a further 350 million. Here, overall moral responsibility also has to be borne in mind.

At international level, I would like to see efforts under multilateral stewardship to focus capacities and create synergies in order to avoid duplication of research and research funding – for example via an international research fund that the WHO would be in charge of and for which it could ensure optimum efficiency in research spending. We hope that the attention currently given to the topic will last. For example, UN Secretary-General Ban Ki-moon appointed a High-Level Panel in late November that is to submit to him a report by June 2016 on how research on poverty-related diseases can be improved to ensure that everyone can access quality treatment at affordable costs. This is a step in the right direction.

The G-Finder is available at: ➤ **www.policycures.org**

Women in Tajikistan at the RAS needs assessment.
Photo: S. Kägi

Reaching the millions!

What 20 years of rural advisory services have taught us

Despite a wide range of approaches and actors, advisory services still fail to reach many potential addressees. What needs to be done to ensure that as many farmers as possible benefit from these services? And above all, how can this be accomplished in a poverty-oriented, sustainable way? This article summarises a selection of what has been learnt in seven studies to capitalise experiences of rural advisory systems in Asian countries.

Current rural advisory service (RAS) systems are becoming more and more pluralistic. This is due to an increasing number of private companies involved in agricultural activities and a rising civil society providing RAS. Despite the growing number of actors, the potential for outreach of today's RAS systems is not yet fully used. Public extension services remain the backbone of RAS systems, while private and civil RAS providers as yet only complement public services. Inter-sectorial collaboration between public, private and civil society stakeholders still rarely takes place. Thus, there is an unused potential for scale in public-private partnerships, as well as in collaboration between civil society and private agencies. This is just one of the insights gained from seven studies on advisory practice in Bangladesh, China, India, Kyrgyzstan, Laos, Nepal and Vietnam. The studies derive learning and recommendations on how RAS systems reach out to large numbers of farmers in a poverty-oriented, ecological and sustainable way.

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Who pays for RAS – in theory and in reality?

In pluralistic RAS systems, a multitude of service providers interact with agricultural producers, and these service providers are funded from various sources. The underlying idea is that all services are paid by those users who have a particular interest in the services. RAS dealing with public interest is financed from public funds, while RAS catering to private interests is financed privately. Current RAS systems don't fully reflect such market-based ideas. Instead, in today's RAS systems,

- publicly financed RAS often serve private interests, mainly of better-off farmers;

- overseas development assistance (ODA) tends to expect private RAS stakeholders to finance services that also serve public interests, such as catering services to small-scale farmers in remote areas;
- benefits of RAS are not reliably attributed to the services, thus agricultural producers are reluctant to pay for RAS although they derive benefits from the services.

These market dysfunctions have two implications for RAS systems. On the one hand, they induce a lack of public finances where these were needed to serve public interests, e.g. for poverty reduction or sustainable resource management. On the other hand, in mainly privately financed RAS, ecological sustainability and inclusiveness are at risk. In order for ODA interventions to be sustainable, these market challenges need to be considered when supporting RAS.

How can ODA boost RAS benefits for public interests?

The studies provide three recommendations for overseas development assistance to strengthen social equity and ecological sustainability of RAS systems:

Selection of project areas according to social and agro-ecological criteria. The geographic area of ODA interventions influences inclusiveness of the supported RAS system. By supporting RAS in regions with a low agricultural potential or in areas representing a high share of disadvantaged groups, ODA increases its potential to create an inclusive intervention.

Looking for the "business case" in RAS if services are supposed to be privately financed. The so-called "business case" supports value chains to which the target group can contribute and creates a value added to the produce, allowing RAS stakeholders to finance RAS.

Only if RAS effectively support both functions of the business case can they be catered to poor smallholder producers, while being financed independently of public funds. Usually, in such market-based RAS, the definition of RAS contents is up to the market stakeholders. This renders RAS particularly prone to neglecting ecological and social priorities (e.g. focus on short-term productivity increases through high input agriculture). Hence, ODA should carefully monitor ecological effects while in parallel promoting sustainable agricultural practices and strengthening advocacy capacities of the selected target group.

Inclusion of ecological and social aspects in project planning and capacity development. ODA increases its potential to steer RAS systems' inclusiveness by defining gender and social equity indicators right at the beginning, by monitoring them over time, and by creating affirmative action. Further, ODA can positively affect natural resource management by influencing not only the institutional setting of RAS, but also the content of RAS e.g. through well-directed capacity development of RAS providers. Similarly, capacity development of RAS providers that goes beyond technical know-how and includes e.g. advocacy capacities can positively affect inclusiveness of RAS systems.

Yet it is a major challenge for ODA to effectively support public interests in RAS. Realistic planning of ODA activities is all the more key. During planning processes, the following aspects are particularly likely to be underestimated :

- There is a trade-off between the financial sustainability of privately financed RAS, social inclusiveness and ecological sustainability of RAS. Considering this trade-off helps to plan RAS interventions realistically and to set accurate expectations. This accounts particularly for financial sustainability of RAS providers also catering to public interests.
- Up-scaling of RAS activities weakens participation of farmers and inclusiveness of RAS. Thus, monitoring and affirmative action gains in importance during up-scaling processes.
- ODA has a considerable influence on RAS contents by (co-)financing certain services and by developing capacities of RAS providers. By taking this opportunity into account, ODA makes best use of its potential to support RAS catering to sustainable resource management.

What are the roles of the diverse stakeholders?

In order for RAS systems to function effectively, there is a need for government, private and civil society initiatives to fulfil certain sector-specific roles.

The **government's key responsibility** is to create an enabling environment for pluralistic and decentralised RAS. On the one hand, this comprises the support of private and civil society involvement in RAS. On the other hand, the government is accountable for an appropriate inclusion of RAS in concerned policies, as well as for decentralised planning and financing of public RAS. Besides, governments can contribute to the quality and outreach of pluralistic RAS systems by realising the following functions:

- defining RAS in public interests, and facilitating and financing its delivery;
- monitoring the quality and outreach of RAS, in particular if services are expected to cater for public interests;
- offering quality accreditation of RAS providers in order to ensure quality of services and to increase RAS providers' potential to get mandated for service delivery.

RAS providers act as agents between farmers and institutions interested in promoting innovation, providing agricultural inputs or finances, or offering output markets. They link all relevant stakeholders in order to enhance production, innovation and marketing systems – these systems are crucial for the livelihoods of producers. The better RAS providers are connected with diverse stakeholders, the greater their potential is to offer

multifunctional services. Such multifunctional RAS are most likely to be demand-driven and financially sustainable.

Project experience shows that RAS providers face challenges or lack incentives to maintain this agent function in particular when it comes to initiating and keeping up linkages.

Agricultural producers are at least partly responsible for ensuring that RAS is demand-driven and effective. However, this is only possible in an environment that enables producers to engage in RAS planning and feedback processes. Farmers further play a key role in agricultural innovation systems: they are expected to pilot new technologies, conduct on-farm research, and spread their experiences in their neighbourhood. Agricultural producers are increasingly expected to pay for RAS. However, this is only realistic if they derive private (financial) benefits from services, and if these benefits are attributed to RAS.

The role of **private companies** which have a demand for RAS is to facilitate and finance RAS that caters to the companies' interests. The content and way of delivering these services considerably depends on the capacities of existing RAS providers, the legal framework of a country, and consumers' demand for specific products, e.g. organic or fair trade-certified products.

Lessons learnt for future ODA support to RAS systems

Institutionalisation of promoted RAS approaches is key in order for ODA interventions to have a sustainable impact. In this respect, the following intervention process has turned out to be successful:

1) Pilot RAS contents, methodologies, and institutional settings.
2) Integrate these pilot approaches into existing structures.
3) Use the pilot activities to create evidence of their benefits.
4) Advocate for institutionalisation and up-scaling of promoted ideas.

By working along such an institutionalisation process, ODA projects face two basic challenges:

- In the course of project implementation, ODA's focus often shifts from inclusiveness to institutionalisation. Since up-scaling of participatory approaches weakens participation of disadvantaged groups in RAS, ODA should address negative effects of up-scaling. In this respect, ODA can raise awareness among implementing partners, consequently monitor outcomes and create affirmative action. All require public funds to be implemented.
- Bilateral projects with the government as the main implementing partner face a dilemma when strengthening advocacy capacities of rural communities, while working exclusively through public institutions. In such a case, only a separate project component that is implemented independently from government structures can support the advocacy capacities of local communities, which are particularly important in the last step of the institutionalisation process.

In pluralistic RAS systems, **RAS providers are mandated** by any RAS-demanding entity to offer services. The possible mandators are the government, private or civil society stakeholders, or agricultural producers resp. their organisations. Therefore, RAS providers must be able to acquire and fulfil service mandates. Increasing RAS providers' potential to get mandated is thus an important function of ODA.

To this end, overseas development assistance had best support:

1) a critical mass of capacitated extension workers able to offer a certain outreach of quality RAS;
2) coordination of RAS providers in order to link individual extensionists to RAS-demanding entities;
3) mutual information on RAS demand and supply; for this, voice of RAS providers and producer organisations is key.

Capacity development of RAS providers is another major ODA contribution. While ODA is limited in time, the adaptation of RAS to on-going environmental and socio-economic changes requires continuous capacity development. Institutionalisation of capacity development is thus essential. In this regard, three approaches have turned out to be effective:

1) In a capacity building cascade, a small number of specialised extensionists train a large number of generalist extension staff. This approach is applied to initially or continuously train a large number of extensionists within a short period.
2) Extension training centres act as agents between researchers, private innovation bearers, line agencies and extensionists. They provide need-based training on extension.
3) Training through RAS-demanding entities: E.g. input companies, output traders, line agencies, or financial institutions train RAS providers according to their requirements. This is only possible if RAS providers are well co-ordinated and connected with demand entities.

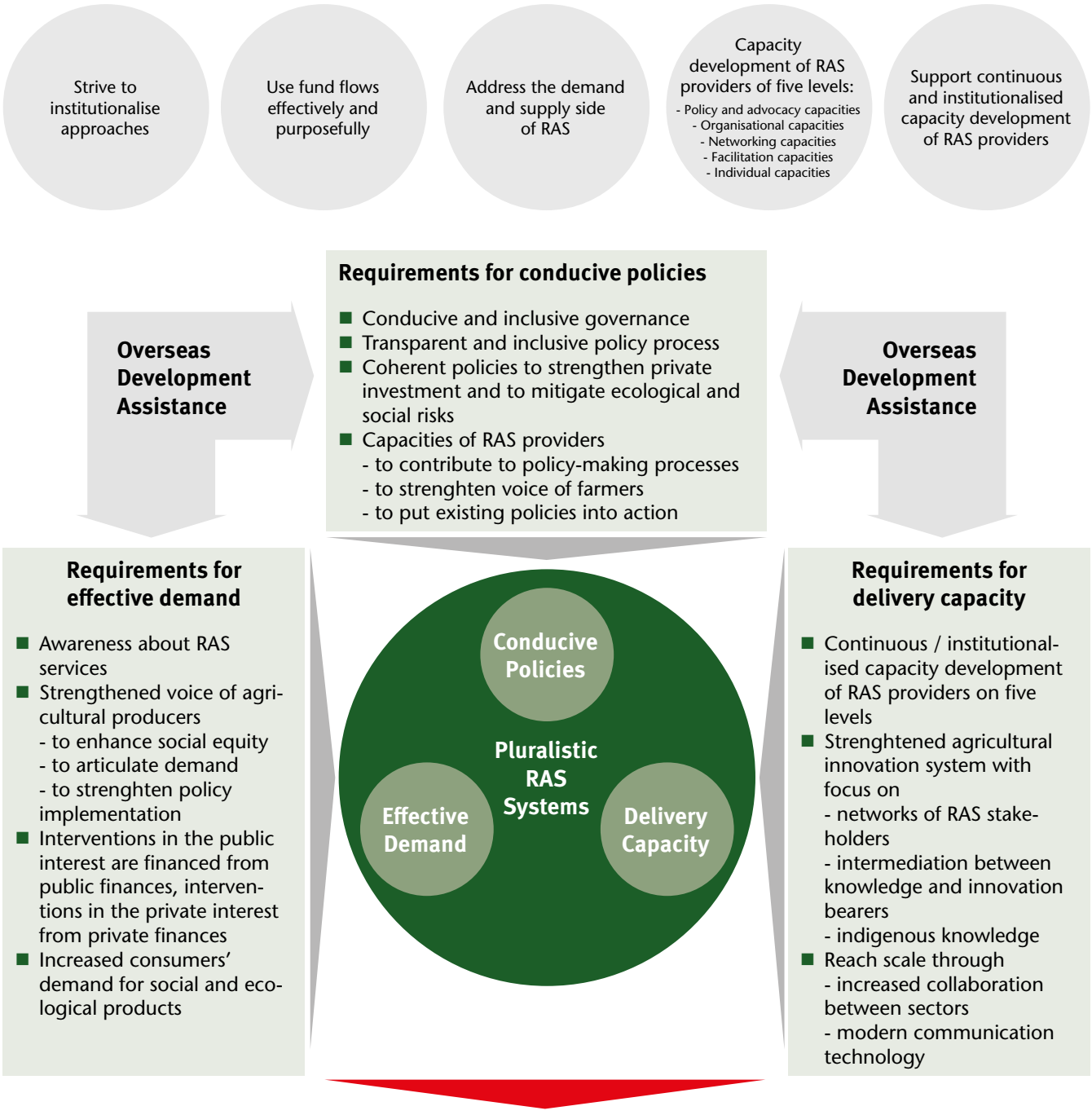
Approach 1 and 2 require continuous investments from public funds as well as the integration of extension in academic curricula.

Decentralised financing of RAS is necessary for local ownership of RAS. ODA funds are a strategic means to support decentralised financing of RAS: ODA can, on the one hand, reinforce existing decentralised fund flows, such as government block grants, by supplementing them with project funds. On the other hand, ODA can create new decentralised fund flows e.g. by supporting commune funds that are managed locally and co-fed by the government. Not only do such locally available funds strengthen local decision-making power, they also offer hands-on practice in financial management for local government structures. Such capacities are key to the further development of decentralised finance systems.

For references, see: ➤ **www.rural21.com**

The Hanoi Statement on Rural Advisory Services

The studies summarised in this article served as a basis for discussion on RAS systems at a face to face workshop of the Agriculture and Food Security Network of Swiss Development Cooperation (SDC) on rural advisory services in Vietnam in March 2015. There, 68 experts on rural advisory got together to prioritise core aspects of RAS systems and to provide recommendations for future ODA interventions. The result is summarised in the Hanoi Statement on Rural Advisory Service Systems, from which a core figure is shown below.



"Reaching the millions" in a poverty-oriented, ecological, and sustainable way

The full Hanoi statement as well as the seven studies to capitalise experiences of SDC financed RAS projects and country RAS systems are available at the SDC Agriculture and Food Security Network:

www.shareweb.ch/site/Agriculture-and-Food-Security/focus-areas-overview/ras-and-agricultural-education

A focus group discussion with members of the farmers committee in Takatalina/San Pedro.

Sustainable land management – not an easy road

Despite years of persistent efforts it has so far proved difficult to establish sustainable systems of land management in Paraguay's small farmer sector. The reasons for this are shown in a study by the Centre for Rural Development (SLE).

Alongside electricity generation, agriculture is the most important economic sector in Paraguay. The distribution of land ownership is extremely unbalanced, however: family smallholdings of less than 50 hectares represent 91 per cent of all farms but make use of just over 6 per cent of the total arable land area; large-scale farms of over 500 hectares represent 2.6 per cent of all agricultural holdings but work 86 per cent of the cropping area. Concentration of land ownership is still on the increase; cropping and pasture land are being expanded by bringing wastelands under cultivation and clearing forests. Consequently, wind and water erosion are causing progressive soil degradation, which has already resulted in substantial losses of yield. Conservation agriculture (CA) and agroforestry (AF) can counteract the trend and are already being practised on a good two-thirds of large farms, but are barely found in the smallholder sector as yet. Attempts are therefore being made, both by the state and as part of development cooperation, to establish both systems on Paraguayan smallholdings. One example, in progress since 2000, is the project on sustainable resource management – Projecto de Manejo Sostenible de Recursos Naturales (PMRN) – carried out by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).

Despite activities over many years, however, today the adoption rate of both systems remains low and hard to sustain. Effectively, conservation agriculture (see Box on page 37) is often only practised for as long as smallholders receive agricultural advice and inputs (such as green manure seed, herbicides, and tools) at no cost. After the project has run its course, many farms fall back on the traditional management method using the plough.

Similarly, the anticipated multiplication effect, whereby practices are copied by neighbouring smallholder farms, is very low. In the evaluation for the fourth phase of the PMRN project (2014) it is estimated that only 16 per cent of the 9,000 smallholder farms advised are actually practising conservation agriculture. Why the adoption rate by farmers is so low despite the activities of advisory services, and which determinants influence smallholder behaviour were studied in 2014 by a group of students at the Centre for Rural Development (SLE) at Humboldt University, Berlin under commission from GIZ.

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Socio-economic conditions

The average farm size in the study region is 11 hectares. The average household is also small, numbering between 1 and 5 persons; these farms only have a small workforce of a few family members. 59 per cent of heads of household are over the age of 51.

More than half (58 %) of the 103 smallholder families questioned possess an official land title; the remaining smallholders have used and managed their land for generations on a customary-law basis. The majority of the families surveyed are mainly subsistence producers, but all sell at least a proportion of their agricultural products. Very few of the families questioned earn their income exclusively from agriculture. 23 per cent say that they take out loans, part of which are spent on inputs for agricultural production.

Women make an important contribution within agriculture and to household income in the form of work. On the farms studied, although fewer than 10 per cent of women possess titles to land, they nevertheless take part in decision-making processes; all important decisions are made jointly.

Smallholder farms are always found to be operating several land-use systems side by side. CL and AF generally account for only a small portion of the land: around half of smallholders (52 %) stated that they were practising or had practised conservation agriculture; of these, more than half do so on less than a quarter of their land, using conventional farming practices in parallel on other parts of their land. Agroforestry systems are still far less widespread than conservation agriculture: only one-third of the smallholders surveyed practise agroforestry or have done so in the past.

The decisive factors

So how can the poor adoption of resource-conserving management practices be explained? One of the reasons for the low inclination towards system conversion may be the high average age of the farmers, since older people are less willing than the young to innovate and take risks, as various studies show. In addition, sowing and weed control in particular are more labour-intensive in the conversion phase to conservation agriculture than the traditional method using ploughs. There are not enough family labourers to cover these peaks in labour demand, nor the equipment for mechanisation of this work to make it easier.

Almost all the families studied also have non-agricultural incomes. Consequently possible medium or long-term yield gains resulting from CA or AF are a low priority within overall household budgets. This alleviates the problem pressure, thus reducing the motivation to bring about major changes by means of system conversion.

Despite a great number of references to the contrary in the literature, the possession of title to land is not a major factor in the introduction of new systems in Paraguay. Land tenure certainly appears to be secure enough for smallholders to put innovations into practice. In contrast, it became clear from the surveys that lack of continuity of advisory work was an important reason for the abandonment of systems shortly after introduction. What was more, due to the advisers' low level of expertise and lack of conviction, advice on AF and CA was not tailored to the context and target group.

Lack of political and institutional embedding

State provision of advice is dominated by the traditional approach of hierarchical (top-down) technology transfer from adviser to smallholder family. One important aspect of the adviser's role is to supply free inputs like fertilisers, seed, pesticides and other production inputs. All in all, the state advisory service is under-staffed and under-resourced; moreover, it is politically instrumentalised, which is reflected in the lack of continuity of local advisory services. Advisory work fundamentally pays far greater attention to men than to women.

As sustainable production methods, conservation agriculture and agroforestry are a perfect fit with the strategic framework of government advisory work, which incorporates relevant core themes such as improvement of the production base and conservation of the natural resources of soil, water and forest. On closer examination it becomes clear, however, that there are only rather unspecific advisory offers on AF and CA. This is a result of the advisers' inadequate training, for they receive little or no in-service training on these themes.

Conservation agriculture and agroforestry – what are the underlying principles?

According to the UN Food and Agriculture Organization (FAO), conservation agriculture (CA) is a farming system which fulfils the following three principles:

- Minimal soil tillage (refraining from use of the plough),
- Crop rotation,
- Permanent soil coverage with green manures or dead organic material.

Agroforestry (AF) is understood to mean a land-use system in which perennial shrubs or trees are produced together with agricultural crops.

Both systems are suited to improving ecological and social sustainability and, at the same time, boosting productivity and the income of smallholder farms.

Alongside the FAO criteria, the CA system disseminated by the PMRN and the state agricultural extension authority DEAG also advocates the non-combustion of harvest residues; such burning continues to be widespread in Paraguay. Another key element in the smallholder context is the production of green manure plants in order to restore soil fertility, maintain soil moisture, reduce weed growth and improve yields.

Interview with a farmer in his field covered by green manure in Caazapa.
Photos: R. Preissler

As regards the institutional and political embedding of CA and AF, two problem areas can be identified:

1) The strong institutional fragmentation of national agricultural policy actors.

2) The strong dominance of international donor organisations which do little towards programme harmonisation and so are not advancing the establishment of a Paraguayan rural framework strategy.

Conclusion

Despite the halting pace of diffusion, it became apparent in the studies that the smallholders have positive attitudes towards conservation agriculture and agroforestry. Particularly in the case of CA, perceptions are centred on improved soil fertility, increased soil moisture and long-term reduction of field labour, whereas in AF the production and availability of the resource of wood are of primary interest. For smallholders, however, conservation agriculture in particular is also linked with disadvantageous aspects such as difficulties in making use of green manures (e.g. poor availability, once the advisory service is no longer supplying the requisite seed), widespread scepticism regarding the use of herbicides, or the experience of declining yields of some crops under the system. The fact that many small farmers also earn non-agricultural income evidently means that they are not under any great economic pressure to implement more sustainable land-use systems.

The findings show that despite the positive perceptions and experiences of small farmers overall, the additional benefits accruing from sustainable management systems are not sufficiently great to compensate for the disadvantages and difficulties that are initially associated with their adoption. CA and AF are farming systems geared towards the long term, and their advantages only unfold after several years when they are used properly. This does not tie in with the planning realities of smallholder families, who have to plan and work on a much shorter-term basis.

From the viewpoint of farmers, the real benefit of participating in the programme is to obtain assistance and support by accessing expert advice and financial or material subsidies from the agricultural extension service or other project promoters. From the other viewpoint, the primary concern of the state agricultural extension authority DEAG is top-down delivery of specified advisory content by the adviser. Adjustment to the needs of smallholders and consideration of possible innovations for farm-specific practice and local adaptation are not part of the repertoire in the study region.

The way forward

The study showed how difficult it is to transfer a land management concept that can be successfully established on large-scale farms with their structural conditions (access to capital, large land holdings, mechanisation, high level of education) into smallholder agriculture, a context with completely different structures (small land holdings, no capital, over-ageing, shortage of labour, lack of mechanisation options). Nevertheless, a series of recommendations for action can be derived on the basis of the study:

- The conservation agriculture concept for smallholder agriculture should be simplified and made more flexible. This would need to involve considering the specific production context of the given small farmer, carrying out a technical needs assessment and adjusting the technology package accordingly.
- The maintenance and expansion of the tree stock on smallholder farms should be reinforced by setting both positive and negative incentives (financial support, laws, and taxes).
- Special agricultural loans which are preconditional upon the introduction of CA/AF could be designed and granted in cooperation with the private sector.
- Existing committees could be strengthened through capacity building.
- The provision of advice should be continuous and family-based, i.e. all adult family members making a decisive contribution to the family farm should be involved.
- The involvement of the whole social setting, i.e. the inclusion of neighbours or of entire village communities (inclusive advisory approaches) leads to a greater acceptance of innovations, as studies from other countries show.
- Awareness raising and capacity building on all political levels (national, regional and municipal) are vital in order to disseminate conservation agriculture and agroforestry sustainably.

Upscaling "organic by default" agriculture – a hope spot for drylands

In India's arid zones, farms are traditionally managed with no or very low chemical inputs. This "natural" organic production method helps maintain the fragile ecological balance but provides only low yields. The Central Arid Zone Research Institute is supporting the traditional farmers with on-farm research to enhance their productivity by making use of modern agricultural and ecological technologies and know-how.

India's low rainfall areas (<500 mm/year) cover about 45 million hectares, about the area of Sweden. They are mostly found in Rajasthan and small parts of Gujarat, Andhra Pradesh, Haryana and Tamil Nadu. Rainfall is erratically distributed and there are frequent droughts, a condition further aggravated by climate change and causing economic uncertainties for local farmers. Multi-component farming systems which include annuals, perennials and livestock are prevalent. Such systems have very low external inputs and rely heavily on recycling of local resources. This type of production can therefore also be referred to as "organic by default".

During the last 50 years, efforts have been made to improve productivity of these farms by use of synthetic external inputs, e.g. fertilisers, pesticides, weedicides etc. However, success was limited to good rainfall years. Use of organic manure is an effective alternative as it provides at least some produce even under prolonged dry spells thanks to its highly efficient nature in recycling of nutrients. Thus it can result in better food and economic sustainability. During the past six years the Central Arid Zone Research Institute (CAZRI) has successfully attempted to redesign the traditional farming systems by incorporating modern eco-technologies to increase their efficiency and outcome. In the following, some examples from north-western India are presented most of which are applicable to the other low rainfall areas and drylands of the world as well. This approach may also be helpful for ecosystem conservation of default organic areas to preserve flora, fauna and heritage agriculture for future use that is otherwise degrading at a very fast rate through the spread of chemicals-based production systems.

Extent of arid zones in different continents of the world

Continent	Area (million hectares)	Percent of total
Africa	1,175.5	46.1
Asia	903.0	35.5
Australia	303.0	11.9
Europe	11.0	0.4
North America	84.6	3.3
South America	70.2	2.8
Total	**2,547.3**	**100.0**

Why organic?

The low and erratic rainfall areas of northwest India are characterised by extreme temperatures and light soils. The traditional farming systems are based on recycling crop residues to increase the humus content of these light soils. Promoting organic agriculture offers several other advantages in these areas:

Diversified farming systems: Farming systems in the region are highly diversified, with annual and perennial crops, trees, grasses and farm animals. This system is efficient in nutrient recycling and in restoring soil fertility. In these areas 10–30 trees/ha are common, and 2–5 animals are reared per family. This integrated organic (by default) farming system minimises pest incidence and controls desertification.

Efficient use of limited water: Water is the scarcest resource in these regions. The use of synthetic fertilisers both increases water demand by crops and reduces the water-holding capacity of these light soils, whereas manure increases the soil's water-holding capacity. Water use can further be reduced by growing low water-demanding crops such as spices, oilseeds and certain medicinal plants.

Fertiliser use and quick conversion: In rainfed areas, due to the erratic pattern of rainfall, the rate of fertiliser application is very low (36.4 kg/ha as compared to the national average of 76.8 kg/ha) – a good op-

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portunity to quickly and easily convert to certified organic farming.

Rich traditional know-how: Rich traditional know-how in these areas provides further strong arguments for organic conversion to ensure the restoration of soil fertility and control pests.

Availability of natural inputs: Plants such as *Azadirchata indica* (neem) and *Calotropis procera* (Indian name: Aak) are good sources of bio-pesticides and are abundantly available in these areas. Minerals such as rock phosphate, gypsum and lime are available in large quantities. These soil improvers also provide plant nutrients and regulate the pH of the soils.

Employment opportunities: With cropping limited to the rainy season, the high population density remains underutilised nine months a year. The migration of human resources during drought periods inhibits the development of these areas. Since organic farming is more labour-intensive and inputs are from local resources, it provides more employment opportunities and social protection than conventional farming.

The 'Like and follow organic system' – the hub of capacity building

People or organisations present their profiles and work to others via the social media, a principle that CAZRI is using to promote organic farming. If all the possibilities are displayed and the outcomes can be seen, a famer just needs to 'like' it and prepare himself to 'follow' it. To this end the institute developed a two-hectare model organic farm (MOF) to show farmers organic farming technologies, how they can be integrated and their synergetic effects. This is the like phase. If a farmer decides to follow (adopt) this approach, CAZRI provides the knowledge and, to some extent, financial support (from various national schemes on agriculture) so that the system can be replicated successfully on the farmer's fields. Another meaning of follow is that once farmers have started adoption, CAZRI staff will do follow-up action from time to time to ensure success.

A neem plantation on a field boundary – a good source of bio-pesticides.

The catchment area of the rainwater harvesting pond is also utilised for drying and threshing crops.

Pheromone traps for white grub and legume pod borer.

A biodiversity corridor provides nectar and shelter to beneficial insects.

Photos: A. Sharma

The certified model organic farm (MOF)

The farm is set up around three main branches of sustainability: rainwater, waste utilisation and field education. The following support facilities to research and demonstrate the organic system were installed:

A trench and mound was dug around the plot for *in situ* conservation of rainwater and *Cassia angustifolia* (senna or sanai), a medicinal shrub, was planted on the mounds for round the year availability of flowers for predators and further prevention of spray drift contamination. Two **rainwater harvesting ponds** of 5,000 litres capacity (each) were constructed with a cemented catchment area for maximum collection of rainwater, which is distributed using a gravity drip system that irrigates two low-volume, high-value crops, i.e. cumin and psyllium.

Manual weeding is done regularly, and uprooted weeds are left as mulch that later decomposes and contributes to organic matter (at about 1.5–2.0 tonnes/ha). A variety of **fruit trees** were planted on the farm to ensure an income from diverse sources and to increase biodiversity: *Zizyphus mauritiana* (Ber), *Emblica officinalis* (Aonla), *Cordia mixa* (Gunda), *Lawsonia alba* (Mehndi), and plants for bio-pesticides: *Adhatoda vasica* (Adusa), *Vitex nigundo* (Nrgundi), *Aloe vera* (Guarpatha) and sanai. Besides the fruit trees there are about 30 naturally grown trees of 30 to 35 years of age of *Prosopis cineraria* (Khejri) and two neem trees that can be used to make bio-pesticides. This plantation also ensures a supply of nectar and shelter for beneficial insects.

Six compost pits were dug inside the farm for making quality **compost** from crop residues, manure and cattle urine. **Bio-pesticides** are prepared in a tank in situ in the field from the

leaves of neem, aak and adusa. **Pheromone traps** are also used for the major pests. This technology is simple to use, cost-efficient and effective.

The farm also keeps its **own seeds** for sowing and distributing to the farmers adopting the organic system. The seeds are preserved with a coating of mustard and castor seed oil (mixed at a ratio of 3:1). **Information boards** are placed at various places in the field so that any visitor can read about and understand different aspects of the system.

For scientific purposes, records are maintained on input use, farming practices and produce storage, and auditors from the Rajasthan Organic Certification Agency (an accredited certification body based in Jaipur, India) visited the farms several times to verify the records and for testing of pesticide residues in the soil and produce. The MOF was certified organic in August 2011, after completing a three-year conversion period.

The outcomes

A rotation of four high-value crops including cluster bean, sesame, cumin and psyllium was selected. Five years after establishing the farm, there has been an overall improvement in soil health and agro-diversity that is helping to make the system more resilient to climatic extremes. Achievements include:

Improved soil properties. The use of cattle manure and compost has led to an observable increase in soil water retention (from 8.43 % to 8.92 %) and soil organic carbon content (from 0.23 % to 0.31 %), which has enhanced crop yields. Biological activity, measured in terms of dehydrogenase enzyme activity, has also improved from 1.06 to 2.36 (p Kat g-1), showing that the soil is becoming more alive.

Resilience to climatic variability and better yields. Crop resilience to climatic variability has been enhanced, observed in sustained crop growth, less incidence of pests and diseases and sustained yield during climatic extremes, compared to conventional farms where crops almost always fail in such situations. Legume cultivation contributed to an average 25 to 30 per cent increase in yield in the subsequent crops of cumin and psyllium.

There is a widely held view that organic systems give poor yields. However, the findings show that, while there may be slightly lower yields than in a conventional one during their introduction, once the system is developed after 2–3 years, the yield levels are comparable to those in the conventional (chemical input-based) system as observed in the fifth year (2013) yields of 917.5 kg/ha for sesame, 1,122.2 kg/ha for cluster bean, 830.9 kg/ha for cumin and 856.4 kg/ha for psyllium in organic system. Preparing most of the inputs on-farm reduced the cost of production by 30 to 70 per cent, depending upon the crop.

Higher diversity and density of beneficial insects. Round-the-year availability of water and nectar and not using chemicals led to an increase in the diversity and density of beneficial fauna, which almost tripled in five years (2008–13). Syrphid flies, wasps of different types, honey bees and geocorid bugs are major beneficial insects for *Zizyphus*. The henna crop attracts *Chrysoperla*, *Apis* sp., syrphid flies and *Coccinellid* beetles (Ladybird beetle). Major beneficial insects on pearl millet, cluster bean and weeds include *Digera muricata* (Lolru), and *Amaranthus virdis* (Cholai), and on *Calotropis* there were *Chrysoperla* and the ladybird beetle, *Chilomenes* sp. Besides insects, 13 species of predatory birds that help in controlling insect pests have been seen including crows, prinia, babblers, etc.

Improving farmers' perceptions about organic farming

A total of 1,500 to 2,000 farmers a year come to visit this farm and get hands-on training. Many of them have adopted these technologies because using local resources makes it a cost-effective and affordable system for drought-prone marginal farmers. Yet they often mention questions and doubts about the organic approach which we listen to carefully. For example, farmers are apprehensive about low yields and the availability of organic inputs. These doubts are cleared when farmers see the standing crops and learn how to make and use proper compost and bio-pesticides. In

Availability of organic inputs

As biomass production is generally low in low rainfall areas, the crucial point with organic farming is limited availability of organic inputs, such as crop residues and animal manure. A survey among farmers in four districts has shown that, when added together, all the organic inputs from available sources provide between 4.5 and 5 metric tonnes/ha. This is sufficient for sustainable rain-fed farming in these areas. The availability of nutrients can be enhanced by management practices such as incorporating legumes in crop rotation, proper composting of dung and use of tree leaf litter, animal urine, the bones of dead animals and non-palatable weed biomass.

Supportive government schemes

Several government schemes are providing support for organic farming. They offer capacity building on eco-friendly technologies and subsidies for compost preparation, rainwater harvesting, the purchase of bio-pesticides, and certification. This year, Pramparagat Krishi Vikas Yojna (Traditional Agriculture Development Scheme) has been launched exclusively for the promotion of organic farming. The National Bank for Agriculture and Rural Development (NABARD) is also providing soft loans to self-help groups who work in agribusiness and favours those working with organic farming.

this low rainfall region, every farmer knows the value of applying manure, but adverse conditions (family, social, financial etc.) mean that farmers often do not make good compost. When dry raw cow dung is applied, this creates problems with termites and weeds. A farmer visiting the MOF can receive a customised nutrition management system according to his conditions and resource availability.

Many of the farmers already know about traditional methods of pest control such as using neem and other bio-pesticides and we, at the MOF, just refine these methods to enhance their efficacy.

A question that is asked by almost all farmers is where to sell organic produce and whether they will get a premium. At the MOF, we suggest they go for group certification, and once the farm group is certified it can approach any of the organic buyers or develop its own brand. We provide facts and figures to demonstrate the shortage of organic produce as well as examples of farmers who have successfully developed their own brand and get a premium price in order to encourage farmers to follow this approach.

It is harder to convince groups of farmers who are exploiting groundwater reserves or using water from the Indira Gandhi Canal of the benefits of the organic approach. They use agrochemicals heavily and are afraid to shift to organic methods because they anticipate a drastic reduction in yields. We suggest a more gradual shift to organic to them: i.e. first follow an integrated use of chemicals and organic methods and then gradually replace the chemicals with organic inputs over 3–4 years. Some of them have been convinced and have started to move towards an organic approach.

In a nutshell, farmers are gradually realising the benefits of organic farming in this area with its erratic climate and are ready to adopt organic methods. But they need knowledge backup tailored to their resources and marketing backup.

The future of organic farming in arid regions

An organic approach is highly suited for and applicable in these low rainfall areas with light soils. These regions have a near monopoly on high value crops, such as oilseeds and spices, which are in great demand internationally, especially if produced organically. In this way, organic production in low rainfall areas can not only boost the economy but also sustain the productivity of natural resources. The management system developed at the MOF may also be useful for low rainfall areas in other parts of the world. Further research is needed to economically and ecologically quantify the contribution that this system makes, and a team of devoted trainers is required in order to up-scale (extend) this system to more interested farmers.

For more information, see:
➤ **www.cazri.res.in**

Farmers get hands-on training on organic agriculture.
Photo: A. Sharma

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Successful Ebola quicktest

An international team of infection researchers have tested a new rapid diagnosis method for Ebola in a field trial in Guinea, West Africa. The testing procedure was carried out with the aid of a portable suitcase laboratory. The mobile laboratory is solar-powered and enables simple on-site diagnostics in remote areas and without the need of fully-equipped laboratories.

In the field study, which was carried out in Guinea from March to May 2015, samples of saliva were taken from people believed to have died of Ebola. The scientists compared the new recombinase-polymerase amplification technique (RPA) with two variants of the detection method commonly used, the so-called realtime polymerase chain reaction (PCR). According to Ahmed Abd El Wahed, a scientist at the University of Göttingen in Germany and at the German Primate Centre, this revealed that RPA works very well with oral swab samples, which greatly simplifies sampling because it is faster and less complicated than sampling blood. Second, the analysis showed that RPA is just as sensitive and specific as the conventional PCR methods, which are based on a far more sophisticated technology.

Out of the 928 oral swabs taken, 120 were identified as positive and 808 as negative using RPA. The reference PCR method used as a control reaction supplied precisely the same results. Both the PCR and the RPA techniques are based on identifying viral RNA in the blood or saliva of infected individuals. However, unlike in PCR, the RPA agents can be used and shipped at ambient temperature, which makes them cold-chain independent. With RPA, Ebola can already be detected after 30 minutes, whereas PCR usually takes several hours and requires repeated heating up of the samples and constant cooling of the enzymes required for the reaction. This complicates the use of the procedure in remote areas. The suitcase laboratory can work with solar power for up to 16 hours. "The mobile diagnostics suitcase makes it easier to detect Ebola and other infectious diseases directly in the crisis areas," says Ahmed Abd El Wahed. In future, the diagnostics suitcase will also be used to detect other infections among humans and animals, for example for paratuberculosis, the dengue virus, the Rift Valley virus and the Chikungunya virus.

A technical assistant performing the Ebola-RPA test in the mobile diagnostics suitcase in Guinea.
Photo: O. Faye

The results of the field study have been published in the specialist journal Eurosurveillance.

(University of Göttingen/sri)

Tuberculosis: good and bad news

In late October 2015, in its Global tuberculosis report, the World Health Organization (WHO) reported that the number of tuberculosis cases had dropped by 42 per cent to 9.6 million between 1990 and 2014. Tuberculosis mortality has nearly halved over the past 25 years. This positive news was closely followed by the sobering announcement that tuberculosis now ranks alongside HIV among the leading infectious causes of death, with the deaths of 1.5 million people (2014) being attributable to the disease. Most of these fatalities could have been prevented if more had been invested in research and development aiming at effective vaccines, improved diagnostics and improved agents and drugs. According to the WHO, sufficient funding of tackling tuberculosis would require eight billion USD a year. Here, developing countries and emerging economies are providing the lion's share of 5.8 billion USD, while the international donors are contributing a mere 800 million – this means that each year, there is a funding gap of around 1.4 billion USD in all.

Resistance is playing an ever greater role in combating the disease. According to the WHO report, worldwide, 3.3 per cent of new cases and 20 per cent of previously treated cases are multidrug resistant (MDR) tuberculosis. This is why new agents are urgently needed. It was not before 2014, after several decades, that two new, highly potent tuberculosis drugs, Bedaquilin und Delamanid, were approved in Europe to treat multi-resistant tuberculosis – under strict safety constraints and as a last available resort for cases of multi-resistant tuberculosis. Only recently, scientists at the Swiss Tropical and Public Health Institute (Swiss TPH) and the University of Zurich detected double resistance to these agents in a patient who had immigrated from Tibet. With genome analysis, the man's pathogenic bacteria were analysed throughout the entire treatment period of more than three years. The examinations demonstrated the speed at which TB bacteria can also develop resistance towards the new antibiotics. It was only possible to save the patient by removing parts of his lungs. Multi-resistance towards commonly used drugs is increasing dramatically, especially in eastern Europe, Asia and parts of Africa, according to Swiss TPH.

(WHO/The Lancet/SwissTPH/sri)

Buch-Tipp

Friedrich Kuhlmann

Landwirtschaftliche Standorttheorie

Landnutzung in Raum und Zeit

Welche landwirtschaftlichen Produkte werden wo, wie und wann erzeugt? Je nach Region weist die Landwirtschaft in Europa ganz unterschiedliche Landnutzungsformen und -intensitäten auf. Warum ist das eigentlich so?

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