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Closing the data gap

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DEAR READERS,

In face of eleven years left to achieve Agenda 2030 and monitor the Sustainable Development Goals (SDGs) on the way there, data access, management and protection is becoming more important than ever. Moreover, identifying measures to combat climate change for resilience and food security requires the availability of accurate and up-to-date data. But data have to be collected, analysed, disseminated and maintained, and in many cases, the capacities needed for this are lacking.

This section of the latest Rural 21 edition is dedicated to showcasing how to close this data gap. The Global Partnership for Sustainable Development Data responsible for monitoring the SDGs gives an overview of data access and management including the related technical, financial and legal barriers they are faced with. The United Nations Food and Agriculture Organization, involved in monitoring SDG2 (ending hunger in all its forms), sheds light on its initiative, which is active in 50 countries. Challenges in data management, especially in Sub-Saharan Africa, are described by the ICON Institute. Our authors' team of the West African Science Service Centre on Climate Change and Adapted Land Use explain how to set up a data base for climate change measurements in the Sahel. Our authors from Palestine depict implementing an Agricultural Census in a fragile context.

Also in this edition, our authors explain what gold mining means for the rural community in Tanzania, how to produce bio-charcoal in Nepal and what the sheep revolution in India is leading to.

We wish you inspiring reading.

Sincerely yours,

Daniela Böhm

FOCUS

INTERNATIONAL PLATFORM

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DATA ACCESS AND MANAGEMENT – WHERE DO WE STAND?

Just eleven years are left to achieve Agenda 2030 and the 17 Sustainable Development Goals. But not only are the SDG targets themselves ambitious. As our author explains, the United Nations also faces the huge challenge of establishing an adequate data base to monitor progress towards the SDGs, and she sheds light on the existing technical, financial and legal barriers to data access.

By Karen Bett

The Sustainable Development Goals (SDGs) were adopted as our blueprint to address challenges such as poverty, inequality, and climate change. The 17 goals seek to ensure prosperity for all people, and the planet, by 2030 – and were adopted together with a framework of 169 targets and 232 indicators. Without great investments in data, information, and knowledge, we won't be able to track or measure progress, and thus are at risk of not meeting the goals. Around the world, the status quo on data access and management leaves much to be desired – we are not collecting, sharing, or analysing data optimally. Too many people, especially already marginalised groups such as the extreme poor, the disabled, and women and children, are invisible in data and therefore invisible when it comes to policy-making and resource allocation. Too many countries simply do not have the resources for comprehensive birth or death registration systems, mapping fields and houses, tracking the impact of climate change and disasters, or collecting and sharing information about health or access to basic services. Setting policies without this baseline core information means resources are wasted and their impact is limited. Also, lack of timely and comprehensive data means that investors do not have all the information needed to make the most effective, efficient financial investments.

WHY GATHER DATA?

But with eleven years to go to the SDG deadline, we still have time to strengthen the data ecosystems and capacity required to monitor and achieve the SDGs. There are tremendous opportunities to fast-track progress by collecting and using the foundational data we need, building capacity and political will to invest in data infrastructures, and then innovating to strengthen new, complementary sources of data.

Data is the raw material for decision-making. Data not only helps to conceptualise solutions, but, as a prerequisite, supports us in understanding the magnitude of the problems.

Data helps donors and policy-makers know what to prioritise, and it assists decision-makers in sequencing solutions. And once we have used data and begun implementing interventions, baseline data can help us track progress and optimise programming as needed.

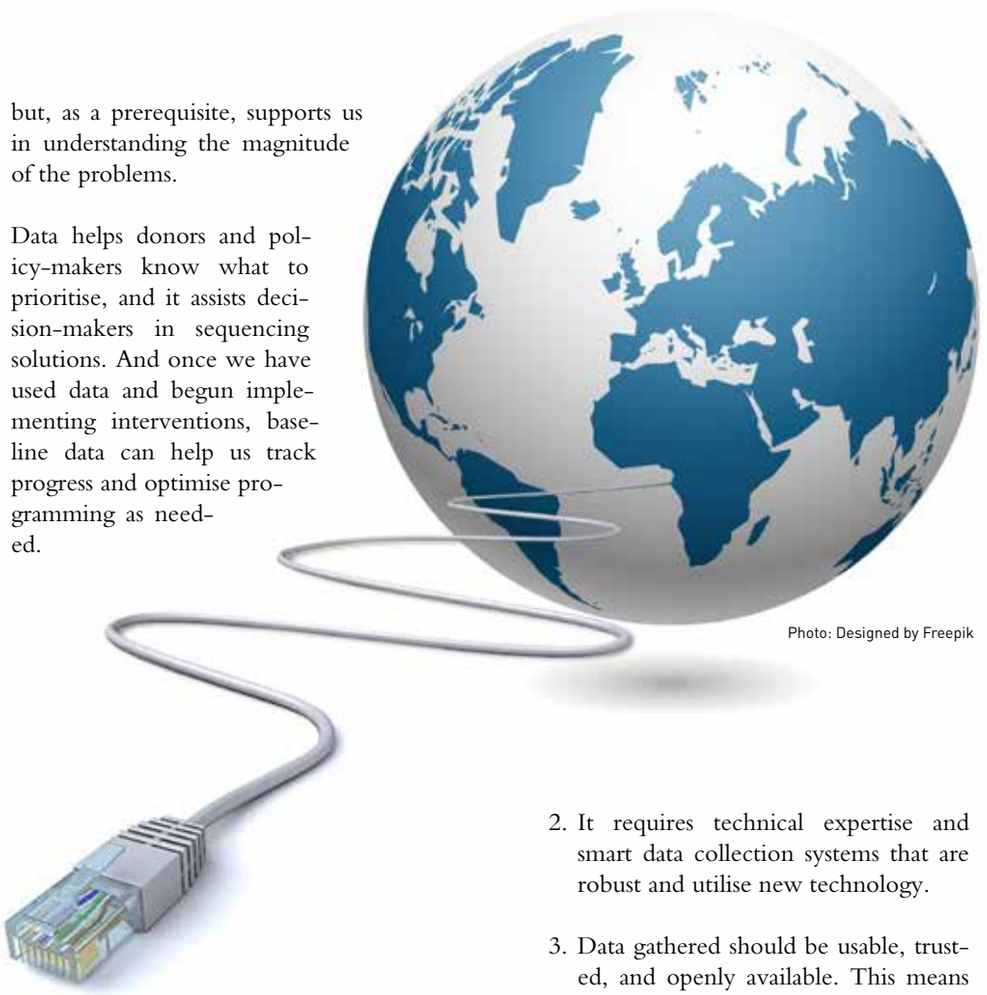


Photo: Designed by Freepik

The SDGs set out a universal agenda requiring progress everywhere, not just in developing countries. Every country will need national and sub-national-level data in order to meet their own unique, context-specific challenges. For this reason, data gathering is a critical first step towards understanding the challenges, and then creating informed, strategic policy solutions.

During data collection, we must consider three key principles:

1. The data must be high quality, timely, and granular, allowing comparison and trend analysis over time, as well as between and within countries. This will make it meaningful for decision-makers.
2. It requires technical expertise and smart data collection systems that are robust and utilise new technology.
3. Data gathered should be usable, trusted, and openly available. This means data should be open to enable public analysis and use, in usable formats that are both human and machine-readable, and accompanied by relevant meta-data for transparency and accountability.

But data gathering is just the first step. There is a lot of work that must happen afterwards, so the data is put to use.

MONITORING THE SUSTAINABLE DEVELOPMENT GOALS

To effectively monitor progress towards the SDGs, we need not only to have the data, but governments must dispose of the human and technological capacity to analyse and use the data, resources to finance those efforts, and political will to then incorporate data when shaping policy.

But in many low-income countries and lower middle-income countries, data sources are not centralised, data collection is not streamlined, data use is not regular, and funding/capacity for all of the above is falling short across the board.

The Global Partnership for Sustainable Development Data, a network made up of governments, businesses, and civil society organisations, brings all of these pieces together to mobilise and coordinate the actions and institutions required to make the data revolution serve sustainable development. Since it was established in 2015, the Global Partnership has elevated data issues at a political level, to make data infrastructures and statistical capacity a priority for governments and donors. And the Global Partnership has facilitated country-led data roadmaps for sustainable development which support governments to convene all relevant stakeholders, assess SDG data availability, identify data gaps, and outline concrete, long-term next steps.

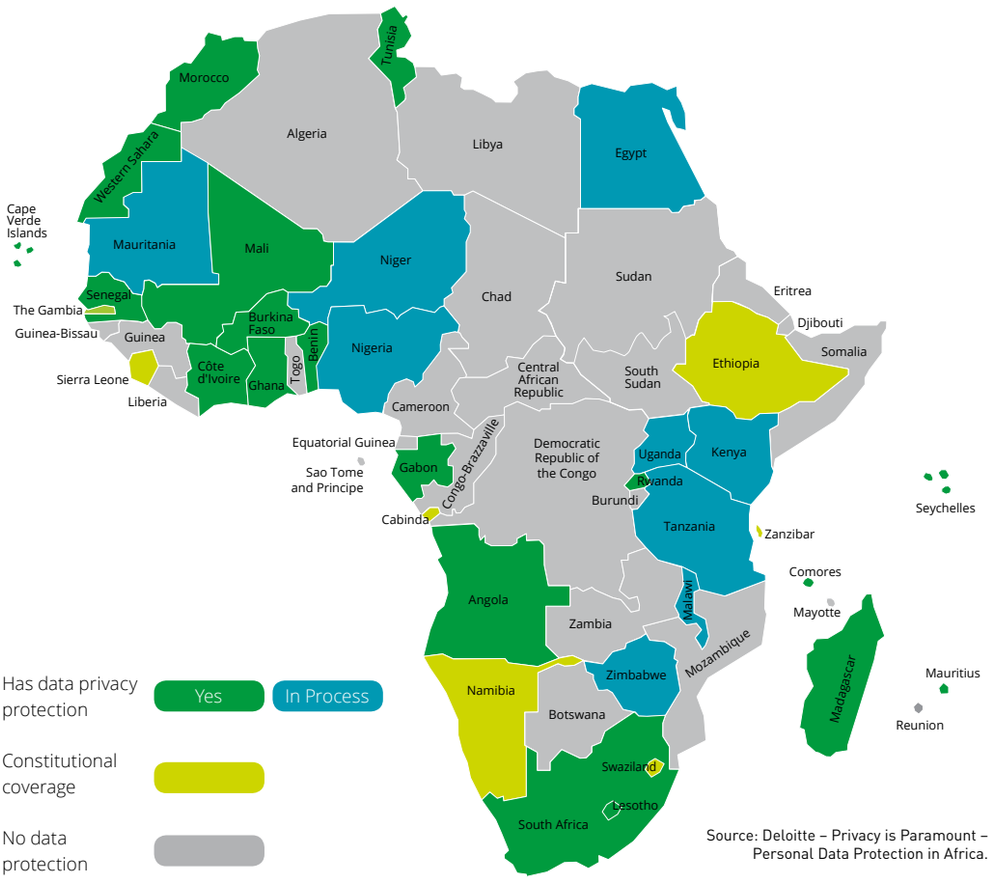
DATA REVOLUTION FOR SUSTAINABLE DEVELOPMENT

The data revolution for sustainable development refers to the transformative actions needed to respond to the demands of a complex development agenda by improving how data is produced and used, closing data gaps to prevent discrimination, building capacity and data literacy in "small data" and big data analytics, modernising systems of data collection, liberating data to promote transparency and accountability, and developing new targets and indicators.

The goal of the partnership is to drive better decisions and better lives for all by facilitating the production, sharing and use of better data. We've learnt some important lessons along the way and identified a few trends in terms of the data barriers many countries face.

DATA ACCESS AND ITS BARRIERS

Data access and use face several challenges around the world, although the issues are more pronounced in the developing world. First, countries don't have enough high-quality data to aid decision-making, and where data exists, it is often collected and shared too late to inform decision-making. Second, the governments and the public often cannot access or use this data due to technical, financial or legal barriers.



Source: Deloitte – Privacy is Paramount – Personal Data Protection in Africa.

Technical barriers to data access

Improved data access begins with strong, tech-smart data collection. There are various technological solutions for collecting data that is timely, obtained at regular intervals, high-quality, human and machine-readable, and easily shareable, but these solutions are often not available in developing countries. Or, if they are made available during a data collection process, the rest of the data ecosystem – which comprises both state and non-state actors – may not be technologically enabled to support and complement that improved data set. With limited technical capacity and financial resources, most countries do not collect data routinely or in a timely manner, and do not have the resources to make the necessary, fundamental technological improvements for a bottom-up, sustainable data approach. This has considerably limited data availability for many SDG indicators, hindering countries' ability to monitor SDG progress and further target policies to ensure resources are reaching those most in need.

In many developing countries, basic Internet connectivity remains a major barrier. According to the International Telecommunications Union, four billion people, or two thirds of the population of developing countries, do not have access to the Internet. This striking gap limits how governments and other stakeholders can share, access and use data. Governments and data producers are often forced to publish PDFs and/or hard-copy versions for data sharing – resulting in data that are not machine readable, not freely accessible, not easily shareable, and not easy to further analyse or compare.

But technology and Internet access are spreading rapidly in developing countries, creating more and more opportunities to promote data access – if these skills and capacities are built into the foundation of teams, infrastructures, and workflows. With improved technology, governments can achieve more high quality, disaggregated and interoperable data, and with an improved Internet, the data can be shared and analysed, leveraged for policy-making, and put to work over and again towards achieving the SDGs.

Financial barriers to data access

Unfortunately, while the demand for more and better data for monitoring the SDGs has been on the rise, it has not translated into commensurate growth in funding for data and for national statistical systems. As such, national

statistical offices remain under-resourced and vulnerable to political influence by those who fund them. The latest data from the Partner Report on Support to Statistics – PRESS – shows that in 2016, the share of Official Development Assistance (ODA) for data and statistics was 0.33 per cent (623 million US dollars). This is far below the estimated cost of collecting data to monitor the SDGs – between USD 2.8-3.0 billion per year up to 2030.

National governments should re-align budget allocations so that domestic resources, combined with increased ODA, can together close this financing gap. Conversations are happening at global level to bring together key stakeholders and identify practical, actionable next steps for increasing the amount and quality of financing for data. Indeed this will require a multi-stakeholder effort to mobilise additional resources, but beyond that, it will require building partnerships, supporting individuals who champion data and statistics in their capitals, and sharing knowledge on data's value and return on investment.

The 50x2030 Initiative, launched last September on the sidelines of the UN General Assembly, is an example of progress in this regard. The initiative commits a coalition of donors and countries to fund and implement an overhaul of agricultural data systems in 50 developing countries by 2030 (see Article on page 7).

Legal barriers to data access

When SDGs were adopted and the data revolution was increasingly being recognised as a necessary ingredient for success, it became evident that the international community would need to develop legal, technical, geospatial, and statistical standards to guide the exchange of data in an open manner that protects privacy, safety and human rights for everyone.

We cannot advocate for more data to become open, available, and shared widely without also addressing the serious privacy implications that come with data sharing. Sharing data can do more harm than good if there are no data protection laws to guide or regulate data use and re-use, while still allowing innovation and data sharing as a public good. This is particularly the case if the data is high-quality, disaggregated data representing otherwise uncounted marginalised groups – data that is most needed for SDG monitoring and implementation.

The current state of legal frameworks for data protection, while better than before, shows that there is more work to be done to ensure we have the right laws in place to protect citizens. In 2017, Deloitte carried out an assessment of the regulatory framework on personal data protection in Africa, to guide multinationals and business entities as they venture into investing in the continent. The results show very little privacy protection in place in the form of legal frameworks, which then hinders business operations, and, as a result, the economic development of a country.

Data protection will benefit everyone, but governments must be in the driver's seat when it comes to data protection and privacy policy.

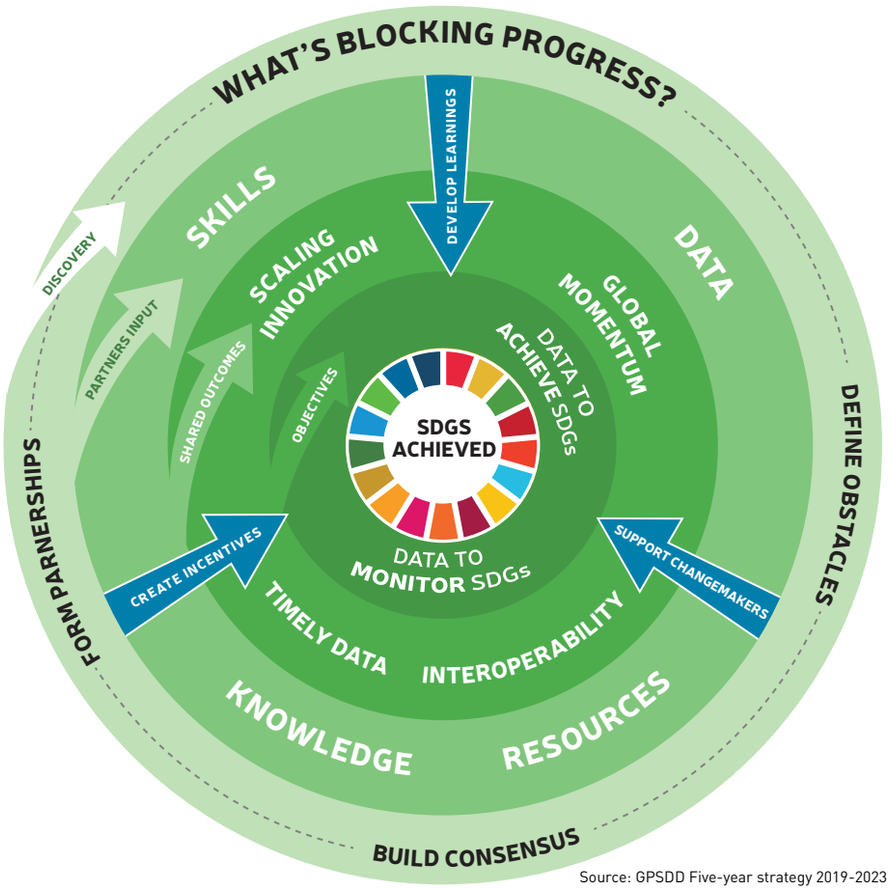
For example, the European Union's General Data Protection Regulation (GDPR) adopted in 2018 triggered and influenced a shift in privacy regulations across the world – to strengthen the legal framework around data access and protection.

THE WAY FORWARD

While the world continues to face these challenges of data access and use, there remains hope that they can be addressed in our time. There are a number of solutions. Among them is the need for solid partnerships with multiple stakeholders. For example, if governments could partner with the private sector, they would be able to gain access to additional data which can inform decision-making and help track the SDGs. In addition, these types of partnership will facilitate the sharing of technical skills, knowledge on best practices and ideas among individuals and across countries.

Without partnerships, it will be difficult to build the much-needed political will to keep the momentum of the data revolution and make investments towards more and better data.

The international community must remain committed to addressing the technical, financial, and legal challenges to data access. With just eleven years to the SDGs' 2030 deadline, without strengthened data ecosystems, more and better data collection, and improved capacity and political will for data use, we risk not meeting our goals.



Source: GPSDD Five-year strategy 2019-2023

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For references and further reading, see online version of this article at: **www.rural21.com**

DATA – A LETHAL WEAPON AGAINST HUNGER

Agriculture can only reach its full potential to feed the masses, drive growth, and reduce poverty if decision-makers – including governments, private sector, and development organisations – have accurate data to make smart decisions. The new '50x2030 Initiative to Close the Agricultural Data Gap' aims to bridge the global agricultural data gap by supporting 50 low and lower-middle income countries in building agricultural survey programmes by 2030.

By Emily Hogue

Samphy owns a 1.5-hectare farm in Western Cambodia. She grows vegetables and fruit trees on a half-hectare plot behind the family's home and rice on another one-hectare plot a kilometre down the road. With the help of her twelve-year-old son and nine-year-old daughter, she also raises chickens. Production on the farm has had its ups and downs from year to year due to weather conditions and Samphy's ability to access resources, like improved seed varieties, extension advice, veterinary services, and credit to purchase inputs.

While Cambodia has experienced unprecedented economic growth in recent years, the country's rising tide has not lifted the boats of all its citizens. In particular, the rural and agricultural sectors have fallen behind, severely outpaced by growth in more industrial sectors and urban environments. Incomes, consumption, and food security lag behind in rural areas such as the one where Samphy lives. Like her neighbours, Samphy's livelihood options are limited within agriculture, and she faces constraints that hinder her productivity on the farm and opportunities off-farm. She struggles to keep food on the table and her children in school.

Samphy's story is an important one, and the details within it typify the situation of millions of smallholder farmers in her country. Their stories are critical inputs to the Government of Cambodia and development partners as they work to make the agricultural sector reach its full potential and to end cycles of rural poverty. Yet these stories – which convey valuable information about what farmers are growing, how they grow it, and their welfare – remain largely undiscovered because Cambodia does not yet have tools in place to gather data as routinely and systematically as needed. Without these data, Cambodian ministries and development partners struggle to set up effective policies and programmes that support small farmers and make the agricultural sector reach its potential as an engine of growth and means of poverty reduction.

Field testing of the Inter-Censal Agriculture Survey 2019 questionnaires in Cambodia.

Photo: FAO/K. Koudelka

CLOSING CAMBODIA'S DATA GAP

Yet, Cambodia has ambition and a plan. In 2018, Cambodia's National Institute of Statistics (NIS) and its Ministry of Agriculture, Fisheries, and Forestry (MAFF) began a partnership with the Food and Agriculture Organization of the United Nations (FAO) to develop an annual agricultural survey programme. This programme, which is based on a new agricultural survey model that FAO launched in 2016, provides complete, fully representative data on agriculture from both household and non-household (commercial) farms using a modular approach that combines an annual core module on production and several periodic rotating modules on key socio-economic and environmental variables.

Planning for the survey has been fast and furious, and collection of the first survey of the programme is set to begin in June 2019. NIS and MAFF plan that the data from the survey – both micro and meta – will be made publicly available by early 2020. Cambodia's new annual agricultural survey is an answer to the country's agricultural data gap, and many other countries are following suit. A new initiative aims to help close the global agricultural data gap by supporting 50 low and lower-middle income countries (L/LMICs) to build agricultural survey programmes by 2030.

50x2030 – DATA-SMART AGRICULTURE

To support countries like Cambodia, the '50x2030 Initiative to Close the Agricultural Data Gap' was launched in September 2018 by a group of donors – including the US Agency for International Development, the Bill and Melinda Gates Foundation, Germany's Federal Ministry for Economic Cooperation and Development, the Italian Agency for Development Cooperation, and Australia's Department for Foreign Affairs and Trade – and multilateral organisations – including FAO,

the World Bank, and the International Fund for Agricultural Development (IFAD). The initiative seeks to transform country data systems across 50 countries in Africa, Asia, the Middle East, and Latin America and make evidence-informed decision-making in agriculture the norm in L/LMICs by 2030. The idea behind 50x2030 is that Sustainable Development Goal 2 – to end hunger, achieve food security and improved nutrition, and promote sustainable agriculture – will not be reached without accurate and timely data to help decision-makers from governments, civil society, the private sector and development organisations strategically plan and gainfully choose their best options. The data gaps in agriculture are widespread, affecting countries that include 800 million or 78 per cent of the world's poorest. Furthermore, most L/LMICs currently cannot produce three critical SDG2 indicators that should be collected through an agricultural survey: 2.3.1 labour productivity, 2.3.2 smallholder income and 2.4.1 land under sustainable production. The Initiative will enable at least 50 of the L/LMICs to report on these key SDG2 indicators by 2030.

The Initiative's vision is to make data-smart agriculture the sector's newest revolution. Cambodia is just part of the starting line-up of twelve countries, with 38 more countries still to come on board (see Figure 3 for an illustrative timeline).

A herculean effort like 50x2030, which is costed at more than 500 million US dollars, requires a herculean-size team to pull it off. As such, the Initiative brings together the persistence and hard work of committed partner countries with the technical and operational capabilities of three multilateral implementers – the FAO, World Bank, and IFAD.

Countries' national statistical offices (NSOs) and Ministries of Agriculture (MoA) are at the centre of the solution and provide leadership to develop and execute the programme to suit their needs. Together with other relevant agencies, they lead the design and implementation of their survey programmes with technical support from the three multilateral implementers.

FAO leads all data-production activities, providing technical assistance and planning support. IFAD heads all data-use activities, working with NSOs, MoAs and others to strengthen the skills, practices, and processes needed for the data to be effectively used in decision-making. The World Bank has a dual role, leading a methodological research and tool-development component as well as housing the Initiative's Program Management Center, which provides planning, oversight, and administrative functions.

Figure 1 – An example of an Agricultural Survey Programme

	Years	1	2	3	4	5	6	7	8	9	10
Core modules	Agricultural holding roster	■	■	■	■	■	■	■	■	■	■
	Crop production	■	■	■	■	■	■	■	■	■	■
	Livestock production	■	■	■	■	■	■	■	■	■	■
Rotating modules	Agricultural economy	■		■		■		■		■	
	Agricultural labour		■				■				
	Production methods and the environment				■				■		
	Machinery, equipment and assets	■				■					

Figure 2 – An example of an Integrated Agricultural and Rural Survey Programme

	Years	1	2	3	4	5	6	7	8	9	10
Agricultural modules	Agricultural holding roster	■	■	■	■	■	■	■	■	■	■
	Crop and livestock production	■	■	■	■	■	■	■	■	■	■
	Rotating module		■		■	■		■			■
Rural socio-economic module	Socio-economic (income, labour, etc.) for agricultural households			■			■			■	
	Socio-economic (income, labour, etc.) for non-agricultural households			■			■			■	

Figure 3 – Illustrative country roll-out

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
12 existing countries	■	■										
+ 2 to 3 new		■	■									
+ 4 to 5 new countries			■	■								
+ 4 to 5 new countries				■	■							
+ 4 to 5 new countries					■	■						
+ 4 to 5 new countries						■	■					
+ 4 to 5 new countries							■	■				
+ 4 to 5 new countries								■	■			
+ 4 to 5 new countries									■	■	■	■

At the country level, the three implementing agencies work with national staff from the NSO and MoA to prioritise data needs, design survey questionnaires and the sampling approach, and put all administrative pieces in place. National research institutions, universities, civil society and the private sector are also engaged in the data discussion. The Initiative supports long-term capacity-building for agricultural data systems. Working with both data producers and users enhances opportunities for meaningful engagement with data, providing an active pathway for evidence-informed decision-making.

ONE APPROACH, TWO BLUEPRINTS, FIFTY REALITIES

Like any development initiative, 50x2030 provides blueprints that can be adapted as work proceeds. Yet, the Initiative's country-led approach means that countries are the true architects, engineers, and builders of their survey programmes. The NSOs, MoAs, and Ministries of Finance are always key players. In most countries, the NSO will oversee survey implementation and data management; although, in some countries, the MoA has the mandate to conduct agricultural surveys and will be in the lead. The Initiative will build into countries' governance structures and operations, while championing good practices that can enhance how relevant agencies interact.

Countries can choose from two flexible survey models designed by FAO and the World Bank and offered by the Initiative – a stand-alone agricultural survey model and an integrated agricultural and rural survey model. The first is the type that Cambodia is implementing. The second (integrated) model combines the farm-based agricultural survey model with a household-based rural survey that collects data on a variety of social and economic topics (see Figures 1 and 2 for examples of the two models).

Each country's reality is unique in terms of its agricultural system, rural sector, and data needs, which is why the Initiative uses adaptable, semi-standardised models. If a country is

already implementing some type of agricultural survey, the programme builds on it. In every case, the survey programme is developed around the country's needs, which will result in 50 unique but comparable and harmonised survey programmes.

BUILDING THE SURVEY PROGRAMME STEP-BY-STEP

Once a country has chosen its basic model and established the roles across its agencies, the next step is to bring all national stakeholders together to discuss data needs in a data user-producer workshop. Since the ultimate goal is to have the data used for informed decision-making, the engagement of data users from the outset is paramount. What data are most needed and how and when they will be used are questions that drive survey design. Operationalising the answers to those questions can be tricky and takes time. In particular, agricultural production, practices, and systems vary so much across geographic and cultural contexts that customisation can be highly complex and requires many rounds of testing.

Typically, countries collect their first survey within a year to 18 months from when support begins. The programme trains national staff to carry out rigorous data collection practices, like adhering to objective interviewing procedures and sample selection, without which data would be biased. The Initiative strongly encourages countries to collect their surveys through Computer Assisted Personal Interviewing (CAPI) using tablets or cell phones. This upgrade to a seemingly ubiquitous technology dramatically improves a country's ability to clean, store, and manage its data, and to do so more quickly. Surveys typically sample 6,000 to 12,000 farms and rural households, and automating the collection and curation processes greatly speeds up the overall survey timeline. Making the upgrade to CAPI can be a challenge, as it requires strengthening the skills of national staff, who are often in short supply, and purchasing and maintaining new equipment. The Initiative generally promotes the use of Survey Solutions, a CAPI software developed by the World Bank, because it is free, user-friendly, and designed to support complex surveys. In all cases to date, countries have been enthusiastic and committed to making the transition to CAPI.

The country's NSO (or MoA in some cases) manages the data generated through 50x2030-supported surveys. Herein lies another set of challenges as countries work to build their needed capabilities and knowledge while also keeping up with rapidly changing technologies and policies around data capture, storage, and protection. FAO staff support national staff to ensure the proper tools, capacities, processes, and systems are in place to capture, curate and safeguard the data.

Once a country has its data, analysis comes next and happens on many levels for many purposes. First, country staff will conduct basic analyses to tabulate indicators and prepare metadata for reports. These activities typically are conducted by the agency managing the survey, supported by guidance and training from FAO. Beyond these fundamental analyses, more complex analyses can and should be conducted to answer important questions for policy-making, research, market studies, investment decisions, development programme design, and more. This is where the field expands and other important players come on the scene.

DATA FOR EVERYONE AND EVERYONE USING IT

Beyond data availability, the Initiative aims to have various stakeholders – policy-makers, businesses, academics, development organisations, and more – use the data in diverse and strategic ways. Universal open data and microdata dissemination are requirements of all 50x2030-supported surveys, and data should be shared following international best practices on open data – typically within six to twelve months for microdata sets. With the understanding that these data are a public good, each country's NSO or MoA is responsible for sharing the data and also protecting it. FAO and IFAD will work with national staff to establish the policies, practices, and capabilities needed for extensive, yet safe data sharing, to include removing personally identifiable information and off-setting geospatial coordinates.

The Initiative deems data use as much a priority as data generation, recognising that supply-side efforts alone are unlikely to increase the use of evidence in decision-making. Early in their programmes, partner countries will collaborate with IFAD to assess their current agricultural data ecosystem, the degree of data use and uptake of evidence by decision-makers within that system, and the barriers to data use. That assessment will inform a contextualised plan to strengthen the ecosystem, including the relationships, capacities, and tools within it. IFAD will help countries to strengthen the capacity of data producers to analyse, interpret and present data and the capacity of decision-makers to interpret data and apply it when solving problems and choosing between options.

At its core, 50x2030 is not a data initiative, but rather a development initiative built on data. Through it, countries will empower themselves to understand the risks and opportunities in their agricultural and rural sectors and turn that understanding into actions that will make agriculture reach its potential as an engine of growth and means of poverty reduction. This high-aiming, far-reaching endeavour will take the stories of Samphy and millions like her and turn them into the ammunition needed to hit the target of zero hunger worldwide.

OWNERS OF THEIR REALITY

Beyond designing and building their survey programmes, countries must own them, too, and owning means putting in the resources to make things happen. Partner countries commit to contributing financial and in-kind resources to their programmes from the start, increasing each year until they fund it independently.

The 50x2030 partners and donors will support the country to plan and mobilise resources, with the goal that the country will provide 100 per cent of funding within five to eight years. Notably, the World Bank is supporting countries to use loans from its International Development Association and International Bank for Reconstruction and Development as they begin to fund their programmes.

While data needs are the guiding light for survey development, resource availability ultimately sets parameters within which decisions must be made. Finding the right balance between producing all the data desired and what a country can afford is always a challenge. Countries are encouraged to think about the sustainability of the programme, targeting the balance between what is most needed and what they will be able to pay for independently some years out.

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OF FACTS AND BIASES

A brief review of the debate on statistics in Africa

Against the background of food security strategies, over the past two decades, there has been a lively international debate on the quality of the statistical data in sub-Saharan Africa. Whereas there is general agreement that data availability is insufficient, explanations of the reasons for this diverge considerably. Our author demonstrates the context of the on-going debate and the challenges the area currently faces.

By Kalifa Traoré

In the 2000s, the economic historian Morten Jerven published a series of articles, of which *Random Growth in Africa* in 2010 and *Poor numbers* in 2013 evoked numerous responses in Africa and among researchers in the countries of the North. Subsequently, Shanta Devarajan, then Chief Economist of the World Bank's Middle East and Northern African Region, published *Africa's Statistical Tragedy*, a gloomy assessment of the state of the statistics on the continent, citing among other factors the lack of capacity in the statistical institutes, unstable funding, confused management of responsibilities, and also the destructuring effect of funding by donors.

There were few written responses by statistical professionals in sub-Saharan Africa, except for the discussion published by Joseph Tedou, Director General of the National Statistical Institute of Cameroon in 2014. He wrote in the 2014 issue of *Stateco* (a journal published by the Economic and Statistical Observatory of sub-Saharan Africa, Afristat) that Jerven's judgment on African statistics was based on the case of Ghana and could not be generalised to the whole continent, and furthermore that African professionals of statistics were aware of the problem of quality and were putting all their efforts into improving it. More recently, in a study of the Pan-African Institute for Statistics, John Kahimbara recognises the existence of the problem but thinks that the current international debate on the quality of African statistics is a source of confusion because it does not help solve the problem. In the same document, he recognises that the state of African statistics is mediocre and misleading, but that while

Food security, nutrition and resilience are central issues of the Permanent Interstate Committee for drought control in the Sahel.

Photo: Jörg Böthling

some regard this as a tragic situation, others see it as a passing phenomenon that will be remedied by technological progress in the data collecting and processing field. Each of these points of view offers part of the truth, but not all of it; what is important is that there are indications of mistrust in and illegitimacy of African statistics.

HOW FOOD SECURITY STATISTICS EVOLVED

It is worthwhile to have a look at the past in order to understand and assess criticism. Let's start with Vincent Bonnecase. In his publication *La pauvreté au Sahel* (Poverty in Sahel), the researcher describes and analyses the history of the implementation of statistics in the French East African colonies, particularly in Upper Volta (now Burkina Faso), Niger and Mali. The work covers the period from 1930-1970, with the emergence of the term "Sahel", which we recognise today as a geopolitical region at international level. Bonnecase describes how, as a result of the famines in the 1970s, aid programmes and studies in the region are becoming more and more important and perennial, leading to the construction and instrumentalisation of indices of poverty marked by intervention by international organisations, themselves seeking to justify their role, and governments increasingly dependent on international aid.

This was the context in which the CILSS (Permanent Interstate Committee for drought control in the Sahel) was created in 1973, with the goal or mandate of "investing in research for food security and the fight against the effects of drought and desertification for a new ecological balance in the Sahel". The Permanent Regional Project for Diagnosis of Food Security in the Sahel (DIAPER), funded by the European Union, was established in 1984 and ran until 2000. Its principal objective was to provide technical and material support to the national agricultural statistics services of the CILSS countries in carrying out agricultural surveys and producing a cereal balance sheet needed to analyse the countries' food situation, and especially to devise measures to be implemented to ensure and manage food security, particularly for establishing national security stocks.

MAINTAINING DATA QUALITY IN A COMPLEX CONTEXT

There were three phases in DIAPER over more than 15 years which contributed to strengthening national structures technically and operationally, particularly the agricultural and livestock statistical services in the Sahel countries. In the meantime, by the middle of the 1990s, the number of CILSS member states increased to 13 (Benin, Burkina Faso, Cape Verde, Chad, Côte d'Ivoire, Gambia, Guinea, Guinea-Bissau, Mauritania, Mali, Niger, Senegal and Togo), with the central issues being food security, nutrition and resilience. These two latter concepts prompted the collection, processing and analysis of new types of data, further raising the complexity of the information systems. The Food Crises Prevention Network (FCPN) promoted by the CILSS and the Sahel and West Africa Club Secretariat, whose goal is to promote dialogue and coordination, establish a coherent and consensual view of the food and nutritional situation, thus assisting decision-making, is based essentially on the results of various statistical instruments for coordination and advocacy on issues of managing food and nutritional security in West Africa.

As can be seen, the establishment of agricultural surveys and information systems on food and nutritional security in West Africa began in Sahel, where food is based on cereals, particularly millet, maize, sorghum and rice. Given this, over a long period, agricultural surveys were concerned with estimating production of these cereals. Subsequently, with the evolution of food security concepts, estimates of production of other foodstuffs (leguminous, oleaginous, tuberous) have begun to be taken into account. After more than 35 years of estimating agricultural production, with the evolution of new technologies, the quality of the methods used has improved somewhat. However, the following questions arise: To what degree does the conformity of the statistical methods used regionally compare to the standards and methodologies of the national statistical institutions? Have the sampling frames in most of the countries become obsolete as a result of the lack of a general census of the population and housing, or an agricultural census, all this against the background of budgetary shortages and political insecurity? Have the methods of estimating yields, such as establishing use per

area regionally and calculating average yield at the national level, proved themselves?

These questions are particularly urgent considering the different possible uses of the data and information produced in this way. Cereal production data enters into the CILSS cereal balance sheet, making it possible to calculate the cereal surplus or deficit which should (depending on the case) determine the country's food security strategy. For a long period, action by the various stakeholders (government, donors, NGOs, etc.) to increase supply or provide food aid was only prompted by deficits, while it was very unusual for this information to be used to manage surpluses and maintain production in the context of a liberalised market.

ARE TOO MANY COOKS SPOILING THE BROTH?

Cereal balance sheets are still prepared and used, but CILSS prefers establishing a "harmonised framework" for analysing food security which is much more complex and demanding in terms of data in order to be an adequate decision-making tool. While the 2000s have not seen crises on the scale of those in the 1970s, the same situation nevertheless prevails in which insecurity of the Sahelian populations in terms of food and nutrition is leading to a major need for quality data and information to manage these crises, with the risk of only producing diverse statistics to meet the interest of those producing them. As Bonnecase stresses, data and information is also produced by NGOs and professional agricultural organisations whose methodologies are not necessarily those promoted by the national statistical institutions, despite the fact that most countries have a law on statistics intended to regulate the sector.

Furthermore, there are contradictions between data from agricultural statistics and other sources and data from agronomical research institutes whose results are intended to promote development. This is particularly the case at the level of agricultural yields. For example, according to data of the Ecowas Agriculture Regional Information System (Ecoagris), the maize yield in Côte d'Ivoire in 2017 is estimated at almost 90 tonnes per hectare. This is surprising, bearing in mind that in the USA, where agriculture is more intensive, the news and marketing organisation Farmer Pro and the United States Department of Agriculture (USDA) put yields at 11.1 t/ha and 11.2 t/ha respectively for 2017. In Burkina Faso, during drafting of an action plan for the cowpea supply chain, yields published in the agricultural surveys reached 3-4 t/ha, while researchers of the Environmental Institute for Agricultural Research – Burkina Faso (INERA) published yields for the improved cowpea variety IT98K-205-8 "Niizwe" of 1-1.5 t/ha. The yield estimated by the ministry of agriculture from the yearly surveys was the only data that could be used for planning development programmes because it is the recognised data, so it proved impossible to propose a programme to improve yields, since farmers were already achieving good results. These basic examples show that work is still needed to decompartmentalise the various services in order to improve the quality of statistical information.

MORE THAN A TECHNICAL CHALLENGE

As the history of establishing statistical systems in Sahelian Africa shows, the constraint here is not simply technical. The need to collect, process, disseminate and use information in the agricultural sector is mainly the consequence of the famines in the 1970s and 1980s. The data initially supported the developed countries in putting in place aid for the poor Sahelian countries and then justifying NGO interventions, in a context of expanding media coverage of the crises and of an increasing number of actors generating statistical information. At the same time, there was a real and growing demand for statistical information, but no serious methodological work involving research institutions, including in particular agronomic research institutes, followed to validate some of the findings.

As far as possible, the priority of Sahelian nations was to carry out agricultural surveys to determine the outcome of the agricultural campaign in progress, mostly to respond to donor demands in terms of food and nutritional security. Agricultural-sector statistics are used more for solving current food security crises than for planning agricultural development. Strategies and development plans for the rural sector formulated on the basis of unreliable data are at serious risk of missing their goals, or if they do reach them, of not reflecting reality on the ground. For development partners, each of them with their own strategy, it seems difficult to coordinate efforts in an area where everyone would gain from working with the same good quality information. Aware of this situation, interregional organisations such as CILSS, Ecowas and the West African Economic and Monetary Union (UEMOA) are starting to address the question of governance in information systems on food and nutritional security, the primary concern being to unify information sources and improve their quality.

THE LATEST INITIATIVES

Several initiatives are in place or are being implemented at both continental and national levels to improve the quality of African statistical data. At continental level, there are the adoption of the African Charter on Statistics in 2009 by the African Union (providing a global framework for improving quality), the Strategy for the Harmonisation of Statistics in Africa 2017–2026 (SHaSA 2) to increase capacity at pan-African organisations and the African Data Consensus on data which is open (Open Data Platform – ODP) and oriented towards demand in decision-making on development, so as to create a statistical culture which in the long term will ensure the independence of national statistical offices. And last but not least, there is the creation of an African Union Institute for Statistics (Afristat), inaugurated in Tunis in November 2018.

SDGS, STATISTICS AND THE ROLE OF THE NORTH

In its 2016 publication entitled *Révolution des données et enjeux de la statistique en Afrique* (Revolution in the data and issues in African statistics), the periodical Cairn.Info looks at several studies and assesses the trend in the quality of the data in recent decades. The article ends by considering the capacity of African countries to implement the Agenda 2030 within the framework of the SDG and the role of public development aid in developing statistics in Africa. It comes to the following conclusion: "This destabilization of public statistics in Africa from the North, whether it is experienced as an all-out attack against the credibility of the African statistical institutes or considered as a progressive conquest by the flourishing market for statistical data, has drawn a number of critical reactions."

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MONITORING CLIMATE CHANGE IN "DATA-SCARCE REGIONS"

Complex phenomena such as climate change require collecting, evaluating and relating extensive amounts of data from observation networks and research activities. For this purpose, the West African Science Service Centre on Climate Change and Adapted Land Use (WASCAL) has developed an extensive data management infrastructure. Our authors show which factors count in such a process when it comes to sustainably securing the flow of data.

By Antonio Rogmann, Ralf Kunkel, Seyni Salack and Belko A. Diallo

Climate change has become one of the most severe challenges to Africa in the 21st century. This is particularly true for West Africa and its Sahel sub-region. Access to data is crucial to enabling the region to develop effective adaptation and mitigation measures and to continue on its way towards sustainable development. For example, to avoid uncontrolled migration causing social and political destabilisation, predictions on population dynamics and applicable estimations of agricultural production are necessary in order to implement programmes providing food security and sustainable livelihoods.

This applies in particular when already existing environmental degradation is accelerated by climate change. But although governmental agencies and scientific institutions regularly collect data on the economic, social or environmental situation, scarce human and technical resources compromise gathering, processing, managing and delivering of the data. In addition, sharing of primary research data – meaning raw data produced by scientists during field work – is practically non-existent. Consequently, researchers unnecessarily invest time and efforts in creating data which may be already there. Thus, in comparison to countries from the Global North, West Africa is assumed to be a "data-scarce region" in terms of access to data created by governmental as well as scientific institutions. This is also reflected by the fact that e.g. from the 831 authors invited for the 5th Intergovernmental Panel on Climate Change (IPCC) report, only 66 (8 %) were African scientists.

Against this backdrop, the West African Science Service Centre on Climate Change and Adapted Land Use (WASCAL) was initiated in 2010 (see Box on page 14). It aims at strengthening the research infrastructure and capacity in West Africa related to climate change. WASCAL is to enhance the resilience of human and environmental systems to climate change and increased climate variability by providing research-based advice to policy-makers and other decision-makers. To facilitate this, the organisation works in three areas: research & education, data collection & technical infrastructure, and data management & sharing.

The automatic weather station provides synoptic weather variables such as rainfall, solar radiation, sunshine hours, wind speed and wind direction, air temperature, air pressure, relative humidity and soil temperature at different depths.

Photo: Seyni Salack/WASCAL

STRENGTHENING WEST AFRICA'S HYDRO-METEOROLOGICAL OBSERVATION NETWORK

To improve the availability of high quality hydro-meteorological measurements and to increase our understanding of land-atmosphere processes and their interactions in the context of climate variability and change, advanced and modern near-surface observation systems are needed. The National Meteorological and Hydrological Services (NMHSs) in West Africa maintain networks of measuring stations to collect standard datasets. However, the observation networks are technically outdated or defective, and various additional factors hamper data gathering and dissemination. As a consequence, many essential climate variables had not been observed or reported over the past few decades. As part of its key mandate, WASCAL has initiated the establishment of transboundary observatories to co-produce high quality hydro-climatological datasets and information useful for research, climate monitoring and service delivery.

The setup of meteorological stations followed the specifications of the World Meteorological Organization. In this context, all parameters required to determine potential evapotranspiration (wind speed, global radiation/sunshine duration, air temperature, relative humidity, air pressure and soil temperatures), wind direction and precipitation are measured with a temporal resolution of 10-15 minutes. Hydrological data comprise water and/or discharge levels and chemical water parameters measured with different temporal resolutions. Scientists can create appropriate temporal aggregates and use the data as input for climate and/or water balance models to prepare decision-making in e.g. early warning of climate disasters. All data is entered into the WASCAL Data Infrastruc-

ture – WADI (see Box). WADI also includes a component to deliver interactive maps as so-called Web Map Services – a standard used in Spatial Data Infrastructures worldwide. The maps are accessible not only by Geoportals but also by any client using Geographic Information Systems (GIS). More than 500 datasets, time series and interactive maps are integrated into the WADI. An example can be seen in the Box on page 15.

THE RESEARCH PROGRAMMES

When starting in 2010, the Competence Centre in Burkina Faso was complemented by two research programmes – the ongoing Graduate Studies Programme and the WASCAL Core Research Programme (2012-2016).

The Graduate Studies Programme consists of ten doctoral programmes and two master's programmes and is coordinated by WASCAL's Capacity Building Department. Each of the programmes focuses on a thematic research framework, such as "climate change and energy" or "climate change and education". The lead universities were selected in a consultative process among the WASCAL countries by considering their scientific and educational strength of faculties in the West African region. Research is mainly conducted within the country where the lead university is located.

For the Core Research Programme the principal research topics – climate and weather, markets and livelihoods, landscape dynamics, risk management and agricultural systems – were identified as substantial to cope with the effects of climate change in the region. Three watersheds – Dano, Vea and Dassari, near the borders of Burkina Faso, Ghana and Benin, respectively – were chosen in order to carry out interdisciplinary research on climate change impacts and mitigation strategies through mapping the peak runoff and flood hazard. They represent areas along a gradient of land-use intensity stretching from rangeland to high-input agriculture.

Wherever appropriate, local stakeholders and their perceptions and knowledge were incorporated in the research. One example is the organisation of the "Farmer innovation contest in rural Ghana". In contrast to developing solutions by external experts and trying to introduce them to rural practice, small-scale farmers from the Upper East region in Ghana were motivated to publish and share their own solutions to agricultural problems. A broad range of innovation themes were covered, such as novelties in animal husbandry, crop management or storage. Finally three innovators were awarded with prizes during the National Farmers Day celebration. The innovations are published in the WADI for free access. Besides information about the applicants, e.g. basic demographics, provided data comprise information on the theme of the innovation, the problem addressed or obstacles and costs of applying the innovation.

WASCAL IN A NUTSHELL

The West African Science Service Centre on Climate Change and Adapted Land Use (WASCAL) was initiated in 2010 in close cooperation with West African and German research institutions. It was funded by the German Federal Ministry of Education and Research (BMBF). The Science Service Centre has become an international organisation under the umbrella of the Economic Community of West African States (ECOWAS) with currently eleven member states (Benin, Burkina Faso, Cap Verde, Côte d'Ivoire, The Gambia, Ghana, Mali, Niger, Nigeria, Senegal and Togo). The hub of this regional research network is the Competence Centre located in Ouagadougou, Burkina Faso.

The WASCAL Data Infrastructure – WADI – was developed by Germany's Research Centre Jülich and the Center for Development Research (ZEF), attached to the University of Bonn, Germany. WADI consists of a central metadata catalogue connected to a repository for research data files, tools for data import, services for storing and publishing geospatial data and a system to import, manage and publish time series data. The data are merged into the central WASCAL portal application, the Data Discovery Portal (DDP), which offers search, visualisation and download tools.

MANAGEMENT AND SHARING OF RESEARCH DATA

Most national research institutions in West Africa have neither facilities nor policies to manage and share research data. One reason is the absence of a data sharing culture, a phenomenon which is not limited to West Africa. On the one hand, scientists would be happy to have access to high quality data. On the other hand, there is a lack of willingness to invest time and efforts to share one's own data with others. Alike, it cannot be ruled out that more informal channels of data exchange among researchers, e.g. cloud solutions such as Dropbox, are considered sufficient, instead of sharing data following open data principles such as F.A.I.R. (Findable, Accessible, Interoperable and Re-usable, which are guiding principles developed by the international initiative FORCE11 in 2016).

However, international developments for safeguarding good scientific practice are increasingly demanding the sharing of research data. Thus, more and more data-intensive international research projects as well as national and international funders require establishing open access to data.

HANDLING INTELLECTUAL PROPERTY AND COPYRIGHTS

Legal uncertainty, for example due to missing licensing schemes considering intellectual property and ownership rights, reduces the motivation to share and re-use data. Therefore, in an initial step, in a participatory process, WASCAL has established a transboundary data sharing policy among the involved NMHSs and the WASCAL research community. This achievement cannot be overemphasised given the complexity of national peculiarities in the handling of intellectual property and copyrights as well as the aforementioned funding constraints. The 'open data'-oriented policy outlines authorship rights and commitments. One main commitment is to upload data into the WADI catalogue within a certain period after data has been created. Otherwise researchers can claim the right of first publication so that access to the data remains restricted until a paper or a thesis is published. Privacy protection is another important issue in the data policy. It states that personal information e.g. within household surveys needs to be anonymised before publishing, unless prior written permission was given by the interviewed person to publish personal information.

Around 90 per cent of the data in the WADI catalogue originates from research carried out in the Core Research Programme. Only little comes from the Graduate Studies Programme or from researchers in the Competence Centre. In order to create an acceptance of the benefits of data sharing and the importance of investing time and efforts to share data, a training with scientists of the Competence Centre and doctoral students of the Graduate Studies Programme was organised to increase knowledge on how to prepare, describe and share

FLOOD HAZARD INDEX MAPS IN THE CATCHMENTS IN BURKINA FASO, GHANA AND BENIN

Integrated in the Flood Hazard Index, flood hazard maps show information on extent, severity and probability of floods. The basis for deriving the flood hazard index maps is formed by the following two datasets: standardised peak runoff rates in cubic metres per second (m^3/s) and standardised digital elevation models. These maps were categorised into five classes using the Natural Break (Jenks) method to produce the Flood Hazard Index (FHI). The FHI ranges from 1 – very low flood hazard intensity to 5 – very high flood hazard intensity. The results were verified by local disaster managers by applying principles of the Participatory Geographic Information System. The interactive maps as well as the geospatial files are freely accessible for further processing through WADI.

data online using the WADI. But this training with a high number of participants was a single event. Continuous assistance could not be provided to the students because of insufficient data management staffing at local level.

In contrast, good experience was gained in training of small groups or individual supervision sessions for Core Research Programme scientists. These trainings, organised by the data management unit at Germany's Center for Development Research of the University of Bonn (ZEF), were followed by continuous supervision and support in the process of standardising, documenting, licensing and uploading data to the WADI.

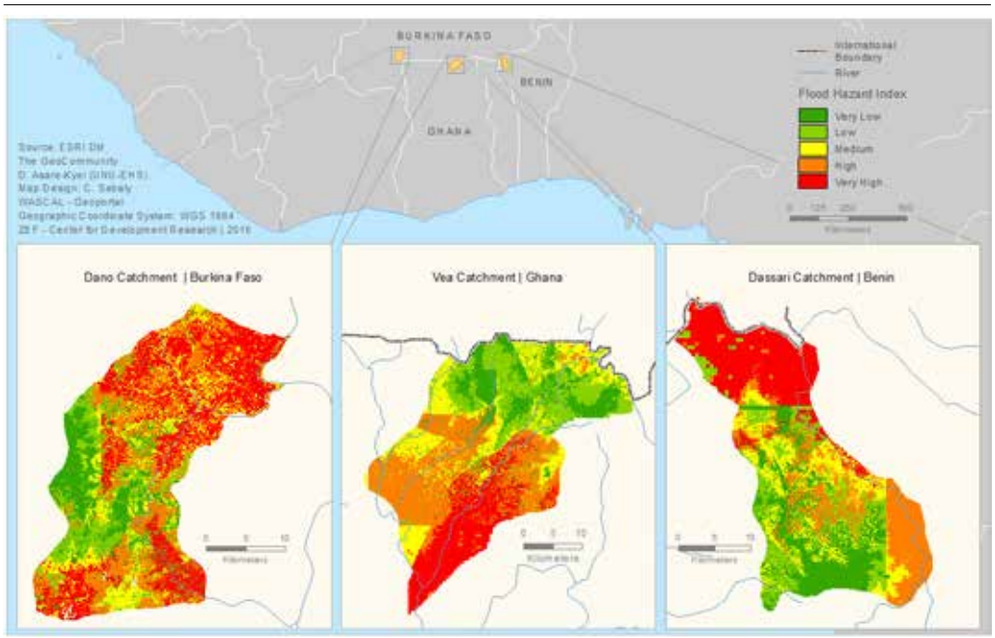
LESSONS LEARNT

To establish continuous data flows from research activities carried out, students at the partner universities have to be motivated and assisted by trainings in small groups, or even individually. Prior to the upload and accessibility of the data, the responsible data manager needs to look into each of the data files to be uploaded into the WADI in order to advise the students on how to comprehensively describe the data by using the online interfaces. Further privacy protection of survey data has to be checked as well as which exchange formats to use, how to name the files, how to add useful data quality assessments to the metadata and how to license the data in compliance with the data sharing policy. At the end of this process, the data manager must make sure the metadata is consistent and complete before publishing it.

Given that there are eleven partner universities, each with around ten students per batch, this cannot be undertaken by a relatively small data management unit like the one at the WASCAL Competence Centre alone. Thus, delegating tasks to the local level could be a solution. Based on a train-the-trainer concept, members of the IT departments at the partner universities could be skilled by the WASCAL data management unit to take over responsibilities and maintenance of the database. These local contact points would in turn train and supervise the students at their university. It is crucial for this approach to be coordinated with and supported by the executive boards at the partner universities. This could have the positive side effect that the universities would gain first experiences with research data management to make them better prepared for the increasing demand of research data sharing in the future. In a further step, the theory of research data management could become part of the scientific curriculum of the studies programmes. It is also recommendable to develop training material for the students. An e-learning platform providing, for example, videos showing how to use the WADI for publishing data could be helpful.

A permanent funding of local and skilled staff providing continuous as well as individual support to research activities together with reliable access to infrastructure including user-friendly data services can be seen as the basic prerequisite for successful data management within the institutional network in WASCAL. At regional level, the WASCAL data management team are also conducting the WeDataMIND initiative (West African Distributed Data and Metadata Infrastructure and Networks for data Discovery and Dissemination) to facilitate discovery of and access to information on existing data sources, data providers and data policies, and to promote their dissemination. The concept resides on automatic sharing of metadata or data available in each organisation. By interconnecting (federating) the organisation's data and metadata infrastructure and servers through suitable web services and search engines, an organisation will be able to share its data/metadata under common data sharing policies, and then discover and have access to those existing in other organisations.

Flood Hazard Index Maps of the Dano, Dassari and Vea Catchment



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THE AGRICULTURAL CENSUS IN PALESTINE

Up-to-date and accurate data on agricultural holdings is an enabling tool for public and private investment as well as a core building block for relevant planning and monitoring in the agriculture sector. In this context, Switzerland supports the realisation of Palestine's Agriculture Census 2020. Our authors depict the process of data gathering in a fragile context as well as the challenges such a venture faces.

By Ayman Daraghmeh and Hasan Ashqar

The borders of enumeration area maps will be updated during the field work.

Photo: PCBS

The agricultural sector has historically been an important driver in creating job opportunities in the Palestinian economy. As of 2010, this sector was employing 11.5 per cent of the Palestinian labour force, of whom 33 per cent were women. Currently the sector employs – formally and informally – an estimated amount of close to 25 per cent of the working-age population (about 760,000 people living in 146,000 households) who rely on farming, livestock rearing, fishing activities and processing. Agricultural products account for about one quarter of Palestinian exports. Around 70 per cent of the agricultural production takes place in the West Bank and 30 per cent in the Gaza Strip (see Box on page 18).

Since current data on the agricultural situation is not up to date and does not reflect the real situation on the ground, an agricultural census is being carried out. Its results will serve as a base for strategic planning and policy-making. Harmonised with Palestinian national requirements and international standards, the Palestinian Central Bureau of Statistics (PCBS) has striven to collect and disseminate official statistics. In cooperation with the Ministry of Agriculture and the Union of Agricultural Work Committees, PCBS implemented the first census on agriculture in 2010. The Agricultural Census 2020 is conducted by PCBS together with the Ministry of Agriculture (MOA) and supported, among other development partners, by the Swiss Agency for Development and Cooperation (SDC).

In the context of Palestine under Israeli Occupation since 1967, all economic sectors have been subject to policies and constraints that impede sustainable development. The agriculture sector has been particularly affected by the confiscation of large areas of land and by loss of access to land, water resources and irrigation development for farmers and herders. The full closure (by land, sea and air) of the Gaza Strip since 2007 and the intra-Palestinian political divide have also heavily contributed to increasing constraints on the agriculture sector.

WHY A CENSUS, FOR WHOM AND HOW?

According to the United Nations Food and Agriculture Organization (FAO), the census of agriculture is one of the key pillars of a national statistical system. The FAO is providing guidelines for its conduct that are utilised for the preparation of the Agriculture Census 2020 in Palestine.

The Agricultural Census shall facilitate future comparisons with neighbouring countries and shall provide data on the structure of the sector as basis for projecting related indicators to optimise the use of agricultural resources and thus contributing to food security and self-reliance. In addition, data will build a sampling frame for future surveys. Such data are the backbone for regional planning, better distribution of resources and meeting the needs of the private sector. These statistics are necessary for the planning and monitoring of agriculture-related programmes by governmental and private institutions. Furthermore, the Agricultural Census will monitor the changes affecting agricultural land as a result of continuous Israeli Occupation, confiscation of land, marginalisation and isolation of the Palestinian population and the building of the Separation Wall. Given important and continuous changes in this regard, an updated census is highly desired and required.

Since agricultural censuses are usually undertaken only every ten years, it is natural to associate them with those aspects of agriculture that change relatively slowly over time. Thus, agricultural censuses are mainly concerned with data on the basic organisational structure of agricultural holdings, such as the size of a holding, land tenure, land use, crop area, irri-

gation, livestock numbers, labour, use of machinery and other agricultural inputs. Agricultural censuses have not normally included data that change from year to year, such as agricultural production or agricultural prices. The census' final results will comprise the number of agricultural holdings classified by type (plant, animal, or mixed), the area of cultivated land, the number of domestic livestock (cows, goats, sheep, poultry, camels, rabbits, etc.), the agricultural labour force and its distribution according to sex and age, the number of agricultural machinery and equipment as well as agricultural applications.

The Agricultural Census 2010 was not built in a way to accommodate sector development and to follow up on its effective or potential growth. Drawing from this experience, the MOA and PCBS planned the upcoming census with sustainability as its core. It is therefore envisaged to establish an effective agricultural registry to decrease the reliance on expensive decennial censuses. The design and purpose of the Agricultural Census 2020 fits under the national strategies to ensure proper prioritisation, planning, budgeting and decision-making by public and private stakeholders.

However, in the occupied Palestinian territory, data related to agricultural holdings may be irremediably altered by land confiscation operated by Israeli authorities for infrastructure (by-pass roads, security fences, etc.) aimed to serve – in priority or in exclusivity – the increasing population of settlers living in the West Bank. Moreover, the building of the Separation Wall between Israel proper and the West Bank, the existence of which was declared unlawful back in 2004 by an advisory opinion of the International Court of Justice, has cut off 150 Palestinian rural communities from their agricultural or pastureland, water resources and public infrastructure.

SUPPORTING THE AGRICULTURAL CENSUS 2020

The Swiss Cooperation Office Gaza and West Bank in Jerusalem helps to strengthen the economic viability of the agricultural sector in the occupied Palestinian Territory. Starting in 2018, the objective of this support is to "establish an updated detailed and accurate holdings database that will assist in planning and policy-making at all levels related to the agricultural sector". By 2021, data on the structure of agriculture, especially for small administrative and geographical units, rare items and detailed cross-tabulations will have been produced.

The frame of the Agricultural Census 2020 is being prepared by listing all holders through visiting every household, using maps to reach all addresses.

Photo: PCBS

Primary users of the census will be the MOA, farmers' unions, agricultural cooperative societies and individual Palestinian private sector investors. Universities, research institutions, NGOs as well as bilateral and multilateral development agencies will also use updated data.

FROM THEORY TO PRACTICE

The data collection of agricultural holdings within a specified period in a specific region is called the enumeration period. The statistical unit is the agricultural holding. The frame of the Agricultural Census 2020 will cover holdings by households and collaborative institutions. The frame is being prepared by listing all holders through visiting every household, using maps to reach all addresses. The census will cover the entire occupied Palestinian Territory, including rural and urban areas and refugee camps.

The census is conducted in three stages: the preparatory stage, the field work stage and the data processing and dissemination stage. The preparatory stage comprises the formation of organisational structures and the agricultural census committees. Consultations are being held with relevant stakeholders and data users to agree on priorities on the census contents. A pilot census will be conducted to draw up a final version of the census manuals, prepare the implementation plans and data processing mechanisms, estimate the number of census personnel required, etc., in parallel to listing agricultural holders and holdings. The borders of enumeration area maps will be updated during the field work. The data processing and dissemination stage includes collecting the questionnaires, editing, coding and entering the booklets and questionnaires, in addition to tabulating and disseminating the preliminary and final results.

> *The planned census will help us – at the ministry – to plan interventions where needed and to identify gaps in the supply chain for national needs. It will also provide essential data to ensure proper management of the sector for the benefit of the farmers and the citizens of the state of Palestine.*
>
> Abdallah Lahlouh, Deputy Minister of Agriculture, Palestine

Two questionnaires will be designed; the first will list households and agricultural holdings, while the second is related to the enumeration of the agricultural holdings. Items and variables are data of households and agricultural holdings, in addition to identification data, building name or owner, type of building and its current use, number of household members (males, females), educational level, the holding management method and main purpose of production amongst others. After having finished the data collection, the processing will

start. Data processing includes all activities after the field work, such as editing of questionnaires, coding, data entry and computer editing. The technical team will follow up the data processing, testing its accuracy and quality and comparing it with the preliminary results and other data resources, in addition to preparing final results of the census.

COPING WITH SPECIFIC CHALLENGES

Challenges arising in collecting data in this context are manifold and unique, ranging between political and security issues to limited infrastructure. Digitisation and ICT tools in particular usually provide solutions to overcome practical problems, but their use is restricted by Israeli regulations. The MOA and PCBS will use innovative paperless technologies to collect data from the West Bank and the Gaza Strip. They will also use particularly developed tablet applications to gain access to difficult-to-reach areas and farmers, especially in the Jordan Valley and in the Gaza Strip. Overall, these difficult-to-reach areas comprise the majority of agricultural land in the occupied Palestinian Territory.

Getting access to the Gaza Strip is another challenge for PCBS staff, one that they decided to mitigate through relying on electronic transmission of data between the Gaza Strip and the West Bank for analysis. Even in this case, PCBS faces the likelihood of power shortages endangering data integrity that must be met with the provision of sufficient fuel for autonomous energy generation. Another set of constraints are laid by Israel's prohibition of the use of unmanned aerial vehicles – commonly known as drones – to collect agricultural data. Indeed, using drones would have provided access and coverage of large swathes of agricultural land, substantially lowering the overall costs of the census.

Despite its dire financial situation, the Palestinian Authority allocated four million US dollars to the Agriculture Census 2020. This amount represents half of its total cost. While the European Union and the Spanish Agency for International Development Cooperation joined Switzerland as co-financing partners, an important financial gap remains (estimated at three million US dollars at mid- 2019), which threatens the implementation and sustainability of this strategic endeavour. Swiss funding combined the provision of financial contributions and technical assistance through the Swiss Federal Office of Statistics to equip MOA and PCBS with up-to-date knowledge and expertise.

PALESTINE'S AGRICULTURAL SECTOR

The agricultural land covers more than 120,000 ha that is cultivated with all kinds of vegetables and field crops, in addition to the groves of fruit trees and to rangeland. The Palestinian agriculture sector is characterised by its diversity. It would benefit from the climatic variations and reap existing opportunities for expanding irrigated and export cash crops if it was able to make full use of agricultural innovation and the presence of agricultural entrepreneurs. However, mainly due to the impact of Israeli Occupation, the sector growth has been severely restricted.

Palestine comprises five agro-ecological zones. The coastal plain zone (Gaza Strip) extends from the North to South on the south-eastern shores of the Mediterranean Sea and is dubbed the "fish basket" of Palestine. The semi-coastal zone – i.e. the north-western corner of the West Bank, which includes the governorates of Jenin, Tulkarem and Qalqiliah – measures the highest annual rainfall. The middle elevation zone ranges from Jenin in the North to Hebron in the South. The steppe zone that extends from Eastern Jenin to the Dead Sea in the South is considered as rangeland, and the fifth zone is located in the Western Jordan Valley.

Agricultural holdings in Palestine are with an average size of 1.86 ha, the majority (88 %) are owned outright by the household. As of 2010, there are 101,172 holdings in Palestine, nearly 70 per cent of which are plant production holdings and 7.6 per cent are livestock holdings, with the remainder comprising diverse production. The sector is a mix of commercial and subsistence farming, which includes farming as a sideline economic activity of many households particularly in the semi-coastal zone with rain-fed agriculture. Most of irrigated farmland is located in the Jordan Valley and the Gaza Strip, while fields in the highlands have hardly any irrigation systems because of climate conditions. The use of machinery is basic, given the nature of the topography in Palestine – much of the work is done manually and is labour-intensive.

Rainfall patterns cause plant production to vary from year to year and it has not experienced significant changes over the last decade. Neither have any major changes occurred in terms of the relative distribution of varieties of different crops, which is characterised in general – and especially in the West Bank – by relatively low value crops and the low percentage of irrigated agricultural areas. Olive tree cultivation covers the largest agricultural area in the West Bank, occupying approximately 57 per cent of cultivated land, while crops, vegetables and other fruit trees account for the remaining area, at 24 per cent, ten per cent and almost nine per cent respectively. In the Gaza Strip, vegetable crops constitute 32 per cent of the total cultivated area, followed by olive trees (24 %) and other field crops (23 %) and fruit trees (21 %).

SUMMING UP...

In addition to the immediate gains of the Agricultural Census 2020 for decision-makers, farmers and investors in terms of available relevant data, the building of an agriculture registry in Palestine will be a key contribution to continuous improvement in the sector and to sustainability. The structure of the agriculture registry will be holders-based. Farmers will have individual protected access to their own specific information that they can update.

The information will be fed into different layers that provide users with the overall picture and related statistics. The registry will be hosted by the MOA with an interface to the GIS system hosted by the Ministry of Local Government, with visual representation through produced maps.

The availability of up-to-date data will allow public and private sector operators to perform the analysis needed for decision-making. The private sector can benefit in terms of identifying appropriate areas of investment, while the ministries and civil society can develop their priorities with regard to policies and/or actions to improve overall sector performance.

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For references and further reading, see online version of this article at: **www.rural21.com**

THE TRUE PRICE OF GOLD

On their quest for gold, multinational corporations are ransacking the north of Tanzania. Local people are losing their land. Many of them are left with no other option but to risk their lives picking gold-bearing rock out of the mine spoil. But some of the smallholders are going back to farming – a way out with an uncertain outcome.

By Klaus Sieg

The wall is omnipresent. Mary Mugesi Chacha just has to take a look out of her hut. The concrete slabs are gleaming in the brilliant sunshine. They are protected by glittering barbed wire that two tall fences stand in front of. On a broad pathway between the two fences, patrol cars belonging to the police and the private security firm do their rounds. Behind the wall, a water cannon is standing on one of the spoil tips the size of a tower block reaching skywards. "That's where our cattle and goats used to graze," remarks the forty-year-old, knitting her brows glumly. The spoil tips come from the North Mara Gold Mine, operated by the multinational Acacia Mining corporation, a subsidiary of Canada's Barrick Gold, the largest gold producers in the world. The company only had the walls and fences erected a few months ago, to keeps so-called intruders from climbing up the spoil tips and looking for gold-bearing rocks. The mine operators regard the tips as their property, which they seek to further exploit.

People have been shot at here in northern Tanzania. There have been deaths and injuries. Women have been abused and raped. The village of Nyakunguru, where Mary Mugesi Chacha lives with her husband and seven children, has also suffered deaths. Young men show scars on their heads and bodies that they have sustained on the tips.

Looking for the gold mine's breadcrumbs is not only dangerous because of the attacks by the security forces. People can slip, fall or have heavy rocks fall on them. Moreover, competition is harsh among these desperados and adventurers. Violence, applied with fists, stones and rocks, is part of everyday life.

This doesn't put off anyone. Again and again, people climb up the tips, usually holding a yellow jerrycan full of water. They pour the water onto the stones, and if any of them contain gold, this can be spotted by the way they shine. Quite a few people come to Tanzania's remote North from other parts of the country or even neighbouring Kenya to engage in this activity.

HUNGER AND POVERTY ARE DRIVING THE PEOPLE TO THE MINES

Mary Mugesi Chacha was also among the so-called intruders. She doesn't really look like an especially brave woman. She carefully chooses her words, eyeing the surroundings with uncertainty. "I was always very frightened, climbed up the tip with hands shaking near-

Mary Mugesi Chacha and her husband working in a maize field in Nyakunguru, Tarime District, Tanzania. Behind them is the wide expanse of the Acacia Gold Mine site.

ly every day. and I slept badly at night," she recalls. Nevertheless, she risked going there again and again, just like her husband, sitting next to her and nodding. "What else could we have done? It was the only way to feed our children, she remarks, explaining that the yield from the family's small field was simply too poor. "I was often dazed, felt weak from hunger and kept on thinking about how I could earn some money to buy food."

Gold has already been extracted on a large scale in northern Tanzania for more than 100 years. Following the German colonial empire's discovery of this precious metal on the shores of Lake Victoria, it opened the first large mine in 1909. Under British rule, the German Empire having lost all its colonies after suffering defeat in the First World War, mining experienced a veritable boom up to the Second World War.

Gold production in northern Tanzania dwindled to insignificance in post-war years. It was not before the 1970s, when prices had again begun to rise, that mining was pursued anew. Then, towards the turn of the millennium, international mining corporations started to take an interest in the region and began to drastically expand extraction. The South African company Anglo Gold Ashanti has its largest open-cast mine in the District of Geita, while Acacia Mining operates three mines in all in the country.

VIOLENT CONFLICTS, POISONED WATER, HUMAN RIGHTS VIOLATIONS

During the last 15 years, an annual average of well over 40 tonnes has been extracted from the ground in Tanzania. This East African country is now Africa's fourth-largest producer. Gold is Tanzania's second most important source of foreign currency, right next to tourism, whose most important destination is in the immediate neighbourhood of the gold mines – Serengeti National Park. The North-Mara Gold Mine, situated a mere two hours away from Serengeti by car, was opened in 2002. It was taken over by Barrick Gold in 2006.

Trouble soon started. In 2008, 200 people from the surrounding villages raided the site and destroyed plant worth 15 million US dollars. A year later, a member of parliament demanded the closure of the mine because 18 people had died in one of the villages through drinking contaminated water. Stricter environmental standards were imposed. The operators renewed the 40,000 square-metre basin for mine wastewater, although they said the measure had been necessary because of vandalism. People still complain of contaminated water today.

The violent conflict between the mine and the so-called intruders and the operators of small mines has also been going on for a number of years. The local population had traditionally mined for gold on part of the Acacia Mining site themselves before they were driven off.

In 2013, some of the victims of the violence brought a suit against Acacia Mining before the High Court in London/UK. The corporation denied the allegations, and in 2015, an out-of-court settlement for indemnity was agreed with the plaintiffs. Details of the agreement are subject to a secrecy clause.

Furthermore, a complaints office for human rights violations was established. However, not only the non-governmental organisation MiningWatch Canada, which has been critically monitoring the impacts of Acacia Mining's operations on the local population for some years, has its doubts whether this office, which is completely dependent on the mining corporation, will be of any help to the victims.

GOLD MINING INVOLVES A HUGE AREA CONSUMPTION, WHICH LEADS TO CONFLICTS OVER LAND

Visitors may take a look around the mine if they have registered for a tour group. In order to get to the other side of the light walls, they have to endure time-consuming security checks. Before they are taken across the site in grill-windowed vehicles, they are all required to hand in their smartphones. Photos of the craters the size of small towns, in which giant excavators, dumper trucks and crushers are rumbling away, don't seem to be desired.

"Since the wall was built, we haven't had any further problems with the intruders," says a woman from Acacia Mining's communication team before veering off to another topic. She prefers to lecture on the mine's social projects in a Power Point presentation. For some years, Acacia Mining has been building schools and health centres to calm the sentiments of the locals.

To the people in the villages, the wall is a further slap in the face. Although the mines hold the land use contracts that they have signed with the government, the surrounding communities have used this land for generations.

"The people in the villages are still waiting for the compensation and infrastructure measures that they have been promised," says the head of a non-governmental organisation that would prefer not to be named. She says that much remains undealt with among those in power locally, and notes that the mine is attracting labour and adventurers. "This in turn leads to an increase in alcohol consumption, violence and prostitution," she adds, claiming that anger is building up in the region.

"Theoretically, I'm not even allowed to leave our hut," explains Mary Mugesi Chacha, smiling bitterly and pointing to a white-painted rock in front of her modest home. It marks the border of the North Mara Mine site, which can be extended to where she lives at any time.

The mine is relentlessly eating its way into the countryside. "We can hear the detonations that they loosen the rock with almost daily," says Mary Mugesi Chacha. The rock, mined both open-cast and underground, is crushed and ground into a fine dust. Afterwards, the gold is leached out with poisonous chemicals, usually with cyanide. Yield is shockingly low.

Around 4,000 mine gold ore down the shafts of the small gold mines in Mgusu, Geita, Tanzania. They crush the ore into powder and rinse out the gold using mercury. Wastewater is then released uncontrolled into the environment.

Photos: Jörg Böthling

Just a few grams of gold are obtained out of a whole ton of rock – barely enough for a pair of wedding rings. Thus gold mining is consuming huge areas and contaminating the environment. People are above all anxious about the mine's huge wastewater basin. Some of the region's villages are located right at the foot of the house-tall dam that the poisoned water is lapping against.

That these fears aren't based on fantasy was demonstrated once again early this year by an iron ore mine wastewater basin dam bursting in Brazil's Brumadinho region. The sludge from the mine, owned by the Brazilian Vale corporation, buried hundreds of people.

EXTRACTING GOLD ON A SMALL SCALE – A DANGEROUS VENTURE

But it is not only the big mines that are responsible for the much-cited curse of gold in the North of Tanzania. In the surrounding villages, gold is extracted on a small scale. Mary Mugesi Chacha regularly hears the clumping of heavy boots worn by men passing her hut and carrying shovels and pick-axes. These men hack and dig in areas that are outside the big mines or are not yet being used by Acacia Mining. Not properly propped or supported, these small mines can quickly turn into graves.

Small washing and screening plants can be seen all over the village. Even a little crushing machine stands between the huts, rattling away incessantly, and noisy enough for Mary Mugesi Chacha to hear even from her hut.

Gold extraction on a small scale involves leaching the gold out of the fine sludge with mercury. This is usually dealt with by women almost always using their bare hands, and it was also the way that Mary Mugesi Chacha earned her money if she did not directly sell the rocks containing gold at a low price to a trader because she urgently needed something to eat for herself and her family. Mercury vapour is extremely harmful to health. "I haven't got any health complaints yet, and I hope it stays that way," she says, looking at her children who have gathered around the table in the family's simple hut and are waiting for their dinner. "This used to be a difficult moment for me because I couldn't put enough on the table for them," she recalls.

But this has changed. Bananas are on the menu alongside maize, various vegetables, rice, and sometimes even meat. How could Mary Mugesi Chacha manage this?

AGRICULTURE AS A WAY OUT

Mary Mugesi Chacha has once again started farming, together with a group of former intruders. They have cultivated a patch of land and are growing rice, using improved seed and applying sustainable methods. Rice will soon follow. Yield provides enough for the families, and additionally, they can sell the surplus on the local market. "None of us now need to risk their lives on the spoil tips," Mary Mugesi Chacha says with pride in her eyes.

This was all possible because she and her comrades-in-arms were able to obtain advice from another group in the village who had already formed a cooperative five years before. They had been supported by a partner organisation of Germany's Brot für die Welt.

Together with others in the group, Mary Mugesi Chacha and her husband hoe the weeds out between the maize plants in their common field. From here too, the wall made of light-coloured concrete and the spoil tips of the big mines are visible. During the night, the giant site is plunged into daylight with searchlights. It then looks like another planet, with an airfield and its own radio masts, a network of roads and dwellings for foreign skilled labour. Here too, rocks painted white mark the edge of the mining site. They are placed way ahead of the concrete wall armed with barbed wire. The field cultivated by Mary Mugesi Chacha's group lies within this land belonging to the mine. How long will the smallholders still be able to use it? "That isn't clear, but we will find another piece of land once things are over here," she explains. Mary Mugesi Chacha is optimistic despite the precarious situation she and her group are in – possibly because she has already had to endure so much more in her life.

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Smoke rising from the open pits creates considerable health hazards for the producers of charcoal.

Photo: Niraj Acharya

Improved charring kilns allow the controlled burning of the bio-wastes. They are less hazardous in terms of fire and particulate matter.

Photo: Niraj Acharya

USING FOREST WASTES TO PRODUCE BIO-CHARCOAL – A SUSTAINABLE BUSINESS MODEL FOR COMMUNITY FORESTS

Invasive forest plants which are usually wasted can be a good source of renewable energy if converted into bio-charcoal. In Nepal, together with partners, Helvetas has developed a private sector-led business model that above all benefits the disadvantaged members of the Community Forest User Groups – through better health, higher income and an enhanced social status.

By Niraj Acharya, Banu Shrestha and Sandip Paudel

In 2016, as much as 76 per cent of Nepal's energy requirement was met through biofuel and wastes. The felling of trees for firewood and charcoal has had a heavy toll on the country's rich forest resources. The conversion of the forests' vast amount of regenerative ground vegetation into carbon rich bio-charcoal could represent an alternative to meet energy demand. Using regenerative forest wastes to produce bio-charcoal would not only help with import substitution of fossil fuel such as coal, liquefied petroleum gas and kerosene, albeit in small amounts, and save the outflow of foreign currencies, it would also create income opportunities for the poor and the disadvantaged while contributing to forest health. Starting in 2014, Helvetas Nepal worked with a set of private value chain actors to build up a sustainable bio-charcoal business model. The four-year initiative has contributed to the management of over 17,500 hectares of forest in 111 community forests.

BETTER HEALTH AND HIGHER YIELD WITH IMPROVED CHARRING KILNS

In Nepal, charcoal is traditionally produced by semi-controlled burning of wood in open pits. Working in open pits poses a risk to one's health as the biomass tends to get contaminated with soil, resulting in dense smoke rising from the ground. This is a particular hazard for the producers, who need to get inside the pit to collect charcoal and are exposed to high respirable particulate matter as well as risking getting burnt. Improved charring kilns, closed containers allowing the controlled burning of the bio-wastes, were therefore introduced by the project. These kilns are easy to handle and less hazardous in terms of fire and particulate matters. Moreover, surveys demonstrated that bio-charcoal yield from the traditionally practised open pit system was 15 per cent, while the improved charring kiln yielded 20 to 25 per cent bio-charcoal. At 6,000 to 7,000 kcal/ kg, the calorific value of bio-charcoal produced in improved charring kilns was 3,000 kcal/ kg higher than that of charcoal produced in open pits.

> Bio-charcoal is a carbon-rich product made from biomass, an organic matter of vegetable or animal origin, through its carbonisation under controlled environmental conditions, a process called charring.

The charcoal was produced from forest wastes such as undergrowth, twigs, shrubs and invasive plant species like *Mikania micrantha*, *Eupatorium adenophorum*, *Eupatorium odoratum* and *Lantana camara*, locally called "banmara", which, if not cleared from the forests, raise the risk of forest fires, repress natural forest diversity and alter soil nutrient composition. As such, the management of the forests' bio-wastes was entrusted to the poor and disadvantaged villagers who were also members of Community Forest User Groups (CFUGs), the self-governing entities registered under the District Forest Offices (DFOs) entitled to use forest products. Collected in the process of managing forest health, such forest waste holds an income and employment potential through its conversion to bio-charcoal, while contributing to reducing greenhouse gas emissions.

A PRIVATE SECTOR-LED BUSINESS MODEL

A business model based on the market systems development approach (see Insert on page 23) which was led by the private sector actors of the bio-charcoal value chain – producers, collectors, processors and traders – was applied. Business development service providers (BDSPs) were employed for this purpose. They are a key link in the value chain, working as advisors to facilitate linkages between value chain actors, market and financial institutions. They also helped in developing and implementing the resource management business plans for the community forests (the source of forest biomass); see also Figure on page 24.

If improved charring kilns are used, the calorific value of the bio-charcoal is about twice as high as with traditional kilns.

Photo: Niraj Acharya

The charcoal is processed into several products. For pillows, the average margin is around 150 US dollars per tonne.

Photo: Niraj Acharya

The BDSPs have been integrated into the value chain as collectors or processors or both. They became pivotal in balancing demand and supply, as they could influence both sides of the chain, i.e. production as well as marketing. And it was in their business interest to explore the market, diversify products and invest in their supply chain (on kilns for charring, the price of which is adjusted in the buying rate of the charcoal) to ensure regular supplies of quality bio-charcoal. The BDSPs offered a buyback guarantee for bio-charcoal to the producers, which is much needed by them to engage in bio-charring. Many of the BDSPs/ processors turned raw bio-charcoal into carbon-dense products such as pillows, pellets and briquettes that were relatively longer lasting than raw char and were easier to handle. Mostly, the processed bio-charcoal is used in the gastronomy industry (for tandoori and barbecue) and in households. The powdered bio-charcoal also goes into making incense sticks and is used as a comingled mixture with fossil coal in brick kilns.

BENEFITS ALONG THE VALUE CHAIN

In economic terms, the business model proved to be advantageous to all value chain actors. The bio-charcoal opportunity not only allowed the communities to clear the forest wastes free of cost, but also helped most of the Community Forest User Groups earn some money as royalty from bio-charcoal producers. The royalty ranges from five to ten US dollars (USD) per tonne for the coal produced.

Individuals involved in producing bio-charcoal are mostly the poor members of the CFUGs who have the responsibility to manage the forests – their source of fuel and fodder. This is an opportunity for them to at least make some money in the bio-charcoal producing season (seven months in a year). Their earnings from bio-charcoal production range from about USD 90 to USD 180 per person per month. The flexibility of working hours in running a kiln has attracted many women into charcoal production. From 2014 to 2017, there was a steady increase in the total number of producers, 52 per cent of whom were women. Some women have also learnt to become charring trainers, which is helping to break gender stereotypes (see Quote above).

"Kushal hired me as a charring trainer for a training in Kamane, Hetauda. The women participants were happy to see me and said that their confidence had been boosted by seeing me as a trainer, adding that they could also produce charcoal if I was able to."

Chandra Kala Risal, a charcoal producer of Jhapali Tole, Simara-Jitpur (a Sub-Metropolitan city in southern Nepal).

The Market Systems Development Approach, also known as Making Markets Work for the Poor (M4P) approach, accounts for a market actors-led perpetuating system which is enabled by business-friendly policies and rules, and is facilitated by public and private support functions.

The **collectors**, who collect bio-charcoal from producer groups in small quantity and sell them to processors in bulk, make an average profit of USD 5 to 25 per tonne. The profit margins of the **processors**, who add value to the raw charcoal by diversifying it into different product types, i.e. pellets, pillows, briquettes, etc., vary according to product type. For pillows and pellets, the average margin is around USD 150 per tonne; in briquettes, the mark-up is USD 2 per 100 pieces. For the **wholesaler/retailer**, there is a mark-up of USD 100 to 200 per tonne at each level of the market.

GOOD MARKS FOR SUSTAINABILITY

A recent review of the bio-charcoal business model shows that it is sustainable from a technological, social, environmental and financial point of view.

The improved charring kiln is locally available and easy to operate. The price is affordable for the economically poor producers – the lowest-priced kiln comes at USD 70. The producers can access the loan for the kilns from micro-finance institutes at a small interest rate or from their own CFUGs (practised in some of the districts), whereby the producers pay off their loan upon the sale of their bio-charcoal in small instalments. As already mentioned, the financing of the kilns by the BDSPs/ processors is an alternative much appreciated by the producers.

The model is contributing to the livelihoods of the poor and the disadvantaged, especially women, by economically empowering them. It is contributing to the revival of bio-diversity and controlling forest fires. The 16 districts where the intervention was carried out offer a potential to produce as much as 90,000 tonnes of bio-charcoal through a small forest management effort. In 2017, these districts produced 8,000 tonnes of bio-charcoal. With the introduction of bio-charcoal, the forest wastes that the CFUGs previously had to pay to get them cleared have now become a source of some income.

The BDSPs have invested heavily in the infrastructure of the value chain with the capacity to produce a multiple of what they are currently achieving. They are looking at the potential for product substitution (LPG, kerosene, fossil coal, etc.) considering the available immense forest resources, international growth of the processed biofuel (PBF) market and the expected conducive policy in the country. Their investments follow their business plan, which was charted in 2016. It covers a period of five to ten years and is indicative of their trust in the profitability and the growth of the sector.

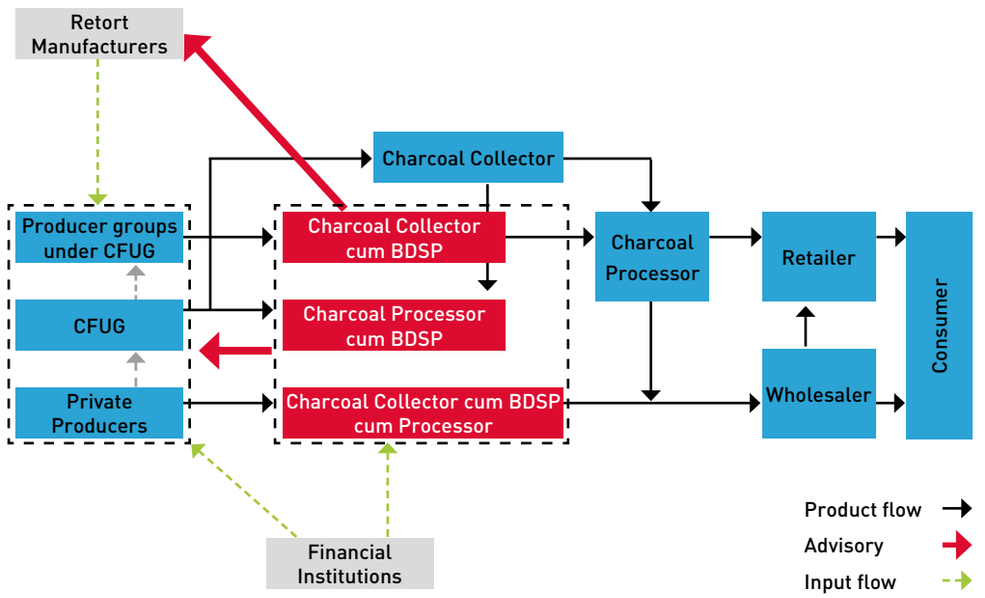
As to environmental sustainability, the incidence of forest fires considerably dropped in the community forests where the interventions were carried out. The findings of the International Centre for Integrated Mountain Development (ICIMOD) suggest that forest fires in the community forests in two of the 16 districts where the intervention was carried out, namely Chitwan and Bara districts, had occurred three times more frequently prior to it.

RETHINKING NECESSARY IN POLITICS

Despite the obvious benefits, the policy is not explicit when it comes to forest waste-based bio-charcoal. The Nepalese government charges a royalty of 15 USD per 100 kg of wood-based raw charcoal. Bio-charcoal made from invasive plant species harmful to forest health is not differentiated from bio-charcoal produced from timber and as such is subject to the same royalties. Entrepreneurs have found a way to work around the issue of royalty, by including bio-charcoal-related activities in the Operational Plan of the CFUG, which needs approval from the District Forest Office. The issue of royalty exemption and a separate treatment to bio-charcoal produced from invasive species is being advocated by the recently constituted umbrella organisation of the bio-charcoal entrepreneurs, the Bioenergy Entrepreneurs' Association of Nepal (BEAN).

At policy level, the country's Biomass Energy Strategy (BES) of 2017 aims at environment and forest conservation through the productive use of biomass as a reliable source of energy in the country's energy mix, thereby reducing dependency on the imported fossil fuel and in the process creating local employment and income. With these developments, the sector is expected to enjoy a much more conducive environment in the future.

The bio-charcoal value chain in Nepal



There are two types of charcoal producers. Most of them are members of the community forest user group (CFUG). Some are individual entrepreneurs who have an agreement with the CFUG to collect the bio-waste and produce charcoal, and then subcontract the work. Payment is based on the quantity of charcoal produced. In both cases, the CFUG gets royalties.
The key market drivers are the business development service providers (BDSPs). As charcoal processors, they have a direct interest in the quantity of raw charcoal to meet their market demand. Therefore, they proactively invest in formulating and capacitating charcoal production groups, pre-financing their kiln, and guaranteeing the buyback of the charcoal produced. This has proved to be the key stimulus for the growth of the sector.

"We used to go to Simla, a north Indian mountain city, to earn money in apple orchards. We could make 100 to 120 US dollars per month, although it was not easy work. A risk of falling from trees while spraying pesticides or plucking apples was always there, one could break one's limbs. Besides, travel would cost 50 US dollars. Now, we have this alternative. We make 200 to 250 US dollars per month for about eight months a year. And what is best is that we are close to our home, just a district away."

Photo: Niraj Acharya

Gam Bahadur Darlami (left) and Nain Singh Khandalukh (right), both from Nawalparasi District, together with another charcoal producer using the improved kiln.

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THE SILENT SHEEP REVOLUTION

With the support of diligent sheep farmers, the selective breeding policy of the government in Himalayan Kashmir in northern India is swiftly moving the region towards self-sufficiency in mutton production. This also offers opportunities for unemployed youth.

By Athar Parvaiz

Meat plays a key role in the food patterns of the majority of the over seven million people living in the Kashmir Himalayas. In cities and towns, people mostly eat mutton, while in rural areas people prefer beef. Mutton is considered as all-season food in Kashmir and is also massively used for *Wazwan*, a multi-course meal with a myriad of meat-based dishes eaten during weddings and other functions. The region has traditionally imported mutton from Indian states like Rajasthan and Punjab. But, Kashmir government's policy of improving mutton production through selective breeding is gradually changing this scenario. The new breed called "Kashmir Merino" which is making it possible is being completely documented for its registration as a separate breed.

From May to October the herders migrate their livestock from lower parts of Kashmir for grazing in the highland pastures.

Photo: Athar Parvaiz

HEADING FOR 75 PER CENT SELF-SUFFICIENCY BY 2029

Geographically, Kashmir valley is a temperate zone lying in between the outer and inner range of Western Himalayas. The region's peculiar geographical location and seasonal conditions offer the best environment for sheep rearing. From the total livestock population of 9.2 million in the region, 3.4 million comprises the sheep population as per the 19th livestock census – the latest one available – carried out in 2012. The average size of a progressive sheep farmer in Kashmir is 150-200 animals. But Kashmir's Sheep Husbandry Department is still not satisfied with the status quo. "Currently, we are only producing 13.3 million kilograms, which is 40 per cent of our total annual mutton consumption of 31 million kilograms, locally. Considering the fact that our people are voracious meat eaters, we have to make efforts to achieve self-sufficiency," says Sheep Husbandry Department Director Abdul Salam Mir. Seventy-five per cent of local mutton consumption is to be produced locally by 2029.

In the past four years, the government has provided sheep to some 5,000 farmers to help them set up sheep farms. Besides, it has been offering health support for the livestock of thousands of other farmers. Recently, the government sanctioned 130 million rupees (1.95 million US dollars) for creating more sheep breeding farms for the livestock imports (for breeding) and establishing 35 more veterinary clinics for sheep at various locations across the state.

IMPROVING THE FEED BASE

In summers, alpine pastures known as *Bahaks* or *Margs* are the natural habitats of sheep. The herders migrate their livestock from lower parts of Kashmir for grazing from May to October to these highland pastures, which are situated in the upper reaches of the forests and are controlled by the state government. Over the years, some of these pastures have been facing issues of degradation due to continuous and indiscriminate grazing and extinction of superior grasses and legumes. Government officials say that they are in the process of addressing these problems in order to improve the quality of the grazing areas. "We have sought a special financial package for the development of these pastures," says Mir. The package is being used to finance the implementation of several programmes, such as the aerial fertilisation of pastures (or manual fertilisation at isolated places where aerial spraying is not possible), eradicating toxic and obnoxious weeds, reseeding clover and other fodder crops or planting fodder trees.

According to Mir, pastureland in plains is shrinking because of growing urbanisation and population growth. "That is why we are now going for the vertical growth of sheep livestock, which means we will increase the meat production capacity of Kashmir Merino," Mir notes. "For example, if an individual so far used to have the carcass weight of 14 kg, we will take it to 18-20 kg." His department is importing livestock from Australia, New Zealand and Texas (US) to infuse new blood into the stock of Kashmir Merino. The focus is not only on meat. "While we want to improve mutton production, we can't afford to lose the wool parameter which we have already

achieved. That is why we are importing dual-purpose Merino. This can help us improve meat production as well as wool quality," Mir explains. "Presently, Kashmir Merino produce wool which has a thickness of 21 microns. But we want to make it even finer," he says.

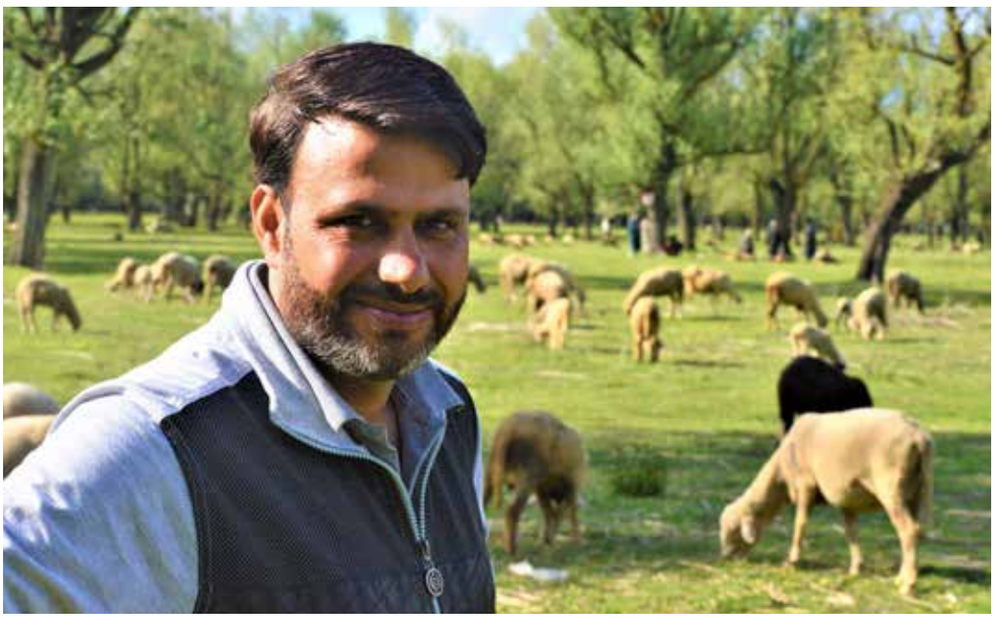
KASHMIR MERINO – THE PERFECT DUAL-PURPOSE BREED

Over the past many years, the Department of Sheep Husbandry in Kashmir has established eight sheep breeding farms at different locations for undertaking cross breeding and other research programmes along scientific lines. Rams are being produced in these farms for serving the flocks of sheep farmers in upgrading. According to Department of Animal Husbandry officials, about 29,000 breeding rams produced in its farms have been distributed for crossbreeding in private flocks. The farmers can use the rams – and three ewes which each of them is also provided with – free of charge for a period of three years. Then the animals have to be returned – also to avoid inbreeding.

As part of the cross-breeding programme, Kashmir valley ewes were crossed with Australian Merino rams, and F1 (first generation hybrid) ewes were bred to Delaine rams of the USA. And then F2 (second generation) hybrids were bred among themselves after proper selection on the basis of wool quality and body weight. The matting among F2 generation continued till a breed with steady and uniform characters evolved which was named as Kashmir Merino.

In addition, in order to establish a vital link between the department and the farmers, 549 sheep extension centres were opened across the length and breadth of the region. Other technical programmes include castrations, lamb markings, docking, health cover, mechanical shearing and education of farmers about scientific farming practices. Sheep husbandry offices are run in each district of Kashmir to offer farmers advice. In 2018, 1,343 farmers joined the sheep development programme with the help of the Sheep Husbandry Department.

"The quality of sheep which we had before the 1990s used to be low on both meat and wool. But since we started the cross-breeding programme to get Kashmir Merino, both these issues have been resolved," says Imran Nazir, a health officer at the Sheep Husbandry Department, adding that Kashmir Merino is far more productive than original local breeds, both in terms of mutton and of wool.



Farmers like Hilal Ahmad Yatoo are important multipliers for the breeding programme of the Kashmiri government.

Photo: Athar Parvaiz

COOPERATIVE FARMERS ENSURE QUALITY CONTROL

Enthusiastic sheep farmers in the region have been of great help in spreading the quality sheep germplasm and improving mutton production in the region. Thirty-seven-year-old Hilal Ahmad Yatoo of north Kashmir's Chandarhama village is one of these farmers. Yatoo owns a flock of 130 Kashmir Merino. What has particularly made him a name in sheep farming is the way he maintains the quality sheep germplasm. He is the leading supplier of breeding rams among farmers in the region.

"We take a lot of care while choosing which ewe should breed with which ram. Much thinking goes into it and also into avoiding inbreeding," Yatoo says, adding that he uses colour-markers. "We also separate the couples when we get the feeling that a certain ewe is ready for breeding." When Yatoo sends his flock to the pastures in Gurez-Bandipora District for three months for summer grazing, he pays extra money to the herder to ensure that his livestock doesn't get mixed with that of others and gives him instructions by marking animals with colour-codes for breeding. So, not surprisingly, his breeding rams fetch him good prices with some of them selling at between 50,000 rupees (USD 757) and 100,000 rupees (USD 1,514).

The young farmer sells around 20 to 30 sheep, including both ewes and breeding rams, each year. Early this year, Yatoo says, he and three other farmers sold 56 sheep to the Faculty of Veterinary Sciences and Animal Husbandry of Sher-e-Kashmir University of Agricultural Sciences and Technology (SKUAST) for its sheep farm. And Yatoo's work was acknowledged at national level when he was conferred the Innovative Farmer Award by the Indian Council of Agricultural Research (ICAR). Yatoo's passion for quality sheep farming is also reflected in the housing management he has opted for his flock. The barn where he keeps his sheep differs considerably from the average Kashmir barn. Yatoo and his younger brother, Showkat, have made use of the Internet for downloading designs of wooden mangers from which the sheep eat. Also thanks to the Internet, they designed the floor in a manner allowing the waste to pass through small gaps and get accumulated in large trays which are removed periodically. This keeps his sheep from soiling their bodies with their waste.

As the government and private job sector offer hardly any employment opportunities, in recent years, educated youth have started getting increasingly involved in sheep production. Some 2,500 youth are currently involved in sheep rearing and are in touch with the Sheep Husbandry Department and the Faculty of Veterinary Sciences and Animal Husbandry wing of the SKUAST to obtain help and guidance.

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