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SMART farming



#122



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ISO focus

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Director of Marketing, Communication and Web | **Nicolas Fleury**

Head of Communication | **Katie Bird**

Editor-in-Chief | **Elizabeth Gasiorowski-Denis**

Editors | **Maria Lazarte, Barnaby Lewis, Clare Naden, Sandrine Tranchard**

Copy editor and Proofreader | **Vivienne Rojas**

Designers | **Xela Damond, Pierre Granier, Alexane Rosa**

Translator | **Alexandra Florent**

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Photo: FAO/Ami Vitale – Kenya livestock



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Thank you to the ISO Treasurer
ISO Central Secretariat announces new Secretary-General
BSJ sheds its regulatory role



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Standards for sustainable agriculture

Agriculture plays a crucial role in the life of an economy, including Kenya's. Here is why the country is looking to ISO standards for its new and sustainable path.

Agriculture has always been, and is likely to remain for some time, an important component of the global economy. To get the most out of the sector, each country/player in the supply chain has to apply good practices, which ultimately contribute to food safety and quality. Farmers apply Good Agricultural Practices (GAP), sellers of commodities/raw materials apply Good Distribution Practices (GDP), and manufacturers apply Good Manufacturing Practices (GMP). And what about ISO standards?

Over the last few decades, ISO standards have moved from being an organization's "justification" to becoming a strategic tool for accessing and conquering global markets. In

fact, standards have morphed into a powerful mechanism to lead positive change by sharing best practice that can revitalize the agricultural sector, create effective (and efficient) business environments, spur economic growth and drive a country's development agenda. This is the reason why ISO standards have become critical in the transfer of technical know-how.

It is said a country or a region that cannot feed itself, cannot have self-pride. As with the economies of most countries in Africa, agriculture is the backbone of Kenya's economy. It is paramount that we create a more competitive and productive agricultural sector and increase food security, not only for Kenyans but for all of Africa.

To many, entering a sustainable development path for agriculture and food seems like a daunting challenge. We believe that it is feasible. It will require the effective use of soil, water, air, energy, and other natural resources, without compromising the ability of future generations to meet their own needs.

The common saying that "the world runs on standards" buttresses the importance of standards in the economic development of any country. For instance, the European Union (EU) is one of Kenya's biggest trading partners, with exports ranging from agricultural commodities such as vegetables and flowers to fish and beef cuts. In 2015, Kenyan exports to the EU accounted for USD 1.26 billion.

With such a sizeable market, producers must incorporate technology that supports sustainable agriculture and, at the same time, protects the environment and consumers. Herein lies the role of standards. They are of particular importance when ensuring that all shipments of food exports – fresh fruits, vegetables and nuts – meet stringent food safety requirements (i.e. the European Union Directives).

In an effort to balance the beneficial role of state-of-the-art technologies with the potential costs to farmers, consumers and the environment, standards for the agricultural sector are needed. These standards provide best-practice guidelines for new technology, machinery and the related processes across the supply chain, as well as the path towards sustainable agriculture.

The Kenya Bureau of Standards (KEBS) has supported the agricultural sector by developing standards and establishing valuable collaborations and linkages with the relevant stakeholders. So far, our collaborations with the Kenya Flower Council, Fresh Produce Exporters Association of Kenya and European Union Standards and Market Access Programme (SMAP) have resulted in notable progress. These collaborations have borne fruit with improved quality and greater appreciation of Kenyan products in export markets.

In Africa, we must not be just takers of standards but strategic contributors in the development and use of ISO standards. This year, we are proud to celebrate ISO's 70th anniversary and its many milestones, including the contributions made by Kenya. It is worth noting that a Kenyan standard was the basis of the first ISO standard for tea! So let's celebrate together as the ISO family – a community that continues to incorporate input from countries all over the world and develops standards that are relevant to all our economies. ■



Charles Ongwae, Managing Director, Kenya Bureau of Standards (KEBS).

Standards have morphed into a powerful mechanism to lead positive change.

ISO turns 70!



First conference in London, United Kingdom, in 1946.



ISO birthday cake at the ISO/CS in Geneva, Switzerland.



Servicio Ecuatoriano de Normalización (INEN).



Österreichisches Normungsinstitut (ASI).



Asociación Española de Normalización (UNE).



Associação Brasileira de Normas Técnicas (ABNT).



Standards Australia (SA) and Badan Standardisasi Nasional (National Standardization Agency of Indonesia, BSN).

Our story began in 1946. After the Second World War that brought devastation in its wake, delegates from 25 countries gathered in London to discuss the future of standardization in a spirit of peace and common well-being. ISO officially came into existence a year later on 23 February 1947, and we are still here today.

We have come a long way since then. Our work has played a central role in stimulating world trade, setting a culture of quality and allowing companies to specialize and compete globally thanks to interoperability – and all while keeping consumers safe. Everywhere you look, there are ISO standards, but this is just the beginning. The demand for standards is increasing and our mandate is growing to cover the new challenges the world is facing today. To celebrate, ISO is running a year-long social media campaign (#ISO70years). As a way of thanking our members for the vital contribution they make to ISO, we will be sharing their photos and messages expressing what it means to be part of ISO on social media. We will also be talking about the impact that the work of ISO technical committees has made on the world. Anniversaries are also great opportunities to take a trip down memory lane, so we will be sharing flashbacks from our history every Thursday (#throwbackthursday/#tbt) throughout the year.

The **FUTURE** of farming

by Elizabeth Gasiorowski-Denis

The challenge of how we'll feed the exploding world population in the future – in a sustainable, cost-effective and environmentally friendly way – is seeding an agricultural revolution. Welcome to farming of the future: a hi-tech, capital-intensive system of growing food sustainably and cleanly for the masses.

Here are the facts. Each second, the world's population grows by nearly three more people, that is 240 000 people a day. By 2025, the global population will reach 8 billion people and 9.6 billion by 2050, according to the Food and Agriculture Organization (FAO). This means there will be an extra billion mouths to feed within the next decade. And in just one generation, there will be more people additionally on the planet than there were at the beginning of the 20th century. Sounds improbable? Well, guess again.

With many of the resources needed for sustainable food security already stretched, the challenges are huge. At the same time, climate change is already negatively impacting agricultural production globally and locally. Farms must increase production of food while preserving the environment, but they can't do it alone and they can't do it using today's traditional farming practices.

Subsistence farming in poorer countries is still a labour-intensive, low-reward industry, at the mercy of unexpected environmental changes, economic downturns and many other risk factors. And while mechanized agriculture in the developed world has considerably increased output per unit of land, more is required to sustainably meet the food demands of tomorrow. Happily, though, the Internet of Things (IoT) – essentially the art of connecting and integrating objects, people, information and systems for intelligent production and services – is now set to push the future of farming to the next level.

ISOfocus asked industry experts for their perspectives on these issues and what needs to be done to meet the ever-growing food demands in a sustainable way – and how ISO standards can help.



Feeding the world

Tom Heilandt, Secretary of the CODEX Alimentarius Commission – responsible for setting international food safety and quality standards and one of two standards-setting bodies under the aegis of FAO – sums it up in a nutshell: “Agriculture exists first to feed people and has done so for thousands of years, and it will have to continue doing the same for hopefully many more.” Not surprisingly, he claims the biggest challenge is always going to be producing safe, good-quality, nutritious and affordable food for a growing population.

The agriculture sector needs to be primed to feed the world, Heilandt says. “For me, the most striking and important crisis is the missing common understanding that the agricultural and food sector is not a business like any other and that we need a long-term vision for agriculture.”

While the industry is more pressed than ever to meet the increasing demand for food, environmental concerns now bring a whole new set of challenges that make the task even more daunting. Climate risks to cropping, livestock and

fisheries are expected to soar in coming decades, particularly in low-income countries where adaptive capacity is weaker. A solution proposed by FAO is for the agriculture industry to become “climate smart”.

Climate-smart agriculture, as defined and presented by FAO at the Hague Conference on Agriculture, Food Security and Climate Change in 2010, is an approach to developing the technical, policy and investment conditions to achieve sustainable agricultural development for food security under climate change.

With increasing pressure to expand production and protect our environment, high-tech farming technologies could play a crucial role, Heilandt says. Furthermore, he adds, “standards are essential in any production system including agriculture. Without using standards and best practices, there can be no progress and creativity.”

Dawn of hi-tech farming

Of course, any conversation on smart farming has to include the manufacturers. And many

companies around the world have stepped up their efforts to speed up IoT use in agriculture. AGCO, a worldwide manufacturer and distributor of agricultural equipment and infrastructure, is one such company.

A few years ago, AGCO unveiled a new global strategy to deal with every aspect of precision farming technology, an approach to farm management that uses information technology (IT) to ensure the crops and soil receive exactly what they need for optimum health and productivity. The new agri-tech strategy, dubbed Fuse Technologies, integrates telematics, data management systems and auto-guidance solutions that, together, have the potential to make farming much more productive and profitable.

Precision farming technologies have a long history at AGCO, says Dr Bernhard Schmitz, Commercial Manager of Fuse Technologies for the company. He believes that farmers will need to turn to new technologies to meet the growing demand for food production in the world. “All our precision farming technologies help our customers to become more efficient and save resources,” he says.

Farmers have already begun employing some high-tech farming techniques and technologies in order to improve the efficiency of their day-to-day work. Schmitz highlights how smart farm technologies can decrease the fuel consumption per hectare, reduce overlap, resulting in less input usage of fertilizer or crop protection products, and allow farmers to invest their inputs where they provide the biggest impact. But where do standards fit into the mix?

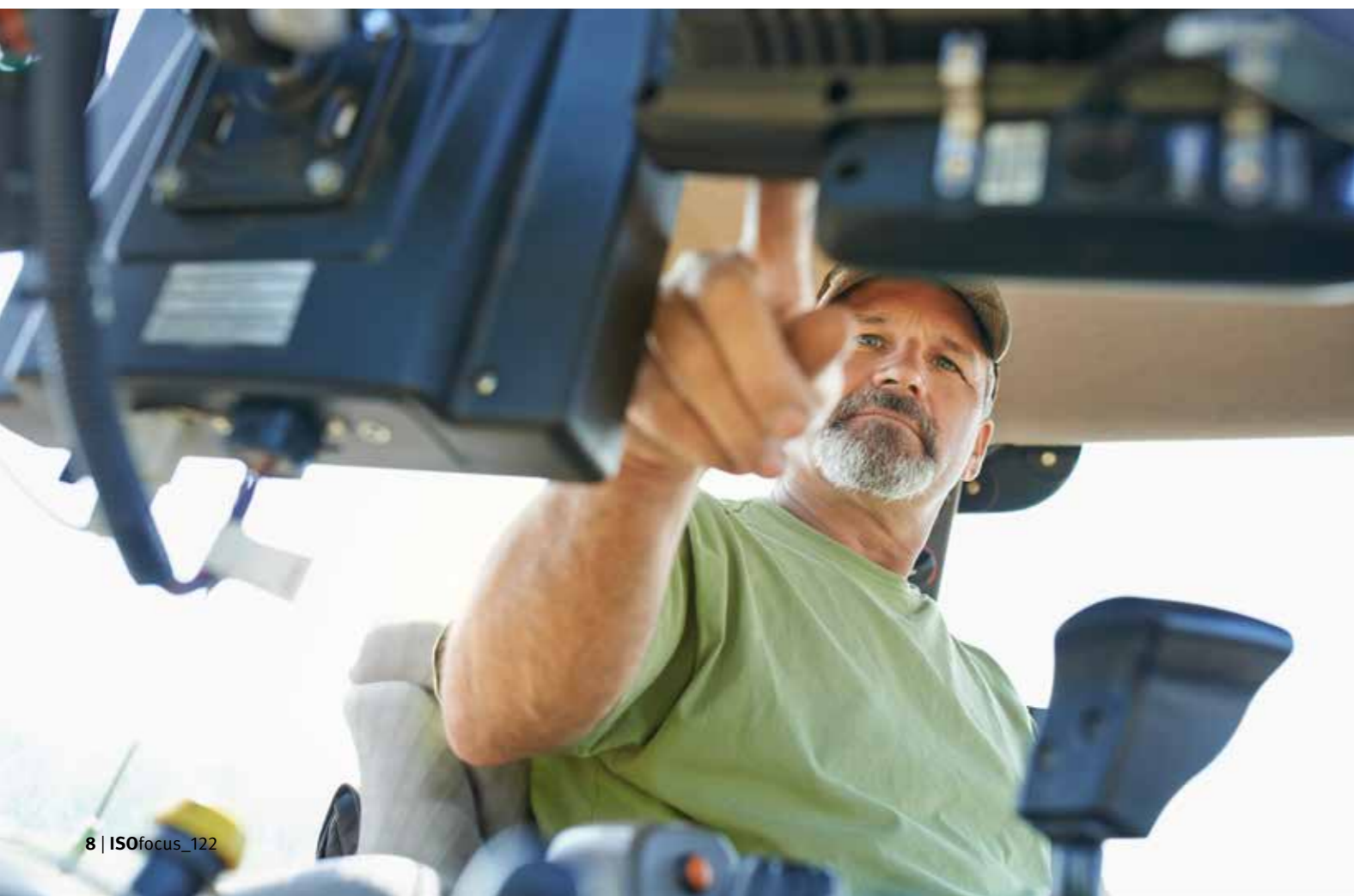
“We, as AGCO, are fully committed to International Standards,” says Schmitz, referring to the importance of standards to AGCO’s overall company strategy. That’s why AGCO participates in the development of ISO standards and uses them in its own technologies. “The ISOBUS standard (ISO 11783) allows our customers to connect devices of different equipment manufacturers to ‘talk’ to each other,” explains Schmitz speaking of the data transfer between tractors.

Precision pays

A recent report entitled “Towards Smart Farming: Agriculture Embracing the IoT Vision”, by technology market consultancy Beecham Research, has suggested that IoT technology will have a crucial role to play in helping to meet the food demands of a growing global population. The report focuses on the opportunities provided by precision farming and the importance of developing “smart” connectivity to enable it.



Companies
around the world
have stepped up
their efforts to
speed up IoT use.



WHAT YOU CAN DO WITH IOT IN AGRICULTURE



The big benefit, says Hermann Buitkamp, Secretary of ISO technical committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, subcommittee SC 19, *Agricultural electronics*, will be the various interesting aspects that IoT can bring about in agriculture.

For example, sensors placed in fields allow farmers to obtain detailed maps of both the topography and resources in the area, as well as variables such as acidity and temperature of the soil. They can also access climate forecasts to predict weather patterns in the coming days and weeks.

“IoT will play a very important role for future farming and will enable farmers to be much more precise, with centimetre-level accuracies,” says Buitkamp. “Thus, the old scattergun approach is definitely a thing of the past.” The benefits resulting from this are tremendous – both in an economic and ecological sense.

As we dream about all the exciting possibilities that IoT will bring to agriculture, our curiosity is piqued as to where standards for the technology can possibly fit into the equation? Well, there is an immense complexity that comes with bringing together a bunch of different types of technology. According to Buitkamp, that complexity remains one of the main stumbling blocks of technology adoption, but not one that can’t be overcome. “There are technical issues we have to fulfil along the path to success,” he explains. “We have to improve the wireless in-field communication, functional safety and repair and maintenance information in order to realize unified interfaces.”

Seeing is believing

The breadth and complexity of modern farm technologies can be a minefield, but it can be even more difficult to sort through effectively when related to IoT. Dr François Coallier, who has been involved in IT standardization for a number of years, is now leading the group of experts responsible for IoT within ISO/IEC JTC 1, the technical committee on information technology that ISO leads jointly with the International Electrotechnical Commission.

For him, it all boils down to managing complexities and increasing efficiencies. “Agriculture is, in many countries, already complex, especially if we include the supply chain. For instance, it is well known that half the world would starve if all international shipping came to a halt,” he says. This is where ISO/IEC JTC 1’s subcommittee SC 41 on IoT and related technologies comes into play.

While the new subcommittee has just been created, its group of experts can draw on the substantive work of two existing working groups that have paved the way

for standards in this field. Coallier predicts that IoT, big data and other technologies that are sometime referred to as “smart ICT” are soon going to be in high demand. “Agriculture is a very important endeavour in our society,” he says. Thus the importance of IoT contributions in this sector.

One of the projects of SC 41 will give rise in the short term to a standard IoT reference framework. This framework will, among other things, encourage openness and transparency in the development of IoT system architectures and in their implementation. It will also provide a technology-neutral reference point to define further standards in IoT.

No doubt the development of International Standards in this maze of complexities will facilitate interoperability and systems integration, giving companies the ability to leverage this technology more efficiently and integrate it in many application areas such as agriculture. For Coallier, the subcommittee’s work will be crucial. “In the long term, as a systems committee, SC 41 should be one of the key players in enabling the elaboration of the IoT standards required by this technology to reach its full market and application potential,” he says.

A smart future

Producing good-quality, nutritious and affordable food in a world of 7.5 billion people is always going to be a huge challenge. And in a world of limited resources, a new hi-tech era will need to be ushered in where automation and data can help farmers address the many challenges of the future.

So what will farming look like in 40 years? Linking so many technologies means that waste will be limited, productivity will be maximized and the environment will be affected as little as possible. Yet one thing is clear, success will demand an enduring focus on driving standards development to ensure that the strides we are making with technology will continue to deliver the productivity and environmental benefits we would like to see over the next couple of decades.

The advances of the mid to late 20th century that so dramatically changed the field of agriculture are beginning to wane. “With the limit of the Green Revolution being reached,” says Coallier, “we need to find ways to feed our growing world population in a sustainable way. One approach is to be more efficient in the use of resources (including people) in producing food, and also eliminate waste in the supply chain. Thus the interest in IoT.” Make no mistake, the future of farming is smart and it will feed tomorrow’s world. ■



Precision farming *takes off*

by Barnaby Lewis

Companies created quite a buzz this year with the announcement that their plans to use drones to deliver packages are becoming a reality. As the technology continues to evolve, the number of users of, and uses for, unmanned aircraft systems has risen to new heights. The need for an International Standard is clear, but what's the link with farming?

More than seven billion lives depend on humankind's unique ability to scratch into the shallow surface of our planet and grow plants. And though the crops are firmly rooted in the soil, the mysterious thing that makes it all work can only be grasped by looking to the skies.

Water and carbon dioxide are transformed by plants into sugar (and water), fuelled by the power of the sun. But ask the farmers who make their living from this miracle and their take on it is probably more down to earth: while sunshine and air for photosynthesis are free, labour, fuel, sprays and fertilizers comprise a substantial cost. Often, even water comes at a price, both

financially and environmentally. In order for farmers to stay in business and keep up with our burgeoning population (in fact, it has grown by about 50 people since you started reading this), we have to use these resources better, and that's where precision agriculture comes in.

The idea has been around since the 1980s, but current technology is making this a reality in ways that most of us couldn't have imagined back then. For the answers, we can look to the skies again. Or rather to Cortney Robinson, Secretary of technical committee ISO/TC 20's subcommittee SC 16, which standardizes unmanned aircraft systems (UAS), or drones as they're more commonly known.



The total number of US-registered aircraft surged to more than 750 000.

A pressing need

Robinson, Director of the Civil Aviation Infrastructure at the Aerospace Industries Association (AIA), is coordinating a group of experts to create an International Standard for drones – ISO 21384. The scope of their work is ambitious, with three parts covering general specifications, product systems and operational procedures, respectively. It's worth noting that Part 1 specifies general requirements for UAS for civil and commercial operations only; it does not cover state or military use, though governments are welcome to apply them. The general specifications of Part 2 give requirements for the design, manufacture and continued airworthiness of any UAS, which, as you'll see later, is a term that covers more than just the drone itself. ISO 21384-3 will specify the requirements for operational procedures. The time frame is demanding, with publication currently scheduled for 2018.

For industry insiders, an International Standard can't come soon enough. "The cost of unmanned aircraft has come down dramatically and that's contributed to an explosion in their popularity with both hobbyists and commercial operators," Robinson explains. This is clear to see from the register that the US Federal Aviation Administration (FAA) maintains for all flying vehicles. "Although voluntary for smaller drones, most enthusiasts choose to register their drone under the 'know before you fly' scheme, and the numbers have jumped dramatically. The total number of US-registered aircraft [manned and unmanned] surged from around 260 000 aircraft in 2015 to more than 750 000 UAS alone today."

Fears hovering low

Public concern around drones is growing at almost the same rate. Whether issues around privacy, vehicles operated by inexperienced users, or modified inappropriately (a number of terrifying examples can be found on YouTube), the current response in the USA is a mix of FAA regulations, industry guidelines and common sense. The AIA, as "the voice of American aerospace and defense", is leading an effort with the FAA to integrate UAS into the American National Airspace System.

The approach varies greatly by country, but in many, as Robinson explains, "a risk-limitation approach is



operated by classifying vehicles according to their size [total mass including payload], and the altitude at which they operate". This combination leads to a risk categorization where, for the top categories, operators are required to have the same level of competency as if they were sitting in the cockpit themselves.

When it comes to farming, unmanned flights can operate at a fairly low altitude (often, less than 120 m, which is a threshold ceiling in some jurisdictions), and all but the largest models are exempt from the need for specific licences on behalf of the operator. With many drones, particularly when it comes to mapping, in-flight behaviour is controlled by software.

More than the sum of its parts

In fact, remote operation and control through software are defining features of drones. To understand the difference between a UAS and a hobby flyer's scale model, we have to think past the craft itself. The airborne part of the system is either a fixed-wing craft, resembling a small aeroplane, or is powered by rotors, often four, commonly referred to as a "quad-copter". Other elements include the ground-control part, a "remote-pilot station" that could be a dedicated building, a laptop or even a smartphone. It plans where the drone should go, how it should react to maintain its course and what information it should collect. The drone and remote station work together thanks to the command-and-control links, the third and final part of the system, that maintain ground-to-air communications. These facets beyond the craft itself are also part of the work of ISO/TC 20/SC 16.

Flight patterns for agriculture typically use a number of overlapping passes up and down the rows of crops. Imagine a field of wheat in, say, Canada. In the prairie states that are so well suited to growing this cereal, a farm could be as large as 1000 ha (a field 2 km wide and 5 km long). On foot, it would take about four hours to cover just the perimeter, yet with the right set-up the whole area can be precisely mapped by drone in the same time.

Several things become clear. Drones can take accurate measurements much faster than a farmer can “walk the field”. At this scale, the quantity of inputs, and thus the potential savings, are enormous (this one hypothetical field could swallow 150 tonnes of nitrogen fertilizers each year). The growing conditions across such a large area are quite variable (some plants may have deep, moist soil whilst other patches will be stony and dry; unwanted insects or fungus could have established colonies in one area but not in another; some plants will be tall while some seeds will not even have sprouted...).

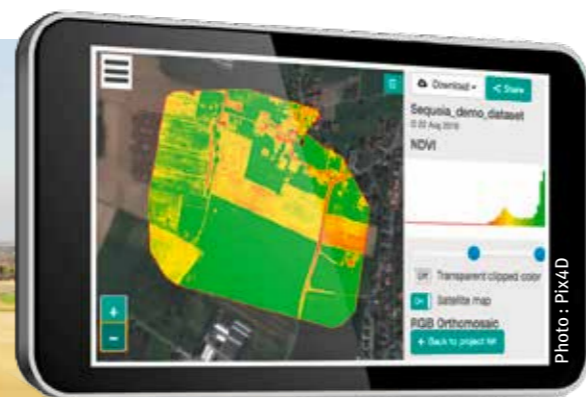
From pixels to bushels

If farmers could build a clear map containing all of this information, then they would potentially be able to spread fertilizer where the soil is poorest, irrigate only the driest spots and spray just the plants that need protection from pests. The potential to save money is huge, but more than this, healthier plants mean higher yields. It's a textbook win-win:

a money-saving, profit-boosting, tech-led way of farming that helps protect our environment while feeding the planet.

But how can such a map be created and, once it exists, how does a farmer translate this into action? One man who knows is Jorge Fernandez, an image processing expert and agriculture solution manager at software company Pix4D. The Switzerland-based outfit, created in Lausanne in 2011, develops cutting-edge software that converts images taken by drone into what Fernandez calls “survey grade, radiometrically and geometrically accurate 2D reflectance maps (the basis for the popular NDVI map) and orthomosaics, as well as 3D point clouds and surface models”.

There are many applications for their work, from real-estate and surveying to spectacular 3D models of Californian giant redwoods that give researchers a new perspective on the CO₂ absorbed by the world's oldest living plants. But for the plants that fuel human life, those that are generally sown, harvested and eaten each year, how does the software work? Fernandez explains: “There are basically three phases: first, data is captured in flight; then, the millions of points of data are interpreted and fitted together to create a map that accurately captures the reflectance of the plants, independently of weather conditions; finally, the farmer, or often a consultant agronomist, prescribes a remedy based on the index maps that have been generated.” This remedy generally specifies the level of input for each part of the field.



More than meets the eye

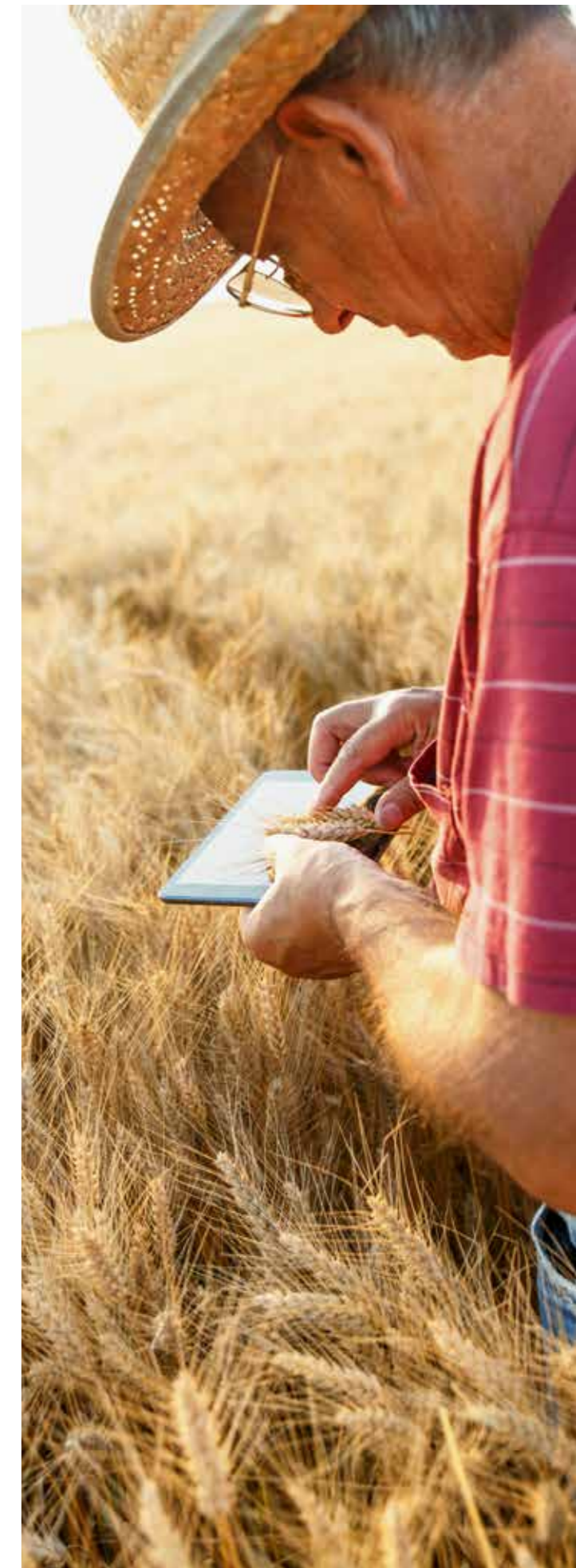
The important thing to note is that the drone is usually carrying something a little more sophisticated than a basic camera. “For farming, one of the most common options is to use a multispectral sensor. It's similar to a camera but has five separate lenses, each for a different colour of light.” Some of these wavelengths can't be detected by the human eye, yet are key for photosynthesis. So how does it work? Fernandez again: “Wavelengths outside of this range can tell us things such as whether a plant is stressed, or if it is affected by a pest even before the symptoms can be seen during inspection. The farmer can then go in for a closer look to identify the cause.”

One of the more common types of map is known as NDVI (Normalized Difference Vegetation Index), which shows up where bare spots in the field are that can't be seen with a regular photograph or from the ground. “It's a very reliable indicator for hydric stress,” Fernandez says, pointing out that engaging a professional, or even directly purchasing a drone system, is a worthwhile investment since “recurring patterns of stress can be identified, meaning that longer-term plans can be developed for problem spots, and farmers can get the most from their land year on year.”

All you need is less

As humankind continues to grow, so does pressure on resources and farmland. While future technology may offer us new ways to further increase our productivity, it seems unlikely that we'll see anything like the fourfold increase in yield that the early 20th century saw with the invention of the Haber-Bosch process and synthetic fertilizers. But considering that the process takes the equivalent energy of one litre of fuel-oil to turn nitrogen in the air into just one kilogramme of fertilizer, it seems that the answer is perhaps to do with using less in the first place.

Taking advantage of the very latest technology in crop protection and nutrition, using water more sustainably, and basing agronomic plans on hard data, sounds like a formula for success. The latest generation of unmanned aircraft is bringing that possibility to increasingly large numbers of farmers, including in developing countries. As their use spreads wider, bringing rural populations into contact with drones, an International Standard is urgently needed to keep operators and bystanders safe, and to get the most from the technology. Fortunately ISO/TC 20/SC 16 is on the case. ■





How **JOHN DEERE** makes farming more precise



After using automated vehicle technology for over 15 years, farm equipment supplier John Deere is now going further, with its sights set on efficiency and sustainability. Here, we talk with one of the company's standards experts about technology trends as well as the highlights and opportunities for smart farming.

Bringing solutions to growers is what tractor and farm equipment manufacturer John Deere has been doing since the self-scouring plow, but things look a lot different today. The company now has a wide and diverse variety of products that are equipped with advanced tools that make agricultural machinery (ag machinery for short) more productive and farmers more profitable. What's more, the company is now able to derive more value by enabling farmers to grow more and use their machinery more efficiently.

From tractors, harvesters, combines and the countless kinds of farm implements that they tow and operate, to lawn and construction equipment, John Deere will continue to expand its product line and bring new solutions to customers all over the world. We caught up with Eric Smith, Strategic Standards Engineering at John Deere, to hear more about today's trends and where the ag machinery company is focusing its efforts when it comes to agtech innovation – and its push for standards.

ISOfocus: For farmers, agriculture isn't just an industry – it's a way of life. How is John Deere charting a sustainable future for agriculture production?

Eric Smith: John Deere products and solutions are designed for efficiency and productivity. By putting science to work, we can offer machines

that not only are productive and efficient, but reflect our commitment to environmental stewardship. John Deere equipment and solutions enable advances in agricultural practices that promote sustainability, including precision guidance and variable rate applications for planting and spraying. These and other technology solutions reduce demand for resources, lower fuel consumption, reduce operating costs and improve productivity.

What, in your opinion, are the challenges faced by farmers, particularly small farmers, in achieving sustainable agriculture? And what key actions need to be taken to address this issue?

The greatest challenge in the future will be feeding the world with fewer resources. There will be less land for crops as farmland is lost to urban development each year and less available water as farmers compete with residential and industrial demands. There will also be a lack of skilled labour, especially in rural areas, forcing small-holder farmers to buy tractors instead of hiring people. By truly understanding our customers' needs and incorporating innovative technology in our products, we are able to offer machines that are not only safer, more productive and more efficient, but also cost less to operate and have less impact on the environment.

For example, by using GPS (Global Positioning System), we can increase machine efficiency and productivity in many operations. Besides helping to steer equipment, our precision GPS technology helps control equipment functions, from field preparation through harvest. Seeding equipment can use GPS to control where to seed, helping to prevent wasteful overlap or planting through waterways. Machines that apply crop protection products and fertilizers use GPS with other machine intelligence technology as well. That leads to a more precise application of crop care products. Less waste, less environmental impact.

ISO's portfolio of International Standards contains everything from food safety to renewable energy. Can you explain how ISO standards could bring added value to governments and business, especially to a company such as John Deere?

ISO standards set the language for commonality. Developed by global experts, these standards are high value to all stakeholders. Robust ISO standards allow governments to avoid duplicating the work individually within their countries. Governments can reference an International Standard rather than developing their own laws and regulations.

For a company like John Deere, the value of International Standards lies in the fact that they set common market expectations. When I was a design engineer, I had to carefully read individual country laws, regulations and standards to determine if the differences were technical or simply a question of terminology. When a country uses an ISO standard in its requirements, I feel more confident



Photo: John Deere



ISO standards
set the language
for commonality.

that features available for one market can be used in other markets.

John Deere's environmental stewardship and citizenship efforts are highlighted in the 2016 Business Roundtable Sustainability Report. What is the role of standards in the successful dissemination of innovation and good environmental practices?

Using life-cycle assessment, John Deere carefully examines every stage of a product's life cycle, looking for ways to reduce the environmental footprint while improving its performance and durability. We follow ISO 14040, *Environmental management – Life-cycle assessment – Principles and framework*, to complete these assessments.

Good safety practices save lives and prevent injuries. Can you highlight how John Deere is

working toward this end? What benefits do you see here in terms of ISO standards?

John Deere is committed to designing and building safe products and has shared safeguarding innovations developed internally, such as roll-over protective structures (ROPS) for tractors, so that others can benefit from these developments. We also support the development of voluntary International Standards through technical committees such as ISO/TC 23, *Tractors and machinery for agriculture and forestry*, subcommittee SC 2, *Common tests*, where input from persons with diverse experiences contribute to the standard. Such standards are used around the world to design and produce safe and effective equipment. Their widespread adoption can allow for more efficient design, testing and manufacturing to ensure farmers have access to safer machinery wherever they till the land. ■



Putting waste **to good use**

by Maria Lazarte

Wastewater irrigation is an economical and high-in-nutrients option for even the poorest farmers. But, if untreated, the consequences for our health and the environment can be catastrophic. Discover the techniques that could transform agriculture as we know it, offering perhaps the most sustainable and efficient use of resources available today.

It's not uncommon to see a Rwandan farmer at work tilling the land by hoe. Motorized engines are only slowly starting to be introduced into the country. The small parcels growing bananas, maize, sweet potatoes or even cassava roots that dominate the agricultural landscape belong to smallholders living off their land. In Rwanda, like many other developing countries, most of the produce is consumed domestically, but the country has high hopes for the future. An ambitious government initiative to reform the agriculture sector, known as Vision 2020, is leading the way for change. But to be successful, it must first address the water challenge.

For centuries, water has been the deciding factor between plentiful food and hunger or starvation. Irrigation emerged as a way for humanity to take control over the elements, reducing risk and increasing efficiency. Today, a staggering 70% of the world's freshwater resources are used in agriculture, with irrigation taking the largest share. Yet, surprisingly, only 20% of farmlands are irrigated. These, however, supply 40% of the world's food – a testament to the groundbreaking impact of irrigation. On a more somber note, these figures are also a stark reminder of the insecurity that still pervades the sector.

Managing scarce resources

By 2050, when the population reaches nine billion, we will need to produce 60% more to feed everyone, according to the Food and Agriculture Organization (FAO). To grow more, we need to irrigate more, but the Organisation for Economic Cooperation and Development (OECD) tells us that, by then, the strain on our water resources will have increased by an astounding 55%.

Although there is enough water to meet this demand, overconsumption and the consequences of climate change can lead to water scarcity, land degradation and food shortage, especially in the least developed regions. Empowering farmers to better manage water is vital. If not, the poorest will suffer. Something needs to change and waste could hold the answer.

The great majority of effluents and wastewater flow back into nature without being treated or reused, which pollutes the environment. One of the targets of the United Nations Sustainable Development Goals (SDG 6) is to halve the proportion of untreated wastewater and increase recycling and safe reuse – the theme of this year's World Water Day. And what better way to use it than in one of the most water-demanding sectors: agriculture.



A stormwater drainage project in a flood-prone valley in the north-west volcanic region of Rwanda.

Today, 70% of the world's water resources are used in agriculture.

Water technology solutions

Wastewater ticks both the sustainability and efficiency boxes, but it's not an innovative breakthrough. The truth is that for many rural communities, especially in developing countries, sewage and wastewater are often the only source of water for irrigation. Even when other options are available, small farmers value its high nutrient content, which lowers or even removes the need for costly fertilizers. This practice has become essential to the livelihoods of many poor people in Asia, Latin America and Africa, including Rwanda. But there is a darker side. If wastewater is not treated before reuse, it can contaminate the crops, surrounding land and water supplies. The health risk to farmers, nearby communities and consumers could be catastrophic.

“Luckily, today we have the technology to remove almost all contaminants from wastewater so that it's safe for use,” says Naty Barak, Chair of the ISO technical committee on water reuse (ISO/TC 282). “But this must be done according to strict and clear guidelines, so standards are essential.”

To respond to this need, ISO has developed ISO 16075 on the safe use of treated wastewater for irrigation. The four-part standard covers issues like design, materials, construction, performance and monitoring to help farmers put in place treated wastewater projects.

“ISO 16075 was designed with farmers in mind,” explains Barak. “For example, here you will find

answers to practical questions around water quality, the types of crops that can be irrigated, risks you should be aware of and the necessary main components like pipeline networks and reservoirs, and much more. The standard will help you make the most of this nutrient-rich resource, while improving yours and your workers' safety and keeping pathogens at bay.”

Wastewater management

Rwanda is just one of many countries for which untreated water is a problem. The country lacks technology for water retention. Its landscape is mountainous, which means that flooding and soil erosion are common. Together with increased urbanization, these factors contribute to the pollution of rivers and other water resources.

“We have a lot to gain from ISO 16075,” says Raymond Murenzi, Director General of the Rwandan Standards Board (RSB), the ISO member for the country. “Since 2011, RSB has been approached by small and medium-sized businesses asking us for guidance on wastewater irrigation. They want to know how to keep the environment and workers safe, but also about practical issues like the type of crops that can take reused water or maintenance instructions for irrigation systems. This is exactly the type of answers they will find in ISO 16075, therefore today we are seriously investigating the application of this standard in our country.”





For Murenzi, use of ISO 16075 will support the country's vision for locally produced crops to conform to good international practice. "The standard will help us increase our exports, create more jobs and keep our own people and environment safe. And the benefits don't just apply to agriculture. Wastewater can also be used for landscape areas and gardens, and even industry. It's a huge win for the country, but also for the region. We think that other African countries will benefit from our experience."

For developing countries like Rwanda, International Standards are a powerful way of making best practice and solutions accessible to everyone. But the story doesn't end here. If you are now convinced that wastewater is an efficient and sustainable option, keep reading because it gets better.

Not all created equal

When it comes to irrigation, there are many techniques available. Today, 80% of irrigation is done by flooding. This method is one of the oldest in humanity's arsenal, but also one of the most wasteful. It involves taking water to a field by ditch or pipe so that it flows over the ground and down to the crop. In some cases, as much as half of the water may be lost to evaporation and runoff. Its attractiveness is that it is widely considered a cheap and low-tech

option, though, in the long-term, it is neither efficient nor sustainable.

"Flood irrigation depletes and contaminates aquifers, uses an excessive amount of chemicals and increases the release of greenhouse gas emissions, which contributes to climate change. It's also not the best solution when it comes to wastewater reuse, because of the bigger chance of contamination as it's spread widely on the land," says Barak.

Unlike flooding, drip irrigation targets the plant and not the soil. The technique uses drippers or emitters to slowly release water packed with nutrients in a steady and uniform flow directly to the roots, one drop at a time. "It makes sense," says Barak, "you avoid overwatering, make the most of your resources and save on fertilizers."

The power couple

According to Barak, Israel has been working on drip irrigation for about 50 years as farmers were struggling to grow crops in the desert. It was the most efficient way to produce more with less and has since been successfully tried and tested with open-field crops, orchards, vineyards and many other farmland areas.

"There is a misconception that drip irrigation is expensive. It can be done with very simple technology, just like it can

be done with very complex machinery. So it's an option that is open to all, but not everyone knows this, and this has been perhaps the biggest barrier to its adoption all these years," explains Barak.

Now picture drip irrigation paired with treated wastewater – it's a power couple. In Israel, treated water is used for about 50% of irrigation, according to the OECD. Both techniques were meant for each other.

Smallholder farmers in rural areas in the developing world have the most to gain from drip irrigation, but a lack of awareness, knowledge and technology are putting up barriers to its adoption. These are exactly the types of issues that standards can help with. Standardizing technology also makes it more accessible and competitive, which reduces cost. ISO has taken a first step with a recently published International Workshop Agreement (IWA) on drip irrigation. For Barak, this IWA will empower more people to understand its potential.

Wastewater reuse and drip irrigation are solid steps in the right direction towards a more sustainable approach to agriculture. "Together, they can help resolve food security, water scarcity, energy cost and depletion of arable land, and even contribute to poverty alleviation, gender equality and urbanization," says Barak.

Building a sustainable solution

The message hasn't been lost in Rwanda. Since the launch of Vision 2020, the country has been putting an emphasis on standards in addition to policies, laws and other strategic initiatives to promote "Made in Rwanda" products. In 2013 the government made 281 standards compulsory, of which 127 are for food and agriculture. "We want to create a solid standardization culture in our country to boost exports of local products. For example, we believe that standards and technical regulations for agricultural mechanization will encourage the use of farming technology," says Murenzi.

Looking ahead to the future, we expect technology to keep evolving, from the development of nutrients, pest control agents and farm equipment to the use of computational technology combined with geolocation devices (known as "precision agriculture"), which will radically change the way our crops are managed. All of these will require standards to increase uptake and ensure quality and safety. As we advance into the next era of agriculture, technological development must continue to be the basis for sustainable crop production. For one thing remains certain: sustainability will be key, if agriculture is to have a future at all. ■

Empowering farmers
to better manage
water is vital.



Adapting agriculture in The Bahamas

MEMBER EXCELLENCE

While agriculture contributes just 1 % of GDP in The Bahamas, its diminishing importance is not the result of a reduction in output but rather spells the growth of other sectors. Here, the ISO member for The Bahamas, BBSQ, highlights how recent initiatives are intended to revive the agricultural industry into an important component of the country's economy.

Until recently, The Bahamas was known for producing and exporting very valuable commodities like bananas, pineapples, oranges and mangoes. But over the past two decades, agriculture has been in a state of decline. With limits on available land, environmental issues and other challenges, it is difficult for farmers to compete with larger producers in other parts of the world. To revive its agricultural industry, the government of The Bahamas has taken a multifaceted approach towards the country's development, which focuses on capital development, market access, finance and education and operates on several levels including the public and private sectors. This broad-spectrum approach is essential for a science-based industry such as

agriculture, whose social and economic implications affect the entire Bahamian society. Investing in standards is one of the most effective ways of promoting agricultural productivity and enhancing environmental sustainability. However, for this "investment" to have a positive impact on agricultural production, it must have support and legitimacy. In this respect, the Bahamas Bureau of Standards and Quality (BBSQ), ISO's member for the country, is taking big steps in the right direction. Here, Dr Renae Bufford, Director of BBSQ, explains how a standards strategy constitutes the foundation and the engine for sustainable development in The Bahamas.

ISOfocus: What are some of the steps the government of The Bahamas has taken to expand and improve local agriculture?

Dr Renae Bufford: Historically, agriculture has held an important position in The Bahamas' economy despite a steady decline in the industry over the years. Today, the agricultural sector contributes less than 1% of the country's GDP, with production mainly focusing on crops (pineapples, bananas, oranges and mangoes), poultry, livestock and dairy. In an effort to stimulate the agricultural industry, the government of The Bahamas has joined forces with the Food and Agriculture Organization of the United Nations (FAO) to steer strategic development and enhance the competitiveness of its agriculture and fisheries sectors. In addition, The Bahamas recently created the Bahamas Agricultural and Marine Sciences Institute (BAMSI) and Bahamas Agricultural and Industrial Corporation (BAIC) designed to address food security, increase agricultural production and reduce dependency on imports. Whereas BAMSI teaches local farmers about agronomy, agro-industries and subsistence, BAIC aims to "stimulate and encourage the creation, expansion and promotion of small and medium-sized businesses" and facilitate employment and import subsidization.



Dr Renae Bufford, Director of BBSQ.

Created under the umbrella of the Ministry of Agriculture and Marine Resources, these national efforts are expected to enhance the ability of the farming and fisheries sectors to fuel economic development, so as to improve the quality of life of the Bahamian people. This powerful vision can only be attained through the protection and preservation of our national agricultural and marine resources for future generations (see www.bahamas.gov.bs).

The Bahamas is already experiencing some of the effects of climate variability and change. How will these impact the country's agricultural sector? In what ways can ISO standards contribute to sustainable agricultural practices?

Climate change affects agriculture in a number of ways and carries deep implications for crop production and fisheries, in the form of extreme weather events such as hurricanes, intense humidity and changes in the frequency and severity of droughts and floods.

The price of climate-change-related disasters is astronomical, increasing the damage caused to the agricultural sectors of many countries and putting them at risk of growing food insecurity. The Bahamas' agricultural sector is no exception. Global climate change factors have a direct impact on animal migratory paths, vegetative growth, potable water quality and turbidity, wind intensity, soil salinity and the sporadic, intense fluctuations in solar irradiation.

Improving the resilience of food production systems is key to feeding the Bahamian citizens. For this reason, using International Standards such as those provided by ISO must be promoted as an integral part of the overall development agenda as these will enable technologies, policies and systems to be put in place that protect against and reduce the effects of climate change.

What are some of the challenges related to small-plot farming versus large-scale agriculture? Here again, where can ISO standards help?

Economies of scale are a significant battle, particularly for small producers. From a price point of view, a farmer on his own will definitely be at a disadvantage, so we must look at strengthening our cooperatives/associations nationally.

Only when we approach this together can we overcome these challenges. Just as BAMSI helps local growers master modern farming technology and guides them to become more efficient, so ISO, through its standards, can support BBSQ, helping us build capacity and strengthen our national standards development process.

Which ISO standards for the agriculture and farming industry are of most interest to The Bahamas and BBSQ?

Standards are critical to everything we do. We try to provide the necessary assistance to our agricultural sector for better penetration into the required markets. Assessing our country's agricultural industry allows us to better address our needs in terms of the safety and quality of products and services. This, in turn, facilitates trade, which benefits both businesses and consumers.

Currently, ISO has a few standards that may assist us in accomplishing our goals in the agricultural industry, including the ISO 22000 series for food safety management systems.

How is the New Rights Pilot Programme helping BBSQ further improve its participation in the development of ISO standards?

The ISO New Rights Pilot Programme¹⁾ has enabled The Bahamas to participate in, and contribute to, the development of International Standards in areas such as tourism, food products and conformity assessment. It provides a platform to engage our national stakeholders and let them "have their say" in the International Standards development process.

BBSQ has recently embarked upon the adoption of ISO standards as national standards. This year, workshops will be conducted to sensitize the Bahamian public to quality management, environmental management, energy management, food safety management, conformity assessment, occupational health and safety, and tourism and related services, highlighting a few of the major areas where standards are needed.

Introducing International Standards to industries within The Bahamas will pave the way to greatly improving business efficiency in product development, processes or services, while giving consumers confidence in the products they purchase. We trust that this will build resilience and enhance our ability to trade at the international level. ■

¹⁾ The New Rights Pilot Programme (2014-2019) is an ISO Council initiative that opens up the possibility for correspondent and subscriber members to take an active part in ISO standards development work.



Photo: FAO/Ami Vitale – Kenya livestock

FAO builds on the ISO 14000 series to provide a comprehensive and sound assessment of the environmental performance of livestock supply chains.

Addressing food security in a changing world

Without a shift to a more sustainable world, food security may be impossible to achieve. Here, FAO's Assistant Director-General, Dr Ren Wang, explains why building a common vision for sustainable agriculture is key and how standards can help.

We work on making agriculture more productive and sustainable.

When it comes to ensuring food security and sustainable agriculture, there simply is no “one size fits all”. Many interventions that have attempted to address the challenges of food security have not considered adequately the intricacies of the problem. The issues at hand are complex and require a multi-pronged approach. For several decades, the Food and Agriculture Organization of the United Nations (FAO) has been at the forefront of work for sustainable agriculture. FAO actively supports countries in their multiple efforts towards sustainable agricultural productivity, which relies on high soil fertility, efficient and sustainable water use, crop management, control of livestock pests and diseases, and the sustainable use of biodiversity. The organization has also taken the lead in defining concepts and promoting international treaties, policies, strategies and programmes for sustainable development in food and agriculture. *ISOfocus* sat down with FAO's Assistant Director-General, Dr Ren Wang, to discuss the challenges that stand to affect agriculture today and in subsequent generations. He spoke about the role of International Standards in support of sustainable agriculture and how their use can help create the conditions for a food-secure future.

***ISOfocus*: If agriculture is to continue to feed the world, it needs to become more sustainable. What are the key ingredients to reinvent the way we grow food in favour of a more sustainable farming model? Can you explain how ISO standards could bring added value?**

Dr Ren Wang: FAO promotes sustainable agricultural systems built on five principles: improving efficiency in the use of resources; conserving, protecting and enhancing natural resources; protecting and improving rural livelihoods, equity and social well-being; enhancing the resilience of people, communities and ecosystems; and creating responsible and effective governance mechanisms.

Take, for instance, the recent proliferation of environmental certifications and claims. These can be confusing for consumers and can limit access to markets, especially for smallholders and developing countries.

ISO can be useful in the establishment of agreed standards facilitating the mutual recognition of schemes as well as their use by companies when developing social and environmental responsibility claims and processes.

The 2016 FAO report “Innovative Markets for Sustainable Agriculture” highlights how innovations in market institutions encourage sustainable agriculture in developing countries. What benefits do you see here in terms of International Standards for smart farming technologies (i.e. self-driving tractors, drones, etc.)?

This publication focuses on innovative ways of connecting smallholders to local markets for sustainable products in developing countries. Most of the innovations presented are institutional like participatory guarantee systems, community-supported agriculture and multi-actor innovation platforms.



Photo: FAO/Giulio Napolitano – ADG Ren Wang

FAO's Assistant Director-General, **Dr Ren Wang**, started his career as a researcher at the Institute of Biological Control of the Chinese Academy of Agricultural Sciences where he pioneered China's programme for managing invasive exotic plants using the classical biological control approach.

This last example could play a role by enabling greater experimentation with technologies locally before trying to create International Standards that might close down options for alternative applications too soon in the innovation process. It is important to note that the 15 case studies presented in the report show that International Standards must be re-appropriated and redefined at a local level to be adopted by farmers.

How do the two standards-setting bodies hosted by the FAO Agriculture and Consumer Protection Department contribute to FAO's efforts to promote sustainable food and agriculture?

FAO hosts the secretariats of two standards-setting bodies: the Codex Alimentarius Commission (Codex) and the International Plant Protection Convention (IPPC), which complement our efforts to achieve food security for all. Collectively, we work on making agriculture more productive and sustainable, improving food systems and food safety. Both the IPPC and Codex are recognized by the World Trade Organization (WTO) under the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS) as plant health and food safety standards-setting organizations, respectively.

In their discussions of food safety and quality issues, the 188 Codex members, covering 99% of the world's population, take decisions on issues that affect the global food supply chain, including complex topics such as biotechnology, pesticides, food additives, contaminants and labelling.

ISO standards provide a useful methodological basis.

Though the IPPC's primary focus is on the plants and plant products that are internationally traded, the Convention, with 183 contracting parties, also covers wild plants, research materials, biological control organisms, germplasm banks, containment facilities, food aid, and anything that can act as a vector for the introduction and spread of plant pests. In addition, FAO hosts part of the secretariat of the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, which is a legally binding instrument to promote shared responsibility and cooperative

efforts among parties in the international trade of certain hazardous chemicals in order to protect human health and the environment.

FAO collaborates actively with ISO in some 40 technical committees, among them food products, machinery for agriculture and forestry and, more recently, plant pests. Can you please comment on the benefits of participation in the standards development process?

For the last 54 years, Codex work has been done on a system of standards, guidelines and codes of practice that allowed agriculture to become global and safe.

The International Plant Protection Convention (IPPC) sets health standards for internationally traded plants and plant products, such as this mango in Western Australia shown with a Mediterranean fruit fly, otherwise known as "medfly".



Photo: IPPC/Pia Scanlon

Complementary by essence, ISO standards have contributed to the success of Codex, especially in areas of methods of analysis and sampling and in overall quality assurance systems that ensure the correct application of complex standards. The increased collaboration benefits both organizations and the quality of standards. While not mandatory for members, the reference made to Codex in the WTO-SPS agreement means that any country asking for stricter standards than Codex needs a scientific justification.

As for the IPPC, it has a number of new standards under consideration, especially commodity standards that, although challenging to develop, would be beneficial to the trading community around the world. While ISO standards are not mandatory for the implementation of IPPC standards, complementarity in ISO standards development to IPPC standards would be very fruitful and should be part and parcel of the work that ISO does. It is important to note that, in the phytosanitary area, IPPC standards take precedence over ISO standards.

In addition, FAO's collaboration with ISO on the three-part standard ISO 19932, *Equipment for*

crop protection – knapsack sprayers, enables us to update the FAO Minimum Standards for these types of equipment. The standards are adhered to when FAO procures equipment for its programmes in the field.

Finally, plant pest prevention and management require the development and use of appropriate methodologies, tools and inputs such as quality seeds, plant protection equipment, pesticides and biological agents. Their efficiency depends on whether or not they meet minimum quality requirements. Standards can facilitate their evaluation provided they have been prepared in collaboration with competent authorities and take into account context specificities.

The aim of the United Nations Sustainable Development Goals is to address the complex challenges we face in our interconnected world. In concrete terms, what does this mean for FAO? In which areas would FAO like to see new or more International Standards?

Adopted by the United Nations to promote prosperity for all while protecting the planet, the 2030 Agenda for Sustainable Development calls



The ISO expert group meets to review the ISO standards on knapsack sprayer safety.

for addressing food, livelihoods and the management of natural resources in a holistic way, in line with FAO's mission. A focus on rural development and investment in agriculture – crops, livestock, forestry, fisheries and aquaculture – is essential to ending poverty and hunger, and bringing about sustainable development.

ISO standards provide a useful methodological basis to achieve this. They are, however, often general and require the formulation of more specific rules. For example, with regard to climate change and other environmental impacts, FAO builds on the ISO 14000 series to provide a comprehensive and sound assessment of the environmental performance of livestock supply chains through the development of guidelines by the Livestock Environmental Assessment and Performance (LEAP) Partnership as well as tools such as the Global Livestock Environmental Assessment Model (GLEAM).

In agriculture, FAO intends to initiate and drive a process for an international dialogue, involving multiple stakeholders, on the sustainable use of mineral fertilizers, which may eventually become an international guideline. On germplasm collections, it supports member countries to implement the Genebank Standards developed under FAO's leadership.

Ultimately, measuring the sustainability of food and agriculture requires guidance on how to conduct an integral assessment of the sustainability of food and agriculture focusing on its three pillars: economic, social and environmental. ■

In agriculture, FAO intends to initiate and drive a process for an international dialogue.



A woman harvests olives in the village of Beino, Lebanon, following the General Principles of Food Hygiene set forth in the Codex Standard for Olive Oils and Olive Pomace Oils.

Sowing the seeds FOR THE FUTURE

By 2050, the world population is expected to grow to 9.6 billion. We need to transform our planet's food systems to be able to feed all those people by the middle of the century – International Standards are a key element of these systems.

Tools and technology

Ending hunger and malnutrition relies heavily on sustainable food production systems and resilient agricultural practices.

ISO's response: ISO standards for tractors and machinery used in agriculture and forestry help deliver a more profitable and sustainable agricultural production by equipping farmers with new technologies, the right knowledge and information, and mechanisms to gain fair access to markets.

Climate change

Be it through droughts, floods or hurricanes, climate change impacts every level of food production.

ISO's response: ISO standards that help quantify greenhouse gas emissions and promote good practice in environmental management are powerful tools for addressing climate change.

Growing cities

Every second, the urban population grows by two people and, by 2050, two-thirds of the world population will be living in urban areas.

ISO's response: With food travelling increasing distances, ISO's food safety management standards help organizations identify and control food safety hazards in the food supply chain.

Quality of soils

Nitrate from agriculture is the most common contaminant in the world's groundwater aquifers.

ISO's response: ISO standards for the measurement and reporting of soil characteristics and potential contaminants improve soil quality.

ISO's response: ISO standards on treated wastewater for irrigation are expected to give stakeholders practical guidance towards the most appropriate solutions for water reuse in communities where water is scarce and encourage a wiser management of water in society.

Water reuse

Agriculture accounts already for 70 % of global freshwater withdrawals and, by 2080, demand for irrigation will have grown by 5 % to 20 % worldwide.



Fonterra's quest for sustainable dairy nutrition

Are you among the one billion people around the world who enjoy the nutritional benefits of dairy from Fonterra and wonder how sustainable dairy production is? The latest *ISOfocus* interview with Carolyn Mortland, Director, Social Responsibility, at Fonterra helps allay your concerns.

Fonterra is a world-leading dairy producer and exporter that is behind much loved brands such as Anlene®, Anchor®, Perfect Italiano®, Tip Top® and more. It is not only a cornerstone of the New Zealand economy, owned by 10 500 farmer shareholders and contributing 25 % of the country's exports, it is also a global company employing 22 000 people and operating in more than a hundred countries around the world.

Dairy consumption is expected to increase around the world, and thirst for milk is forecast to be particularly strong in emerging markets such as China, where dairy demand is projected to double in the next ten years. Maintaining environmental sustainability while satisfying growing global demand for dairy can be challenging.

ISOfocus sat down with Carolyn Mortland, Director, Social Responsibility, at Fonterra to find out more about how standards help Fonterra manage its business in a socially responsible way, including managing its environmental footprint, so that consumers worldwide can continue to enjoy the goodness of New Zealand milk.

***ISOfocus*: How do ISO standards ensure that Fonterra, one of the world's largest dairy companies with operations in more than a hundred countries, maintains social responsibility and minimizes its environmental footprint by reducing greenhouse gas emissions in its operations?**

Carolyn Mortland: Several years ago, Fonterra adopted ISO 26000, which has helped us further embed social responsibility into the cooperative's business functions throughout the world. Developing sustainable food production systems that improve health and generate rural livelihoods while operating within environmental limits is critical to achieving the United Nations Sustainable Development Goals for a fairer, more prosperous world.

Almost half of the greenhouse gas emissions in New Zealand are due to agriculture. For this reason, Fonterra regularly undertakes life-cycle analyses of its carbon footprint, including on its main on-farm supply in New Zealand, in China and through Dairy Australia for Australia. This allows the cooperative to investigate trends and focus on areas for improvement. What's more, milk processing facilities run on vast amounts of energy and Fonterra is using ISO 50001 to help reduce its power consumption.

Guided by its use of the aforementioned ISO standards, Fonterra is committed to limiting its impacts on the environment and finding ways to reduce greenhouse gas emissions through investing in clean technologies and resource-efficient upgrades at our production sites, as well as assessing renewable energy resources such as biomass, solar, geothermal and wind power with the aim of reducing our reliance on fossil fuels.





Carolyn Mortland, Director, Social Responsibility, at Fonterra.

Fonterra aims to reduce energy intensity by 20% by 2020 in order to cut down emissions in its global dairy supply chain and fight climate change. How does the company plan to boost its energy efficiency? How can standards help?

Fonterra’s energy strategy is in line with the World Energy Council’s well-recognized “Energy Trilemma” that looks at the security of supply, cost and environmental sustainability. Fonterra’s energy efficiency programme, which is shaped by the use of ISO 50001, aims to reduce energy consumption per tonne of production within our New Zealand operations by 20% by 2020. Since it began in 2003, we have achieved a more than 16% reduction in manufacturing energy intensity – this is equal to saving enough energy in 2015 to power 190 000 average homes in New Zealand each year.

Standards provide Fonterra with information on industry best practice and a goal to work towards at the highest level. Internal audits are aligned to the ISO 50001 standard and include blitzes across its operations, where they have identified nearly 900 initiatives to improve energy use since 2003.

Fonterra’s Edendale plant is the most energy-efficient dairy manufacturing site in New Zealand, according to the national Energy Efficient and Conservation Authority (EECA). Since 2003, it has reduced its energy intensity by 48% per tonne of product. In a recent expansion, four new processing sites were built without the need for a new coal boiler. This was achieved by implementing numerous energy recovery projects within our existing plants and designing highly efficient new installations.

The cooperative is also working to make its distribution network even more energy-efficient in accordance with the requirements of ISO 50001. Last year, it increased the proportion of freight by rail by more than 10% compared to the previous year. This meant the total volume moved by rail was equal to 184 730 truck movements on road, saving an estimated 25 000 tonnes of carbon dioxide equivalent compared to road transport.

Moreover, Fonterra’s shipping partner, Kotahi, has recently started using larger, more sustainable and efficient ships to help transport Fonterra’s product to more than 140 countries worldwide.

As a company with a global presence, how does Fonterra use standards such as ISO 26000 and ISO 14001 to maintain its commitment to sustainability in its international operations?

We have an annual process that considers stakeholder perspective and current performance to plan areas for improvement. ISO 26000 has been really useful to ensure that we are proactively taking into account the full range of topics relevant to our global business. Supporting our use of ISO 26000, we have also been long-term users of ISO 14001 to ensure our manufacturing facilities can be independently certified against internationally recognized standards for environmental management and sustainability. This not only drives continuous improvement at our

sites but also helps us keep a focus on influencing our supply chains and their environmental performance. By adopting standards like ISO 26000 and ISO 14001, we can concentrate on material issues, prioritizing our improvements so we can plan more robustly.

Through its dairy development programme, Fonterra is furthermore working to help grow dairying industries in developing countries, including Indonesia and Sri Lanka, to ensure they have a safe, sustainable supply of dairy nutrition while also creating thriving communities. This is in line with Fonterra’s commitment to social responsibility that is supported by the use of ISO 26000.

Fonterra boasts of the distinctive qualities of milk based on New Zealand’s verdant pastures. How is Fonterra working alongside Standards New Zealand and other partners to protect its national jewel and ensure the world can continue to enjoy its milk?

Fonterra and its farmers are proud of New Zealand’s traditional grass-fed farming model where animals are free to graze on pasture. It is this pasture-based and highly efficient farming, coupled with New Zealand’s high proportion of renewable energy, which makes our country’s dairy industry one of the most emissions-efficient in the world.

Fonterra is continually working and partnering with other industry bodies and agencies to ensure dairying

has a sustainable future. For example, we have worked with the Ministry for Primary Industries and the EECA to identify ways for dairy farmers to save electricity on farm. Audits of 150 farms were taken in accordance with NZS 3598:2000 at Level 2, which provides a reasonably detailed investigation of energy supply and use that identifies areas where savings may be made. This standard was developed jointly by Standards New Zealand and Standards Australia.

A post-audit survey estimated that a total of 161 000 kWh per year of savings were accruing from recommendations already acted upon and another 297 000 kWh would result from the implementation of further recommendations.

Mitigating methane emissions on farm is currently achieved through the adoption of good management practices on the farmstead, including improved animal health and pasture management. By adopting such practices, New Zealand has seen the total emissions efficiency on farm increase by over 20% from 1990 to 2014.

Moreover, Fonterra continues to invest in the Pastoral Greenhouse Gas Research Consortium with the New Zealand government and other industry partners to find ways to mitigate biological emissions from livestock.

As a global company, we are incredibly proud of what we have achieved so far and excited about taking the best of New Zealand out to the world. ■

Fonterra is investing in clean technologies and resource-efficient upgrades at its production sites.



Photo: Fonterra

Fonterra is using ISO 50001 to help reduce its power consumption.

FACILITATING TRADE IN SERVICES

Why do standards matter for trade in services? To explore this question, the Australian Permanent Mission to the World Trade Organization (WTO) held a meeting in March 2017 on "Technical Standards in Trade and Services".

Services make up an overwhelming part of the global economy, accounting for around 75 % of GDP in developed countries and around 50 % in developing countries according to World Bank data. In this context, it is clear that there is a growing need for International Standards in the services sector, explains Markus Jelitto, Counsellor, Trade in Services Division of the WTO.

Acting Secretary-General of ISO Kevin McKinley highlighted the urgency to respond to the market demand for service standards as well as to the challenges and opportunities it brings. He underlined the need for International Standards to facilitate trade, support innovation, fix asymmetries, and for use in conformity assessment to enhance confidence in the services sector. ISO members from Australia and Spain provided national perspectives on service standards and how their respective countries were responding to the changing services landscape.

ISO currently has more than 700 published standards related to services. Some of these can be referred to as "pure" service standards, in that their main purpose is clearly to help with the provision of a service (for example, service provision in the tourism sector). Others support the infrastructure necessary to the provision of a service (for example, in the IT and transportation sectors). Yet a third category consists of horizontal standards, such as management system standards, that can also be applied to services.

CONSUMERS DRIVE ROAD SAFETY BY DESIGN

Thanks to its Committee on consumer policy (COPOLCO), ISO has excelled at providing solutions that benefit consumers and companies alike through the development of market-relevant standards with everyday applications. This year, COPOLCO is exploring ways to counter the appalling detriment to the life and health of the world's population caused by unsafe road infrastructure, traffic systems and vehicles. This work will kick off at an international workshop in Kuala Lumpur, Malaysia, on 17 May 2017 as part of COPOLCO's annual meeting.

"Road safety by design" is one of several hot topics on ISO's agenda being introduced by ISO's consumer stakeholders this year. COPOLCO is seeking to harness the benefits of relevant International Standards, such as ISO 39001, *Road traffic safety management systems – Requirements with guidance for use*, by helping ISO member representatives link standards to national legislation and initiatives in order to achieve better outcomes for consumers and society as a whole.

Other initiatives include an International Workshop Agreement on the "sharing economy", an ISO standard to protect the "vulnerable consumer" and a proposal on "privacy by design" to enhance the digital security of consumer data.



THANK YOU TO THE ISO TREASURER

Miguel Payró was honoured for his achievements as ISO Treasurer from July 2013 to January 2017 following the ISO Council meeting in Geneva, Switzerland, in March 2017.

"In his role as ISO Treasurer, Miguel gave us much good advice on financial matters and played an important role in the general financing of our organization and the preparation of our annual budget," ISO President Dr Zhang Xiaogang said before presenting Miguel with a set of cufflinks. "So, for all these reasons and many more, I would like you to join me in thanking Miguel Payró for his dedication to the role of ISO Treasurer. It has been a pleasure working with you over the last few years and we wish you all the best in your future endeavours."

Miguel Payró is Chief Financial Officer at GeNeuro SA, a Geneva-based biotechnology company. Previously, he was Chief Financial Officer at the Franck Muller Group, one of the world's leading luxury watch groups. There, he was instrumental in reorganizing the corporate structure and implemented the first consolidation and international accounting standards.

Miguel Payró was superseded as ISO Treasurer by Dominique Christin from 18 January 2017. Mr Christin is the co-founder and partner of BianchiSchwald (formerly BCCO), an independent business law firm founded in 2001 in Switzerland, in which he serves as Counsel since 2016.

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Photo: David Plas Photography

ISO CENTRAL SECRETARIAT ANNOUNCES NEW SECRETARY-GENERAL

The International Organization for Standardization (ISO) is happy to announce that it has appointed Mr Sergio Mujica as its new Secretary-General, effective from July 2017.

For the last seven years Mr Mujica has been the Deputy Secretary-General of the World Customs Organization (WCO), prior to which he spent 15 years working for the Government of Chile with the Ministry of Agriculture, the Ministry of Economic Affairs and as the Director-General of the Chilean National Customs Authority. A Chilean national, he has a law degree from the Pontificia

Universidad Católica de Chile and a master's degree in International Law from the American University in Washington D.C.

"On behalf of the ISO family, I would like to congratulate Mr Sergio Mujica on his appointment as ISO Secretary-General and I look forward to working with him in the future," said ISO President Dr Zhang Xiaogang.

Mr Mujica takes over from Mr Kevin McKinley, who has been Acting Secretary-General of ISO since August 2015, after spending 12 years as Deputy Secretary-General.

BSJ SHEDS ITS REGULATORY ROLE

The regulatory division of the Bureau of Standards Jamaica (BSJ), ISO's member for the country, is being separated from the agency and transformed into a new entity called the National Compliance and Regulatory Authority (NCRA), which comprises the food, legal metrology and standards compliance inspectorates. With this split, BSJ seeks to better fulfil its mandate of advancing standardization, metrology and conformity assessment, while the new operation will be the regulator.

This strategic move follows a World Bank study, which pointed out that combining the standards development and regulatory functions under the same umbrella was a source of inherent conflict in BSJ's organizational structure. With the new transformation, BSJ will continue to support the development of Jamaican businesses and facilitate their access to regional and international markets.

Executive Director Yvonne Hall notes that BSJ has taken on its revamped role of "facilitator" with great gusto, as evidenced by the continuously improved service delivery. BSJ, which holds an ISO 9001 certification for quality management, is also accredited to ISO/IEC 17025 for the competence of its testing laboratories, while its Industrial Training Unit is currently seeking accreditation to ISO/IEC 17024 and will be the first of its kind in the Caribbean to offer certification of personnel.



Photo: BSJ

SERBIA CHAMPIONS ISO 37001



Photo: ISS

Anticorruption was high on the agenda at the First Preparatory Meeting of the 25th OSCE Economic and Environmental Forum, which took place in Vienna, Austria, earlier this year. This was the first of a cycle of meetings of the OSCE, Europe's largest security-oriented intergovernmental organization, to inject political stimulus in the debate on economic, environmental and security-related issues.

Under the theme "Greening the economy and building partnerships", this Preparatory Meeting provided an opportunity to explore how the OSCE and participating states can increase security and stability through good governance, economic participation and greater connectivity.

In his opening statement, OSCE Secretary General Lamberto Zannier said the fight against corruption was decisive in fostering sustainable economic development, and thus peace and prosperity, stressing that the private and public sectors have to join forces to prevent misconduct and establish a culture of trust in government and business.

On the topic of integrity, Tatjana Bojanic, Acting Director of ISS, ISO's member for Serbia, set forth the many benefits of implementing ISO 37001 on anti-bribery management systems. Meanwhile, she said, a translation of the standard into Serbian was already underway for national adoption in the spring.



The barriers to sustainability are multifaceted.

From bean to bar

THE CHALLENGES OF THE COCOA INDUSTRY

by Clare Naden

It is the key ingredient in one of the world's favourite affordable luxury treats, but the reality behind cocoa is bittersweet.

A sustainable cocoa industry is the goal of a new ISO technical committee that hopes to build a better future for cocoa farmers – for the greater benefit of us all.

“I got bitten by the cocoa bug when I was just a kid,” says cocoa farmer Francisco Miranda. “My grandma had a small cocoa farm which she inherited when she was young. I remember she would take me on long trips up a river to her farm, which was tended by workers. She would go in her boots with a gun holstered, ready for action, and ride her horse and help the harvest and lift the cocoa bags and be the boss. My sweet grandmother would turn into this hard-working cowgirl... it was mesmerizing.

“Years later, when I got the opportunity to oversee my own farm, I jumped at it. I have since been very much involved in agriculture and have had the chance to grow many crops, but there is none so kind to the environment, so encouraging to biodiverse fauna and so inviting to birds as cocoa. We are proud to be cocoa farmers. We know our cocoa is world-renowned.”

Francisco, who is General Manager of Ecuadorian exporter and producer Guangala and oversees a 240 ha cocoa farm in Ecuador with over 70 employees, is just one of the 14 million or so cocoa workers in the industry, and with reasonable productivity and a disease-resistant cocoa variety, one of the luckier ones. Because most cocoa farmers are worryingly poor.

No easy crop to grow

The vast majority of cocoa production comes from smallholder farms under 5 ha, according to the International Cocoa Organization (ICCO). There is often a lack of organization amongst farmers to share resources or burdens, and their productivity is often low or of low quality due to inefficient farming methods.

What's more, cocoa farmers tend to live in regions that are poor, with inadequate infrastructure such as bad roads, poor healthcare

and sanitation and substandard education, making it difficult to access markets. This extreme poverty has a knock-on effect, causing other problems such as poor health, child labour and malnutrition. The situation is further compounded by the fact that cocoa trees only grow in regions close to the equator, under the right conditions, and are vulnerable to disease, pests and climate change.

With 33 years in the cocoa trade, Pierre Etoa Abena, Senior Technical Advisor to the National Cocoa Coffee Board of Cameroon (NCCB), understands the issues faced by farmers well. “As a producer, having a decent price that covers production costs and gives me a profit is central to my sustainability, but there are many barriers to this. There are many organizations involved in the supply chain, each with different criteria and requirements; at the same time, costs are increasing for things like fertilizers and transporting the cocoa abroad.”



Antonie Fountain, Managing Director of The VOICE Network, an association of non-governmental organizations (NGOs) and trade unions working together to address sustainability issues in the global cocoa supply chain, concurs. “The market doesn’t work for the farmers, it’s true. There needs to be a way of ensuring they receive a reasonable price for their goods. Yes, there are other factors: they need to diversify, they need access to good equipment and fertilizers and they need training in effective agricultural methods. But without ensuring a fair price, these measures alone won’t make the sector sustainable.”

Francisco agrees that the barriers to sustainability are multifaceted. Ever-changing government regulations and instability in cocoa markets are forcing what was once a very stable industry to step back and reconsider its options, he says. “The key challenges revolve around what you can’t plan for. Sustainability requires many changes in infrastructure and long-term investment by the farmers; yet without contracts or commitments or a sustainable price, many farmers cannot [even] meet basic caloric needs. Breaking point will come soon and the more

vulnerable players in the supply chain will continue to suffer.”

Dr Torben Erbrath, Director of the Association of the German Confectionery Industry BDSI’s Chocolate, Chocolate Products and Cocoa Division, says that if nothing is done, consumers will eventually feel the effects. “Without empowering and investing in small-scale farmers, we will struggle to provide sufficient cocoa supply in the future,” he explains. “Young farmers will leave cocoa growing.”

Taking the initiative

There are lots of programmes and initiatives intended to help cocoa farmers and improve the sustainability of the industry, but, some argue, these are not always as effective as hoped and often only really reach the most organized farmers.

The International Cocoa Initiative, the European Cocoa Association, the Federation of Cocoa Commerce and the World Cocoa Farmers’ Organization are just some of the entities that have sprung up in the last few decades to improve

the sustainability of the cocoa industry. Add to that a number of agreements and frameworks, such as the Global Cocoa Agenda, signed at the first World Cocoa Conference in 2012 by most of the cocoa-producing and -consuming nations as well as industry players, which outlines the roles and responsibilities of all involved to make cocoa production sustainable. This has resulted in many governments of cocoa-producing countries developing national plans aimed at achieving sustainable cocoa production.

Other initiatives working towards a better life in cocoa-growing communities include:

- The World Cocoa Foundation’s CocoaAction, which aims to train 300 000 farmers by 2020 to boost productivity and improve the situation of women and children working in the industry¹⁾
- The Framework for Action – an agreement between the US Department of Labour and the governments of Ghana and Côte d’Ivoire – aimed at reducing child labour in cocoa farming communities in West Africa
- The Nestlé Cocoa Plan, which aims to improve lives for farmers through various initiatives such as training in better agricultural practices, the distribution of higher-yielding cocoa plants and a child labour monitoring and remediation system

In addition, many national governments have set goals for sustainability in the industry, such as the Netherlands, which is working towards 100% sustainable cocoa by 2025, and Germany, which aims to have at least 50% of the cocoa consumed certified “sustainable” by 2020.

Antonie Fountain recognizes that there is a lot being done, but it is not enough, and he believes the industry largely agrees that the problem will not be solved at the current pace of action. “One of the biggest challenges is that we need more transparency on who is doing what and to what effect, how much money is being put in, how much is being paid in taxes and how much is being put into infrastructure. So more transparency is required, more sharing and understanding of what is being done and what is working.”

¹⁾ Cocoa Barometer 2015.

The Netherlands have set goals to work towards 100% sustainable cocoa by 2025.



A taste of standardization

ISO technical committee ISO/TC 34, *Food products*, subcommittee SC 18, *Cocoa*, which is jointly managed by ISO's member for the Netherlands (NEN) along with members from key cocoa-producing countries Côte d'Ivoire (CODINORM) and Ghana (GSA), is ISO's first committee for sustainably produced commodities, a new field of expertise for ISO.

Together with the European Committee for Standardization's technical committee CEN/TC 415, *Sustainable and Traceable Cocoa*, whose secretariat is held by Danish Standards (DS), ISO's member for Denmark, they are developing the ISO 34101 series of standards, *Sustainable and traceable cocoa beans*, which aims to address the challenges the cocoa sector faces.

Along with International Standards such as ISO 2451 and ISO 2292, which set the specifications and quality requirements for cocoa beans, the ISO 34101 series of standards is designed to be used by all those involved in the cocoa supply chain, from the farmers to the purchasers. It is intended to help with the implementation of good agricultural practices, protection of the environment and the improvement of the social conditions of farmers.

Jack Steijn, Chair of both committees, says the use of these standards will have a valuable impact on the livelihoods of cocoa farmers and their workers because it will help them transform their farms into economically viable businesses. "This will help to make cocoa farming more attractive to young people, which is important as the average age of farmers has risen rapidly over the last few decades." He is optimistic about the future: "We also envisage that the ISO 34101 series could be considered as a pilot for other commodities, such as coffee, bananas and cotton, and therefore might provide opportunities for supporting the sustainable development of those sectors through new ISO standards."

The ISO 34101 series of standards, currently under development and due for publication sometime next year, will specify requirements for a management system for the production of cocoa, assist with the traceability of sustainably produced cocoa beans and thus could be helpful in the development and adherence to certification schemes. It could become the quality control for other certification programmes.



The ISO 34101 series of standards aims to address the challenges the cocoa sector faces.

Getting certified

Increasing consumer awareness of the plight of farmers has led to a number of certification schemes in the chocolate industry, such as Fairtrade, UTZ and Rainforest Alliance. These are all steps in the right direction, but they have their limitations.

The plethora of schemes have slightly different criteria and around 25% of the world's cocoa production is now produced sustainably, but it is not enough. Challenges still exist, such as the credibility of the auditing and the difficulty of adapting certification systems to both small and large farms.

Many of the certification organizations such as those mentioned above are involved in the development of the ISO 34101 series to help harmonize certain criteria, as the standards hope to set a benchmark to which all organizations and sustainability programmes, including those of private companies, may align.

Sweetening the future

Pierre Etoa Abena of the National Cocoa Coffee Board of Cameroon says the new standards will be a welcome tool. "It is true that many NGOs do take a lot of time to get to understand the farmers' realities and there is an ongoing fight to improve the farmers' income, but there are still significant areas of need such as protecting the environment, wildlife and the people involved. New standards in sustainable cocoa production will help improve those areas and will provide a common base, ensuring a clear and transparent process to claim a premium for any certified cocoa."

Cocoa farmer Francisco hopes the standards will be a wake-up call for those further up the supply chain, impacting on price and contract terms for those on the farm. "What we need is to have the markets look at both sides of the equation, to measure the human impact as well as the economic impact when mandating new terms," he says. "No sustainability can come at the current price range as farmers can't even eat their own cocoa to sustain their livelihood. International Standards for cocoa could be a big step forward to help farmers get out of the poverty trap." ■

