



# Harnessing the chances of digitalisation for rural development

Lessons-learnt in German-funded rural development projects

As a federally owned enterprise, GIZ supports the German Government in achieving its objectives in the field of international cooperation for sustainable development.

**Published by:**  
Deutsche Gesellschaft für  
Internationale Zusammenarbeit (GIZ) GmbH

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Bonn and Eschborn

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As at April 2018

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## ↘ List of Abbreviations

AGRA	Alliance for a Green Revolution in Africa
API	Application Programming Interface
BMZ	German Federal Ministry for Economic Cooperation and Development
CARI	Competitive African Rice Initiative
CCKN-IA	Climate Change Knowledge Network in Indian Agriculture
CGIAR	Consultative Group on International Agricultural Research
CoP	Community of Practice
CTA	Technical Centre for Agricultural and Rural Cooperation
DAS	De-bushing Advisory Service
DFID	Department for International Development (United Kingdom)
ECIC	Ethiopian Climate Innovation Center
ESAI	Ethiopia Sustainable Agribusiness Incubator
FAO	Food and Agriculture Organization of the United Nations
GAP	Good Agricultural Practices
GIAE	Green Innovation Centres for the Agriculture and Food Sector
GIS	Geographical information system
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
GODAN	Global Open Data for Agriculture and Nutrition
GPS	Global Positioning System
ICT	Information and Communication Technology
ICT4Ag	ICT for Agriculture
ICT4D	ICT for Development
ICT4SDG	ICT for Sustainable Development Goals

IICD	International Institute for Communication and Development
IoT	Internet of Things
ITU	International Telecommunications Union
ITAACC	Innovation Transfer into Agriculture-Adaptation to Climate Change
MBWin	Micro Banking System for Windows
M&E	Monitoring and Evaluation
NGO	Non-governmental organization
NICE	Network for Information on Climate (Ex)change
PPP	Public-Private Partnership
RGT	Royal Green Technologies
RIICE	Remote Sensing-Based Information & Insurance for Crops in Emerging Economies
RISE	Response-Inducing Sustainability Evaluation
SDG	Sustainable Development Goal
SHF	Small Holder Farmer
SIGEF Destinação	Sistema de Gestão Fundiária (System for land tenure regularization)
SMS	Short Message Service
SNRD	Sector Network Rural Development
SV ELR	Sectoral Project Rural Development
USAID	United States Agency for International Development
WSIS	World Summit on the Information Society
WSIS+10	The UN's 10-year review of the World Summit on the Information Society →

# ➤ Introduction

Today's fast-evolving information and communication technology (ICT) represents a tremendous opportunity for rural populations to improve productivity, to enhance food and nutrition security, to access markets, and to find employment opportunities in a revitalized sector.

(ICT in Agriculture: Connecting Smallholders to Knowledge, Networks and Institutions, World Bank 2017, available at <https://openknowledge.worldbank.org/handle/10986/27526>)

The World Bank describes information and communications technology (ICT) (see Fig. 1) as a game changer for sustainable development. ICTs can boost economic development and link small producers from developing countries to global value chains. They also have enormous potential for accelerating progress on the Sustainable Development Goals (SDGs). Paragraph 15 of the 2030 Agenda for Sustainable Development states that 'the spread of information and communication technology and global interconnectedness has great potential to accelerate human progress, to bridge the digital divide and to develop knowledge societies'. Specifically, SDGs 4, 5 and 17 indicate the relevance of ICT for rural populations:

**SDG 4 – Quality Education:** ICTs are powering digital learning, which has become one of the world's fastest-growing industries. Mobile devices now allow students in remote areas to access learning assets.

**SDG5 – Gender Equality:** ICT provides women with access to the same online resources and opportunities as men. This enables them to have a stronger voice in their communities, their government and at the global level. ICTs provide new opportunities for women's economic empowerment by creating business and employment opportunities, particularly in the agricultural sector.

**SDG 17 – Partnerships for the Goals:** As a means of implementation, ICTs are highlighted in SDG 17 as having cross-cutting transformative potential. Indeed, **ICTs are crucial for achieving all of the SDGs** as they are catalysts that not only accelerate all three pillars of sustainable development (economic growth, social inclusion and environmental sustainability), but also provide an innovative and effective means of implementation in today's interconnected world.

The agriculture sector is pivotal for sustaining the livelihoods of people living in rural areas, the provision of food & income and the creation of jobs. It is the base for the future of rural economies. This report prioritises ICT solutions that promote agriculture and those sectors with forward and backward linkages to agriculture.

Today, several rural development challenges are particularly salient:

- To sustainably promote rural areas in a way that delivers long-lasting outcomes for local people, it is essential to implement support measures outside the agriculture sector. The policy framework and institutional environment must prioritise the promotion of rural areas and set objectives to this end. All sector policies that are relevant to people in rural areas must then be aligned with these objectives. Efficient coordination processes across the local, regional and national levels will ensure civic participation and suitable resource allocation.
- Natural resources are coming under increasing pressure from agriculture, population growth, climate change and urbanisation. Forest, land, water and pasture resources therefore need to be managed sustainably and their use and conservation balanced.
- People in rural areas require access to services such as health, education, water, electricity and communication. The corresponding infrastructure, including roads, energy and ICTs, must therefore be installed or upgraded.

ICTs can contribute significantly to all these<sup>1</sup> aspects of rural development.

Since the turn of the millennium, global donors have come to view ICT for agriculture (ICT4Ag) as a powerful instrument for developing the agricultural sector (see also Fig. 2). It can transform poor agricultural practices, yields and revenues in developing countries into farming that improves the livelihoods of millions of small farmers. It can improve finance, marketing and trade. With this in mind, the German Federal Ministry for Economic Cooperation and Development (BMZ) has drawn up its Digital Agenda (detailed in the publication [Harnessing the digital revolution for sustainable development](https://www.bmz.de/en/publications/type_of_publication/information_flyer/information_brochures/Materialie276_digital_agenda.pdf)<sup>2</sup>) to shape the application of ICTs in the German development portfolio. What this agenda makes clear is that digital applications can help to bring information and knowledge to rural areas and, in so doing, 'leave no one behind'.

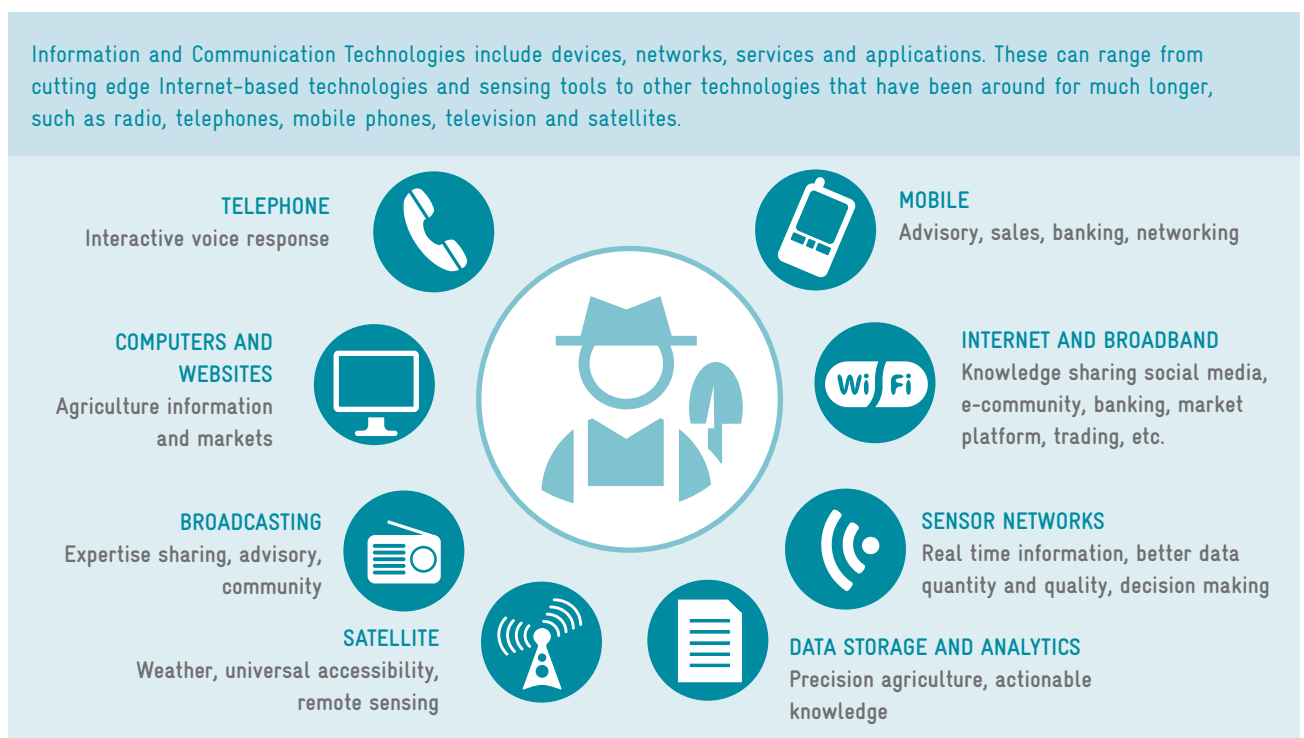
1 It is, however, beyond the scope of this report to cover all these aspects. Available at <http://www.worldbank.org/en/publication/wdr2016>

2 Available at [https://www.bmz.de/en/publications/type\\_of\\_publication/information\\_flyer/information\\_brochures/Materialie276\\_digital\\_agenda.pdf](https://www.bmz.de/en/publications/type_of_publication/information_flyer/information_brochures/Materialie276_digital_agenda.pdf)



### Figure 1: Definition of ICTs

(Source: Gender and ICTs, FAO, 2018, p.2)

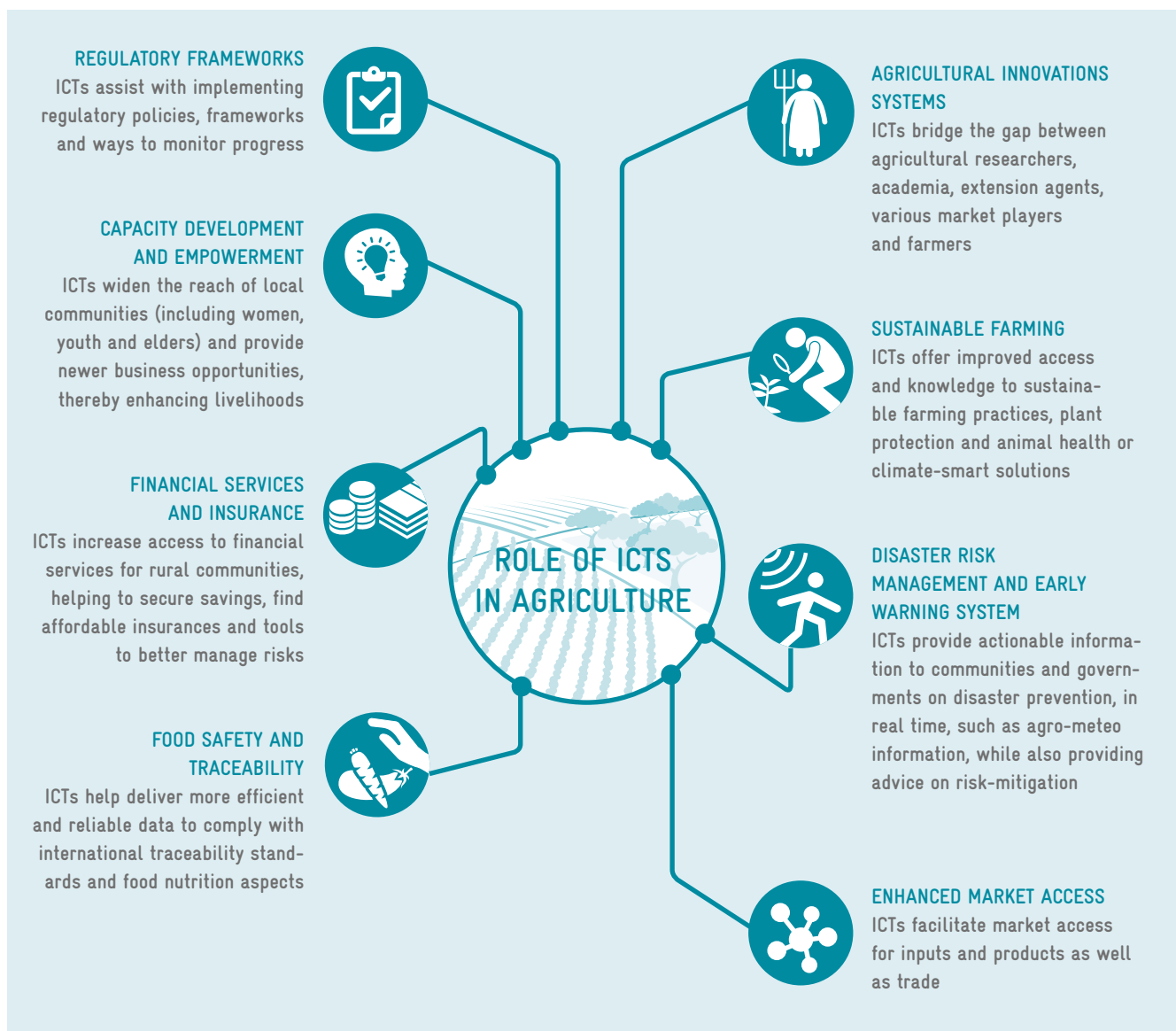


As women and young people living in rural areas are socially disadvantaged, strategies designed to support people in rural areas must consider these groups' specific needs. Women account for 40% of agricultural labour, produce 90% of staple foods and are central to the marketing of produce and to childcare and household management. Despite their integral role in rural livelihoods, women lack access to basic services, assets, agricultural inputs and political decision-making processes.

It is estimated that the global population will grow to 9.8 billion by 2050, with developing regions in particular experiencing a rising share of young people and young adults. In Africa, for example, the rural population, which stood at 622 million in 2010, will grow to 927 million by 2050. By then, around 65% of Africa's young people will live in rural areas. Lack of income opportunities in the agricultural sector or the rural non-farm economy will therefore leave many of Africa's young adults unemployed. Pressure on housing markets and social services in rural areas and small and mid-sized rural towns will increase further.

**Figure 2: Role of ICTs in Agriculture**

(Source: Gender and ICTs, FAO, 2018, p.11)







ICTs have the potential to provide women and young people in rural areas with equal rights, access to services, and equitable livelihood options. Despite rapid technological advances and the opportunities they provide for service delivery in rural areas, the research indicates that most of today's existing ICT4Ag initiatives still depend on external financial support, fail to scale up and have a limited impact.<sup>3</sup> Constructive scepticism and realism have replaced the initial euphoria surrounding ICTs.

While the ICT4Ag market is growing, people in developing countries are not in a position to fully reap the benefits of the digital transformation. Firstly, various digital divides separate the global north and south, young and old people, women and men, urban and rural areas, etc. Secondly, as digital solutions are increasingly integrated into rural development approaches, more and more personal data (including data on health, finances, birthdates and national identity) are being collected. As such, the question around privacy protection and the human right to self-determination becomes more relevant and complex, especially when those involved are vulnerable individuals.

In 2016, the GIZ Sector Network Rural Development Africa (SNRD Africa) together with the GIZ Sectoral Project Rural Development (SV ELR) published the study [Use of ICT for Agriculture in GIZ projects – Status quo, opportunities and challenges](#).<sup>4</sup> It was a first stocktake of ICT solutions implemented by GIZ, funded by the German Ministry of Economic Cooperation and Development (BMZ). However, to gain deeper insights into the success factors and challenges of the different ICT4Ag solutions used in GIZ projects, it was felt that additional research was needed. This report is the fruit of this research and compiles its conclusions. It also offers recommendations for development projects, →

<sup>3</sup> Braun, J. and Baumüller, H., 'Unleashing the rural digitisation potential', Rural 21, Vol. 51, No 2/2017, Frankfurt, Germany, available at <http://www.rural21.com/english/archiv/archiv-ve2017-02en/>

<sup>4</sup> Available at <http://www2.giz.de/wbf/4tDx-9kw63gma/GIZ-ICT-study-final-interactive-version.pdf>



showing how they can harness the full potential of ICTs as a means for promoting the agricultural sector as part of a broader strategy to promote rural areas – be it as part of German development cooperation or beyond.

An increasing number of ICT4Ag solutions have been implemented in GIZ agricultural projects in recent years. These projects' experiences have been analysed in depth for this publication and the findings of this analysis, provided herein, serve as useful guidance for project and planning officers working on agricultural development projects.

**The overall objectives of this study are to**

- introduce a number of important aspects such as equal access to ICT for women and young people,
- capture and share lessons on the implementation of digital solutions for rural beneficiaries, and
- provide project managers with recommendations on how to plan and implement sustainable ICT4Ag business models.

This report draws on data gathered from and experiences gained during the implementation of 52 ICT4Ag solutions, which were developed for 29 GIZ projects operating in 34 countries. The authors are grateful for all the contributions that GIZ projects have made to this report.



# ➤ 1. The potential of rural digitalisation in Africa – key facts

This chapter provides an overview of the status quo of digitalisation in Africa, presents insights into the opportunities and challenges arising from ICT4Ag solutions, and introduces ICT's potential to empower the rural population with a specific focus on rural young people and women.

## DIGITAL TRENDS IN RURAL AFRICA

In 2012 the World Bank<sup>5</sup> noted that, in certain African countries, more people have access to a mobile phone than to adequate sanitation. Today, the number of people with mobile connections in Africa now totals 995 million, representing 81% of the continent's total population (see Fig. 3). At the same time, agriculture sustains the majority of rural livelihoods in developing countries.

ICTs can benefit the agricultural sector by offering farmers services that improve their access to inputs, financial services and markets, by gathering and disseminating information, and by facilitating social learning and exchange. In Africa the majority of these services still rely on SMS and voice-based systems as this ensures the services can be accessed by those with a basic mobile phone. The advent of smartphones, however, offers a new world of services to rural users. According to AGRA (2016),<sup>6</sup> Africa's smartphone penetration currently stands at 24% (see Fig. 4) but will reach 50% in economically leading sub-Saharan countries in the next five years. In January 2017 the social media platform Hootsuite<sup>7</sup> calculated that social media use in Africa had grown by 47% since the preceding January, which equates to an increase of 48 million new users in only 12 months.

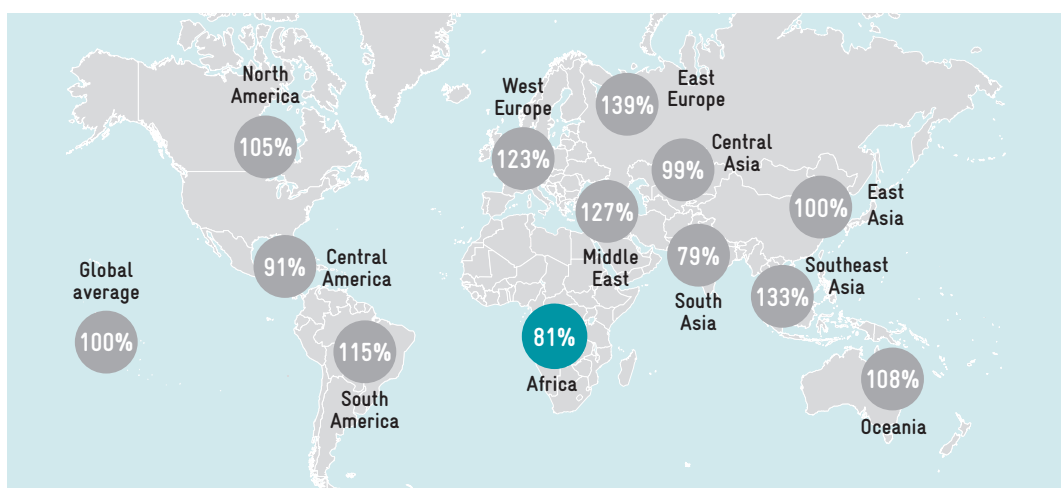
5 J. L. Irigoyen, 'What Do Toilets and Cell Phones Have in Common?', The Water Blog, World Bank, 2012, available at <http://blogs.worldbank.org/water/what-do-toilets-and-cell-phones-have-in-common>

6 AGRA, Africa Agriculture Status Report 2016, p. 177, available at <https://agra.org/aasr2016/>

7 Digital in 2017 – Global Overview, Hootsuite, 2017, slide 12, available at <https://www.slideshare.net/wearesocialsg/digital-in-2017-global-overview>

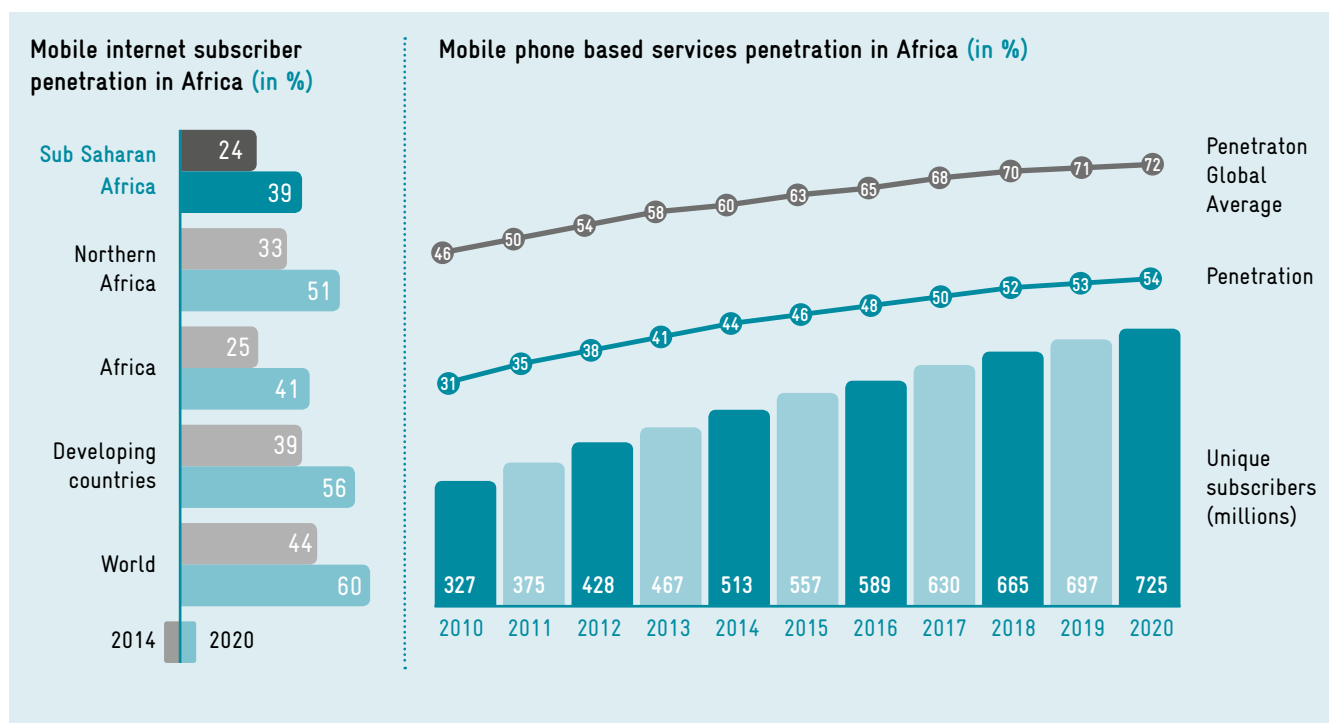
**Figure 3: Mobile connectivity by region**

(Source: <http://www.slideshare.net/wearesocialsg/digital-in-2017-global-overview> p.68)



**Figure 4: Mobile phone based services penetration in Africa**

(Source: Africa Agriculture Status Report, 2016, AGRA p. 175)



8 The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.'

Source: 'IoT Agenda', Tech Target Network, July 2016, available at <http://internetofthingsagenda.techtarget.com/definition/Internet-of-Things-IoT>

9 World Development Report 2016: Digital Dividends, World Bank, Washington DC, p. 90, available at <http://www.worldbank.org/en/publication/wdr2016>

At the same time, the 'internet of things'<sup>8</sup> is making it possible to connect up diverse and multiple devices through the mobile network. In so doing, huge amounts of data are being generated (so-called big data) that can be analysed using cloud-based technologies. The results of these analyses can then be fed into strategic policy and project design decision-making processes, or, depending on the type of the user's personal mobile devices, can deliver information. This has the potential to significantly reduce transaction costs, which continue to hinder smallholders' access to markets in Africa.

## LESSONS FOR ADAPTING DIGITAL TECHNOLOGIES FOR AGRICULTURE

Harnessing the rapid growth of the internet and its associated digital technologies is critical to help farmers obtain the information they need and offers great potential for promoting agricultural development. That said, not all of the ICT4Ag solutions introduced have been successfully scaled up or gained wider acceptance. Indeed, some were discontinued once the donor or grant funding came to an end. This being the case, to be able to fully exploit the potential of ICT4Ag in rural areas, four lessons must be considered:<sup>9</sup>

### 1. Agriculture is becoming increasingly knowledge intensive and high tech – these technologies need to be made accessible for small-scale farmers

Entrepreneurs in some of the world's newest industries have begun allocating their money and tech talent to exploring opportunities in farming. However, in rural areas inhabited mainly by smallholders, technologies usually have a limited reach. A key task for development partners could therefore be to make high-tech ICT solutions accessible for small-scale farmers. This will require the development of creative and innovative approaches that enable illiterate and otherwise disadvantaged people to make use of advanced technologies.



## 2. ICT solutions are more likely to succeed if farmers see them as relevant and trustworthy

If ICT4Ag solutions are to be successful, they must be closely tailored to their intended beneficiaries' needs and expectations, their existing skills and capabilities for using the technology in question, and their level of trust in the technology. This will require a thorough understanding of the traditional and cultural context and the educational level of the end-users and their livelihoods and of the impact, the technology will have on the latter.

## 3. ICTs are no panacea in themselves

ICT solutions need to be backed up with complementary investments. For instance, 'analogue components' such as physical infrastructure (e.g. internet access and electricity) and skills (e.g. literacy and e-skills) are often needed.<sup>10</sup> Instead of focusing on the technological aspects of ICT4Ag, practitioners should therefore work to build a better understanding of the intended beneficiaries and the trade-offs for them.

## 4. The country's ICT4Ag policies and its broader regulatory environment must be taken into account

While the expansion of mobile phone access has been rapid and commercially self-sustaining, even among large sections of the poor, the same is not true of the internet. In the long run, the internet has the potential to deliver even greater impacts on rural growth, but much depends on finding the sustainable ICT4Ag business models needed to promote its uptake also in the poorest parts of the world.

<sup>10</sup> E-skills or electronic skills include those needed to make use of ICT as well as those required to apply and develop them (Source: <http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:E-skills>).





11 Advantech Consulting Ltd, Digital Harvest, AGRA, October 2016, available at [https://www.rafllearning.org/sites/default/files/20161024\\_digital\\_harvest\\_final\\_report.pdf?token=iFv2y-WN](https://www.rafllearning.org/sites/default/files/20161024_digital_harvest_final_report.pdf?token=iFv2y-WN)

The AGRA financial inclusion team, in partnership with the MasterCard Foundation, has been assessing the business models of 15 ICT4Ag solution providers in Ghana, Kenya and Tanzania. The team's report<sup>11</sup> identifies more than 150 different solutions in these three countries that **enable farmers to access information on market prices, good agronomical practices and the weather**. While AGRA's sample is small, its report does provide insights on the solutions' weak spots and the possible improvements needed to grow and sustain the solutions that offer real value to the farmers.

## Five key traits of a sustainable ICT4Ag business model

AGRA's business model review identified **five key traits of sustainable business models**:

**1. Revenue models that involve agribusinesses or institutions covering the cost of smallholder farmers' access to the service (i.e. the client paying for the service is different to the person using it).**

This model is important as most smallholder farmers are often unable, and sometimes unwilling, to pay for such services. They also mistrust or resist innovation and technologies, such as automated payments and push messaging, that they feel are using up their airtime (phone credit).

**2. The use of low-cost digital delivery channels combined with more expensive face-to-face promotion and marketing to gain the trust of smallholder farmers and gather regular customer feedback.**

Successful solution providers combined (cheap) digital delivery channels with (expensive) face-to-face promotion and marketing activities to gain the trust of smallholder farmers and collect regular customer feedback.

**3. Solutions that combine valued and focused services, offered in partnership with trusted organisations that provide access to content, users or infrastructure.**

Limited customer segmentation, weak relationship management and limited customer feedback mechanisms often inhibit user uptake and retention. Partnerships with trusted organisations such as farmer associations are an increasingly important factor for the success of a solution.

**4. Key performance indicators and customer feedback loops to monitor the business.**

In many cases, solution providers insufficiently track financial key performance indicators and have a limited view of their cost drivers. To ensure the solution's sustainability, customer feedback loops need to be improved so that the business model can be better adapted to users' needs and expectations.

**5. Business models that have diversified sources of revenue such as subscription and usage fees combined with advertising and commission.**

The successful solution providers have diversified their sources of income by combining subscription and usage fees with advertising and commission. While the sale of data collected through the solution is often mentioned as a revenue stream, successful examples of such sales have yet to be identified.

**At a glance:** To make their ICT4Ag solutions sustainable, projects need to take a **user-centred approach**. When seeking to scale up their ICT solution, they must therefore pay attention to users' needs, expectations and willingness to pay, must stay abreast of changing customer behaviours and must monitor the level to which farmers trust the solution. At the same time, solution providers need to have a convincing business model with a long-term economic perspective.



## USING ICT FOR AGRICULTURE TO EMPOWER RURAL WOMEN AND YOUNG PEOPLE

### Closing the digital gender divide

The interrelationship between gender and ICT is becoming an increasingly prominent feature on the international agenda. **This is due in large part to the 2030 Agenda's goal of empowering women and girls by enhancing their use of ICT.** The outcome document of the overall review of the World Summit on the Information Society (WSIS+10), adopted by the UN General Assembly, draws attention to the still significant digital divide between women and men: Worldwide, around 200 million fewer women than men are connected to the internet.<sup>12</sup>

The 2016 World Development Report<sup>9</sup> points out that women could substantially benefit from technology, and in particular from the access it provides to work opportunities, **when the barriers concerning ownership, access and control** as well as the underlying barriers to women's employment, voice and agency are adequately addressed.

In 2017, Betterplace Lab published the findings of its survey Bridging the Digital Gender Gap,<sup>13</sup> which focused on six countries including Ethiopia, India and South Africa. Based on the results of the survey, the Lab drew conclusions and formulated the following recommendations for plugging the gaps in gender-specific access to digital technologies:

1. Donors need to **understand the socio-cultural circumstances** of their female target market, identify **gatekeepers** (parents, husbands, teachers) and incorporate both into the process of developing and designing programmes and products.
2. Products and services that are tailored to **women's lived realities and working conditions** should be supported. Accordingly, services should also be made available in **local languages**.

#### Facts and figures on the digital gender divide

##### ACCESS

In Africa **18% of men** report using the internet, compared to **12% of women**.<sup>9</sup>

##### AFFORDABILITY

The countries with the **highest internet costs have the lowest numbers of women online** and the largest gender gaps in internet use.<sup>14</sup>

##### SKILLS AND EDUCATION

**Lack of expertise and high costs** are the two main barriers keeping women offline. Women's confidence regarding their digital abilities rises dramatically with increased education.<sup>14</sup>

##### ECONOMIC PARTICIPATION

If governments and businesses can double the pace at which women become frequent users of technology, they could reach **gender equality in the workplace by 2040 in developed nations and by 2060 in developing nations**.<sup>15</sup>

12 Women's Pathways to the Digital Sector: Stories of Opportunities and Challenges, BMZ, Bonn, Germany, 2017, available at [https://www.bmz.de/en/publications/type\\_of\\_publication/weitere\\_materialien/studieSkills4girls.pdf](https://www.bmz.de/en/publications/type_of_publication/weitere_materialien/studieSkills4girls.pdf)

13 'Bridging the Digital Gender Gap', Betterplace Lab, 2017, available at <http://www.betterplace-lab.org/en/bridging-the-digital-gender-gap-2/>

14 Women's Rights Online: Translating Access into Empowerment, World Wide Web Foundation, 2015, available at <http://webfoundation.org/docs/2015/10/womens-rights-online21102015.pdf>

15 Getting to Equal, Accenture, 2016, available at [https://www.accenture.com/t00010101T000000\\_\\_w\\_\\_/\\_ares/\\_acnmedia/PDF-9/Accenture-Get-ting-To-Equal.pdf](https://www.accenture.com/t00010101T000000__w__/_ares/_acnmedia/PDF-9/Accenture-Get-ting-To-Equal.pdf)



Providers of online services view rural and impoverished regions as unprofitable. They therefore need to be encouraged to carry out comprehensive target group analyses and to **tailor their services to the needs of women living in rural areas**.

3. Donors need to acknowledge the power of **peer-to-peer training**. For example, daughters often teach their mothers how to use digital applications. This 'digital head-start' is something that practitioners can harness.
4. It is important to **promote secure digital spaces** for women, as it is only in such spaces that women will ask questions and discuss problems that they would otherwise tend to conceal. In contrast to open online forums, private digital spaces can protect women from verbal sexual violence.
5. Donors should support **projects that encourage women and girls to develop technology**. When women see other women involved in the design of technology and the development of solutions, women improving conditions for themselves and for others, they are emboldened to take part.

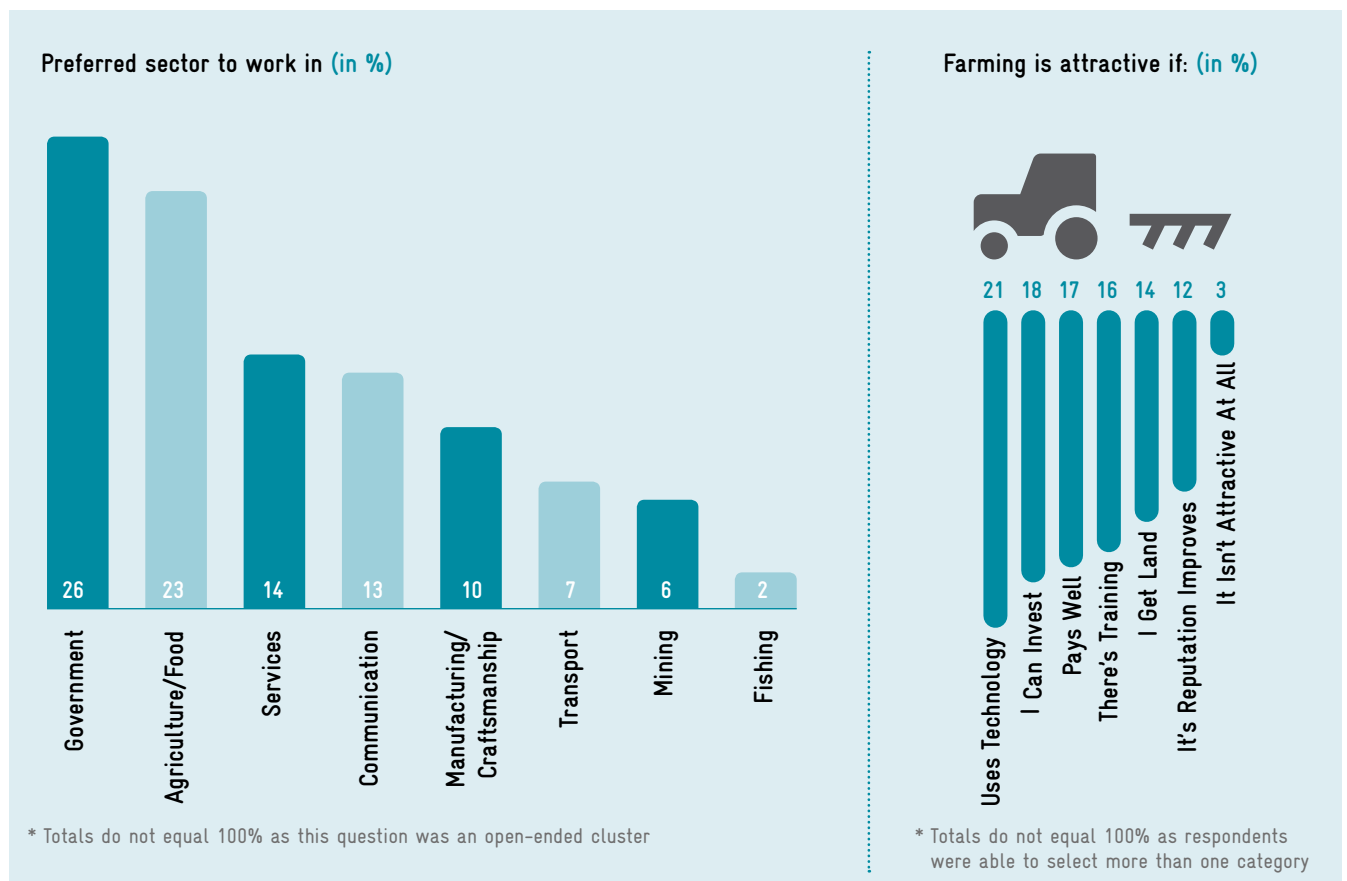
### ICT to empower young farmers

About 65% of the total population of Africa is below the age of 35 years. Africa is the world's most youthful continent. Nowadays, 10 million young Africans enter the continent's workforce each year – more than have ever done so before.<sup>16</sup> Employment opportunities for the rapidly growing number of young people in rural areas are available in the agricultural sector and the rural non-farm economy. ICT can play a catalytic role in making these employment opportunities profitable and more attractive.

16 AGRA, Africa Agriculture Status Report 2015, Nairobi, Kenya, available at <https://reliefweb.int/sites/reliefweb.int/files/resources/africa-agriculture-status-report-2015.pdf>

**Figure 5: Role of ICTs in enhancing the attractiveness of rural jobs**

(Source: GeoPoll Report 2017, unpublished)



17 GeoPoll, Rural Perceptions of the Young Generation in Sub-Saharan Africa, 2017.

18 Farmerline is a technology product company that has developed a voice-activated system to send farmers agricultural advice.

19 CTA, Innovate for Agriculture: Young ICT Entrepreneurs Addressing Challenges and Transforming Agriculture, 2016, available at <http://www.cta.int/en/article/2016-03-29/innovate-for-agriculture.html>

The role ICTs play in enhancing the attractiveness of rural jobs and areas was confirmed by the findings of an SMS survey, conducted in early 2017, of 10,000 young Africans.<sup>17</sup> The vast majority (92%) of the respondents indicated that technology/the internet will play an important role in their jobs or livelihoods over the next five years. Remarkably 23% of participants opted for the agriculture/food sector as their preferred field of occupation (see Figure 5), placing this sector second in the ranking. Participants identified 'attractive conditions in the farming sector', 'better education', 'access and use of new technologies' and 'the internet' as determining factors for their future decision-making.

In its 2016 report Innovate for Agriculture, the Technical Centre for Agricultural and Rural Cooperation (CTA) highlights three promising areas for engaging young farmers in the field of ICT for agriculture:

**1. Improvement of agricultural production – using the speed of ICT to put information into the hands of young agripreneurs**

Young smallholder farmers and extension officers use ICT tools to access basic information about cultivation. Farmerline,<sup>18</sup> for example, sends automated, daily SMS messages from extension officers that walk farmers through best practices in cultivation.

**2. Access to finance – using ICT to connect young agripreneurs to banks**

Young farmers often remain stuck in subsistence farming because they lack the capital to enter the commercial space or to secure alternative sources of income. Co-banking platforms such as Ensibuuko's MOBIS provide more than 40,000 rural farmers in Uganda with financial access.

**3. Trading, markets and consumption – using ICT to provide young agripreneurs with access to markets**

Mkulima Young re-engaged more than 60,000 young people in agriculture by making markets accessible through an online platform and improving the social image of farming.<sup>19</sup>



## ➤ 2. Using ICT for agriculture: Examples from the German technical cooperation portfolio

The case studies presented in this chapter have been selected from the German development portfolio, funded by the German Federal Ministry for Economic Cooperation and Development (BMZ). Selection was done in consultation with the Sector Network Rural Development Africa's community of practice for ICT4Ag and fall under one of the following eight categories:

1. Extension services, productivity, learning, capacity development
2. Market price systems, commodity exchange, trading
3. Value chain/farm/herd management
4. Diagnostic and collaborative tools, early warning, weather
5. Finance, payments, insurance
6. Data collection, GIS, field survey, monitoring and evaluation
7. Farmers' voice, lobbying, advocacy
8. Environment

### ➤ 1. EXTENSION SERVICES, PRODUCTIVITY, LEARNING, CAPACITY DEVELOPMENT

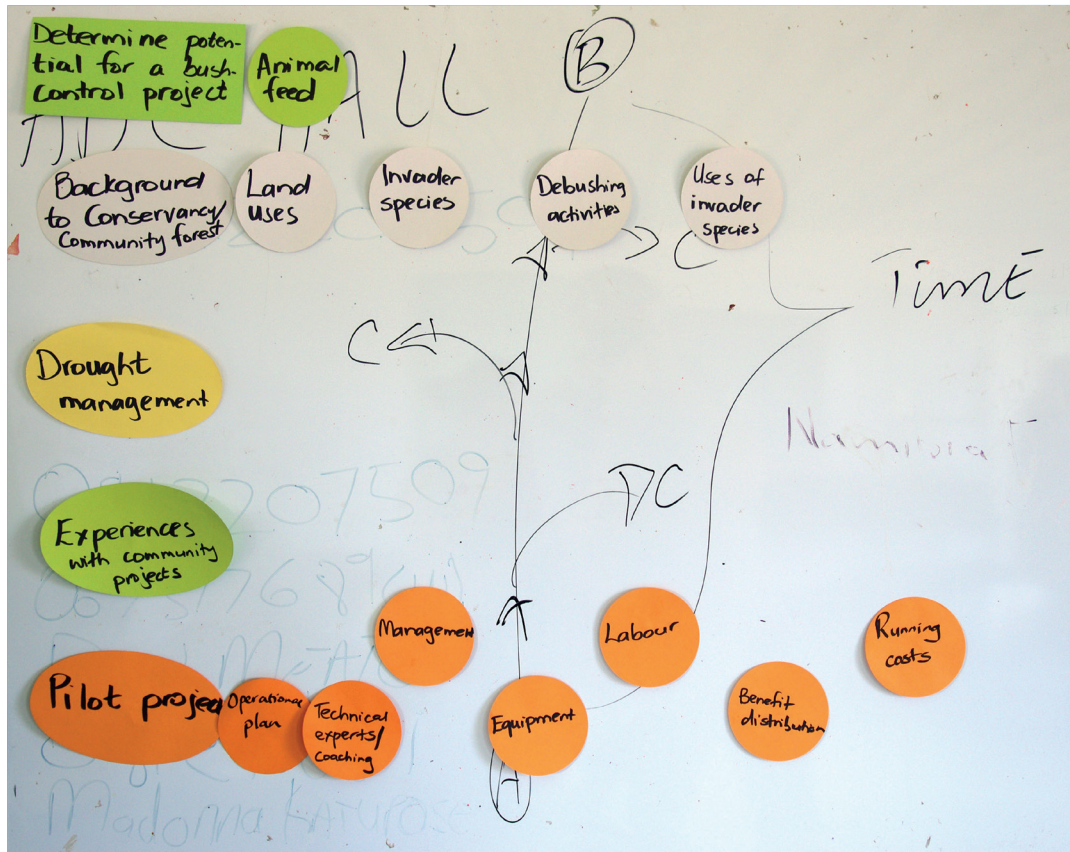
#### USING ICT IN NAMIBIA TO RAISE FARMERS' AWARENESS OF BUSH ENCROACHMENT

##### **Context**

Bush encroachment is a major challenge in Namibia, affecting more than 30 million hectares of farmland and generating economic losses of up to NAD 1.7 billion (approx. EUR 110 million). Farmers are those most affected by bush encroachment and, at the same time, have the least means to deal with the phenomenon. In 2014 the Namibian and German governments launched a bilateral project to tackle the encroachment with so-called de-bushing measures.

##### **Objective**

Improved strategies and methodologies for dealing with bush encroachment in Namibia have been developed. A dedicated advisory service is in place and reaches out to the target group.



### Approach

The Support to De-bushing project established a knowledge and outreach platform, the De-bushing Advisory Service (DAS), that provides farmers and other stakeholders with relevant advice and promotes sustainable bush control and biomass utilisation solutions. To maximise its outreach, the DAS uses modern communication channels.

### HIGHLIGHTS

#### Use multiple communication channels to reach farmers and other stakeholders

In response to the findings of a national baseline survey of the target group, diverse communication channels were employed as a way to ensure effective engagement with a broad range of potential beneficiaries. While radio advertising tends to be the best approach for reaching farmers, especially those in rural areas, social media platforms like Twitter make it possible to engage with decision-makers in the public and private sectors. An integrated system based on spatial data, the Bush Information System, is currently under development.

### Results

- **A series of topical video documentaries** were developed illustrating the approach and concepts promoted by the project. These video clips are often used by interested parties, both in Namibia and internationally, as a primary source of information.
- **Radio broadcasts** were put together to raise the target group's awareness of key bush encroachment topics. These informative audio programmes were translated into local languages and broadcast on national radio.

- **Social media platforms are used for outreach.** The project uses Facebook and Twitter to stimulate the interest of a broad range of individuals and groups such as young people and decision-makers.
- **An online Decision Support System has been developed.** This web-based decision-support tool helps farmers to make de-bushing decisions based on their specific circumstances (e.g. the level of bush encroachment on their farm, the current season, etc.).
- **Email, SMS and call-centre services** provide farmers in remote areas with the support they need. In 2016 over 300 enquiries were made via these channels.
- **A training and mentoring programme** upskills farmers in bush control techniques, value addition, aftercare (biological, manual or chemical) following the initial bush control, and rangeland management.

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 DAS Namibia's publications:  
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### Learning

1. Communication channels must be chosen based on the local framework conditions (e.g. radio for remote areas).
2. Suitable/tested software packages are crucial; efforts fail when the professional programming or maintenance of ICT solutions is lacking.




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## 3D ANIMATIONS FOR FARMERS IN WEST AND CENTRAL AFRICA

### Context

The maxim 'knowledge is power' neatly sums up the ethos of the Sustainable Smallholder Agri-Business (SSAB) programme, which focuses on agricultural extension services, productivity, learning and capacity development. Working with Digital Africa, a special initiative of the Federal Ministry of Economic Cooperation and Development (BMZ), the SSAB's ICT team is developing and disseminating 3D animated videos on good agricultural practices and cross-cutting issues.

### Objective

The SSAB's objective is to help 404,600 West and Central African smallholders, who mainly farm in the cocoa-growing areas of Cameroon, Côte d'Ivoire, Ghana, Nigeria and Togo, to sustainably increase their incomes and food supply through diversified production. Digital extension material in the form of 3D animations support the face-to-face extension services delivered by partners and the adaptation of these services to Africa's rapidly growing digital environment.

### Approach

Research-based analogue training material that has been proven to be effective is turned into 3D animated videos. The videos are produced in a modular format so they can be easily converted into different languages (see the GIAE Nigeria case study in the highlights box) and adapted to reflect new developments (e.g. the occurrence of new pests like the fall armyworm). Another key element, in addition to the videos, is the development of innovative strategies to communicate extension messages to farmers, such as:





- **WhatsApp for What's GAP** – WhatsApp, the world's most widely used messaging application, is one of the channels used to disseminate the animated videos and extension messages. In this way, existing WhatsApp-related linkages between the farmers and the programme partners are utilised.
- **Cinema on the go** – Handheld pocket projectors are purchased for use by those delivering training to partners in the cocoa farming communities.
- **Diverse online channels** – A variety of online channels have been identified, ranging from GIZ's YouTube channel to partner websites and online extension platforms.
- The **digital principle of designing the video with the user** is strictly followed: farmers are involved in the production process to ensure the material's relevance. The roll-out of the videos in the four countries of Cameroon, Côte d'Ivoire, Ghana and Nigeria and the modular design for easy adaptation are factors that reflect the build-for-scale principle. By working with local production studios, the existing ecosystem is included as much as possible.

## HIGHLIGHTS

### Provide farmers with a practical how-to tool

Three 3D animations have been produced on maize production, healthy nutrition and the safe use of pesticides. The Nigerian initiative Green Innovation Centres for the Agriculture and Food Sector (GIAE) of the BMZ has taken one of SSAB's 3D animated videos on good agricultural practices (GAP) in maize growing in southern Nigeria and adapted it for use in the country's north.

In total, 110 state extension agents in Kaduna and Kano states have received training on how to use the 3D animations to complement their face-to-face training. By the end of the 2017 growing season, up to 21,600 maize farmers in these states were reached.

GIAE's experience shows that, as a visual and practical how-to tool, this digital extension material offers great potential for promoting the adoption of technology and innovation related to GAP and to other cross-cutting issues.

## Results

- The sector developing digital extension solutions and agricultural educational videos and 3D animations is limited in Western Africa. Production studios' perceptions about farmers tended to be caricatural and distorted. To address this issue required intensive capacity development.
- There are 708 extension agents and trainers in the four countries, half of whom are individually tasked with running eight different WhatsApp groups that each comprise 20 farmers. A combined total of around 50,000 farmers is therefore reached with WhatsApp.
- 100 pocket projectors are used to show the videos to up to 30,000 farmers per year per country.

## Learning

1. Ensure adequate cooperation with partners to encourage them to use the digital extension material.
2. Make use of existing solutions (e.g. WhatsApp) instead of reinventing the wheel.
3. Animations are not comics. Be very careful how you depict farmers.

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## MOBILE APPLICATION TO REDUCE CROP LOSSES AND PROMOTE EMPLOYMENT FOR YOUNG PEOPLE LIVING IN RURAL TUNISIA

### Context

In Tunisia, farmers in rural areas and especially female farmers lack sufficient and timely access to expert information. Public extension services are often unavailable or are not adapted to these farmers' particular needs, and the cost of bringing in private experts to provide the required information in the required time frame is prohibitive. This undermines the productivity of small farmers, resulting in crop losses ranging from 15% to 30%. In addition, the country is struggling with high rates of unemployment that especially affects younger generations, and agriculture is not seen as an attractive sector.

### Objective

The project works with more than 10,000 smallholders, promoting sustainable and innovative agriculture that reduces crop losses by increasing female and male farmers' access to plant protection expertise. This knowledge is delivered through a free-to-use smartphone app called Plantix, which also offers innovative in-app services promoting the employment of young people in the agricultural sector.

### Approach

The smartphone application Plantix was developed in Germany by the private start-up PEAT to fight plant diseases and pests. Using photo recognition technology, the app enables users to quickly identify the causes of plant damage and then offers solutions contained in its library of high-quality expert information on pests, diseases, symptoms, triggers, treatment options and preventive measures / GAP. By supporting faster diagnosis and better decision-making on treatment and prevention measures, this ICT4Ag solution can help to mitigate crop losses.

An integrated development partnership with the private sector involving PEAT and Royal Green Technologies (RGT), a Tunisian start-up providing agro-advisory services, was set up to adapt Plantix to the Tunisian context. This involved: creating content for the library on the six crops relevant for Tunisian smallholders, which was then validated by the partner ministry; collecting pictures of diseased plants for the database; adapting the interface to meet local users' needs; and raising the target group's awareness of the new ICT tool.

In addition, 50 young, predominantly female agriculture graduates were recruited as 'plant doctors', provided with a smartphone and then trained on the app itself, on its plant protection topics and on collecting pictures for the database. These plant doctors are also receiving support on developing their own business concepts and models for an innovative start-up in the field of agricultural extension or services.

### Results

No evaluation data are available yet as the initiative only got underway in the spring of 2017. The expected results, in particular for woman-led households, are reduced food losses, which should lead to higher incomes, enhanced food and nutrition security and resilience, and better environmental protection. Youth employment is also expected to rise.





### Providing female farmers with access to Plantix

The Plantix app has been specifically adapted to meet the needs of (digitally) illiterate female farmers, offering an accessible user interface and functions such as text-to-speech, pictures/icons, and Tunisian Arabic and French language options. To encourage local female farmers, who generally do not use smartphones, to use Plantix, the young plant doctors based in rural farming communities promote the app in culturally appropriate ways. This includes demonstrating how the app provides access to easy-to-understand and practical advice on plant treatments and damage prevention. The aim is to increase the productivity and incomes of female farmers and, at the same time, reduce the gender gap in ICT4Ag.

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Plantix:  
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A key success factor that is also one of the main challenges is to convince both the Ministry of Agriculture and Environment and Tunisia's farmers of (a) the reliability of recommendations made by a smartphone app and (b) the need to work with young entrepreneurs on developing sustainable business models that make Plantix available to female farmers.

### Learning

1. The more complex the technology is, the more training and qualified extension support will be required to ensure successful outcomes.
2. Innovations in ICT4Ag help to make agriculture more attractive to young people.
3. Younger generations are particularly well placed to benefit from the opportunities presented by both new and traditional solutions: they are more open to new technologies and can learn traditional methods from their seniors.





## A HEALTH HOTLINE FOR PEOPLE IN REMOTE RURAL AREAS OF MALAWI

### **Context**

About 815 million people worldwide are currently undernourished and some two billion suffer from malnutrition. In Malawi the Food and Nutrition Security Programme (FNSP), under the One World – No Hunger special initiative of the BMZ, works through health care structures and agricultural extension services to promote increased dietary diversity. The aim is to make this the norm for future generations.

At present, mothers, fathers and other caregivers seeking advice from health care professionals often have to travel long distances to reach health care facilities. However, if Malawi is to successfully tackle its high rate of long-term malnutrition and prevent effects such as stunting, the project will need to reach households in the country's remote rural areas.

### **Objective**

The programme works at the household level with food- and nutrition-insecure people, especially women and children, to improve their food and nutrition situation.

Chipatala Cha Pa Foni (which translates as 'health centre by phone') is a call centre of the Malawi Ministry of Health that enables people living in remote villages and isolated rural areas to access essential information using their mobile phone.

## Approach

Through its implementing partner VillageReach, Chipatala Cha Pa Foni provides information and advice on reproductive, maternal and child health issues including healthy nutrition and hygiene. The toll-free phone hotline is operated by Ministry of Health staff trained in health and nutrition and currently answers up to 100 calls a day. A comprehensive messaging service that can be scheduled in line with the subscriber's week of pregnancy or the child's age is also available. The service is currently being promoted by governmental extension officers and community groups and advertised through leaflets, SMS and radio jingles. Chipatala Cha Pa Foni, has recently been scaled up nationwide with financial support of several donors whereby FNSP supports the hotline in its two target districts of Dedza and Salima. These two districts have a total population of around 1.1 million.

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### Providing women in remote rural areas with access to health information

The project enhanced Chipatala Cha Pa Foni's advisory services by supporting the introduction of a women-focused nutrition component. The hotline's original activities focused on providing specific health care information and advice to mitigate the distance between villages and health centres. The hotline now provides its users with comprehensive health and nutrition advice in line with national guidelines.

## Results

FNSP has committed to support the hotline for a total of six years. From December 2016 to November 2017, the call centre received 10,444 calls. In the past 6 months alone, 7,565 calls were registered, 24% of the callers were pregnant and postnatal women seeking advice on maternal and child nutrition.

The on-demand hotline service ensures anonymity and is able to help women, men and children in hard to reach areas. Anecdotal evidence suggests that the nutrition component of the service is much appreciated by the target group. However, quantitative monitoring is still at an earlier stage. It is crucial to further raise awareness about the service in Malawian households.

## Learning

1. In Malawi the target groups' access to mobile phones has been increasing. However, the basic infrastructure to support the technology in rural areas (e.g. electrical connections and network coverage) remains deficient.
2. Promoting the hotline to a rural and geographically remote target group involves substantial effort and the use of multiple communication channels.
3. The service must be clearly communicated so that potential users know about it, can understand its benefits and are more likely to use it.





## CATALYSING THE ADOPTION AND USE OF SCALABLE TECHNOLOGIES IN AFRICA (CAUSA), BENIN

### Using a Confluence wiki to manage a project promoting large-scale innovation in Benin

#### Context

This project is working to address the fundamental problem of the limited outputs and technical progress achieved by agricultural innovation systems. The low distribution and use of technologies is mainly due to restricted access and insufficient exchange as well as a lack of agricultural knowledge among the population.

#### Objective

The project's main objective is to drive forward an innovation process that, in particular, accelerates the spread of new and improved agricultural technologies. To do this, it promotes the systematic exchange of information and communication between stakeholders in individual value chains and between stakeholders in the research and development sector.

#### Approach

Multi-stakeholder platforms (MSPs) facilitate access to innovations and accelerate their circulation. The platforms comprise a system of virtual hubs (eHubs) that provide information on agricultural innovations and on services and solutions designed to meet users' needs and desired outcomes. Using the MSP, farmers can engage directly with agricultural researchers to source advice on the problems they face. Included in the platform is an e-learning module that promotes the development of expertise and the wider uptake of measures.

By accessing research results and exchanging with experts and each other via the MSP, farmers can increase their yields and, in so doing, secure their food supply and income. New technologies also enable farmers to respond to the impacts of climate change.

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## HIGHLIGHTS

### Making innovation accessible for farmers and processors along agricultural value chains

Confluence wiki software is used to coordinate, document and evaluate the innovation support and business development services provided under the scheme. In total, 27 national experts and 150 young professionals support 309 groups of farmers and processors in the poultry, maize, rice and soybean value chains. This network of beneficiaries is spread across some 50,000 km<sup>2</sup>.

## Results

- The project team has been using the MSP since 2015. The platform enables team members to systematically exchange with 6,000 stakeholders in near real-time.
- The MSP has had such a decisive impact on the users' productivity that it has become indispensable. Participants now send less email and hold fewer meetings, but get more done.
- The biggest challenge is to develop and implement a knowledge management strategy for systematic content development and exchange that achieves the desired outputs and outcomes.

## Learning

1. The commitment of those managing the project to take the lead and use the platform is key.
2. Getting an experienced user to deliver a one-day introductory session is an effective way to get new users quickly up to speed.
3. The Confluence software is flexible. Careful administration, systematic user and group management and the elaboration of knowledge management concepts and strategies are essential to maximise the benefits of its use.
4. A results-oriented business model is needed for a system that documents the entire collaboration process in real-time.
5. Professional support is required for maintenance and hosting.



## ➤ 2. MARKET PRICE SYSTEMS, COMMODITY EXCHANGE, TRADING

### CREATING MARKET LINKAGES FOR SMALLHOLDER FARMERS IN SOUTH AFRICA USING INNOVATIVE ICT SOLUTIONS

#### **Context**

The Government of South Africa's strategy for addressing food security is to create a more inclusive agricultural value chain for the country's 2.3 million smallholder farmers (SHFs) and subsistence farmers who have limited access to markets, services, information, finance and inputs.

About 35,000 commercial farmers dominate the South African agriculture sector and produce the majority of the country's food. It transpires that potential buyers are reluctant to work with or purchase from SHFs, as reliable data on these producers are not readily available. Vodacom has therefore created a cloud-based web and mobile software solution that links SHFs to agribusinesses, information, services and markets and will, in future, produce reliable data.

#### **Objective**

The project uses mobile and web applications to link 16,000 SHFs to approximately 40 agribusiness as well as markets, information and cashless value, resulting in higher incomes and more jobs.

#### **Approach**

The Connected Farmer platform is a cloud-based web- and mobile-enabled software solution that links farmers from any value chain via agribusinesses to an ICT platform. A train-the-trainer programme covering the use of the mobile application and business development for start-ups will enable selected extension workers to cascade their learning and skills to others. Selected agribusinesses will be supported and connected up to better and sustainable markets.

In accordance with the nine principles for digital development, workshops were held with stakeholders and possible users to ensure that the app met users' needs. The app is also being reviewed and adjusted on an ongoing basis.

Similar platforms that have already been tested and successfully implemented in other countries are being modified for use in South Africa. Prior to its commercial launch, the app's compliance with all relevant technological, legal and regulatory policies was ensured. The private partner Vodacom planned the project with sustainability and scalability in mind. Finally, an innovative partnership with Manstrat, an online technical agricultural partner, was created.

At present, it is not planned to use open data. Privacy will be governed by South Africa's Protection of Personal Information Act (POPI Act), which ensures the privacy of personal data. Best practices are documented and shared as they become available.



## HIGHLIGHTS

### Connect smallholder farmers up with markets and information

The inclusion of Manstrat as the online agricultural technical partner will provide agribusinesses with the opportunity to access professional technical information for their mentorship programmes. Bespoke strategies will be produced for selected agribusinesses to support their development of market linkages.

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## Results

The success of the project remains to be determined, as it only got underway in July 2017. It is envisaged that, by the time the three-year project completes, the platform will be fully commercially operational, it will have enabled 1,000 additional people to enter the labour market and 3,300 people will have increased their income by 10%.

Of the 16,000 SHFs that the project aims to connect to the platform, 33% will be women and 33% young people.

The main challenge experienced when implementing this project was the preparation phase, which took much longer than anticipated.

## Learning

1. Build more time into the programme for the preparation phase.
2. Have a technical partner on board from the very outset, when conceiving the project.



## ➤ 3. VALUE CHAIN/FARM/HERD MANAGEMENT

### CROP MANAGEMENT RECOMMENDATIONS FOR AFRICAN RICE FARMERS

#### Context

Rice is an important staple crop in Africa. Local rice production does not, however, meet demand, which is soaring as a result of population growth, urbanisation and changes in consumer behaviour.

Some 90% of Africa's domestic rice is produced by smallholders. However, as these growers tend to have a poor knowledge of good agronomic practices, sub-optimum management practices and limited access to input and output markets, their yields are low. Furthermore, missing links in the value chain have made the rice sector unsustainable.

#### Objective

The Competitive African Rice Initiative (CARI) aims to increase the competitiveness of domestic rice and improve rice farmers' livelihoods.

The ICT4Ag solution RiceAdvice has been designed to improve good agricultural practices, increase the productivity and incomes of rice farmers and, at the same time, **empower young people** through job creation and livelihood improvement.

#### Approach

RiceAdvice, an Android-based application developed by AfricaRice in consultation with end-users, provides farmers with personalised advice on field-specific rice management practices for increasing rice yields and grower incomes. Recommendations are validated in field trials and continuously updated through further research.

As most of the targeted farmers do not own a smartphone or tablet, they must access RiceAdvice guidance through a third-party. For this reason, more than 300 service providers from the public and private sectors have, since the app's launch, received training on how to use RiceAdvice and support rice farmers.

#### HIGHLIGHTS

##### Using RiceAdvice:

- increases income
- increases rice yields
- reduces soil degradation
- creates business opportunities
- empowers rural young people





## Results

So far, RiceAdvice has reached more than 19,000 rice farmers. Once farmers use the app and realise the benefits of having access to tailored guidance, they often indicate a willingness to pay for the service. This shows that there is the potential for developing business models in a sustainable way and represents an opportunity to empower Africa's young people through job creation.

Farmers using the app can increase their yields by around 0.6 to 1.8 tonnes per hectare, reduce fertiliser inputs by up to 50% and thus increase their income by USD 100–250 per hectare.

Traditions and cultural constraints not only limit female farmers' access to services provided by men, but also restrict women's opportunities to work as service providers themselves. Poor infrastructure (poor internet connections and electrification in rural areas) and equipment malfunction (software and hardware errors) are other obstacles that need to be considered.

## Learning

1. Farmers and extension officers are not fully aware of ICT's potential for improving production.
2. With 3,000 farmers to every 1 extension worker, the provision of intensive and bespoke assistance is not possible. ICT can help solve this problem by facilitating the scaling out and dissemination of information and knowledge.
3. Guidance through ICT applications is delivered faster compared to face-to-face interactions.
4. ICT solutions are highly cost effective.

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## 4. DIAGNOSTIC AND COLLABORATIVE TOOLS, EARLY WARNING, WEATHER

### MOBILE SOIL LAB, NAMIBIA

#### Context

The crop yields obtained on Namibia's small-scale farms are very low because of low soil fertility, climate change and inadequate farming practices. In general, farmers in the country are unable to access soil analysis services, and diagnostic tools, be they conventional or digital, are largely unavailable. Farmers therefore apply either no or non-adapted fertilisers.

The Adaptation of Agriculture to Climate Change in Northern Namibia project supports the introduction of conservation agriculture, which is based on three principles: minimum soil disturbance, organic soil cover and crop rotation. This method, in combination with the appropriate application of organic and/or inorganic fertilisers, supports farms' adaptation to climate change and ensures higher crop yields.

#### Objective

The project's objective is to promote the use of climate-adapted farming methods, with a focus on conservation agriculture.

The mobile soil lab will provide smallholder farmers with improved access to soil information.

#### Approach

Mounted on a 4x4 vehicle, the mobile soil lab offers analytical services to remote communities that would otherwise have no access to a lab. Instead of using chemicals for soil analyses, the unit uses X-ray<sup>20</sup> and infrared technology. The results of the analysis are transferred to a server in the Netherlands, where 15 soil parameters are calculated. The details of the soil parameters, together with an easy-to-understand fertiliser recommendation, are digitally returned to the lab within two to four hours. A printout is then provided and explained to the farmer.

Currently, the lab is a joint endeavour of the Namibian Ministry of Agriculture, Water and Forestry and the project. It offers its services in three Namibian regions, which together contain around 33,000 agricultural households. The ultimate aim is to charge farmers for the service, making the lab a viable business proposition for a private service provider.

#### HIGHLIGHTS

##### Making soil analyses affordable

In Namibia, standard soil analyses cost from EUR 20 to 50 per sample, depending on the parameters analysed. With the mobile soil lab, these same analyses can be offered at a much lower rate. The cost of procuring the lab could already be recovered by using it to analyse samples that the project would otherwise have sent to conventional labs.

<sup>20</sup> X-ray: a form of electromagnetic radiation, similar to light but of shorter wavelength and capable of penetrating solids and of ionizing gases.



### Results

The mobile soil lab began a pilot phase of operations in November 2016 with the aim of raising awareness about the lab itself and developing a robust business model.

For the lab to be successful, farmers need to see the benefits of performing soil analyses. Since the cost of analysing a sample with the mobile lab is much lower than with a conventional lab, the analyses are likely to be more acceptable to farmers. Another advantage for farmers is the quick turnaround time for receiving results and fertiliser recommendations.

### Learning

1. High initial investments may provide cheaper solutions in the long run.
2. The development of a business plan is crucial for the sustainability of the service.
3. Digital solutions can be beneficial for the environment (e. g. no chemicals needed).

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## RISE 3.0 – MEASURING FARM SUSTAINABILITY

### Context

Agricultural production and agriculture-based value chains face numerous challenges in meeting the growing human population's demand for food and raw materials and doing so in a way that conserves natural resources, is efficient, and respects animal welfare and biodiversity in the context of climate change. First and foremost, a farm is an economic enterprise and a place where people work. Good working conditions, a high quality of life and good economic performance are therefore the pillars of a successful farm operation. If agriculture is to be economically, socially and ecologically sustainable, it must fulfil all the above-mentioned criteria both now and in the long term.

Developed by the School of Agricultural, Forest and Food Sciences at the Bern University of Applied Sciences, Switzerland, the Response-Inducing Sustainability Evaluation (RISE) is a computer-aided approach for examining and assessing the sustainability of agricultural production at the farm level. Since 2012, GIZ has been using the RISE software tool in different countries all over the world on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ).

### Objective

RISE is a method for measuring sustainability and communicating its findings. It is not designed as a system for certifying farms, but rather as a way to (a) facilitate discussions on sustainable farming based on an objective analysis, (b) initiate reflection through awareness-raising and (c) inculcate a process of continuous improvement in sustainability performance. RISE can be applied to any farm irrespective of its size, degree of commercialisation and location.

### Approach

RISE makes it possible to comprehensively assess sustainability within an appropriate time frame.

#### HIGHLIGHTS

##### Enhancing the sustainability of agricultural production at the farm level

Those using the RISE tool work closely with farmers to learn how they manage their farms and identify what their challenges and opportunities are. A major benefit of using RISE is that it can provide detailed feedback in hard copy to the farmer after the interview. Based on this output and discussions with the farmer, concrete actions can be drawn up to enhance the sustainability of his or her farm.

### Results

The results of the RISE analysis are expressed as a polygon (see Figure 6) with 10 indicators, which serves as the basis for further discussions and strategy formulation with the farm manager.

To date, RISE has been used in 57 countries around the world by more than 300 trained RISE users. It has reached more than 3,300 agricultural operations over the last 15 years.

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<https://www.giz.de/expertise/downloads/giz2013-en-ri-se-flyer.pdf>



### Learning

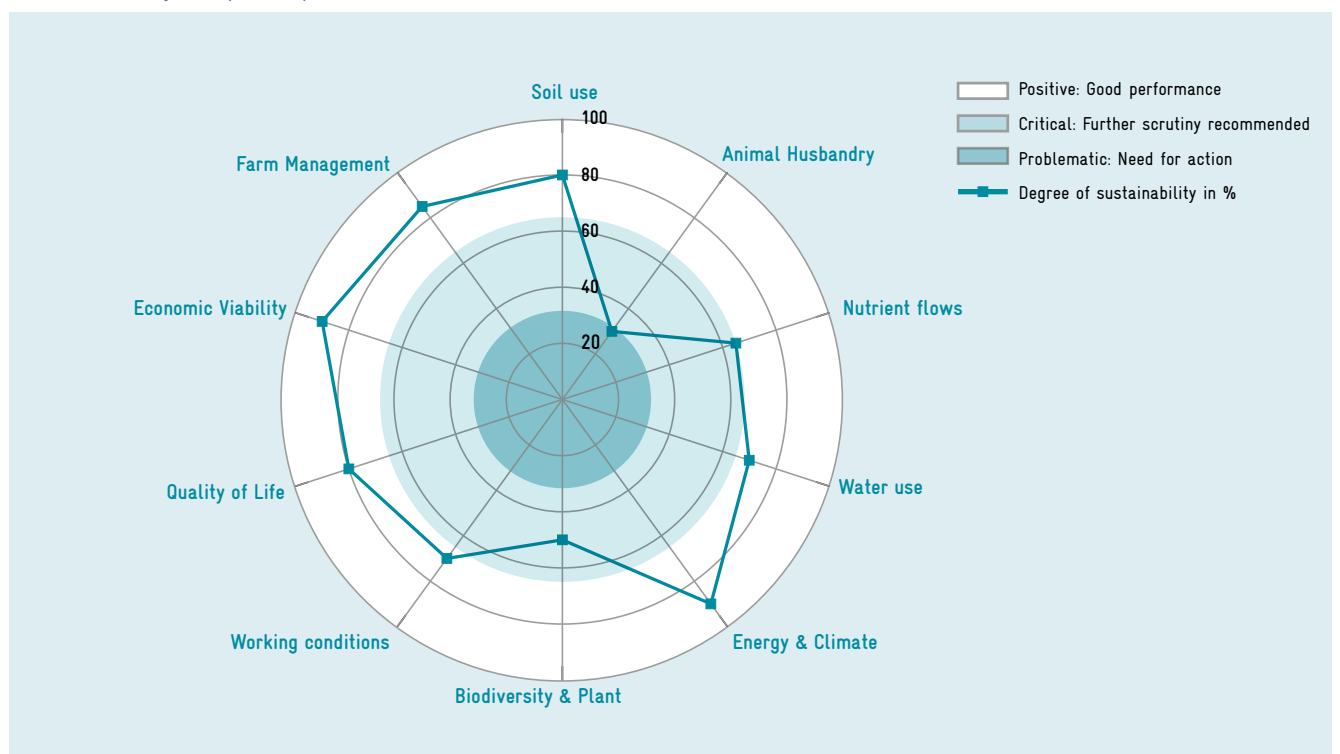
1. The level to which the RISE results accord with on-farm realities is generally good. The farmers appreciate receiving immediate feedback in hard-copy form.
2. Small-scale farmers are often unaware of the concept of sustainability. Also, it is frequently the case that, when farmers are interviewed for the RISE process, they can arrive with certain expectations (e.g. that they will receive support from a GIZ project).

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RISE leaflet: <https://www.giz.de/expertise/downloads/giz2013-en-rise-flyer.pdf>

### Figure 6: Results of a RISE analysis

(Source: GIZ Project report, unpublished)



## ➤ 5. FINANCE, PAYMENTS, INSURANCE

### USING DIGITALS SOLUTIONS TO IMPROVE ACCESS TO FINANCIAL SERVICES FOR SMALLHOLDER FARMERS IN UGANDA

#### Context

More than 70% of Ugandans work in agriculture, making it a sector of major economic importance. However, smallholder farmers in particular face a number of challenges such as:

- Limited access to markets, insufficient knowledge of good agronomic practices, and poor market information on prices and quality.
- Digital data on individual farmer transactions is not being gathered, which means farmers cannot keep track of their performance.
- Limited access to appropriate financial services (e.g. for agricultural investments), as farmers often lack the collateral or proof of income required to secure credit, and financial institutions are slow to extend agricultural lending to rural areas.

These constraints result in poor quality produce, low production yields and a dependency on informal cash sources, such as sales to intermediaries, to meet immediate cash needs.

#### Objective

Using digital transaction records of coffee deliveries to support the development of adequate financial services for smallholder coffee farmers in Uganda.

#### Approach

In 2013 GIZ and the software company SAP joined forces to set up a private sector development partnership under the develoPPP.de programme.

Through the partnership, SAP developed and GIZ introduced SAP® Rural Sourcing Management, a mobile solution running on the SAP Cloud Platform. This system includes a smartphone application that links to a central database featuring a sophisticated analytical information system. When coffee farmers deliver their bags for registration at bulking stations, the smartphone application is used to record the details of the delivery as well as subsequent transactions such as cash advances, bulking, hulling, selling to exporters and final payments. All this data is captured digitally and uploaded to the central database as soon as mobile network coverage is available. The paths of both coffee and money are now traceable along the entire value chain. The SAP solution was piloted worldwide in different value chains. In Uganda the system has been in use since 2013 and covered 24,000 smallholder coffee farmers and 5,300 sesame farmers.

Apart from being a solution for efficient value-chain management, SAP Rural Sourcing Management was identified as a potential entry point to financial services: First, the solution can be used to introduce mobile payments to farmers, reducing the risk of cash payments in the field. Second, a track record of the deliveries and income made by individual smallholder farmers can be generated. Financial institutions can use this systematic and digital transaction history to undertake the required risk evaluations and support a more efficient loan assessment process. In this way, the information gap between smallholder farmers and financial institutions can be bridged, making the provision of financial services to farmers a much more feasible proposition for financial service providers.



#### HIGHLIGHTS

- A single, app-enabled smartphone used in a cooperative can capture several hundred farmers' transactions.
- Farmer associations see significant increases in transparency and trust within their institutions.
- Additional functionalities, such as extension services, insurance, Monitoring & Evaluation (M&E), etc. can be integrated to increase the benefits for smallholders.
- Consideration of the lessons learned led to the development of the Strategic Alliance "Farmers as Entrepreneurs", which aims to use digital systems to improve the access to finance for 33,000 smallholder farmers in Uganda.

#### Results

- 24,000 smallholder farmers have been registered digitally.
- 19,500 farmers have received financial literacy training.
- Value-chain-specific agricultural finance products have been developed and rolled out by partner financial institutions
- More than 950 new bank accounts have been opened and over 800 loans disbursed to smallholder coffee farmers by August 2017.

#### Learning

1. Using ICT in agricultural projects is an effective way to bridge geographical gaps and source lacking data.
2. Developing the technology is straightforward. The most difficult aspect is ensuring that the technology is being used correctly once it is rolled out.
3. Digital solutions are not stand-alone: approaches need to be embedded in both a comprehensive strategy and the agricultural context.
4. To achieve sustainable structures that continue beyond the lifetime of the project, it is essential to cooperate with the companies **directly involved in a value chain and its management**, with a long-term business interest, and to develop the digital solution with them.

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## MICROFINANCE IN RURAL AREAS – ACCESS TO FINANCE FOR THE POOR (AFP) IN LAOS

### Context

Laos is categorised as one of the world's least developed countries. Two-thirds of its 6.5 million citizens live in rural areas where access to formal financial services is severely limited. This remains a major challenge for both the Lao economy and individual households. People in rural areas often have limited financial resources to cope with emergencies or to expand their businesses, and they cannot deposit their money safely because there are no banks within reach.

### Objective

Access to Finance for the Poor (AFP) aims to enhance financial inclusion in Laos and focuses in particular on poor people living in the country's rural areas. Its objective is to get increasing numbers of rural people to use the sustainable financial services provided by network-supported village banks. ICT's role is to streamline operations, minimise risks, and enhance data collection and the AFP's monitoring and evaluation processes.

### Approach

The AFP works closely with the Lao central bank, the Bank of the Lao, to build a responsible and inclusive financial sector through enhanced supervision and regulation.

The project is working with seven microfinance institutions (MFI) in six of the country's provinces, helping these MFIs in their role as network support organisations (NSOs). These NSOs are formal financial institutions that, in the main, provide ongoing technical support and financial services to community-managed savings and loan groups, so-called village banks– in some of the country's most remote areas.

The AFP program has implemented IT-solutions on all three of its intervention levels. On all levels the work began with a thorough analysis of the needs of the users. On national level, the AFP has supported the roll-out of a new supervisory software of the Bank of the Lao PDR that ensures the timely monitoring of market developments for non-bank financial institutions. The seven MFIs that the project supports directly have been equipped with a core banking system, 'MicroBanking System for Windows (MBWin)', to monitor and steer their financial flows. Finally, on village level, MFI employees use an Excel-based solution that helps them to better supervise, monitor, coach and advise village banks.

### Results

Between 2009 and December 2017, the project helped to provide 115,394 members with access to adequate financial services through more than 600 village banks. In aggregate, members' savings exceeded EUR 18.5 million, and 24,852 loans were issued.<sup>21</sup> The share of the portfolio considered to be at risk is 2.1%, which indicates excellent repayment rates.

**Women represent more than 50% of members, have access to 77% of all accounts, and fill 37% of the village banks leadership positions.**

These results would not have been achieved without the successful application of the ICT infrastructure and its continuous adjustment.

<sup>21</sup>Data as of 12/2017, Exchange Rate 10, 213 LAK/EUR





### Learning

1. An ICT solution is only as strong as the competence of those who use it. Make sure to build the required capacity!
2. Aim for sustainable solutions. An excellent system may become worthless if no support structures exist after the project supporting it withdraws.
3. Keep in mind that start-up and scaling-up might need different solutions.

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en/worldwide/17492.  
html](https://www.giz.de/en/worldwide/17492.html)

## REMOTE-SENSING-BASED INFORMATION AND INSURANCE FOR CROPS IN EMERGING ECONOMIES (RIICE), INDIA

### Context

In India, rice is by far the most important food crop for millions of small and marginal farmers whose livelihoods depend on the grain. The availability of rice is therefore equated with food security. The uptake of agricultural insurance as a way to achieve food security has shown considerable promise in India. However, the provision of insurance services is hampered by a number of challenges that mostly revolve around the availability of transparent and timely information on several aspects of rice production such as the area under cultivation and the yield of a particular administrative unit.

### Objective

The objective of RIICE, a public-private partnership between GIZ, the Swiss Agency for Development and Cooperation, the International Rice Research Institute, Sarmap and Swiss Re, is to reduce the vulnerability of smallholder farmers engaged in rice production. RIICE's technology uses satellite data to generate information on, for example, rice area statistics, mid-season rice yield forecasts and end-of-season yield estimates down to the village level. This helps government decision-makers, insurers and relief organisations to better manage domestic rice production and distribution both during normal growing conditions and after natural disasters.





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ASEAN press release  
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<https://www.asean-agrifood.org/press-release-satel-lite-technology-ex-pedites-insurance-payouts-in-india-crop-insurance-programme/>

GIZ web page for the  
project:  
<https://www.giz.de/en/mediacenter/40547.html>

### Approach

Initiated in 2012 in the Indian state of Tamil Nadu, the project has actively collaborated with government, academia and the business community to establish a successful model for harnessing technology that sustainably delivers products and services. The products and services pertain to the generation of rice area and yield maps and subsequent assessment of losses due to adverse climatic conditions like flood or drought. Underpinning this work is a sustained process of engagement with the government and the creation of a policy environment that allows the project's deliverables to be used by both public and private insurers for the purposes of portfolio monitoring and, in the case of imminent losses, claim administration.

### Results

In 2016, as a result of the project partners' outreach efforts, the Government of Tamil Nadu officially approved the piloting of the RIICE technology. The ensuing growing season saw the worst drought recorded in Tamil Nadu for 140 years. RIICE measured the areas of rice lost across 1 million hectares, an area worked by close to 1.4 million farmers. This made it possible to pay out on eligible farmers' claims for prevented/failed sowing within only three months of the harvest period. Without the technology, this process normally takes up to a year.

### HIGHLIGHTS

India is the first RIICE-using country to facilitate crop insurance payouts, and Tamil Nadu is the first state in India to apply the project's deliverables under the country's flagship crop insurance scheme.

### Learning

1. Before the technology can be presented to the government/users, it must be tried and tested to ensure its accuracy, consistency and suitability for providing reliable and timely information.
2. To ensure the dialogue does not get lost in scientific complexities, but rather caters to the needs and requirements of both policy-makers and farmers and maximises their benefits, effective stakeholder engagement is critical.
3. A key approach for promoting technology adoption is to build the decision-makers' capacities by providing them with the relevant crop information and the know-how and technical advice they need to make use of such information in administering crop insurance.



## 6. DATA COLLECTION, GIS, FIELD SURVEY, MONITORING AND EVALUATION

### OVERVIEW: UNDERSTANDING THE POTENTIAL OF REMOTE SENSING FOR THE AGRICULTURAL SECTOR

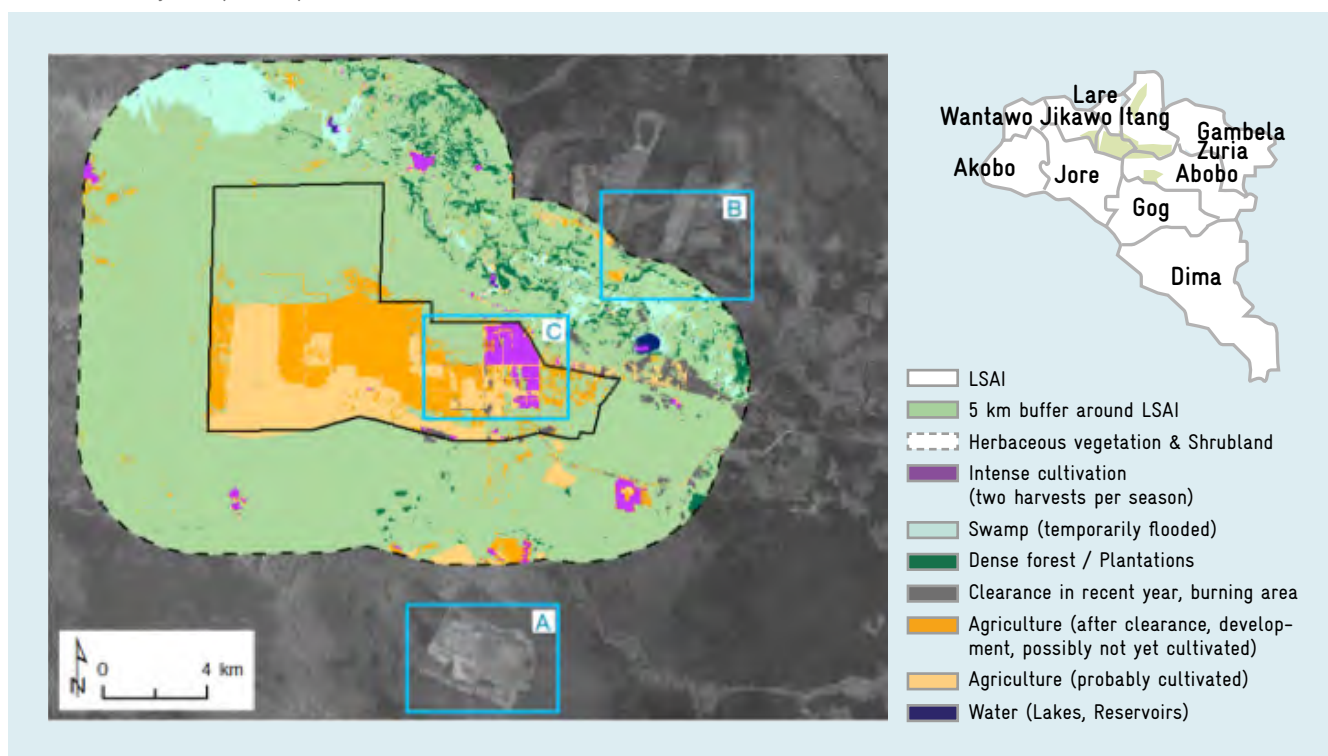
Information gathered using remote sensing is particularly valuable for the agrarian sector, as evidenced by the Lao and Indonesian best-practice case studies following this article.

Remote sensing involves observing the Earth's surface by taking digital images from remote carrier platforms, such as satellites, aeroplanes or drones. For the agrarian sector, it constitutes a valuable source of information for different actors and fields of application. For instance, information on the spatial distribution of various land uses, on the vitality status of crops and forests or on flooded or drought-affected areas can be generated at a relatively low cost, even for inaccessible areas. Such spatial information is useful for those promoting sustainable approaches in the agrarian sector, for example:

- Farmers are better equipped to pursue precision farming using water, pesticides and fertiliser more effectively, or can benefit from improved early-warning systems that enhance responses to pest infestations, droughts or floods.
- Agricultural insurances use remote sensing data to improve crop models, to estimate yields, and to compensate farmers' actual losses.

**Figure 7: Land use map created from satellite imagery**

(Source: GIZ Project report, unpublished)



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- Policy-makers and administration benefit from an enhanced information base, for example, to monitor and implement international goals such as the SDGs, to enhance disaster preparedness by monitoring crop development, to enhance integrated land use planning, or to fill specific information gaps like the demarcation of parcel boundaries or the calculation of carbon storage.
- Remote sensing is already an important information source in the agrarian sector and, given the growing number of challenges arising in agriculture and the need for coherent spatial information, its importance is increasing. Fortunately, as the availability of raw remote-sensing data and information products steadily increases, so the procurement costs decline. A number of data and information products, which cover almost all the world's surface, are free of charge and publicly accessible.

Well known in this regard are the Landsat data of the National Aeronautics and Space Administration (NASA) and the Sentinel data of Copernicus, the EU's Earth observation programme. These data are already used by operational monitoring systems and for fact-based planning and administration for the agrarian sector.

German development cooperation's agrarian projects make use of remote-sensing data and methods. They e.g. assist crop insurance operations, support sustainable rice production and increase the resilience of agricultural production with regard to the effects of climate change.

Given the increasing benefits of using remote sensing, development cooperation should work even harder to build its partners' capacities in the technology, enabling them to make greater use of remote sensing.

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## DIGITAL DATA COLLECTION IN LAOS

### Context

GIZ's Land Management and Decentralised Planning project is working to secure the land rights of rural communities in Laos. It supports participatory land use planning and the systematic land registration of both individual and communal plots. Additionally, the programme strengthens decentralised development planning at both the district and province levels, which includes the monitoring and improvement of land investments. Throughout the project, it uses innovative digital tools, especially in its web-based monitoring system.

### Objectives

- Support increased land tenure security for rural communities by proving to stakeholders that information forms the basis for improved land governance.
- Operate an integrated monitoring system that combines all the project's data in one accessible online database.
- Equip user with tablets with pre-installed mobile applications for remote data collection.



### Approach

All monitoring and evaluation data is entered in the field by the project's advisors and counterparts based in the target provinces. To support their work, especially in the area of land conflict monitoring (see box), apps were developed to facilitate remote data-entry on site. The information collected using the app is geocoded for precise display on maps. As internet access and speed is an ongoing issue, the app was also developed to be usable offline.

### ICT tools used

- KoBo toolbox: <http://www.kobotoolbox.org>
- SmartSheet: <https://www.smartsheet.com>
- AppSheet: <https://www.appsheet.com>

#### Example: Conflict monitoring system

As part of a recent pilot initiative, a customised Android app for use on a tablet or smartphone was developed to improve the project's monitoring activity at the village level. This app is used to collect data on land-related conflicts, involving issues such as large-scale investments in cash crops or small-scale land use conflicts. The app is bilingual, easy to use and also works offline. Tablets were issued to the project's counterparts in one of its target provinces to facilitate their documentation of any land-related conflicts they encounter.

The status and location of each conflict is made visible on a map, which makes it easier to plan additional conflict resolution measures. After the current pilot phase, the next step is to roll out the initiative in other provinces.



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## Results

- The web-based M&E system provides the project with all the information they require and can be accessed at anytime from anywhere.
- Less time is required to gather monitoring data directly on the ground, and the data collected is better quality.
- The project's teams continuously update the information.

## Learning

1. Keep the user in mind and define the purpose for using digital tools.
2. Involve the partner early on and try to use bilingual tools.
3. Try to design technical tools so that they are as easy to use as possible and can be used offline.

---

## PARTICIPATORY CULTURAL SPACE MAPPING IN THE KASEPUHAN VILLAGE OF CIPTAGELAR IN INDONESIA

### Context

This mapping initiative is part of the Innovation Factory programme, which brings young innovators together from Africa, Asia and Europe to explore how ICT for agriculture (ICT4Ag) solutions can benefit the specific local contexts of four different countries: Germany, Ethiopia, Indonesia and Senegal.

The Innovation Factory programme was commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ) and is implemented by GIZ. Its focus is on data collection, GIS tools, field survey, and monitoring and evaluation processes, and it provides the overall framework for these initiatives.

The national challenges tackled by the Innovation Factory participants were as follows:

- **Germany:** exploring low-tech solutions for community-supported agriculture.
- **Ethiopia:** using ICT-based methods and technologies to improve beekeeping and honey production.
- **Indonesia:** working with an indigenous community to make their village 'smart' using ICT and digital media.
- **Senegal:** developing an agricultural technology innovation hub that brings together young people and agribusinesses to work on ICT solutions.

Here, we will focus on the **Indonesian case**.

### Objective

New forms of bottom-up agriculture networks based on user-centred design methods and ICT tools create a space for collaboration between urban actors and rural practitioners with the aim of developing more sustainable technological solutions to support small-scale farming around the world. By being able to collect, analyse and use geo-spatial data on its indigenous territory, the rural population of Kasepuhan Ciptagelar in West Java can make informed decisions.

For centuries, most of Indonesia's indigenous communities have sustainably managed their forests. The Kasepuhan indigenous community consists of more than 600 villag-



es, distributed across three municipalities of West Java and Banten Province. Since 1368 this community has successfully maintained forest cover on most of its territory (approximately 103,000 hectares), with carefully selected areas being given over to the cultivation of food crops. Nowadays this forest forms the heart of Java's Mount Halimun Salak National Park.

### Approach

The process to scientifically and objectively map this community's cultural space was carried out in 2016 by scientists from the Institut Teknologi Bandung in concert with the Common Room Foundation and the Kasepuhan community in Ciptagelar village. To make the village 'smart', geospatial data and sociocultural information was collected covering areas including ancestral beliefs and traditions and the characteristics of the local economic and environmental system.

### HIGHLIGHTS

- The bridging of indigenous and scientific knowledge.
- The holistic approach and multidisciplinary collaboration implemented.
- The growing interest of Indonesia's geospatial information agency, Badan Informasi Geospasial, in transferring the participatory mapping model to other areas of the country.

### Results

The main outputs of the mapping activity were the cultural space map (which currently covers 3,000 hectares) and the white paper on the contribution of participatory mapping towards the fulfilment of the Indonesian Government's One Map Policy. Additionally, a map of hydrological data is also being drawn up.



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Innovation Factory:  
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### Key success factors of the ICT4Ag component:

- The users' participation in its design.
- The collaborative multi-stakeholder approach employed.
- The mapping, based on the Gambung Mandate, which was defined in collaboration with the Kasepuhan community and relevant stakeholders from government, academia and civil society.

The main challenges when implementing the ICT component:

- Given the village's rural location, it is difficult to ensure stable renewable energy supply, and internet access is limited.

### Learning

1. The participation of the local community is crucial to the success of any project carried out on indigenous territory (user-centred design process).
2. The intervention in Kasepuhan Ciptagelar, including the participatory cultural space mapping, piloted a particular model of a holistic smart-village development project that integrates environmental protection, sociocultural preservation, renewable energy, ICT infrastructure development, indigenous knowledge management, and economic empowerment. This model can be replicated and further developed in other regions and even other countries.
3. Multi-stakeholder interaction is crucial if the mapping is to be successful, scientifically valid and supported by official authorities and is to relate to the cultural context.

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## ➤ 7. FARMERS' VOICE, LOBBYING, ADVOCACY

### DIGITAL TOOLS: ENHANCING THE CLIMATE RESILIENCE OF FARMERS IN INDIA (ICT-enabled networks for exchanging advice with farmers)

#### Context

The changing climate and weather patterns are already impacting on India's food security and on the livelihoods of the 240 million farmers who depend on the rains there. In 2009 over 5.7 million hectares under rice cultivation (NICRA, 2009) in India were affected by erratic rainfall. The Agriculture Ministry (2015) that crops on 18 million hectares were damaged due to weather variations. In 2015 over nine million farmers in Maharashtra alone were affected by drought.

In India, there are more than one billion mobile subscriptions,<sup>22</sup> 46% of which are held by rural dwellers. Also there are 462 million internet users (153 million of whom live in rural areas), which means the number of Indians using the internet is five times larger than the population of Germany, and this number keeps on growing.

GIZ, working in partnership with India's Ministry of Agriculture and Farmers Welfare (MOAFW), implemented the Climate Change Knowledge Network in Indian Agriculture (CCKN-IA) project, which uses innovative digital tools for climate change adaptation in agriculture. Aligned to the targets under SDG 13<sup>23</sup>, the project facilitated the inclusion of farmers' feedback in the development of agricultural strategies and interventions.

22 TRAI (Telcom Regulatory Authority of India), 2016

23 Targets under SDG-13, iterates on the need for improving education, awareness-raising and human and institutional capacity development and early warning systems



## Objective

The Climate Change Knowledge Network in Indian Agriculture operates in selected districts of three Indian states. It promotes dialogue between different stakeholders with the aim of establishing links between climate change and sustainable development in agriculture.

## Approach

Applying the digital principles for sustainable development, the CCKN-IA developed an open source and API-based<sup>24</sup> ICT platform called Network for Information on Climate (Ex) Change (NICE+). With this platform, knowledge can be exchanged effectively between stakeholders in real-time. This enables policy-makers and planners, managers, research institutions, extension systems and farmers to collaborate on the selection of timely responses (e.g. sowing, pest and disease management, irrigation, etc.). The CCKN-IA system is coordinated by the national partner, India's National Institute of Agricultural Extension Management which ensures a three-tier quality assurance process is applied to localised knowledge (content development, validation and approval, and feedback from farmers), and ensures the timely dissemination of this knowledge. Advice in these areas is exchanged through multiple media such as Android applications, social media, illustrative posters, notice boards, SMS and video sharing sites. Extension service providers also facilitate this exchange with farmers.

The ProSoil project<sup>25</sup> and its partners (the National Bank for Agriculture and Rural Development, MANAGE and certain NGOs) are currently working on adapting and scaling up this approach and its ICT system.

24 Application Programming Interface (API): an API is a set of definitions, protocols, and tools for building application software.

25 Soil Protection and Rehabilitation for Food Security, a global program of the German Federal Ministry of Economic Cooperation and Development and its special initiative "ONE WORLD – No Hunger", implemented by GIZ

### Exchanging advice with farmers while empowering women and young people

- Over 350 registered network members use the knowledge gathered on the NICE+ system.
- More than 23,000 farmers receive advice on the subject of quality.
- Over 100 experts from 32 different institutions use the network to exchange knowledge.
- The tablet applications enable local agriculture extension agents to collect feedback and queries from farmers and share them with experts.
- Most village-based extension service providers are women and young people. Using ICT, they are better equipped to efficiently carry out their extension work and, in so doing, can become role models in their communities.
- In general women were not an integral part of traditional extension services. ICT therefore provides women with easy access to knowledge and expertise.
- The nine digital development principles must be applied right from the outset.

## Results

An independent third-party impact assessment was conducted in the project areas. The data gathered on project farmers (registered farmers) shows that:

- around 90% of the farmers reported receiving contextual advice that was relevant to their local needs;
- 65% of the farmers received responses to queries within two days and almost all were satisfied with the response provided;
- 77% of the farmers adopted 50% or more of the advice given; and
- 85% of the farmers reported benefiting from increased yields and 74% from reduced production costs.



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Climate Change  
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www.cckn-ia.org

### Learning

- 1. Use open source solutions:** partners and other interested parties find it easier to adapt and use ICT solutions that are built using open source and API-based software and have a modular structure.
- 2. A detailed baseline and stakeholder assessment** helps to identify the key issues and right partners when developing and implementing digital solutions.
- 3. Putting in place quality management processes and institutional systems** helps to ensure that ICT solutions are used to the best effect, are more sustainable and can be scaled up more easily.
- 4. Support for scaling-up:** Once a successful pilot has completed, it is important to provide partners with the support they need to scale up the initiative.
- 5. Capacity development** should focus on promoting supportive processes with incentive systems and on fostering cooperation among the diverse stakeholders and developing their institutional capacities.
- 6. ICT is a very efficient tool for enabling knowledge transfer** as it is highly cost-efficient and fast.

## ➤ 8. ENVIRONMENT

### SIGEF DESTINAÇÃO – A SYSTEM FOR LAND TENURE REGULARISATION IN BRAZIL

#### Context

Launched in 2009, Terra Legal is a national programme for allocating and regularising 55 million hectares of Brazilian federal land in Amazonia, which it does by approving and issuing secure land titles to family farmers. The clarification of land claims and improved legal security are a prerequisite for the protection and sustainable use of the Amazon rainforest. Since 2014 the Terra Legal programme has been supported by the framework of Brazilian-German development cooperation. Part of this support involves the development and application of an IT module called SIGEF<sup>26</sup> Destinação.

#### Objective

The aim of the cooperation with Terra Legal is to improve the governance of public federal and state land in accordance with the Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests (VGGT), agreed by the United Nations' Commission on World Food Security. The SIGEF Destinação IT module is designed to structure tenure regularisation and the issuing of land titles, making these processes more efficient and transparent.

#### Approach

SIGEF Destinação facilitates the administrative steps involved in approving the estimated 160,000 land claims that Terra Legal must process. These steps include cadastral data analysis, the identification of pending issues, the issuing of land titles and the monitoring of compliance with clauses on environmental obligations, agrarian use and payments. The IT module will be deployed in the 12 Terra Legal regional offices that are responsible for federal lands.

26 Sistema de Gestão Fundiária (engl. Land Management/Tenure Systems)

## HIGHLIGHTS

### An efficient and transparent way to provide land titles for family farmers

SIGEF Destinação facilitates the process of issuing land titles to family farmers by interfacing with other databases to improve the efficiency, security and transparency of land tenure regularisation in the Amazônia Legal region of Brazil.

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en/worldwide/33654.  
html](https://www.giz.de/en/worldwide/33654.html)

## Results

The SIGEF system contributes to the effort to build a reliable land tenure database for the Amazon Basin. Other government programmes, such as the National Environmental Registry of Rural Properties that monitors private land holders' compliance with environmental legislation, can also use this resource.

Work to develop SIGEF Destinação got underway in 2015, with the system due to enter in operation in 2018. A key challenge arising during the development phase was the changing institutional and legal framework. For example, a new law on land tenure regularisation required modifications to the system. Another challenge is to fill the system with reliable data. To create a coherent database, the effective use of SIGEF by other land agencies at both the federal and state levels is necessary.

## Learning

If the system is to be a success, it must be populated and used by other state agencies. Interinstitutional dialogue involving high-level decision-makers is therefore essential.



# Map of GIZ projects using ICT4Ag



Extension services, productivity, learning, capacity development



Market price systems, commodity exchange, trading



Value chain/farm/herd management



Diagnostic and collaborative tools, early warning, weather



Finance, payments, insurance



Data collection, GIS, field survey, monitoring and evaluation



Farmers' voice, lobbying, advocacy



Environment

## 1. PERU

- Global Programme: Responsible Land Policy 🧑🌾 📱

## 2. BRAZIL

- Land Regularisation in the Amazon 🧑🌾 📱 🌿

## 3. EGYPT

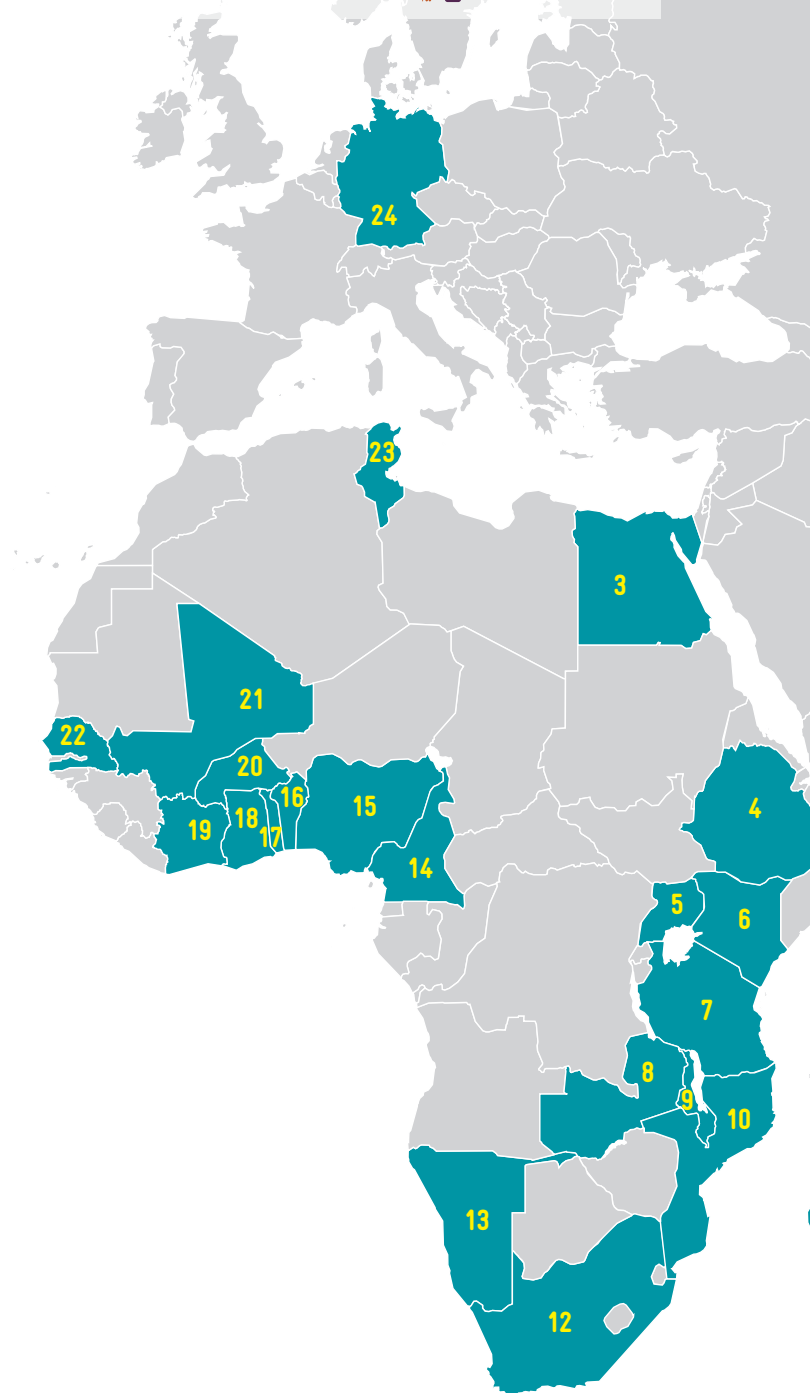
- Responsible and Inclusive Business Hub (RIBH) 🧑🌾 📱
- Egyptian German Water Management Reform Programme 🧑🌾

## 4. ETHIOPIA

- Innovation Transfer into Agriculture – Adaptation to Climate Change (ITAACC) 🧑🌾 📱 🌿 📱 📱 📱 📱
- Global Programme: Soil Protection and Rehabilitation for Food Security (ProSOL) 🧑🌾 📱 📱
- Green Innovation Centres in Agricultural Systems (GIA) 🧑🌾 📱 🌿 📱 📱 📱
- Innovation Factory – Realising shared solutions (IZR project) 🧑🌾 📱 📱

## 5. UGANDA

- Strategic Alliance: Farmers as Entrepreneurs – Improving the Livelihoods of Smallholders in Uganda (Agrufin) 🧑🌾 🌿 📱
- Global Programme: Responsible Land Policy 🧑🌾 📱



## 6. KENYA

- Innovation Transfer into Agriculture – Adaptation to Climate Change (ITAACC) 🌾🔄📱📶📡📷📹📺📻📞
- Green Innovation Centres in Agricultural Systems (GIA) and Bilateral Food Security Projects 🌱🔄📱📶📡📷📹📺📻📞
- Bilateral Project: Drought Resilience in Northern Kenya 🌾📱
- Global Project: Promotion of nutrition-sensitive potato value chains in East Africa 📱

## 7. TANZANIA

- Innovation Transfer into Agriculture – Adaptation to Climate Change (ITAACC) 🌾🔄📱📶📡📷📹📺📻📞

## 8. ZAMBIA

- Innovation Transfer into Agriculture – Adaptation to Climate Change (ITAACC) 🌾🔄📱📶📡📷📹📺📻📞🌱
- Green Innovation Centres in Agricultural Systems (GIA) 🌱🔄📱📶📡📷📹📺📻📞

## 9. MALAWI

- Global Programme: Food and Nutrition Security, Enhanced Resilience 🌾
- More Income and Employment in Rural Areas of Malawi (MIERA) 🌾📱📶
- Green Innovation Centres in Agricultural Systems (GIA) 🌱🔄📱📶📡📷📹📺📻📞

## 10. MOZAMBIQUE

- Green Innovation Centres in Agricultural Systems (GIA) 🌱🔄📱📶📡📷📹📺📻📞
- African Cashew Initiative (ACI) 🌱🔄📱📶

## 11. MADAGASCAR

- Global Programme: Responsible Land Policy 🌾📱

## 12. SOUTH AFRICA

- Employment for Sustainable Development in Africa (E4D) 🌾🔄📱📶📡📷📹📺📻📞

## 13. NAMIBIA

- Support to de-bushing 🌾
- Adaptation in Agriculture to Climate Change in Northern Namibia 🌾📱

## 14. CAMEROON

- Sustainable Smallholder Agribusiness (SSAB) 🌾📱
- Green Innovation Centres in Agricultural Systems (GIA) 🌱🔄📱📶📡📷📹📺📻📞

## 15. NIGERIA

- Sustainable Smallholder Agribusiness (SSAB) 🌾📱
- Competitive African Rice Initiative (CARI) 🌾🔄📱📶📡📷📹📺📻📞
- Green Innovation Centres in Agricultural Systems (GIA) 🌱🔄📱📶📡📷📹📺📻📞

## 16. BENIN

- Innovation Transfer into Agriculture – Adaptation to Climate Change (ITAACC) 🌾🔄📱📶📡📷📹📺📻📞
- Green Innovation Centres in Agricultural Systems (GIA) 🌱🔄📱📶📡📷📹📺📻📞
- Global Programme: Responsible Land Policy 🌾📱
- African Cashew Initiative (ACI) 🌱🔄📱📶

## 17. TOGO

- Green Innovation Centres in Agricultural Systems (GIA) 🌱🔄📱📶📡📷📹📺📻📞

## 18. GHANA

- Sustainable Smallholder Agribusiness (SSAB) 🌾📱
- Competitive African Rice Initiative (CARI) 🌾🔄📱📶📡📷📹📺📻📞
- Integrated Climate Risk Management (ICRM) 📱
- Green Innovation Centres in Agricultural Systems (GIA) 🌱🔄📱📶📡📷📹📺📻📞
- African Cashew Initiative (ACI) 🌱🔄📱📶

## 19. CÔTE D'IVOIRE

- Sustainable Smallholder Agribusiness (SSAB) 🌾📱
- Eliminate Deforestation from supply chains 🌱📱
- African Cashew Initiative (ACI) 🌱🔄📱📶

## 20. BURKINA FASO

- Competitive African Rice Initiative (CARI) 🌾🔄📱📶📡📷📹📺📻📞
- Green Innovation Centres in Agricultural Systems (GIA) 🌱🔄📱📶📡📷📹📺📻📞
- African Cashew Initiative (ACI) 🌱🔄📱📶

## 21. MALI

- Green Innovation Centres in Agricultural Systems (GIA) 🌱🔄📱📶📡📷📹📺📻📞
- Innovation Transfer into Agriculture – Adaptation to Climate Change (ITAACC) 🌾🔄📱📶📡📷📹📺📻📞

## 22. SENEGAL

- Innovation Factory – Realising shared solutions (IZR project) 🌾📱

## 23. TUNISIA

- Innovation Transfer into Agriculture – Adaptation to Climate Change (ITAACC) 🌾🔄📱📶📡📷📹📺📻📞
- Promotion of Sustainable Agriculture and Rural Development 🌾📱
- Green Innovation Centres in Agricultural Systems (GIA) 🌱🔄📱📶📡📷📹📺📻📞

## 24. GERMANY

- Innovation Factory – Realising shared solutions (IZR project) 🌾📱

## 25. INDIA

- Global Programme: Soil Protection and Rehabilitation for Food Security (ProSOL) 🌾📱
- Remote sensing-based Information and Insurance for Crops in Emerging Economies (RIICE) 📱📶
- Climate Change Knowledge Network in Indian Agriculture (CCKN-IA) 🌾📱

## 26. LAOS

- Microfinance in Rural Areas – Access to Finance for the Poor 📱
- Global Programme: Responsible Land Policy 🌾📱

## 27. INDONESIA

- Innovation Factory – Realising shared solutions (IZR project) 🌾📱
- Eliminate Deforestation from supply chains 🌱📱

## 28. VANUATU

- Coping with Climate Change in the Pacific Island Region (CCPIR) 🌾🔄📱📶📡📷📹📺📻📞

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## ➤ 3. Lessons learned from implementing ICT solutions in agricultural projects

This chapter details the lessons learned from the implementation of 52 different ICT4Ag solutions, which formed part of 29 GIZ projects operating in 34 countries. While most of the examples are from the sub-Saharan region, a few are also from Asia and from India in particular. Almost 40% of these 52 projects contained an explicit ICT component, while the remainder employed ICT as part of their implementation strategy. The level of progress made on these projects varies: some are just starting their ICT interventions, whereas others have two to five years of experience to report on.

Although the ICT components differ substantially in terms of their geographical or thematic scope, their target group and their goal, the lessons they offer are consistent.

### 1. PARTNERSHIPS

#### **Multi-stakeholder dialogues**

Agriculture is the single most important sector in rural areas. Its promotion requires the collaboration of a variety of stakeholders, as does the development and implementation of ICT4Ag solutions, which need the support and expertise of various stakeholders from the public and private sectors and from civil society. The majority of projects therefore highlight the [importance of multi-stakeholder processes](#) as a way to integrate multi-disciplinary expertise, draw on the findings of research and extension activities, and coordinate the interests and motivations of those involved. A considered steering and management structure can help to promote the development of a common vision and the agreement of shared values and principles. With regard to facilitating the coordination of large and complex multi-stakeholder dialogues, all respondents from the projects under review mentioned a clear need for adequate funding.

#### **Private sector collaboration**

When it comes to collaborating with the local or international private sector, there is less consensus: Some practitioners strongly recommend utilising commercial interests to scale up ICT solutions, whereas others argue that working with the private sector often leads to divergences from development objectives (e.g. regarding the processing of farmers' personal data). Given that operating in rural areas is often not an attractive proposition for ICT service providers, further down the line these providers may opt



to withdraw their services, leaving users without any alternatives. In cases where ICT solutions are operated by a service provider but funded by donors, a critical question arises: *Who will be able to pay for the ICT-based services at the end of the project phase, particularly in commercially unattractive rural areas?* On top, the question of *“how can the protection of personal data be guaranteed”* is of key importance here (also compare section 5. Data protection). It is essential to fully consider these questions at the outset of an intervention.

### **Local partner capacity for scaling-up**

Experiences very clearly show that, for any ICT4Ag solution, the local partner's capacities to continue using and scaling-up the solution is of the utmost importance. Typically, the pilot phase of an ICT solution provides insights into the process and adaptations required for continuity and even for scaling-up. While partners are often very keen to use and replicate approaches in other areas, the know-how required to scale them up tends to be lacking. Donors have a key role to play here, as they can facilitate the hand-holding process for any scaling activities. Without this support, partners are left with an appreciation of the utility of digital solutions, but lacking the capacities required to scale the solutions up and mainstream them.

## **2. SUSTAINABLE ICT4AG BUSINESS MODELS**

Research indicates that many ICT4Ag solutions do not survive beyond the lifetime of the externally funded project they form part of. Among practitioners, there is therefore a broad consensus on the need to develop sustainable ICT4Ag business models. The following lessons learned are relevant for two types of ICT solution: those designed as an explicit ICT intervention and those used as an instrument in an implementation strategy.

### **1. Gain a better understanding of the direct and indirect intervention's impact on the users' livelihoods**

Project teams mentioned the need for a monitoring and evaluation framework that makes it possible to determine whether ICTs are actually positive for the beneficiaries or whether they could be doing more harm than good. This question is particular- →

ly relevant in cases where ICTs are used to replace traditional methods for providing in-the-field advice. ICTs are not necessarily neutral; the cultural values that come with the new technologies can differ from those of the users. Projects must therefore ensure to undertake impact assessments of ICT4Ag measures and must decide which evaluation level (output, outcome or impact) and indicators need to be addressed and how.

## **2. Adapt the ICT component to the target group**

Most agree that the development and implementation of an ICT solution needs to be demand driven. For this, providers need a fundamental knowledge of the user's local needs and expectations, of their cultural and sociological context and of the potentials and limitations of the technical and environmental ecosystem (starting with basics such as access to electricity, mobile networks and the internet). What works well in one country or region may not in another. What is needed, then, is an assessment of the skills available within the target group and appropriate training on how to use the ICT solution. When initiatives are tailored in this way, it is more likely that the target group will take ownership of the ICT solution.

The majority of projects did, however, also caution against developing exaggerated expectations regarding ICT tools and pointed to the fact that human, face-to-face interaction is still the best way to ensure mutual understanding, build trust and transfer knowledge. ICTs can enhance but cannot replace such interactions, particularly when the projects in question involve extension advisory services. Projects should therefore invest in developing the human capacity required to use the ICT4Ag solution effectively and efficiently – e.g. by providing extension agents with training that makes them better equipped and better informed for their role as intermediaries between farmers on the one hand and agronomy experts and researchers on the other.

## **3. Managing the fast pace of change in ICT solutions**

As the pace of change – be it technological, climatic, environmental or social – accelerates, projects need put in place the competencies and human resources that will enable them to systematically and better monitor and assess technological updates and solutions. They will need to observe their impact on the target groups' livelihoods as well as the users' changing environment, needs, expectations and behaviour.

## **3. HUMAN CAPACITY REQUIRED TO IMPLEMENT ICT SOLUTIONS**

In general, it is particularly beneficial to have resource persons in place with a good overview of new technological trends (both general and sector-specific) and of the state of the art of the technology. With regard to existing ICT capacities in the local context, projects cited a particular need for expertise and human resources that would enable them to gain the required technical and regional/context-specific knowledge. Accessing local expert consultants and 'hybrids' (i.e. agricultural experts familiar with ICT4Ag in the developing-country context) would be an effective way to bring in extra capacity. For most ICT4Ag solutions, the main problem is not in sourcing technical ICT expertise, as private companies or NGOs with the relevant expertise can be brought in. Rather, the key challenges are in gaining an overview of the sector sufficient for the selection of suitable solutions and providers, and in formulating contracts for initiatives comprising multiple



partners and interests. One solution suggested by a large number of projects is the compilation of a 'white list' which catalogues tried-and-tested ICT solutions that are suitable for application in agricultural development projects in different contexts.

#### 4. BUDGETS FOR IMPLEMENTING ICT4AG SOLUTIONS

The experiences of projects that have been implementing ICT4Ag solutions for a few years show that the budgeting process for ICT4Ag solutions must be carefully considered and planned, must feature feedback loops and must provide for adaptations throughout the development and implementation process. The implementation budget should factor in the costs of

- performing baseline studies or working with local experts/consultants to understand the local ecosystem and context, the legal framework conditions, and the target group and their needs, expectations and available skills;
- relevant skills training; and
- in some cases, improving internet access and electricity in remote rural areas to ensure these areas have equal access to the technology.

Once the piloting of the ICT4Ag solution gets underway, the project will need look at ways to draw out lessons for continuity or scaling-up, which will require time and budget and the design a participatory methodology that involves target-groups/end-users. This user-centred approach is key for increasing the uptake of a technology. However, it is time-consuming and, as such, requires patient development partners. For projects collaborating with the private sector, the protracted nature of this approach can prove challenging.

#### 5. DATA PROTECTION

As agricultural projects using ICT4Ag will be collecting increasing amounts of personal data (including on users' sex, age, income, and health status), questions arise as to who is responsible for the security of these data collections and whether the individual citizen, consumer or farmer will be able to check how his or her data are being used and processed. Local stakeholders are mostly unaware of data privacy issues and are hence vulnerable. When working with people's data, projects must therefore uphold the data subjects' right to self-determination, enabling them to access and rectify their personal data and delete them once their storage is no longer necessary.

While developed countries usually have national data protection regulations in place and the means for enforcing them, this is not true for all partner countries. Development partners must therefore comply with their own country's rules on data privacy and security (including techniques for safe data access, transmission, storage and backup) when working in developing countries. For the German development portfolio, this means that the German Federal Data Protection Act (BDSG) must be applied in cases where there is no or weaker data protection law covering the project area. For this reason, the projects highlighted the importance of cooperating with expert consultants who are familiar both with the national data protection legislation applicable for the project area and with the donor countries' own data protection regulations. Data protection should be integral to every ICT solution and must be **thoroughly considered at the outset** of any project.



## ➤ 4. Recommendations for unleashing the potential of ICT4Ag – particularly for women and young people in rural areas

This chapter is aimed at agricultural advisers, managers and planners and looks at how they can best implement user-centred, sustainable ICT4Ag business models.

### HOW CAN ICT4AG BE USED TO EMPOWER WOMEN AND YOUNG PEOPLE LIVING IN RURAL AREAS?

Following are a number of key recommendations developed on the back of a review of GIZ agricultural projects: .

#### **1. Explore the local ICT ecosystem** – and learn from others!

To start with, look for local ICT providers involved in agriculture-related services.

Engage with other organisations to determine which local or regional solutions and services they are using, what lessons they have learned and what they recommend – particularly with regard to the targeting of rural women and young people.

Many projects across the German development portfolio have used and are using digital solutions. Many of these initiatives, which are based on local needs and knowledge, have tended to re-invent the wheel instead of employing global exchange networks to learn from others. Even if no ICT solutions are available for your local context, it is worth looking outside your thematic silo, talking to colleagues who work in other sectors in your country or region. Note that ICT used for a specific purpose in one project may contribute in a different way in another project context. ICTs are used for multiple purposes, linking people, organisations, institutions and sectors that have traditionally operated separately from one another. To create linkages and foster collaboration between different interventions, an [open and flexible implementation design](#) that features feedback loops and provides for adaptations is required.



## 2. Implement a user-centred approach – leave no one behind!

'ICT is more about people than technology'

ICT is a tool, not a panacea. Before considering the use of a new technology, determine the kinds of ICT solutions that the intended beneficiaries are already using, their needs and expectations, their willingness to pay for the service, their ability (skills) to use it, and the technology's impact on its users' livelihoods, which should be considered as part of an often delicate traditional cultural equilibrium. The ICT solution needs to be made available in local languages and must provide content that is relevant and adapted to the specific needs and skills of female farmers.

### Useful questions to ask on integrating gender in ICT4Ag interventions

Before starting work on ICT4Ag interventions in a given area, it is good practice to assess their impact on gender. Include questions on the use and effects of ICT in these assessments, such as: **Do women have equal access to mobile phones/smartphones and the internet, the funds to pay for access (airtime), and the digital literacy to use ICTs? Is the content relevant for women?**

If an intervention is already ongoing, the simple questions listed below can help to ensure gender is better integrated in ICT activities. This will help to promote equal access for women, which is a persistent challenge. Project teams should always look for possible approaches and conditions that enable equal access:

- What kind of **setting and/or framework** would be required to integrate your ICT solution in a culturally appropriate way, and how can you work to develop that? How can you raise your partner's awareness of the importance of equal access to ICT?
- What is required to make the design of the ICT **interface** useable by (digitally) illiterate female farmers?
- Once the solution has been rolled out, what approaches can your project and partners identify to **get more women using the ICT solution** (e.g. providing e-skills training for girls, putting in place support services/intermediary structures that enable and encourage rural women to use the ICT tool, etc.)?



To tailor the solution in these ways, engage with local expert consultants who can provide the required regional/context-specific expertise. Project teams should seek to build on what the target group uses already and combine it with new technologies.

To ensure an inclusive approach, actively **involve the (female) target group** in the process to develop the new technology as this will ensure the resulting ICT solution is (female-) user centred. One outcome of the inclusion of women's voices has been the promotion of **secure digital spaces**, designed to protect women against cyber violence.

Experiences show that ICT solutions can fail to meet farmers' needs. Therefore, promoting **face-to-face interactions and discussions between holders of technological/research knowledge on the one hand and end-user farmers** on the other is at least as important as providing digital channels or platforms for knowledge transfer. Efforts should, in the main, be dedicated to strengthening the **capacities of intermediaries** (extension agents, private service providers or appropriate farmers) and should cover using ICTs (a) to access and transfer knowledge and (b) as a channel to foster mutual understanding between farmers and agronomy experts and researchers.

Specifically **involve and train** female intermediaries in order build their capacities and facilitate outreach to other female farmers.

### 3. Protect your farmers' data

Local stakeholders are often largely unaware of issues around data rights and privacy and are therefore vulnerable in this regard. Those responsible for an intervention that gathers data from such stakeholders must ensure to protect their data rights and privacy – especially if cooperating with the private sector. To start with, projects should **familiarise themselves with their partner country's data legislation that is applicable to the project area**. Because most developing countries have no or only very weak data protection regulations, projects working in such countries must comply with the donor country's rules on data privacy and security. In general, the **collection of personal data should be kept to a minimum** and should only be collected if it is essential, such as for accountability reasons or monitoring and evaluation. It will therefore be necessary to carefully consider what kind of personal data is needed and why, how the data will be used, and what minimum amount of data is required for accountability and how to collect it.

As personal dignity and respect<sup>27</sup> is a core aspect of data protection, data must always be collected in a **culturally and contextually appropriate manner**.

Once the data are collected, those managing them for the project should **keep personal data separate from any other data collected**, and they must store them securely, limiting access to authorised persons only. Likewise, the data collection process and the totality of the data lifecycle must not result in any negative physical, psychological or political consequences for the farmers.

27 Compare Oxfam's responsible programme-data policy: [https://www.oxfam.org/sites/www.oxfam.org/files/file\\_attachments/story/oxfam-responsible-program-data-policy-feb-2015-en.pdf](https://www.oxfam.org/sites/www.oxfam.org/files/file_attachments/story/oxfam-responsible-program-data-policy-feb-2015-en.pdf)

#### 4. Exclusively support sustainable ICT business models – ensure sustainability beyond short-cycle external funding

The respondents' experiences show that collaborating with the [private sector through public-private partnerships \(PPPs\) or integrated partnerships for development \(IEPWs\)](#) is a good way to bring in private sector innovation and technical capacity and to generate sustainable commercial interest in the adaptation or scaling-up of existing and proven digital solutions. In this sense, the role of development partners and implementers like GIZ is one of facilitator, mobilising the capacities of the private sector for rural development. Efforts to support private ICT services<sup>28</sup> have employed diverse business models and revenue streams:

- One incentive for a private company to invest in and run ICT solutions is the opportunity to offer a variety of services (extension or financial services, training, insurance, etc.) to the farmers.
- ICT providers such as NGOs or private actors that contribute to public interests often use an indirect financing model. The ICT solutions they offer represent commercially interesting communication channels for other private enterprises, which can use them to reach new customers and promote their products (e.g. fertilisers) and services. To use these channels, private companies pay a fee, which enables the public or non-profit ICT provider to offer the service free of charge to farmers.
- The selling of metadata and of user rights for algorithms developed by other private companies is another business model. For instance, a crop insurance company can use metadata to improve how it develops or tailors its services, or to customise the marketing of its products and services so that it closely reflects client needs. However, before using any person-related data, the providers must guarantee that they have obtained the farmers' informed consent.
- Other sustainable business models include: SMS-based agricultural services, with farmers paying a set fee for every SMS they receive; initiatives that combine the capacities of the private sector with the knowledge and content developed by publicly funded research institutes; and collaborations between mobile communication companies and agricultural enterprises.
- Finally, [diversified funding](#) (i.e. a combination of the abovementioned revenue and financing streams) is a feasible option for promoting sustainable ICT4Ag business models.

<sup>28</sup> i.e. working with companies that already provide tools and services or that receive support from an external stakeholder in order to make their products and services sustainable and user-friendly for small-scale farmers.

Experiences gained from cooperations with the private sector show that, when designing an ICT solution, the strategy for ensuring long-term sustainability and agreeing who is going to pay for what [should be established at the outset](#). Hope-based approaches, where it is hoped that a solution developed with external funds will be taken forward by the partner when the funding ends, do not work well. If the partner is not willing to commit to the project from day one and only external actors are driving it, the solution is doomed to failure. The performance of sustainable ICT4Ag business models therefore heavily depends on convincing the right partners to include farmer-friendly functionalities and to balance the interests of, on the one hand, the private sector and, on the other, stakeholders such as civil society and development partners that can oversee the management of farmers' data, etc.

#### 5. Integrate your ICT solution in a mainstream public institution – even if this takes time!

'We learned that optimum use can only be ensured if processes are in place with incentive systems (both financial and non-financial) and are anchored by institutional systems.'



To support the optimal use of your ICT solution, embed it in mainstream organisations and their processes. First, identify relevant mainstream partners and institutional processes. Performing a detailed stakeholder assessment can help in identifying both appropriate partners and the public institutions suited to serve as the institutional anchor.

**When targeting female farmers, women's rights organisations and civil society organisations with expertise in promoting gender equality make valuable partners.**

As external interventions often have a short cycle and are time-bound, project teams are often tempted to undertake independent processes to explore, develop and pilot ICT solutions. Dialogue on adapting these solutions to the institutional environment is, as a result, relegated to a second step, which, approach-wise, is problematic.

Having the right partners is crucial when it comes to getting mainstream public institutions on board, not only to participate in the pilot phase, but also as potential advocates for scaling up the solution. This is particularly important in countries like India where the government provides farmers with a wide variety of free (or subsidised) services, which considerably limits farmers' willingness to pay for other agricultural services. In such situations, farmers will only take up an ICT-based service if it is integrated in the government's extension systems. The benefit of this is that large sections of the population, and particularly farmers who live in commercially 'unattractive' rural areas, will be able to access to the ICT solution.

#### **6. Ensure that your information is good quality**

ICT amplifies both the positives and the negatives. Projects therefore should ensure that the information they provide to their ICT end-users (e.g. on market prices or the weather) is always up to date and of good quality. This will require the development of proper quality assurance protocols or other mechanisms for guaranteeing the high quality and relevance of the information and knowledge communicated. As agriculture is a highly complex economic activity, these quality assurance checks must be dynamic, responsive and regular, and must be designed in a way that reflects this complexity.

#### **7. Encourage learning and exchange – across your sector!**

*'It is surely the case that other projects have worked with or even developed ICT applications that are very helpful (e.g. for farm data collection); yet, for others working in different fields or regions around the world, information on these applications is hard to find.'*

Engage in the ICT exchange platforms or communities of practice (CoP) that already exist for agriculture and other rural development sectors (e.g. health, education, infrastructure), as they are sources of cross-sectoral learning and forums for the exchange of expertise, solutions and resources. Using webinars and collaborative online platforms, content can be developed in a decentralised way that contributes to increased transparency and accountability.

**In the longer run, consider installing regional and global 'enablers' – i.e. young male and female digital early-adopters who can support digitalisation efforts in specific countries. To overcome the digital gender divide, girls' and women's e-skills should be developed, enabling and encouraging them to use and create new ICT technologies.**

Collaborative design ensures local and contextual ICT needs are better understood and can be acted on more quickly. The evolution of technology and of the digital community is fast paced and dynamic, so stay alert for new developments and emerging networks and innovation hubs.

#### **8. Closely engage with your partners** – and reconsider your role!

*'We are facilitators for developing the ICT solution; our partners define and we facilitate.'*

External stakeholders such as development partners can play an important role in facilitating the provision of ICT services and the capacity development of ICT providers. As a sector, agriculture is multi-disciplinary and therefore requires the integration and engagement of multiple stakeholders. A key challenge is understanding relevant processes – i.e. stakeholders' capacities and needs and their engagement in the sector. *From the inception of the ICT-solution*, engage with and involve relevant stakeholders such as the government and farming communities. Continually communicate with your partners and develop their capacities so they are able to carry on using, improving and scaling up the new technologies and ICT solutions. Also, ascertain whether the partner wants to transfer the technology to other regions and, if so, determine the ways in which it can be easily transferred and adapted to other communities and new challenges.

#### **9. Implement ICTs as an integral part of your project**

*'ICT solutions are a process and not just an add-on product.'*

Advisers, managers and planners should consider ICTs (excluding web presence and knowledge management) to be integral to the project design and not just an add-on. During the project design phase, identify relevant processes and interventions and ascertain where ICT contributes to improving a process and enhancing the effectiveness and efficiency of an intervention.

**In what areas can projects harness the potential of ICT solutions for reducing gender-specific disadvantages and empowering female farmers in a targeted way?**

#### **10. Rethink your monitoring and evaluation framework**

*'Assess whether your ICTs are actually positive or whether they could do more harm than good.'*

Be conscious of the impact that a chosen ICT solution may have on its beneficiaries. Ascertain whether the new technologies and/or ICT solutions will deliver a proven impact or whether people in rural areas would be better off without them. Study your monitoring and evaluation (M&E) framework to see if any of its indicators would be suitable for measuring the impact of the ICT solution. These could cover user satisfaction, the performance/stability of the software, or the reach or long-term uptake of the ICT solution. Be aware of any effects on gender and monitor them.

Use the data that already exists for M&E: Service providers using ICTs to deliver advisory services by mobile phone often automatically track the reach of their service (e.g. how many people receive the messages, at what time of the day/in which planting season, from which location within the project area). ICT solutions also offer useful options for



communicating with people in rural areas. For example, training impacts and outcomes can be measured using SMS surveys or exchange platforms. To improve oversight on project activities, record keeping and the steering of interventions, a [central database](#) can be built to facilitate the monitoring of past and current developments at the farmer level and beyond, and to support cooperation and the exchange of data between public and non-public actors.

ICTs are also useful tools for implementing M&E. Once the project team is connected up with farmers (e.g. through a digital platform), it can carry out surveys among its target groups using mobile-phone-based M&E technologies. Farmers will however, require ongoing technical support because, if their technical issues and questions go unanswered, their engagement will dwindle and they will not contribute to the M&E system.

## 11. Explore different software solutions

[‘Using open source options does not mean the software is free of charge.’](#)

29 Open-source software development: the development of software based on a source code that is made available to the public free of charge.

As a principle, and to ensure sustainability, explore the use of open source options<sup>29</sup> when developing ICT solutions, as they can be more easily adapted and used by partners and other interested users. The solution should be modular and adaptive such that users can define the system based on their contextual needs. When operating in several countries, it is worth exploring the potential of using the same ICT solutions in the different countries. [Using open source does not mean the software is free of charge](#). Similar to software offered by commercial providers like SAP, any open source solution requires software developers to adapt the solution to the specific needs of the context, and these needs can change over time, requiring ongoing maintenance, support and funding. The selection of the software is therefore dependent on the ICT business model used and on stakeholders’ interests, opportunities and willingness to pay. If the best option is to collaborate with a commercial software provider, the interests of the smallholder and the implications for scaling up need to be assessed.

## 12. ‘Post-piloting’ – keep your partners interested!

Given the current pace of technological advances, it is critical to sustain the interest of all partners involved in the development, service delivery and use of the ICT solution. Partners delivering services to rural people need to be encouraged to tailor their services to the needs of their customers – even those in very remote areas.

If, after a successful pilot, partners are left to their own devices, scaling can become a challenge. To develop a suitable ICT solution, the following actions are required:

- understand partners’ needs and perform context analyses;
- assess the suitability of a solution;
- develop the processes needed to support the use of the solution;
- develop the ICT solution;
- carry out the iterative testing of both the technology and the processes;
- develop partners’ capacities to scale up the solution.

You will also need to address your partners’ understanding of the dynamics of the ICT solution: framework conditions and/or the target groups’ needs might change quickly, which can sometimes give rise to additional costs and, in some cases, may even result in the failure of an intervention.







## ➤ Annexes

### I. CHECKLIST FOR SUCCESSFULLY PLANNING AND IMPLEMENTING ICT4AG IN A PROJECT CONTEXT

The integration of ICT in a project or programme context is best seen as a prototyping process where one works through a number of steps leading to new situation, which is then taken as the starting point for a next phase, and so on. Many things can go wrong at any point in the process, but many such problems or surprises can be avoided by performing a thorough preliminary analysis. Iterative learning is an inevitable part of any ICT-integration process.

The collection of points listed in following tables constitutes a general checklist for the steps one can/should take during the process. However, the ordering of the different steps can differ from situation to situation, and the extent to which/how precisely they are executed is highly dependent on the local context.

## INFORMATION AND COMMUNICATION ANALYSIS

A good information and communication analysis should ideally be conducted with the participation of stakeholder(s) who may include the user(s), the information provider(s), the solution/service provider(s) and/or the beneficiaries

- What are the information needs of the user? (What type of information would she like to have? What type of information would he like to share?) Establish a complete list and prioritise items together with the user.
- What are the user's communication needs? (With whom and with how many people does she want to communicate? How often? etc.) Establish a complete list and prioritise items together with the user.
- How does the user currently receive information? (Via which channels? Are these channels analogue and/or digital?) What channels does he use to reach others?
- How does the user currently communicate with her environment and with the 'outside world'?
- What channels does he use, how often, and how much does this cost?
- What are the advantages and disadvantages of the current information and communication channels being used? Consider their timeliness, speed, reliability, reach, distance, cost, etc.
- If the user's intention is to apply the solution to reach a number of other 'beneficiaries', the information/communication needs, current information/communication channels and patterns, etc. of these beneficiaries must also be analysed.

## SITUATIONAL ANALYSIS

A situational analysis generally involves a baseline/field study and some desk research

- **What infrastructure does the user currently employ and what condition is it in?**
  - Office: What electronic hardware is already in use? Is there air conditioning, electricity, access to landline or mobile phone networks, access to the internet?
  - If there is no or limited connectivity and access to power, what alternative options exist (diesel generator, solar power, nearby town, etc.)?
  - What type/level of network and bandwidth (e.g. 2G, 3G, 4G, etc.) can the user access?
  - Technical support: Are there hardware/software suppliers, repair shops and technicians in the vicinity?
- **Climate and geography**
  - How hot/cold can it get? How humid? How dusty?
  - Does the topography (e.g. mountains or valleys) or urban features (e.g. high buildings) limit connectivity?
- **Security**
  - Can the user's home/office be locked up securely and/or guarded? Is theft common in the locality?
- **Capacity**
  - How capable is the intended user/beneficiary of using the ICT solution generally and using it to send/receive information specifically? Consider factors including illiteracy, computer literacy, phone use, advanced ICT capacities, etc.
- **Regulation**
  - Are there limitations/regulations regarding the use of specific ICTs (e.g. licenses for using radio/TV/VSAT, licenses for broadcasting, prohibited content, etc.)?
  - Are there measures in place to promote the use of ICTs (e.g. tax breaks on ICT equipment, subsidies, etc.)?
- **ICT infrastructure**
  - What is the state of ICTs in the country? How much are they used?
  - How many people use mobile phones and the internet?
  - How many network operators, internet providers, ICT solution/service providers and hardware vendors are there? How well distributed are they throughout the country?
  - Are there local software developers?
  - Are there local networks or communities of practice for ICT(4Ag) stakeholders (users, enablers, service providers)?

## SOLUTION DESIGN

Do not fixate solely on technological solutions. In most cases, a combination of traditional and modern/technological channels is the best way to guarantee good uptake. Indeed, in some cases technology is best avoided altogether! While solutions can be designed in different ways, where possible the design process should involve the participation of stakeholders.

A good way to develop and trial different ICT solutions is 'rapid prototyping'. This process involves bringing together users and developers in a safe environment to determine what the solution's minimum functionalities should be, what the user interface should look like, etc. Developers then check whether others are building similar solutions and communicate their findings to the users. This process is repeated and the solution improved in response to feedback until the functional design is considered optimal. Once a prototype is agreed, the developers can begin to build it.

- **Look for existing solutions**  
In many cases, using an existing (ICT) solution is the easiest way to overcome basic/generic information and communication problems:
  - Which existing solution is most suitable for the information and communication habits/patterns/uses of the user or beneficiary?
  - What services/solutions are (a) already being used locally or (b) being offered locally/internationally and under what terms?
- **Adapt/localise an existing solution in order to suit the needs/habits/patterns of the user/beneficiary.**
  - Do you have sufficient knowledge of existing and forthcoming technologies, of software and of programming languages to be able to effectively supervise the adaptation process?
  - Have you built enough flexibility into your project planning to be able to cope with unexpected delays?
- **Create a brand new solution. This approach is useful if the need/problem at hand is very specific and if existing solutions fail to respond to current or foreseen 'next-phase' issues.**
  - Do you have sufficient knowledge of existing and forthcoming technologies, of software and of programming languages to be able to effectively supervise the development process?
  - Is the proposed solution compatible with other platforms and other software – both now and in the future?
  - Have you built enough flexibility into your project planning to be able to cope with unexpected delays?
- **Support**
  - Will the company/person who builds the solution still be available in the foreseeable future should problems arise or adaptations need to be made?
  - Is the source code available?
- **Always embed the solution. A solution is not developed and used in isolation. It should therefore be embedded in an existing information system or form part of a new system.**
  - Does the solution tap into existing patterns of information exchange?
  - If the solution replaces existing information habits, what measures will you take to overcome resistance to the new solution?
  - What measures will you take to promote the adoption of the new solution?

- **Ownership: Who owns/will own the application/solution?**
  - If it is GIZ, do you envisage transferring ownership at a later stage or making the solution publicly available?
  - Is the source code open?
  - If it is the user(s), do they have the technical (and financial) capacity to maintain and potentially further develop the solution?
  - If it is the service/solution provider, what are/will be the terms of use – both during and after the project?
- **Design for scale**
  - Have you considered the potential for a larger roll-out during/after your anticipated project?  
Scale is not a necessary criterion in all cases. However, try to avoid a situation where your ICT solution offers little or no option for scaling or replication by assessing and mitigating dependencies during the design phase. You can do this by (a) employing a 'systems' approach that considers the implications of a design beyond the confines of the project it is being developed for and (b) applying a larger geographical scope than that of your intervention when analysing your technology choices.
- **Sustainability**
  - When the intervention completes and support is withdrawn, will the user(s)/beneficiaries be able to economically and socially sustain the ICT solution? How?
  - What is the value proposition? Can the solution generate revenue? If so, is it possible to develop a business model?
  - If revenue is generated indirectly (e.g. via a higher yield or via a better market price for products), does it work out greater than the cost?
  - Does the ICT solution require regular updates/upgrades, equipment renewal, etc.? What are the estimated costs of doing this?
  - Who is the user (type)? How likely is it that this user will continue to use the ICT solution?
- **Privacy and security**
  - Have you assessed the security risks that your solution poses for its user(s) and their data?
- **Gender**
  - Who will be the direct user(s) of the ICT solution?
  - Are there social, educational, economic, cultural or other factors that may hinder users' access to and/or adoption of the ICT solution?
  - Can the ICT solution's design process be used as a means for mitigating these potentially limiting factors?

## INDICATORS TO CONSIDER WHEN SELECTING A PARTICULAR APPLICATION OR SERVICE PROVIDER

Choosing a service provider or a specific application is a critical step in any ICT project. A number of indicators can help you determine whether the service provider and/or application is appropriate for your purposes.

- Current user satisfaction and feedback
- Reach (How many farmers can effectively be reached?)
- Current uptake (number of users) and growth rate
- Type of users (if known)
- Location and geographical spread/availability (urban, rural, national, regional, etc.)
- Accessibility (On what types of devices is the app or service being provided?)
- Affordability (What does the service cost?)
- Adaptability (Can the app/service be easily modified/localised? By whom? How much will this cost?)
- Interface, ease of use
- Support available (training, learning materials, online/phone helpdesk, debugging)
- Quality and provenance of content (if applicable)
- Stability (bugs, downtime)
- Pricing model (free, subscription, pay per message, etc.)
- Financial sustainability (How solid is the underlying business model, if any?)
- Data storage (if applicable)  
NB: Cloud storage can be problematic in some developing countries.
- Range of platforms supported (web, Java, Android, Apple, Windows, etc.)
- Technological continuity (Is the app being further developed and/or supported? How dependable is the owner?)
- Current language(s) and the possibilities for translation into other languages
- Possibility of interactivity
- Is the service provider open to working in partnership?

## IMPLEMENTATION

Once you have identified the ICT solution/service, you can start 'implementing'. Depending on the type of solution involved, the order of planned activities can vary substantially. In your planning, take into account that some activities will be dependent on the good functioning of the ICT solution.

- **Existing capacity**
  - Do you/the user(s) have sufficient IT capacity to take the next steps required for solution development, procurement, installation, testing, debugging, maintenance, etc.?
  - Do you have in-house expertise or do you rely on external support?
  - Is reliable technical support locally available?
- **Planning**
  - Have you/the user(s) built sufficient flexibility into the planning and sequencing of activities?
  - Have you identified 'learning moments' throughout the process?  
N.B. Factor in the likelihood of delays and ensure your other planned project activities are not highly dependent on the ICT solution.
- **Partnering**
  - Have you/the user(s) considered partnering with specific service/solution provider(s) and/or other enabling organisations?
  - Have you opted to work with local partners or international organisations, or both?
  - Have you checked whether similar local users (user organisations) have experience of using ICT solutions? For those that have, what were their experiences and what lessons did they learn?  
N.B. International ICT companies/organisations may offer advanced and state-of-the-art technology and/or strong change-management advice, but local companies/ organisations may be better aware of local circumstances and the conditions in which ICTs can be applied.
- **Contracting**
  - Have you/the user(s) established who will be the solution/service provider?
  - Can you establish a service-level agreement (SLA) with the provider? Will it be possible to apply sanctions if the provider fails to respect the terms of the agreement?
  - Do you have access to the legal expertise required to check the completeness of the SLA and/or follow-up on its delivery?

## IMPLEMENTATION

- **Testing**
  - Have you/the user(s) established a testing period for the ICT solution?
  - Have you established a testing protocol? (Who will test what and for how long? Who will provide feedback on what? etc.)
  - Given that an ICT solution is never 'finished', what are your minimum requirements for giving the green light for its roll-out?
- **Procurement**
  - Have you/the user(s) established a complete list of necessary equipment/hardware/software? Make sure to consider spare parts/replacement hardware and protective equipment (power regulators/stabilisers, batteries, surge protection, etc.).
  - Do you have a list of preferred suppliers?
  - What service and guarantee terms does the supplier offer?
  - Do you have the technical support required to check the quality of the delivered goods?
- **Installation**
  - Who will install the ICT solution?
  - Do you/the user(s) have the technical support required to check the quality of the installation?
- **Capacity building**
  - What capacities do user(s) and beneficiaries need to be able to engage with/use/maintain the ICT solution?
  - Have you assessed the users' existing ICT capacities (e.g. basic Microsoft office, basic maintenance, advanced Microsoft office, specific applications, etc.)?
  - Do suitable facilities (e.g. well-equipped training venues) exist for the capacity-building/training to be delivered locally?
  - Can the capacity-building/training be delivered by a local partner?  
N.B. It is worth identifying local trainers/champions/power-users and providing them with training that enables them to assist/train/coach other end-users.



- **Monitoring and evaluation (M&E)**

- Have you drawn up a specific monitoring (and evaluation) methodology for assessing user satisfaction and the results/impacts of the ICT solution?
- Have you identified the user(s) and beneficiaries you want to involve in the M&E process?
- Have you considered using ICT tools to enhance your M&E (e.g. online surveys, phone-/SMS-based feedback surveys, SMS quizzes, etc.)?

N.B. Mobile network operators and/or aggregators often have very powerful tools at their disposal for analysing their clients' satisfaction levels and use patterns. However, they are often reluctant to share the data gathered by these tools. Make sure to explore your options to this regard before signing a contract with a service provider!

- **Equipment monitoring and maintenance**

- Do you/the user(s) have the technical support required to regularly check the condition of the equipment, to replace malfunctioning hardware and software, to maintain the equipment, etc.?

N.B. Consider using local trainers/champions/power-users who are able to monitor/assist/advise/coach other end-users.

- **Collaboration within and across sectors**

- Have you looked outside of your own value chain/sector/ discipline/domain when seeking to form collaborations and exchange learning with other actors?

At all stages, seek to bring in diverse expertise from across disciplines and industries, as working across sector silos results in more coordinated and more holistic approaches. Note, however, that while this may provide important benefits, it can be complicated and time-consuming and thus may frustrate the achievement of quick results.

- **Mutual learning**

- Did you incorporate learning opportunities in your work that involve sector peers and other stakeholders?
  - Can you tap into the potential of ICT-enabled networking, learning and sharing? For example, consider supporting expertise networks and communities of practice, learning platforms, e-mail lists, etc.
- N.B. Also consider facilitating face-to-face peer sharing and running exchange visits between organisations locally and nationally.

## IMPLEMENTATION

- **Data and proprietary rights**
  - Have you established the approach you will take regarding proprietary rights on content, software, etc.? From a development perspective, an 'open' approach to technology-enabled international development provides a framework for using open data, open standards, open source and open innovation, and for investing in software as a public good. However, this open approach may not coincide with the interests of your (private) partner(s), and it may problematise the building of business model(s) based around the sale of content products.

## II. THE NINE DIGITAL PRINCIPLES

### ONE: DESIGN WITH THE USER:

- » Develop context-appropriate solutions informed by user needs.
- » Include all user groups in planning, development, implementation, and assessment.
- » Develop projects in an incremental and iterative manner.
- » Design solutions that learn from and enhance existing workflows, and plan for organizational adaptation.
- » Ensure solutions are sensitive to, and useful for, the most marginalized populations: women, children, those with disabilities, and those affected by conflict and disaster.

### TWO: UNDERSTAND THE ECOSYSTEM:

- » Participate in networks and communities of likeminded practitioners.
- » Align to existing technological, legal, and regulatory policies.

### THREE: DESIGN FOR SCALE:

- » Design for scale from the start, and assess and mitigate dependencies that might limit ability to scale.
- » Employ a “systems” approach to design, considering implications of design beyond an immediate project.
- » Be replicable and customizable in other countries and contexts.
- » Demonstrate impact before scaling a solution.
- » Analyze all technology choices through the lens of national and regional scale.
- » Factor in partnerships from the beginning, and start early negotiations.

### FOUR: BUILD FOR SUSTAINABILITY:

- » Plan for sustainability from the start, including planning for long-term financial health, e.g., assessing total cost of ownership.
- » Utilize and invest in local communities and developers by default, and help catalyze their growth.
- » Engage with local governments to ensure integration into national strategy, and identify high-level government advocates.

### FIVE: BE DATA DRIVEN:

- » Design projects so that impact can be measured at discrete milestones with a focus on outcomes rather than outputs.
- » Evaluate innovative solutions and areas where there are gaps in data and evidence.
- » Use real-time information to monitor and inform management decisions at all levels.
- » When possible, leverage data as a by-product of user actions and transactions for assessments.

**SIX: USE OPEN DATA, OPEN STANDARDS, OPEN SOURCE, OPEN INNOVATION:**

- » Adopt and expand existing open standards.
- » Open data and functionalities, and expose them in documented APIs (application programming interfaces) where use by a larger community is possible.
- » Invest in software as a public good.
- » Develop software to be open source by default with the code made available in public repositories and supported through developer communities.

**SEVEN: REUSE AND IMPROVE:**

- » Use, modify, and extend existing tools, platforms, and frameworks when possible.
- » Develop in modular ways favoring approaches that are interoperable over those that are monolithic by design.

**EIGHT: ADDRESS PRIVACY & SECURITY:**

- » Assess and mitigate risks to the security of users and their data.
- » Consider the context and needs for privacy of personally identifiable information when designing solutions and mitigate accordingly.
- » Ensure equity and fairness in co-creation, and protect the best interests of the end-users.

**NINE: BE COLLABORATIVE:**

- » Engage diverse expertise across disciplines and industries at all stages.
- » Work across sector silos to create coordinated and more holistic approaches.
- » Document work, results, processes, and best practices, and share them widely.
- » Publish materials under a Creative Commons license by default, with strong rationale if another licensing approach is taken.

### III. RELEVANT ACTORS AND NETWORKS IN ICT4AG

This annex provides those new to ICT4Ag with an overview of key actors and networks and of relevant access points. A more comprehensive list can be found in the first edition of this study, [Use of ICT for Agriculture in GIZ projects – Status quo, opportunities and challenges](#), which is available at <http://www2.giz.de/wbf/4tDx9kw63gma/GIZ-ICT-study-final-interactive-version.pdf>

#### **AGRA, <http://agra.org/>**

The Alliance for a Green Revolution in Africa exists to fulfil the vision that Africa can feed itself and the world – transforming agriculture from a solitary struggle to survive to a business that thrives. Formed in 2006, AGRA is an independent African-led and Africa-based organisation committed to putting farmers at the centre of that continent's growing economies. With headquarters in Nairobi and offices in Ghana, Mali, Mozambique and Tanzania, AGRA works across 18 countries in Africa.

#### **AgricInGhana, <http://agricinghana.com/>**

The AgricInGhana blog is run by Syecomp Business Services Ltd, a company that offers agricultural consultancy services in GIS/GPS surveying and mapping, research and training. The blog highlights issues affecting agricultural development in Ghana and its wider sub-region, and it showcases technological innovations and practices that can be shared and made relevant to farmers and other stakeholders in the value chain. The blog also promotes agricultural research and provides information on the different market access support services that farmers can draw on to increase their productivity, incomes and livelihoods.

#### **Bongohive (Zambia), <http://bongohive.co.zm/>**

Lusaka's innovation and technology hub catalyses the growth of Zambia's entrepreneurial community. It provides entrepreneurship and start-up support programmes, workshops and events, all of which focus on turning Zambia into Africa's next hotbed of innovation.

#### **Burkina NTIC (Burkina Faso), <http://www.burkina-ntic.net/> (in French)**

Set up by Yam Pukri and IICD in 2001, Burkina NTIC is a local network on ICT4D and its sub-themes (ICT4Governance, ICT4Ag, ICT4Democracy, etc.). Yam Pukri hosts the network's website, lists and related websites, develops web pages and software, and organises ICT4D-related activities and training in Burkina Faso and Niger.

#### **CABI, <http://www.cabi.org/>**

The Centre for Agriculture and Biosciences International is an international not-for-profit organisation that improves people's lives worldwide by providing information and applying scientific expertise to solve problems in agriculture and the environment. The CABI's approach involves putting information, skills and tools into people's hands, and it has increasingly been using ICT to disseminate its content.

#### **CGIAR, <http://www.cgiar.org/>**

CGIAR is a worldwide partnership involved in agricultural research for development. Its work contributes to the global effort to tackle poverty, hunger and major nutrition imbalances, and environmental degradation. Its work is carried out in 15 centres, all of which are CGIAR Consortium members, and in close collaboration with hundreds of partners including national and regional research institutions, civil society organisations, academia, development organisations and the private sector. CGIAR is running a

number of projects that explore how ICT can enhance the effectiveness and impact of agricultural research and innovation on its target issues, mentioned above.

**CTA, <http://ict4ag.org/en/>**

The Technical Centre for Agricultural and Rural Cooperation is a joint international institution of the African, Caribbean and Pacific (ACP) Group of States and the European Union (EU). Its mission is to advance food and nutritional security, increase prosperity and encourage sound natural resource management in ACP countries. It provides access to information and knowledge, facilitates policy dialogue and strengthens the capacity of agricultural and rural development institutions and communities. The CTA is funded by the EU and has its main office in the Netherlands. The CTA issues a regular [ICT update](#) newsletter and organises major annual conferences, which have included: Making the Connection, held in 2012 in Addis Ababa; ICT4Ag, held in 2013 in Kigali; and Fin4Ag, held in 2014 in Nairobi. It also hosts so-called Plug-and-Play workshops in various ACP countries, during which local ICT4Ag service providers present their solutions to other agricultural stakeholders.

**CTIC Dakar (Senegal), <http://cticdakar.com/fr/> (in French)**

Founded in 2011 as a non-profit public-private partnership, CTIC is an ICT incubator and accelerator that aims to become financially self-sustaining and independent of its funders (GIZ, infoDev, Orange Sonatel, and the Government of Senegal) by 2016. This will be achieved mainly by growing the revenue it earns from the companies enrolled in its incubation programme, but also by offering other consultancy and event services.

**Digital Green, <http://www.digitalgreen.org>**

Digital Green is a not-for-profit international development organisation that uses an innovative digital platform for community engagement to improve lives in rural communities across South Asia and sub-Saharan Africa. It partners with local public, private and civil society organisations to share knowledge on improved agricultural practices, livelihoods, health and nutrition. It uses locally produced videos and face-to-face approaches to disseminate its material.

**E-TIC.net (Senegal), <http://www.e-tic.net/>**

Initiated in 2009 in Mali and Senegal, E-TIC is a training programme run by the Swiss organisation ICVolunteers that provides farmers, herders and fishers with locally adapted content and communication forums in different media (e.g. SMS, web, voice, community radio, etc.). Its content includes information and learning on organic farming and on improving crop management and income through sustainable agricultural production and productivity. E-TIC's AgriGuide is a compendium of best practices for organic production, which aims to provide farmers with learning tools to increase their knowledge of sustainable agricultural production and productivity and thus improve their crop management and income. It is not clear whether the programme is still active.

**Ethiopia Climate Innovation Center (ECIC), <http://ethiopiatic.org/>**

Launched in 2014 and funded by the UK and Norway, ECIC is a part of infoDev's Climate Technology Programme (CTP), which is currently implementing a network of innovation centres in seven other countries around the world. ECIC provides financing, mentoring and advisory services to local clean-tech entrepreneurs working in agribusiness, energy efficiency, renewable energy and biofuels.

**Ethiopia Sustainable Agribusiness Incubator (ESAI), <http://preciseethiopia.com/incubator/>**

Initiated in 2013, ESAI is a USAID-funded project that is jointly managed by Ethiopia's Precise Consult International PLC and the USA's Economic Transformation Group. ESAI's goal is to transform Ethiopian agriculture sector by sector, enhancing the competitiveness of the entire value chains of the dairy, sesame and honey sub-sectors. By identifying and supporting existing pioneer firms and stimulating and promoting emerging dynamic entrepreneurs, ESAI aspires to enable and nurture the creation of innovative businesses whose primary mission involves addressing value chain problems and value addition and thus the transformation of the sub-sector. These businesses will serve as test beds for the formation of new kinds of value addition and new models for farm-to-market linkage.

**Farm Radio International, <http://www.farmradio.org/>**

Farm Radio International (FRI) is a Canadian charity that works with more than 500 radio partners in 38 African countries to fight poverty and food insecurity. FRI operates a special on-line community called Barza, and develops radio scripts, information packages and a weekly electronic news service, which it shares with thousands of African broadcasters. They, in turn, use these resources to research, produce and present relevant and engaging programmes for their audiences, which comprise tens of millions of farmers.

**GODAN, <http://www.godan.info/>**

Launched in October 2013 at the Open Government Partnership Conference, the Global Open Data for Agriculture and Nutrition (GODAN) initiative works to foster high-level policy and institutional support for open data across the public and private sectors. To address the urgent challenge of ensuring world food security, GODAN supports the proactive sharing of open data, making information about agriculture and nutrition available, accessible and usable. GODAN is a rapidly growing group with, at present, 169 partners from national governments as well as non-governmental, international and private sector organisations.

**iceaddis (Ethiopia): <http://www.iceaddis.com/>**

iceaddis is a tech innovation hub in Addis Ababa, which started life in 2011 as a GIZ-supported project. iceaddis registered as a company in 2015 and operates an ICT-oriented co-working space in an accessible location in downtown Addis Ababa. The innovation hub also runs a rapid prototyping and entrepreneurship facility for architecture and engineering students at Addis Ababa University. iceaddis has recently been incubating AgriVas, a start-up that is working to develop an Android mobile app for teff farmers. The app will convert text-based content on modern farming methods, market prices and weather information to voice, enabling illiterate farmers to listen to the content.

**IFAD, <http://www.ifad.org>**

The International Fund for Agricultural Development (IFAD) is a specialised agency of the United Nations. It was established as an international financial institution in 1977 and represents one of the major outcomes of the 1974 World Food Conference. The IFAD funds a large number of national programmes and projects, some of which incorporate ICTs.

**i-Hub (Kenya), <https://www.ihub.co.ke/>**

The iHub catalyses the growth of the Kenyan tech community by connecting people, supporting start-ups, and surfacing information. Since its inception in March 2010, the

iHub has flourished, taking on and overcoming challenges and adapting to meet the needs of the Kenyan tech community. Its initiatives include: iHub Research; m:lab, with eMobilis and the University of Nairobi; consultancy activities; the UX Lab; and Gearbox, a design and rapid prototyping facility that will be strategically located in Nairobi's industrial area (a smaller Gearbox facility is also being installed on the iHub premises).

**i-network (Uganda), <http://www.i-network.or.ug/>**

i-network is an ICT for development (ICT4D) organisation in Uganda. Established in 2002, the network now has over 800 registered 'members' from the public, private and civil society sectors. Over time, and with the support of its IICD counterparts in The Hague, i-network has also developed expertise in ICT4D project implementation within Uganda.

**Jokkolabs (western Africa), <http://jokkolabs.net/en/>**

A non-profit independent organisation, Jokkolabs is an open innovation ecosystem and a virtual cluster for a social change based on an organic entrepreneur community and a network of innovation centres. It has operations in Abidjan, Bamako, Banjul, Casablanca, Dakar and Ouagadougou.

**kLab (Rwanda), <http://klab.rw/>**

As Rwanda works to establish a knowledge-based economy and achieve its Vision 2020 goals, fostering innovative ICT-based SMEs is increasingly important. kLab (knowledge lab) is a unique open technology hub in Kigali where students, recent graduates, entrepreneurs and innovators come to work on their ideas and projects and turn them into viable business models.

**Principles for Digital Development, <http://digitalprinciples.org/>**

This initiative is led by the Principles for Digital Development Working Group, which comprises a variety of donors, non-governmental organisations, companies and individuals working in international development. The Principles for Digital Development are 'living' guidelines that can help development practitioners to integrate established best practices into technology-enabled programmes. They are written by and for international development donors, multilateral organisations and implementing partners, and they are freely available for use by all.

**The Open Source Initiative, <http://opensource.org/>**

The Open Source Initiative is a non-profit corporation with a global scope formed to educate people on and advocate for the benefits of open source and to build bridges between different constituencies in the open source community. Open source is a development method for software that harnesses the power of distributed peer review and process transparency. The promise of open source is higher quality, better reliability, greater flexibility, lower costs, and an end to predatory vendor lock-in. One of its most important roles is as a standards body, maintaining the Open Source Definition for the good of the community. The Open Source Initiative Approved License trademark and programme creates a nexus of trust around which developers, users, corporations and governments can organise open source cooperation.

**Women of Uganda Network, <http://wougnnet.org/>**

Established in May 2000 by several women's organisations in Uganda, the Women of Uganda Network (WOUGNET) is a non-governmental organisation that encourages women to use ICTs as tools for sharing information and addressing issues collectively.



## IV. LIST OF ICT4AG PROGRAMMES AND PROJECTS

This annex provides insights into Germany's current ICT4Ag development portfolio. In so doing, it aims to

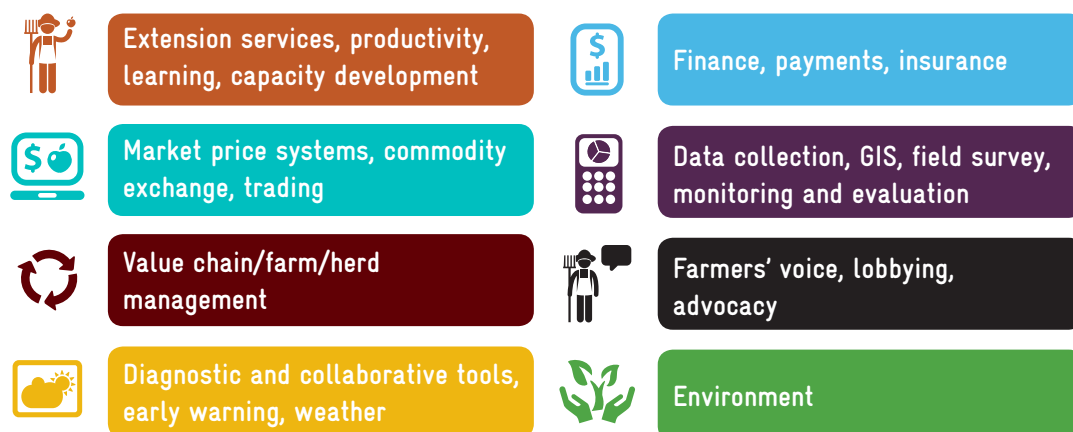
- inspire project leaders and implementing officers to integrate digital solutions into the diverse areas of their agricultural projects and programmes,
- share relevant contacts and links, and
- exchange knowledge and experiences with colleagues from field of ICT4Ag.

To learn more about the ICT solutions implemented in projects that completed in 2017, please consult the publication Use of ICT for agriculture in GIZ projects – Status quo, opportunities and challenges, which is available at <http://www2.giz.de/wbf/4tDx9kw-63gma/GIZ-ICT-study-final-interactive-version.pdf>.


For further information on the use of ICT4Ag in GIZ's agricultural and nutrition-related projects, please contact Julia Bayer ([julia.bayer@giz.de](mailto:julia.bayer@giz.de)) at the Sectoral Project Rural Development or Nadine Günther ([nadine.guenther@giz.de](mailto:nadine.guenther@giz.de)) at the Sector Network Rural Development Africa (SNRD).


Join GIZ's online ICT4Ag community of practice at <https://www.snrd-africa.net/sub-page/ict-for-agriculture/>.



### ICT CATEGORIES:





## 1. Extension services, productivity, learning, capacity development


Programme/project	Support to de-bushing
ICT category	
Period	1 Jan 2014 – 31 Dec 2017
Country	Namibia
Value chain	-
ICT specific project/ component	ICT is part of the implementation strategy
ICT application	Videos, radio broadcasts, Facebook, Twitter
Short description	<p>The project uses a series of topical video documentaries, which have also been posted on YouTube, to illustrate the approach and concepts promoted, namely bush control and biomass utilisation.</p> <p>The project uses locally produced radio broadcasts to raise the target group's (farmers and SMEs) awareness about the potential of bush control and biomass utilisation. These broadcasts are available in various local languages.</p> <p>Social media like Facebook and Twitter are used to reach farmers, businesses and decision-makers. In addition, the project is supporting three partner institutions to build their online presence (i.e. websites) and is developing an online Decision Support System that is based on workflow/business-process modelling.</p>
Target group	Final beneficiaries, project partners
Number of people reached	Up to 1,000 people
Application empowers women/ young people	The application targets young people in particular through social media
Further information and contacts	<p>Asellah David: <a href="mailto:asellah.david@giz.de">asellah.david@giz.de</a></p> <p>De-bushing Advisory Service: <a href="http://www.dasnamibia.org/">http://www.dasnamibia.org/</a></p> <p>GIZ webpage on the project: <a href="https://www.giz.de/en/worldwide/28648.html">https://www.giz.de/en/worldwide/28648.html</a></p>

Programme/project	Global Programme: Food and Nutrition Security, Enhanced Resilience
ICT category	
Period	1 Oct 2014 – 30 Sep 2020
Country	Malawi
Value chain	-
ICT specific project/ component	The ICT component is a part of the implementation strategy
ICT application	Hotline and SMS service
Short description	With the support of an NGO and INGOs, Malawi's Ministry of Health operates a hotline providing health and nutrition advice. The target groups are pregnant and lactating women, and parents and carers of small children. Additionally, a health-related SMS reminder service, which is synchronised to the woman's week of pregnancy or the child's age, is available. Both services are provided to beneficiaries free of charge.
Target group	Final beneficiaries
Number of people reached	Up to 10,000 people
Application empowers women/ young people	The ICT solutions specifically target women
Further information and contacts	Katja Altincicek: <a href="mailto:katja.altincicek@giz.de">katja.altincicek@giz.de</a> GIZ webpage on the project: <a href="https://www.giz.de/en/worldwide/32194.html">https://www.giz.de/en/worldwide/32194.html</a>






Programme/project	Sustainable Smallholder Agribusiness (SSAB)
ICT category	 
Period	1 May 2014 – 30 Sep 2019
Country	Cameroon, Côte d'Ivoire, Ghana and Nigeria
Value chain	Cocoa
ICT specific project/ component	ICT is a specific component of the project
ICT application	3D animations, mData, SMS-based monitoring
Short description	The project employs several ICT4Ag solutions: <ul style="list-style-type: none"> <li>• 3D animations on good agricultural practices (GAP) in the cocoa sector</li> <li>• mData, a mobile data capturing system built within SSAB</li> <li>• An SMS-based monitoring system for regional use that monitors the Farmer Business School training and good agricultural practices carried out by the project's local partners in five West or Central African countries.</li> </ul>
Target group	Final beneficiaries and project partners
Number of people reached	-
Application empowers women/ young people	The ICT solutions specifically target young farmers
Further information and contacts	Charlotte Chirimuuta: <a href="mailto:charlotte.chirimuuta@giz.de">charlotte.chirimuuta@giz.de</a> GIZ webpage on the project: <a href="https://www.giz.de/en/worldwide/16002.html">https://www.giz.de/en/worldwide/16002.html</a>


Programme/project	Innovation Transfer into Agriculture – Adaptation to Climate Change (ITAACC)
ICT category	
Period	6 Dec 2012 – 31 Mar 2018
Country	Benin, Ethiopia, Kenya, Morocco, Tanzania, Tunisia and Zambia
Value chain	-
ICT specific project/ component	ICT is a specific component of the project
ICT application	ITAACC knowledge transfer platform
Short description	ITAACC aims to forge links throughout Africa between the demand side – those seeking innovations in climate change adaptation – and the supply side – international agricultural research. It will therefore work with interested partners on developing a knowledge transfer platform for this purpose. In Benin, under the Catalysing the Adoption and Use of Scalable Technologies in Africa (CAUSA) project, a Confluence wiki has been set up to coordinate, document and evaluate the innovation support and business development services that national experts and young professionals provide to groups of farmers and processors operating in the poultry, maize, rice and soybean value chains.
Target group	Project team, final beneficiaries and project partners
Number of people reached	More than 10,000 people
Application empowers women/ young people	CAUSA specifically targets women and young farmers
Further information and contacts	For ITAACC Felix Zeiske: <a href="mailto:felix.zeiske@icipe.org">felix.zeiske@icipe.org</a> GIZ webpage on the project: <a href="https://www.giz.de/expertise/html/18725.html">https://www.giz.de/expertise/html/18725.html</a> ITAAC website: <a href="http://www.icipe.org/itaacc/">http://www.icipe.org/itaacc/</a>  For detailed information on Benin Marc Bernard: <a href="mailto:marc.bernard@cimonline.de">marc.bernard@cimonline.de</a>

Programme/project	Promotion of Sustainable Agriculture and Rural Development
ICT category	
Period	1 Jul 2016 – 30 Jun 2019
Country	Tunisia
Value chain	-
ICT specific project/ component	The ICT component is a specific part of the project design.
ICT application	Smartphone App Plantix
Short description	The project has rolled out Plantix, a free-of-charge, locally adapted smartphone app that provides innovative app-based services for the agricultural sector and supports the promotion of youth employment.
Target group	Project team, final beneficiaries, project partners
Number of people reached	Up to 10,000
Application empowers women/ young people	The ICT solution specifically targets women and young farmers
Further information and contacts	Nadine Günther: <a href="mailto:nadine.guenther@giz.de">nadine.guenther@giz.de</a> GIZ webpage on the project: <a href="https://www.giz.de/en/worldwide/22735.html">https://www.giz.de/en/worldwide/22735.html</a>


Programme/project	Egyptian-German Water Management Reform Programme
ICT category	
Period	1 Jul 2015 – 31 Dec 2018
Country	Egypt
Value chain	-
ICT specific project/ component	No, but ICT is part of the implementation strategy.
ICT application	Training videos
Short description	Farmer-to-farmer training videos on the reuse of water that are being widely disseminated in the project area through the internet and social media and through screenings offered at extension service centres and locally using Digital Green's mini-projector-based approach.
Target group	Farmers
Number of people reached	Up to 10,000
Application empowers women/ young people	The ICT solution specifically targets women.
Further information and contacts	Nadine Gouda: <a href="mailto:nadine.gouda@giz.de">nadine.gouda@giz.de</a> GIZ webpage on the project: <a href="https://www.giz.de/en/worldwide/16272.html">https://www.giz.de/en/worldwide/16272.html</a>


## 2. Market price systems, commodity exchange, trading


Programme/project	Employment for Sustainable Development in Africa (E4D)
ICT category	    
Period	1 Jan 2015 – 31 Dec 2019
Country	South Africa
Value chain	-
ICT specific project/ component	ICT is a specific component of the project design
ICT application	AgriApp
Short description	The project uses AgriApp, a mobile phone application that creates market linkages by provides agribusinesses with information on farmers who can supply to these businesses.
Target group	Final beneficiaries
Number of people reached	Around 16,000 farmers
Application empowers women/ young people	The ICT solution specifically targets women and young farmers
Further information and contacts	Annamarie Grobler: <a href="mailto:annamarie.grobler@giz.de">annamarie.grobler@giz.de</a> GIZ webpage on the project: <a href="https://www.giz.de/en/worldwide/31947.html">https://www.giz.de/en/worldwide/31947.html</a>

Programme/project	More Income and Employment in Rural Areas of Malawi (MIERA)
ICT category	
Period	1 Feb 2015 – 31 Jan 2019
Country	Malawi
Value chain	Groundnuts, Soya, Sunflower, Cassava, Rice, Chili/Paprika, Rice, Macadamia
ICT specific project/ component	ICT is used throughout the project but not a particular component as such
ICT application	Viamo's DataWinners for smaller survey used by the program and partner organizations, ODK for larger M&E surveys and the Agricultural Commodity Exchange for Africa's (ACE) Market Information System (MIS)
Short description	Both the project team and the partners' extension staff use DataWinners to conduct surveys of, for example, farmer organisations or to conduct follow-up assessments of program interventions such as the Farmer Business School or the ACE Marketing School (AMS). The ACE MIS is used to disseminate market information and trade opportunities to registered clients. The project plans to work with ACE on improving and scaling up this service (especially in terms of the type and quality of information it provides).
Target group	Project team, final beneficiaries, project partners
Number of people reached	More than 10,000 people
Application empowers women/ young people	-
Further information and contacts	Paul Cronjaeger: <a href="mailto:paul.cronjaeger@giz.de">paul.cronjaeger@giz.de</a>


### 3. Value chain/farm/herd management


Programme/project	Competitive African Rice Initiative (CARI)
ICT category	
Period	18 Dec 2013 – 30 Jun 2018
Country	Burkina Faso, Ghana and Nigeria
Value chain	Rice
ICT specific project/ component	ICT is part of the implementation strategy
ICT application	SMS service
Short description	CARI uses an SMS service to inform farmers about good agricultural practices and provide them with fertiliser recommendations tailored to their available budget and soil conditions.
Target group	Final beneficiaries, project partners
Number of people reached	Up to 10,000 people
Application empowers women/ young people	The ICT solution specifically targets women
Further information and contacts	Anna Thinius: <a href="mailto:anna.thinius@giz.de">anna.thinius@giz.de</a> CARI website: <a href="http://cari-project.org/">http://cari-project.org/</a>

Programme/project	African Cashew Initiative (ACI)
ICT category	
Period	14 Dec 2015 – 31 Dec 2018
Country	Benin, Burkina Faso, Ghana, Côte d'Ivoire, Mozambique
Value chain	Cashew
ICT specific project/ component	SAP value chain management/traceability
ICT application	SAP Rural Sourcing Management is a database and smartphone system for value chain management, and is available in over 10 different languages, including local languages. It covers six crops (cashew, cocoa, coffee, rice, sesame and shea) and is used by more than 100,000 small-scale producers. So far, over 150,000 transactions have been recorded. The system is currently being developed to include functionalities for input and service supply, more transactional analytics, and GIS crop business views.
Short description	With this traceability software, high-volume transactions such as farmer registration, prepayments, purchases, logistics and payments are recorded in the field using a smartphone and then synchronised in real-time. An intuitive laptop application supports data analysis, facilitates operational field support and ensures traceability.
Target group	-
Number of people reached	-
Application empowers women/ young people	-
Further information and contacts	Rita Weidinger: <a href="mailto:rita.weidinger@giz.de">rita.weidinger@giz.de</a> African Cashew Initiative website: <a href="http://www.africancashewinitiative.org">www.africancashewinitiative.org</a>


Programme/project	Green Innovation Centres in Agricultural Systems (GIA) and Bilateral Food Security Projects
ICT category	
Period	-
Country	Kenya
Value chain	-
ICT specific project/ component	The ICT component is part of the implementation strategy
ICT application	FrontlineCloud, Survey Solution, Esri, AgriPar and FarmDrive
Short description	<ul style="list-style-type: none"> <li>• <b>FrontlineCloud</b> is an SMS-based platform that sends weekly, monthly and seasonal weather forecasts to smallholder farmers. To benefit from the project interventions such as field days, trainings, fodder establishments or vine multiplication sites, technical advice from the Ministry of Agriculture is included in the SMS.</li> <li>• <b>Survey Solution</b> is a digital data-collection platform used by the project to support its studies and to collect seasonal follow-up data for progress monitoring.</li> <li>• <b>Esri</b> is a platform that geospatially maps different project sites and identifies new sites for intervention. The project has installed a GIS lab at Bukura Agriculture College for the purpose of building the geospatial mapping capacities of the target group, namely government extension staff and students.</li> <li>• <b>AgriPar</b> is an online market platform where buyers and sellers operating in diverse value chains can interact and seal business deals.</li> <li>• <b>FarmDrive</b> is an ICT platform that links smallholder farmers without financial security to financial institutions that can support these farmers to procure farm inputs.</li> </ul>
Target group	Project team, final beneficiaries, project partners
Number of people reached	Up to 2,000 people
Application empowers women/ young people	The ICT solutions specifically target young people and women
Further information and contacts	Prisca Watko: <a href="mailto:prisca.watko@giz.de">prisca.watko@giz.de</a> Sylvester Malowa: <a href="mailto:sylvester.malowa@giz.de">sylvester.malowa@giz.de</a>


#### 4. Diagnostic and collaborative tools, early warning, weather


Programme/project	Global Programme: Soil Protection and Rehabilitation for Food Security (ProSQL)
ICT category	
Period	21 Nov 2014 – 30 Sep 2021
Country	Ethiopia, India
Value chain	-
ICT specific project/ component	The ICT component is part of the implementation strategy
ICT application	Online platform
Short description	In Ethiopia the project's online platform is used for geospatial watershed planning and physical rehabilitation. In India the project uses the platform to combine soil information with agrometeorological data to develop specific advice for farm-based extension services.
Target group	Project team, final beneficiaries, project partners
Number of people reached	-
Application empowers women/ young people	-
Further information and contacts	Christina Ketter: <a href="mailto:christina.ketter@giz.de">christina.ketter@giz.de</a>


Programme/project	Adaptation in Agriculture to Climate Change in Northern Namibia
ICT category	
Period	23 Feb 2015 – 30 Sep 2019
Country	Namibia
Value chain	-
ICT specific project/ component	The ICT component is part of the implementation strategy
ICT application	Mobile soil lab
Short description	The project operates a mobile soil lab that visits farmers in their villages and analyses their soil samples on site. Instead of using chemicals, the lab employs infrared and X-ray technologies to perform the analysis. The outputs are then sent to a server in the Netherlands, which produces a report on soil nutrients and makes fertiliser recommendations within only two to four hours.
Target group	Final beneficiaries
Number of people reached	Up to 100 people
Application empowers women/ young people	-
Further information and contacts	Alexander Schöning: <a href="mailto:alexander.schoening@giz.de">alexander.schoening@giz.de</a> GIZ webpage on the project: <a href="https://www.giz.de/en/worldwide/34175.html">https://www.giz.de/en/worldwide/34175.html</a>




Programme/project	Coping with Climate Change in the Pacific Island Region (CCCPIR)
ICT category	
Period	31 May 2016 – 31 Dec 2019
Country	Vanuatu
Value chain	-
ICT specific project/ component	The ICT component is part of the implementation strategy
ICT application	KoBoCollect
Short description	The project uses the KoBoCollect application in the field to assess storm damage, especially in rural and remote areas. This information is then uploaded directly to a server in the capital Port Vila for processing by the National Disaster Management Office (NDMO), which uses the data to produce a report and ultimately an adequate response plan.
Target group	Final beneficiaries, project partners
Number of people reached	-
Application empowers women/ young people	The ICT solution specifically targets young people and women
Further information and contacts	Coen Bosboom: <a href="mailto:coen.bosboom@giz.de">coen.bosboom@giz.de</a> Pacific Community webpage on the project: <a href="http://www.spc.int/coping-with-climate-change-in-the-pacific-islands-region-cccpir-programme/">http://www.spc.int/coping-with-climate-change-in-the-pacific-islands-region-cccpir-programme/</a> GIZ webpage on the project: <a href="https://www.giz.de/en/worldwide/14200.html">https://www.giz.de/en/worldwide/14200.html</a>


Programme/project	Sector Project Sustainable Agriculture (NAREN)
ICT category	
Period	1 Jan 2016 – 31 Dec 2018
Country	Global
Value chain	-
ICT specific project/ component	The ICT component is part of the implementation strategy
ICT application	WOCATpedia, and RISE
Short description	WOCATpedia is a wiki through which members of the World Overview of Conservation Approaches and Technologies (WOCAT) network can interact. Users feed information on their sustainable land management approaches and technologies into the wiki for discussion and sharing. WOCAT is an established global network that supports innovation and decision-making processes in sustainable land management. GIZ is a member of the WOCAT consortium and is heavily engaged in developing WOCATpedia. The Response-Inducing Sustainability Evaluation (RISE) method is used to measure the sustainability of agricultural production, and then communicate the results for use in agricultural extension, education and supply chain management. RISE is available in seven languages and can be used both online and offline. The sector project uses RISE in different partner countries as a diagnostic tool to collect data on the sustainability of a particular farm.
Target group	Project team, final beneficiaries, project partners
Number of people reached	-
Application empowers women/ young people	-
Further information and contacts	Dr. Dieter Nill: <a href="mailto:dieter.nill@giz.de">dieter.nill@giz.de</a> GIZ webpage on the project: <a href="https://www.giz.de/en/worldwide/39650.html">https://www.giz.de/en/worldwide/39650.html</a>


Programme/project	Integrated Climate Risk Management (ICRM)
ICT category	
Period	1 Nov 2015 – 31 Oct 2018
Country	Ghana
Value chain	-
ICT specific project/ component	The ICT component is part of the implementation strategy
ICT application	Africa RiskView
Short description	The project's partners are training smallholders in appropriate agricultural practices that will enable them to deal with future challenges posed by climate change. Using the Africa RiskView software, the project is also supporting its Ghanaian partners on their preparations for accession to the African Risk Capacity (ARC) system. The ARC is an African Union insurance scheme that enables African governments to finance disaster and emergency measures in the event of severe drought or flooding.
Target group	Project partners
Number of people reached	More 10,000 people
Application empowers women/ young people	The ICT solution specifically targets women
Further information and contacts	Branko Wehnert: <a href="mailto:branko.wehnert@giz.de">branko.wehnert@giz.de</a> GIZ webpage on the project: <a href="https://www.giz.de/en/worldwide/44071.html">https://www.giz.de/en/worldwide/44071.html</a> Information on the Africa RiskView package: <a href="http://www.africanriskcapacity.org/2016/10/31/africa-riskview-introduction/">http://www.africanriskcapacity.org/2016/10/31/africa-riskview-introduction/</a>


Programme/project	Responsible and Inclusive Business Hub (RIBH)
ICT category	
Period	1 Jan 2014 – 31 Dec 2017
Country	Egypt
Value chain	-
ICT specific project/ component	The ICT component is part of the implementation strategy
ICT application	Sustainability Flower tool
Short description	The tool offers two self-assessment options (one lasting five minutes, the other lasting 30) to assess sustainable practices in agribusiness. The tool is targeted at private businesses in Egypt that operate in farming (including smallholders), processing, trading and retail. Users complete the simple questionnaire and then receive feedback, which can be downloaded as a PDF for later use.
Target group	Final beneficiaries, project partners
Number of people reached	Up to 1,000 people
Application empowers women/ young people	The ICT solution specifically targets women
Further information and contacts	Michael Janinhoff: <a href="mailto:michael.janinhoff@giz.de">michael.janinhoff@giz.de</a> Self-assessment tool for the sustainable business practice of a company: <a href="http://www.sekem.com/en/self-assessment-tool-for-the-sustainable-business-practice-of-a-company/">http://www.sekem.com/en/self-assessment-tool-for-the-sustainable-business-practice-of-a-company/</a>

## 5. Finance, payments, insurance


Programme/project	Strategic Alliance: Farmers as Entrepreneurs – Improving the Livelihoods of Smallholders in Uganda (Agrufin)
ICT category	
Period	24 May 2017 – 31 Jul 2019
Country	Uganda
Value chain	-
ICT specific project/ component	ICT is a specific component of the project design
ICT application	Value chain tracking tools, mobile banking, agricultural extension SMS, video training
Short description	The project uses SAP or other value chain tracking tools to collect farmer income histories for the purpose of facilitating access to financial services, ensuring transparency, etc. Furthermore, the project provides mobile banking for smallholders, agricultural extension SMS and video training.
Target group	Final beneficiaries, project partners
Number of people reached	In total, around 33,000 farmers (NB: not all of these have benefited from the same applications)
Application empowers women/ young people	The ICT solution specifically targets young people and women
Further information and contacts	Anna Karolina Lamik: <a href="mailto:anna.lamik@giz.de">anna.lamik@giz.de</a> GIZ webpage on the project: <a href="https://www.giz.de/en/worldwide/19361.html">https://www.giz.de/en/worldwide/19361.html</a>


Programme/project	Microfinance in Rural Areas – Access to Finance for the Poor
ICT category	
Period	1 Dec 2014 – 30 Nov 2017
Country	Laos
Value chain	-
ICT specific project/ component	-
ICT application	MBWin, and an Excel-based monitoring tool
Short description	MBWin, a software established by FAO and GIZ (then GTZ) in 1999, supports MFI managers to accurately set up financial accounts and track performance, and facilitates their reporting to the country's central bank, the <b>Bank of the Lao PDR</b> . The <b>Excel-based monitoring tool</b> serves the same purpose, but is used by entities that are not regulated and supervised by the Bank of the Lao PDR. The tool's outputs are instead designed for submission to network support organisations (NSOs), entities that provide products and services to village banks. The tool is used to collect and aggregate data from village bank transactions, partly for the purpose of supervision, partly for making decisions on the financial products that the NSO will offer to its village banks.
Target group	Project team, project partners, Central Bank
Number of people reached	More than 100,000 people
Application empowers women/ young people	The ICT solution and the overall project approach help to make traditionally-used village funds safer and more transparent. Beneficiaries are the general population of rural villages. Women and younger people benefit disproportionately more because without village bank they are factually excluded from formal financial services.
Further information and contacts	Thorsten Fuchs: <a href="mailto:thorsten.fuchs@giz.de">thorsten.fuchs@giz.de</a> GIZ webpage on the project: <a href="https://www.giz.de/en/worldwide/17492.html">https://www.giz.de/en/worldwide/17492.html</a> Fact sheet for the project <a href="https://www.giz.de/en/downloads/ENG%20AFP%20Fact%20Sheet.pdf">https://www.giz.de/en/downloads/ENG%20AFP%20Fact%20Sheet.pdf</a> Promoting Gender: <a href="https://www.giz.de/en/downloads/giz2014-en-financial-inclusion-gender-rural-areas.pdf">https://www.giz.de/en/downloads/giz2014-en-financial-inclusion-gender-rural-areas.pdf</a> MBWin website: <a href="http://www.mbwin.net/">http://www.mbwin.net/</a>

Programme/project	Green Innovation Centres in Agricultural Systems (GIA)
ICT category	
Period	1 Oct 2014 – 30 Sep 2021
Country	Benin, Burkina Faso, Cameroon, Ethiopia, Ghana, Kenya, Malawi, Mali, Mozambique, Nigeria, Togo, Tunisia and Zambia
Value chain	Various
ICT specific project/ component	The ICT component is part of the implementation strategy
ICT application	Mobile banking, FarmDrive, RiceAdvice, CowManager, video animations, radio broadcasts
Short description	<ul style="list-style-type: none"> <li>• In Kenya mobile banking makes it possible to transfer money directly to people's mobile devices. FarmDrive collects data on farmers' operations to facilitate these farmers' access to loans from financial institutions.</li> <li>• To improve access to markets in Benin and Togo, interested farmers can sign up to receive information on market prices, which is sent daily to their mobile phone.</li> <li>• To improve productivity management, smartphone apps have been developed to provide weather forecasts (Nigeria), diagnose plant damage (Tunisia), and recommend suitable fertilisers and show how they should be used (RiceAdvice, offered in Benin, Burkina Faso and Nigeria). Animated videos covering good agricultural practices and radio broadcasts are also used to deliver learning on an ongoing basis.</li> </ul> <p>The above provides a general overview of the ICT4Ag used by Green Innovation Centres. For more detailed information, please contact the team members listed below.</p>
Target group	Project team, final beneficiaries, project partners
Number of people reached	More than 10,000 people
Application empowers women/ young people	The ICT solutions specifically target young people and women
Further information and contacts	Bastian Beege: <a href="mailto:bastian.beege@giz.de">bastian.beege@giz.de</a> GIZ webpage on the project: <a href="https://www.giz.de/en/worldwide/32209.html">https://www.giz.de/en/worldwide/32209.html</a> FarmDrive: <a href="https://farmdrive.co.ke/">https://farmdrive.co.ke/</a> RiceAdvice: <a href="https://www.riceadvice.info/en/">https://www.riceadvice.info/en/</a>


Programme/project	Remote sensing-based Information and Insurance for Crops in Emerging Economies (RIICE)
ICT category	
Period	1 Nov 2013 – 31 Dec 2019
Country	India
Value chain	Rice
ICT specific project/ component	The ICT component is a specific part of the project design
ICT application	GIS, and remote sensing
Short description	The RIICE project aims to generate reliable and accurate crop statistics (i.e. averages and yields) that can be used to support the provision of crop insurance in the locations where the project is active. The project uses innovative technologies such as remote sensing and GIS to achieve its objectives, and it works in close cooperation with both the government and the insurance community.
Target group	Project team, project partners
Number of people reached	Up to 100 people
Application empowers women/ young people	-
Further information and contacts	Manoj Yadav: <a href="mailto:manoj.yadav@giz.de">manoj.yadav@giz.de</a> RIICE: <a href="http://www.riice.org/">http://www.riice.org/</a> ASEAN SAS article on RIICE: <a href="https://www.asean-agrifood.org/projects/riice/">https://www.asean-agrifood.org/projects/riice/</a> SNRD article on RIICE: <a href="https://snrd-asia.org/riice-remote-sensing-based-information-and-insurance-for-crops-in-emerging-economies/">https://snrd-asia.org/riice-remote-sensing-based-information-and-insurance-for-crops-in-emerging-economies/</a>



## 6. Data collection, GIS, field survey, monitoring and evaluation

Programme/project	Global Programme: Responsible Land Policy
ICT category	
Period	1 Nov 2015 – 31 Oct 2021
Country	Benin, Laos, Peru, Madagascar and Uganda
Value chain	-
ICT specific project/ component	The ICT component is part of the implementation strategy
ICT application	Drones, tablets, and smartphones
Short description	The project uses drones for remote sensing and the mapping of land rights (parcels). The pictures captured by the drones can also help in conflict resolution processes. Tablets are used for data collection activities such as conducting surveys and progress documentation. Smartphones can also be used to map parcels
Target group	Project team, final beneficiaries
Number of people reached	More than 10,000 people
Application empowers women/ young people	-
Further information and contacts	Florian Nitzinger: <a href="mailto:florian.nitzinger@giz.de">florian.nitzinger@giz.de</a>


Programme/project	Innovation Factory – Realising shared solutions (IZR project)
ICT category	
Period	6 Nov 2014 – 31 Mar 2018
Country	Ethiopia, Germany, Indonesia, Senegal
Value chain	Various
ICT specific project/ component	ICT is a specific component of the project design
ICT application	Differs depending on the country
Short description	<p>The Innovation Factory programme brings together young innovators from Africa, Asia and Europe to explore and develop ICT4Ag solutions for their own local contexts:</p> <ul style="list-style-type: none"> <li>• Indonesia: working with an indigenous community (Kasepuhan Ciptagelar, West Java) to develop a 'smart' village based on the strategic use of ICT and digital media.</li> <li>• Senegal: agricultural technology innovation hub where young people and agribusinesses come together to explore how to harness ICTs.</li> <li>• Ethiopia: using ICT-based methods and technologies to improve beekeeping and honey production.</li> <li>• Germany: low-tech options for community-supported agriculture.</li> </ul> <p>New forms of bottom-up agriculture networks based on user-centred design methods and ICT tools create a space for collaboration between urban actors and rural practitioners with the aim of developing more sustainable technological solutions to support small-scale farming around the world.</p>
Target group	Final beneficiaries, project partners
Number of people reached	-
Application empowers women/ young people	The ICT solutions specifically target young people and women

Further information and contacts	<p>Angela Zur: <a href="mailto:angela.zur@giz.de">angela.zur@giz.de</a>  Anne Talk: <a href="mailto:anne.talk@giz.de">anne.talk@giz.de</a>  Innovation Factory article on the Senegal ICT4Ag techhub: <a href="http://www.innovation-factory.info/ict4agriculture/ict4agriculture-senegal/">http://www.innovation-factory.info/ict4agriculture/ict4agriculture-senegal/</a>  Re:publica article on the Global Innovation Gathering: <a href="https://re-publica.com/en/17/session/nourishing-our-communities-rural-and-urban-platforms-food-innovation">https://re-publica.com/en/17/session/nourishing-our-communities-rural-and-urban-platforms-food-innovation</a>  Innovation Factory case studies: <a href="http://icebauhaus.com/wp-content/uploads/2016/10/Innovation_Factory_ICT4AG_ALL_September-2016_WEB.pdf">http://icebauhaus.com/wp-content/uploads/2016/10/Innovation_Factory_ICT4AG_ALL_September-2016_WEB.pdf</a>  Agence Ecofin article on the Yeesal AgriHub in Senegal (in French): <a href="http://www.agenceecofin.com/innovation/1803-36740-le-hub-yeesal-agri-hub-met-les-innovations-digitales-au-service-de-lagriculture-senegalaise">http://www.agenceecofin.com/innovation/1803-36740-le-hub-yeesal-agri-hub-met-les-innovations-digitales-au-service-de-lagriculture-senegalaise</a></p>
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Programme/project	Land Management and Decentralised Planning (LMDP), and Enhanced Land Tenure Security (ELTeS) Under the Global Programme: Responsible Land Policy
ICT category	
Period	1 Jan 2015 – 31 Dec 2017
Country	Laos
Value chain	-
ICT specific project/ component	ICT is a specific component of the project design
ICT application	Tablets, and a monitoring and evaluation (M&E) system
Short description	The projects use a digital and web-based M&E system. With the help of tablets, an impact assessment survey was conducted with more than 500 respondents. The projects are also planning to develop an interactive quiz that makes female villagers more aware of their land rights.
Target group	Project team, final beneficiaries
Number of people reached	Up to 1,000 people
Application empowers women/ young people	The ICT solutions specifically target women
Further information and contacts	<p>Vera Scholz: <a href="mailto:vera.scholz1@giz.de">vera.scholz1@giz.de</a>  SNRD webpage on land management and decentralised planning in Laos: <a href="https://snrd-asia.org/land-management-and-decentralised-planning-lmdp/">https://snrd-asia.org/land-management-and-decentralised-planning-lmdp/</a></p>

Programme/project	Bilateral Project: Drought Resilience in Northern Kenya
ICT category	 
Period	1 Jan 2017 – 31 Dec 2018
Country	Kenya
Value chain	-
ICT specific project/ component	ICT is a specific component of the project design
ICT application	-
Short description	The project supports the mapping of basic data, showing changes in rainfall and other factors (pasturelands, water points, rural infrastructure, etc.). The data collected are retained in a digital database. Because all the collected data incorporates GPS data, it will be possible to conduct comparative studies to determine whether and how the study sites are changing.
Target group	Project partners
Number of people reached	Up to 100 people
Application empowers women/ young people	-
Further information and contacts	Prisca Watko: <a href="mailto:prisca.watko@giz.de">prisca.watko@giz.de</a> Sabine Schenk: <a href="mailto:sabine.schenk@giz.de">sabine.schenk@giz.de</a> GIZ webpage on the project: <a href="https://www.giz.de/en/worldwide/40504.html">https://www.giz.de/en/worldwide/40504.html</a>

Programme/project	Eliminate Deforestation from supply chains
ICT category	 
Period	9 Feb 2017 – 28 Feb 2019
Country	Côte d'Ivoire and Indonesia
Value chain	-
ICT specific project/ component	The ICT component is part of the implementation strategy
ICT application	Global Forest Watch (satellite imagery)
Short description	Global Forest Watch is an open-source platform that uses satellite imagery to monitor forest cover change and land use. Interested parties can use Global Forest Watch to monitor the status and progress of deforestation-free commodity programmes in areas prone to deforestation.
Target group	Project team, project partners
Number of people reached	-
Application empowers women/ young people	-
Further information and contacts	Achim Kress: <a href="mailto:achim.kress@giz.de">achim.kress@giz.de</a>


Programme/project	Global Project: Promotion of nutrition-sensitive potato value chains in East Africa
ICT category	
Period	1 Jan 2016 – 30 Jun 2021
Country	Kenya
Value chain	Potato
ICT specific project/ component	The ICT component is part of the implementation strategy
ICT application	Tablets
Short description	The project held training courses for 60 agricultural advisors, teaching them how to use tablets to develop questionnaires and collect data.
Target group	Project partners
Number of people reached	The aim is to collect data from approximately 12,000 farmers
Application empowers women/ young people	-
Further information and contacts	Dominik Fortenbacher: <a href="mailto:dominik.fortenbacher@giz.de">dominik.fortenbacher@giz.de</a> GIZ webpage on the project: <a href="https://www.giz.de/en/worldwide/40726.html">https://www.giz.de/en/worldwide/40726.html</a>

## 7. Farmers' voice, lobbying, advocacy

Programme/project	Climate Change Knowledge Network in Indian Agriculture (CCKN-IA)
ICT category	   
Period	1 Jun 2013 – 30 May 2017
Country	India
Value chain	-
ICT specific project/ component	ICT is a specific component of the project design
ICT application	Knowledge platform (NICE+), the Telegram messaging service, video sharing websites, Facebook and SMS
Short description	In collaboration with India's Ministry of Agriculture, the CCKN-IA project uses NICE+, an innovative ICT-based knowledge platform, to improve the processing, sharing and use of information and knowledge relating to climate change adaptation in agriculture. The platform also provides an effective two-way link between farmers and experts that enables farmers to quickly source the specific advice they need. Alongside its own open-source applications and ICT technologies, the project also works with social media such as Telegram, Facebook and video sharing websites.
Target group	Final beneficiaries, project partners
Number of people reached	Up to 23,000 small and marginal farmers have been reached
Application empowers women/ young people	The ICT solutions specifically target young people and women
Further information and contacts	Navin Vivek Horo: <a href="mailto:navin.horo@giz.de">navin.horo@giz.de</a> CCKN-IA website: <a href="http://cckn-ia.org/en/">http://cckn-ia.org/en/</a> SNRD webpage on CCKN-IA: <a href="https://snrd-asia.org/climate-change-knowledge-network-in-indian-agriculture-cckn-ia/">https://snrd-asia.org/climate-change-knowledge-network-in-indian-agriculture-cckn-ia/</a> GIZ webpage on the project: <a href="https://www.giz.de/en/worldwide/30032.html">https://www.giz.de/en/worldwide/30032.html</a>



## 8. Environment

Programme/project	Land Regularisation in the Amazon
ICT category	
Period	1 Oct 2016 – 30 Apr 2020
Country	Brazil
Value chain	-
ICT specific project/ component	ICT is a specific component of the project design
ICT application	The SIGEF Destinação IT module
Short description	GIZ is supporting the development and improvement of SIGEF Destinação, a public land allocation system that makes the process of issuing private land titles more efficient by interfacing with other databases and automating land regularisation in the Amazon.
Target group	Final beneficiaries, project partners
Number of people reached	Up to 1,000 people
Application empowers women/ young people	-
Further information and contacts	Bettina Kupper: <a href="mailto:bettina.kupper@giz.de">bettina.kupper@giz.de</a> GIZ webpage on the project: <a href="https://www.giz.de/en/worldwide/33654.html">https://www.giz.de/en/worldwide/33654.html</a>

## Further categories

Programme/project	Sector Network Rural Development (SNRD) Africa
ICT category	Other
Period	-
Country	Africa
Value chain	-
ICT specific project/ component	-
ICT application	-
Short description	<p>SNRD Africa is a community of practice for local and international GIZ staff working in the area of rural development in Africa. As a powerful knowledge sharing hub, it helps to promote sound capacity-development approaches. SNRD Africa covers all aspects of rural and sustainable development, and is involved in more than 70 projects and programmes (some of which are based in Germany) in 26 African countries. Altogether, more than 400 staff and consultants contribute to the successful outcomes achieved by its operations. For more information, visit <a href="https://www.snrd-africa.net/">https://www.snrd-africa.net/</a></p> <ul style="list-style-type: none"> <li>• SNRD Africa runs a virtual community of practice (CoP) specifically for ICT4Ag, which can be accessed at <a href="https://www.snrd-africa.net/subpage/ict-for-agriculture/">https://www.snrd-africa.net/subpage/ict-for-agriculture/</a></li> </ul>
Target group	-
Number of people reached	-
Application empowers women/ young people	-
Further information and contacts	Nadine Guenther: <a href="mailto:nadine.guenther@giz.de">nadine.guenther@giz.de</a>

Programme/project	Sectoral Project Rural Development
ICT category	Other
Period	Jan 2012 – March 2018, with a possible extension to July 2021
Country	Germany
Value chain	-
ICT specific project/ component	-
ICT application	-
Short description	<p>The project compiles and analyses good practices on the integrated use of ICTs for the implementation of agricultural and rural development. It develops practical knowledge products and provides project planners, practitioners and policy-makers with advisory services on ICT4Ag. The project works to mainstream the use of locally adapted ICT solutions with the goal of promoting modern, integrated rural development measures as drivers for rural transformation. Other of its main activities include setting up and facilitating information exchange and networking (e.g. through the SNRD community of practice for ICT4Ag).</p>
Target group	-
Number of people reached	-
Application empowers women/ young people	-
Further information and contacts	<p>Petra Jacobi: <a href="mailto:petra.jacobi@giz.de">petra.jacobi@giz.de</a>            Julia Bayer: <a href="mailto:julia.bayer@giz.de">julia.bayer@giz.de</a></p>

## V. REFERENCES AND LITERATURE

The following list comprises an up-to-date selection of relevant literature for projects interested in integrating ICT solutions into their work or seeking an overview of the different dimensions of ICT4Ag (e.g. its relationship to the SDGs, the use of open data and data governance, and approaches for addressing digital divides). A more comprehensive list, which focuses more broadly on ICT for development (ICT4D), is provided in Use of ICT for Agriculture in GIZ projects – Status quo, opportunities and challenges, available at <http://www2.giz.de/wbf/4tDx9kw63gma/GIZ-ICT-study-final-interactive-version.pdf>

### I. ICT FOR AGRICULTURE

#### **Africa Agriculture Status Report 2016, AGRA**

<https://agra.org/aasr2016/public/assr.pdf> (21 March 2018)

#### **ICT in Agriculture: Connecting Smallholders to Knowledge, Networks, and Institutions, World Bank**

<https://www.openknowledge.worldbank.org/handle/10986/27526> (21 March 2018)

This resource is designed to support practitioners, decision makers, and development partners who work at the intersection of ICT and agriculture. In this revised e-Sourcebook you will find updated modules on ICT in the work of producer organizations; in research, extension and innovation.

#### **ICT in linking farmers to markets: Innovative mobile applications and lessons learned from the past and the future, CTA 2015:**

[https://publications.cta.int/media/publications/downloads/1874\\_PDF\\_x0NaTJC.pdf](https://publications.cta.int/media/publications/downloads/1874_PDF_x0NaTJC.pdf)  
(21 March 2018)

Mobile phones are more than tools for communicating; farmers consider them as a status symbol in society. Mobile money provides complementary services to farmers in the areas of banking, insurance and microfinance. Farmers need mobile applications that can meet their changing information needs and suit their information seeking behaviour.

#### **ICT uses for Inclusive Agricultural Value Chains:**

<http://www.fao.org/3/a-aq078e.pdf> (21 March 2018)

This study documents the various kinds of information and communications technology (ICT) initiative being implemented globally to improve agricultural value chains and agribusinesses.

#### **Digital Dividends – World Development Report 2016, World Bank**

<http://documents.worldbank.org/curated/en/896971468194972881/pdf/102725-PUB-Replacement-PUBLIC.pdf> (21 March 2018)

A must-read report, exploring the internet's impact on economic growth, on social and economic opportunity, and on the efficiency of public service delivery. It analyses the factors that have allowed some businesses, people and governments to benefit greatly from the internet – and others not. To help countries better leverage the internet for development, it identifies the policy reforms required in the ICT sectors, in complementary sectors and in the development community.

**Digital Harvest, AGRA, 2016:**

[https://www.rafllearning.org/sites/default/files/20161024\\_digital\\_harvest\\_final\\_report.pdf?token=iFv2y-WN](https://www.rafllearning.org/sites/default/files/20161024_digital_harvest_final_report.pdf?token=iFv2y-WN) (21 March 2018)

For Digital Harvest, the AGRA financial inclusion team, in partnership with the MasterCard Foundation, assessed the business models of 15 ICT4Ag solutions providers in Ghana, Kenya and Tanzania. The report identifies more than 150 different ICT solutions in these three countries that enable farmers to access information on market prices, good agronomical practices and the weather. While AGRA's sample is small, its report does provide insights on the solutions' weak spots and on the possible improvements needed to grow and sustain the solutions that offer real value to the farmers.

**The Global Information Technology Report 2015, ICT for Inclusive Growth, World Economic Forum, Dutta, S., Geiger, T. and Lanvin, B., 2015**

[http://www3.weforum.org/docs/WEF\\_Global\\_IT\\_Report\\_2015.pdf](http://www3.weforum.org/docs/WEF_Global_IT_Report_2015.pdf) (21 March 2018)

Since 2001, The Global Information Technology Report series, published by the World Economic Forum in partnership with Cornell University and INSEAD, has measured the drivers of the ICT revolution using the Networked Readiness Index. The Report covers 143 economies. Drawing on its content, it is possible to identify priority areas that will enable these economies to more fully leverage ICTs for development.

**E-Agriculture Strategy Guide**

<http://www.fao.org/3/a-i5564e.pdf> (21 March 2018)

This publication provides a framework for countries in developing their national e-agriculture strategies

**Global Good Practice Notes series, GFRAS**

<http://www.g-fras.org/en/download.html> (21 March 2018)

**How to Grow and Sustain the Digital Harvest? AGRA, 2016:**

[https://www.rafllearning.org/sites/default/files/20161024\\_digital\\_harvest\\_final\\_report.pdf?token=iFv2y-WN](https://www.rafllearning.org/sites/default/files/20161024_digital_harvest_final_report.pdf?token=iFv2y-WN) (21 March 2018)

The AGRA financial inclusion team in partnership with The MasterCard Foundation has been assessing the business models of fifteen ICT4Ag solutions providers in Kenya, Tanzania and Ghana. In their report, they refer to the 150+ different ICT solutions in these countries that allow farmers to access information on market prices, good agronomical practices, and weather updates. AGRA's sample is small, but allows insights in flaws and possible improvements needed to grow and sustain the solutions that offer real value to the farmers.

**ICTs in Linking Farmers to Markets: Innovative Mobile Applications and Lessons Learned from the Past and the Future, Mammo, Y., CTA, 2015**

[https://publications.cta.int/media/publications/downloads/1874\\_PDF\\_x0NaTJC.pdf](https://publications.cta.int/media/publications/downloads/1874_PDF_x0NaTJC.pdf) (21 March 2018)

Mobile phones are more than just tools for communicating; farmers consider them to be a social status symbol. Furthermore, mobile money provides farmers with complementary services in the areas of banking, insurance and microfinance. Farmers need mobile applications that can meet their changing information needs and are suited to their information-seeking behaviour.

### **Success Stories on Information and Communication Technologies for Agriculture and Rural Development**

<http://www.fao.org/3/a-i4622e.pdf> (21 March 2018)

The case studies showcased in this publication use ICTs to address problems in agriculture and rural development. This work is an effort to promote sustainable and usable ICTs for agriculture.

### **The Global Information Technology Report 2015, ICT for Inclusive Growth, World Economic Forum 2015**

[http://www3.weforum.org/docs/WEF\\_Global\\_IT\\_Report\\_2015.pdf](http://www3.weforum.org/docs/WEF_Global_IT_Report_2015.pdf) (21 March 2018)

Since 2001, The Global Information Technology Report series published by the World Economic Forum in partnership with Cornell University and INSEAD has measured the drivers of the ICT revolution using the Networked Readiness Index. For each of the 143 economies covered, it allows areas of priority to be identified to more fully leverage ICT for development.

### **'Unleashing the rural digitisation potential', Braun, J. and Baumüller, H., Rural 21, Vol. 51, No 2/2017, Frankfurt, Germany,**

<http://www.rural21.com/english/archiv/archive2017-02en/> (21 March 2018)

### **Use of ICT for Agriculture in GIZ projects – Status quo, opportunities and challenges, GIZ, 2016**

<http://www2.giz.de/wbf/4tDx9kw63gma/GIZ-ICT-study-final-interactive-version.pdf>

(21 March 2018)

### **What Do Toilets and Cell Phones Have in Common?**

<http://blogs.worldbank.org/water/what-do-toilets-and-cell-phones-have-in-common>

(21 March 2018)

## **II. OPEN DATA FOR AGRICULTURE**

### **Introducing the Agriculture Open Data Package – Beta version, GODAN, 2016**

[http://www.godan.info/sites/default/files/GODAN\\_Agriculture\\_Open\\_Data\\_Package\\_BETA\\_1.pdf](http://www.godan.info/sites/default/files/GODAN_Agriculture_Open_Data_Package_BETA_1.pdf) (21 March 2018)

The Agriculture Open Data Package (AgPack) provides a roadmap for governments, suggesting six policy areas where open data can support the agriculture sector. Based on a participatory process with politicians, agricultural experts and the open data community, 14 key data categories have been identified. The categories include data on pest and disease management, production advice, soil, hydrology, elevation, meteorology, markets, infrastructure, value chains, land use and productivity, rural projects, government finance, official records, and regulations. The AgPack also looks at 10 examples of open data in action, showing how governments are harnessing data to address sustainable agriculture and food security around the world.

### **'How Can Sensor Technologies and Precision Farming Improve Agriculture?', ICTworks, 2016**

<http://www.ictworks.org/2016/09/07/how-can-sensor-technologies-and-precision-farming-improve-agriculture/> (21 March 2018)

This blogpost details the outcomes of a USAID initiative exploring the potential for precision agriculture technologies in developing countries.

**Open Data and Smallholder Food and Nutritional Security, CTA, Jellema et al., February 2015**  
[http://www.cta.int/images/Opendataforsmallholders-report\\_.pdf](http://www.cta.int/images/Opendataforsmallholders-report_.pdf) (21 March 2018)

This report by Alterra aims to provide a better understanding of the actual impact of the open data movement on the food and nutrition security of smallholders, and it highlights areas of potential opportunity that have yet to be addressed.

**Open Data Barometer: data poverty the next frontier of widening inequality, World Wide Web Foundation, 2016**

<http://webfoundation.org/2016/04/open-data-barometer/> (21 March 2018)

This report assesses worldwide progress on open data initiatives. It shows that, while over half of the countries studied report to having such initiatives, less than 10% of the government data vital for sustainable development is open.

**Open Data and smallholder food and nutritional security, CTA 2015:**

<http://hdl.handle.net/10568/75490> (21 March 2018)

This report by Alterra aims to provide a better understanding of the actual impact of the open data movement on the food and nutrition security of smallholders and highlight the areas of potential unfilled opportunity

### III. DATA OWNERSHIP AND DATA PROTECTION IN THE DIGITAL AGE

**Privacy by Design – The 7 Foundational Principles, Cavoukian, A., Internet Architecture Board**  
[https://iab.org/wp-content/IAB-uploads/2011/03/fred\\_carter.pdf](https://iab.org/wp-content/IAB-uploads/2011/03/fred_carter.pdf) (21 March 2018)

**Data protection in the context of digital financial services and Big Data, GIZ, 2016**

[http://www2.giz.de/wbf/4tDx9kw63gma/Datenschutz-Diskussionspapier\\_E\\_140416\\_Internet.pdf](http://www2.giz.de/wbf/4tDx9kw63gma/Datenschutz-Diskussionspapier_E_140416_Internet.pdf) (21 March 2018)

This discussion paper sets out to (a) define the terms surrounding digitisation, Big Data and financial systems development as regards data protection, (b) examine the opportunities and risks that these trends present for the partner countries of German development cooperation in order to (c) derive approaches that German development cooperation actors can use for financial systems development and for data protection in general. The chosen focus – data protection and data security – is just one aspect of ‘digital financial services’ as a broader theme.

**‘Data Protection Laws of the World’, DLA Piper**

<https://www.dlapiperdataprotection.com/index.html#handbook/world-map-section>  
(21 March 2018)

This handbook provides an overview of the key privacy and data protection laws and regulations of nearly 100 different jurisdictions and offers a primer to businesses as they consider this complex and increasingly important area of compliance.

**‘How to Develop and Implement Responsible Data Policies’, ICTworks, 2016**

[http://www.ictworks.org/2016/11/21/how-to-develop-and-implement-responsible-data-policies/?utm\\_source=ICTworks&utm\\_campaign=78016270f3-ICTworksEmailRSS&utm\\_medium=email&utm\\_term=0\\_0814c7961e-78016270f3-48338097](http://www.ictworks.org/2016/11/21/how-to-develop-and-implement-responsible-data-policies/?utm_source=ICTworks&utm_campaign=78016270f3-ICTworksEmailRSS&utm_medium=email&utm_term=0_0814c7961e-78016270f3-48338097)  
(21 March 2018)

**Policy on the Protection of Personal Data of Persons of Concern to UNHCR, 2015**

<http://www.refworld.org/docid/55643c1d4.html> (21 March 2018)

**Resolution on Privacy and Humanitarian Action, 37th International Conference of Privacy and Data Protection Commissioners, Amsterdam, 2015**

<https://icdppc.org/wp-content/uploads/2015/02/Resolution-on-Privacy-and-International-Humanitarian-Action.pdf> (21 March 2018)

**'Rethinking Informed Consent in Digital Development', ICTworks, 2016**

[http://www.ictworks.org/2016/11/07/rethinking-informed-consent-in-digital-development/?utm\\_source=ICTworks&utm\\_campaign=43f8f04af1-ICTworksEmailRSS&utm\\_medium=email&utm\\_term=0\\_0814c7961e-43f8f04af1-48338097](http://www.ictworks.org/2016/11/07/rethinking-informed-consent-in-digital-development/?utm_source=ICTworks&utm_campaign=43f8f04af1-ICTworksEmailRSS&utm_medium=email&utm_term=0_0814c7961e-43f8f04af1-48338097) (21 March 2018)

**'The Ongoing Challenge of Protecting Privacy in Digital Development', ICTworks, 2016**

<http://www.ictworks.org/2016/04/18/the-ongoing-challenge-of-protecting-privacy-in-digital-development/> (21 March 2018)

This blogpost looks at how most NGOs have not updated their consent forms and policies for many years, despite our growing use of technology, for many different purposes, in our work. The post explores the various questions and insecurities that this raises, many of which are difficult to address.

#### IV. ICT AND THE SDGS

**'Government design principles', gov.uk**

<https://www.gov.uk/design-principles> (21 March 2018)

**Harnessing the digital revolution for sustainable Development, BMZ, 2017**

[http://www.bmz.de/en/publications/type\\_of\\_publication/information\\_flyer/information\\_brochures/Materialie276\\_digitale\\_agenda.pdf](http://www.bmz.de/en/publications/type_of_publication/information_flyer/information_brochures/Materialie276_digitale_agenda.pdf) (21 March 2018)

**ICT & SDGs – How Information and Communications Technology Can Achieve the Sustainable Development Goals, The Earth Institute of Columbia University and Ericsson, 2015**

<https://www.ericsson.com/res/docs/2015/ict-and-sdg-interim-report.pdf> (21 March 2018)

**'ICT for a Sustainable World #ICT4SDG, ITU**

<http://www.itu.int/en/sustainable-world/Pages/default.aspx>, (21 March 2018)

Web content looking at how ICTs form the backbone of today's digital economy and have enormous potential to accelerate progress on the SDGs and improve people's lives in fundamental ways.

**Principles for Digital Development, 2013**

<http://digitalprinciples.org/> (21 March 2018)

**Toolkit – Digitalisation in Development Cooperation and International Cooperation in Education, Culture and Media, BMZ, 2016**

[https://www.bmz.de/en/zentrales\\_downloadarchiv/ikt/Toolkit-Digitalisation-Development-Education-Culture-Media.pdf](https://www.bmz.de/en/zentrales_downloadarchiv/ikt/Toolkit-Digitalisation-Development-Education-Culture-Media.pdf) (21 March 2018)

How can we best utilise and further develop the enormous potential of digitalisation in all its diversity? This toolkit on digitalisation in development cooperation and international cooperation in education, culture and media has been developed to provide answers to this question.

**From Principle to Practice: Implementing the Principles for Digital Development, Waugaman, A., 2016**

<https://digitalprinciples.org/resource/from-principle-to-practice-implementing-the-principles-for-digital-development/> (21 March 2018)

This report is an important new tool for the development executive seeking to navigate this period of transition, and for others seeking to increase the success of digital development.

**V. Closing digital divides**

**'Digital Inclusion Success Stories', ITU**

<http://www.itu.int/en/ITU-D/Digital-Inclusion/Pages/Success-Stories.aspx>  
(21 March 2018)

**'Innovations to Accelerate Universal Internet Adoption', 2017, ICT works:**

<http://www.ictworks.org/2017/03/15/innovations-to-accelerate-universal-internet-adoption/> (21 March 2018)

An article on the Digital Impact Alliance's report on Closing the Access Gap: Innovation to Accelerate Universal Internet Adoption (available at <https://www.usaid.gov/sites/default/files/documents/15396/Closing-the-Access-Gap.pdf>), which seeks to understand business model and technology innovations with the potential to accelerate access to and the adoption of mobile phones and the internet in emerging markets.

**'Introducing the Mobile Information Literacy Curriculum', ICTworks, 2017**

[http://www.ictworks.org/2017/01/04/introducing-the-mobile-information-literacy-curriculum/?utm\\_source=ICTworks&utm\\_campaign=e78bb7d652-ICTworksEmailRSS&utm\\_medium=email&utm\\_term=0\\_0814c7961e-e78bb7d652-48338097](http://www.ictworks.org/2017/01/04/introducing-the-mobile-information-literacy-curriculum/?utm_source=ICTworks&utm_campaign=e78bb7d652-ICTworksEmailRSS&utm_medium=email&utm_term=0_0814c7961e-e78bb7d652-48338097) (21 March 2018)

Mobile information literacy is necessary to help people learn how to find and evaluate the quality and credibility of information obtained online, understand how to create and share online information effectively, and use systems safely and securely. Mobile information literacy is critical to help people better consume, generate and disseminate trustworthy information through both digital and traditional media. The six-module Mobile Information Literacy Curriculum for mobile-first users is available for use and adaptation and can be downloaded from <http://tascha.uw.edu/mobile-information-literacy-curriculum/>

**'What is equal rating and why does it matter?', Mozilla**

<https://equalrating.com/our-goal/> (21 March 2018)

Connecting the unconnected is one of the greatest challenges of our time, and one we must work on together. We will need corporate, government and philanthropic efforts to ensure that the internet, as the world's largest shared public resource, is truly open and accessible to all.

**ICT and women's empowerment**

**'Bridging the Digital Gender Gap', Betterplace Lab, 2017**

<http://www.betterplace-lab.org/en/bridging-the-digital-gender-gap-2/> (21 March 2018)



**Getting to Equal – How digital is helping to close the gender gap at work, Accenture, 2016**  
[https://www.accenture.com/t00010101T000000\\_\\_w\\_\\_/\\_ar-es/\\_acnmedia/PDF-9/Accenture-Getting-To-Equal.pdf](https://www.accenture.com/t00010101T000000__w__/_ar-es/_acnmedia/PDF-9/Accenture-Getting-To-Equal.pdf) (21 March 2018)

**Gender and ICTs - Mainstreaming gender in the use of information and communication technologies (ICTs) for agriculture and rural development, FAO 2018:**

<http://www.fao.org/publications/card/en/c/18670EN> (21 March 2018)

This publication looks at the benefits of Information and Communication Technologies (ICTs) when placed in the hands of men and women working in agriculture and in rural areas. It examines the challenges to be overcome and makes recommendations so that rural communities can take full and equal advantage of the technologies.

**Promoting Equal Chances for Men and Women to Use and Benefit from ICT-enabled Agricultural Value Chain Development, IICD, 2015**

<https://iicd.org/documents/promoting-equal-chances-for-men-and-women-to-use-and-benefit-from-ict-enabled-agricultural-value-chain-development/> (21 March 2018)

This publication explores issues of gender in ICT4D projects and is based on case study research conducted among projects in Kenya, Tanzania and Uganda. The publication pulls together insights and learning regarding the effects of ICT uptake and use on women's empowerment and gender relations in agricultural value chain development, maternal and child health, and hospital management information systems projects. Accompanying the publication are three stand-alone case studies, which provide more information.

**'The long-run poverty and gender impacts of mobile money', Suri, T. and Jack, W., Development Economics, Science 354, 8 Dec 2016**

<https://www.jefftk.com/suri2016.pdf> (21 March 2018)

The report discusses the results of a study on the long-term effects of M-Pesa on the economic lives of Kenyans.

**Women's Pathways to the Digital Sector: Stories of Opportunities and Challenges, BMZ, 2017**

[https://www.bmz.de/en/publications/type\\_of\\_publication/weitere\\_materialien/study\\_eS-kills4girls.pdf](https://www.bmz.de/en/publications/type_of_publication/weitere_materialien/study_eS-kills4girls.pdf) (21 March 2018)

The purpose of this study was to understand ICT's role in realising women's rights, gender equality and women's economic empowerment and, in so doing, identify challenges and opportunities.

**Women's Rights Online – Translating Access into Empowerment, World Wide Web Foundation, Oct 2015**

[http://webfoundation.org/docs/2015/10/womens-rights-online\\_Report.pdf](http://webfoundation.org/docs/2015/10/womens-rights-online_Report.pdf)

(21 March 2018)

This report explores the true extent of the digital gender divide in nine cities located in nine different developing countries. In so doing, it aims to gain a better understanding of the empowering potential of ICT as a weapon against poverty and gender inequality, and the barriers that must be overcome to unlock this potential.

## ICT and young people

### **Africa Agriculture Status Report 2015 – Youth in Agriculture in sub-Saharan Africa, AGRA, 2015**

[https://publications.cta.int/media/publications/downloads/1888\\_PDF.pdf](https://publications.cta.int/media/publications/downloads/1888_PDF.pdf)

(21 March 2018)

The chapters in the narrative section of this 2015 Report address the current status of young people in sub-Saharan Africa and describe the opportunities and potential that the region's 'youth bulge' brings to agriculture. The Report describes the opportunities arising from the use of improved technologies (high-yielding varieties and hybrids, organic and inorganic fertilisers, conservation farming methods, and appropriate mechanisation); the rapid penetration and uptake of ICT; innovative and inclusive financing programmes and investments; entrepreneurship and agribusiness initiatives; formal and informal education and training; and the steps being taken towards a more conducive policy environment.

### **Charta von Berlin, BMZ, 2017**

[https://www.bmz.de/de/mediathek/publikationen/reihen/infobroschueren\\_flyer/infobroschueren/sMaterialie335\\_BerlinCharta.pdf](https://www.bmz.de/de/mediathek/publikationen/reihen/infobroschueren_flyer/infobroschueren/sMaterialie335_BerlinCharta.pdf) (in German) (21 March 2018)

### **ICT and the Future of Food and Agriculture. Industry Transformation – Horizon Scan, Ericsson, 2015**

[http://unsdsn.org/wp-content/uploads/2015/09/ICTSDG\\_InterimReport\\_Web.pdf](http://unsdsn.org/wp-content/uploads/2015/09/ICTSDG_InterimReport_Web.pdf) (21 March 2018)

This document outlines the possible roles of ICT within the food and agriculture industries, with a focus on food production and supply chains. Having gained an understanding of the thresholds within this industry, several possible ICT interventions are then identified that may enable a transition to sustainable food systems.

### **Innovate for agriculture – Young ICT entrepreneurs overcoming challenges and transforming agriculture, CTA, 2016**

<http://hdl.handle.net/10568/91708> (21 March 2018)

An increasing number of young innovative entrepreneurs in African, Caribbean and Pacific (ACP) countries are developing ICT for agriculture solutions to support agricultural value chains, providing employment and livelihood opportunities. This report introduces 30 innovators; 21 are covered in detail, while the remaining nine are listed as 'innovators to watch'. A couple of innovators who come from outside the ACP but offer services in these regions are also featured. The publication is a collection of life stories that will be of interest to aspiring agri-tech entrepreneurs in all countries.

### **'Rural Perceptions of the Young Generation in sub-Saharan Africa', GeoPoll, 2017**

(21 March 2018)

As part of a large data-collection process across sub-Saharan Africa, GeoPoll captured the perceptions of 10,000 respondents in rural communities on matters including their income situation, the state of schools and jobs, skills training, the ease of finding a job, the importance of technology, what factors make a job good, what needs to be improved for women, and what makes a good life.

## VI. ICT FOR MONITORING AND EVALUATION

**'5 Fantastic Guides to Developing Project Monitoring and Evaluation Programs', ICT works, 2017**

<http://www.ictworks.org/2017/03/29/5-fantastic-guides-to-developing-project-monitoring-and-evaluation-programs/> (21 March 2018)

## VII. ICT STATISTICS

**ICT Facts and Figures, ITU 2017:**

<https://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2017.pdf>

(21 March 2018)

**'Digital in 2017: Global Overview', We Are Social Ltd**

<https://wearesocial.com/special-reports/digital-in-2017-global-overview>

(21 March 2018)

**Internet World Stats, Miniwatts Marketing Group**

<http://www.internetworldstats.com/> (21 March 2018) Internet World Stats is an international website that features up-to-date world internet usage figures, population statistics, travel statistics and internet market research data for over 243 individual countries and world regions.

**'Internet Users Statistics for Africa', Internet World Stats**

<http://www.internetworldstats.com/stats1.htm> (21 March 2018)

**Global Information Technology Report 2015, World Economic Forum**

<http://reports.weforum.org/global-information-technology-report-2015/>

(21 March 2018)

This report features the latest iteration of the Networked Readiness Index, which assesses the factors, policies and institutions that enable a country to fully leverage ICT for increased competitiveness and wellbeing.





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