

FACTSHEET: Digital Agriculture

**CLIMATE SMART AGRICULTURE
KNOWLEDGE PRODUCTS FOR EXTENSION WORKERS**
Customised Information Tools for Agricultural Professionals

Audience: Farmers Organisations/Youth Organisations, Civil Society, National Extension Staff, Local Extension Staff, Young Farmers



Factsheet



Decision
Point



Gender



Youth



Climate
Smart



Technology



IITA, 2015



Farmers and other actors in agricultural value chains need significant amounts of information to implement Climate Smart Agriculture. **Information and Communications Technologies (ICTs) and Digitalization** can play a key role in knowledge exchange, targeting recommendations, market integration and access to finance. This can make agriculture a profitable and an attractive enterprise for young farmers and others.

Key Messages:

1. To make climate smart decisions, farmers need to have access to targeted and timely information based on their needs:
 - Especially weather forecasts/information
2. Digital agriculture aims to make farming systems more efficient in two ways:
 - Increasing access to usable information/knowledge
 - Increasing access of extension providers/researchers to reliable data from farmers, to influence more effective and efficient service delivery.

How is CSA Different?

1. CSA places greater emphasis on **hazard and vulnerability assessments** and **emphasises weather forecasting** (short term) and **climate scenario modelling** (long term) in the decision-making process for new agricultural interventions
2. SA promotes the **scaling up of approaches** that achieve **triple wins** (increase **production**, increase **resilience** and [if possible] **mitigate GHG emissions**), while at the same time **reducing poverty** and **enhancing ecosystem services**
3. CSA promotes a systematic approach to:
 - a. Identifying **best bet** opportunities for agricultural investment
 - b. Contextualising **best bet** options to make them **best fit** their specific context through learning and feedback loops
 - c. Ensuring the **enabling environment** is in place so that farmers (and other stakeholders) can invest in CSA practices and technologies to catalyse adoption.

What is ClimateSmart Agriculture (CSA)?

CSA comprises three interlinked pillars, which need to be addressed to achieve the overall goals of food security and sustainable development:

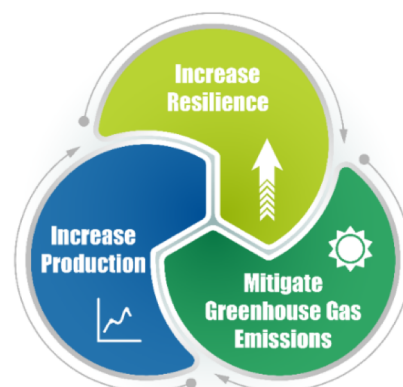
1. **Productivity:** Sustainably increase productivity and incomes from agriculture, without negative impacts on the environment
2. **Adaptation/Resilience:** Reduce exposure of farmers to short-term risks, while building capacity to adapt and prosper in the face of shocks and longer-term stresses (resilience). Attention is given to protecting ecosystem services, maintaining productivity and our ability to adapt to climate changes
3. **Mitigation:** Wherever and whenever possible, CSA should help to reduce and/or remove greenhouse gas (GHG) emissions. This implies that we reduce emissions for each unit of agricultural product (e.g., through decreasing use of fossil fuel, improving agricultural productivity and increasing vegetation cover).

CSA = Sustainable Agriculture + Resilience – Emissions.

Entry Points for CSA

- CSA practices and technologies
- CSA systems approaches
- Enabling environments for CSA.

Relevant knowledge is widely available. CSA combined with digital/ICT approaches, in gathering and disseminating information and knowledge, provide a significant opportunity for farmers and extension providers alike in making farming systems more sustainable and more efficient.



2 / DIGITAL AGRICULTURE

WHAT IS DIGITAL AGRICULTURE?

ICRISAT defines Digital Agriculture as....

“ICT and data ecosystems to support the development and delivery of timely, targeted information and services to make farming profitable and sustainable while delivering safe nutritious and affordable food for all.”



HOW CAN DIGITAL AGRICULTURE/ICT4AG HELP FARMERS AND EXTENSION SYSTEMS?

The empowerment that comes from providing farmers with informed options is **transformational**, especially for **women** and **youth**, providing an opportunity to deliver targeted and timely information to farmers based on their needs. Digital Agriculture aims to make farming systems more efficient and sustainable in two distinct ways:

1. Increase smallholder farmers’ **access to usable information/knowledge**
2. Increase access to reliable **data** from farmers by extension providers /researchers, to influence more effective and efficient service delivery.

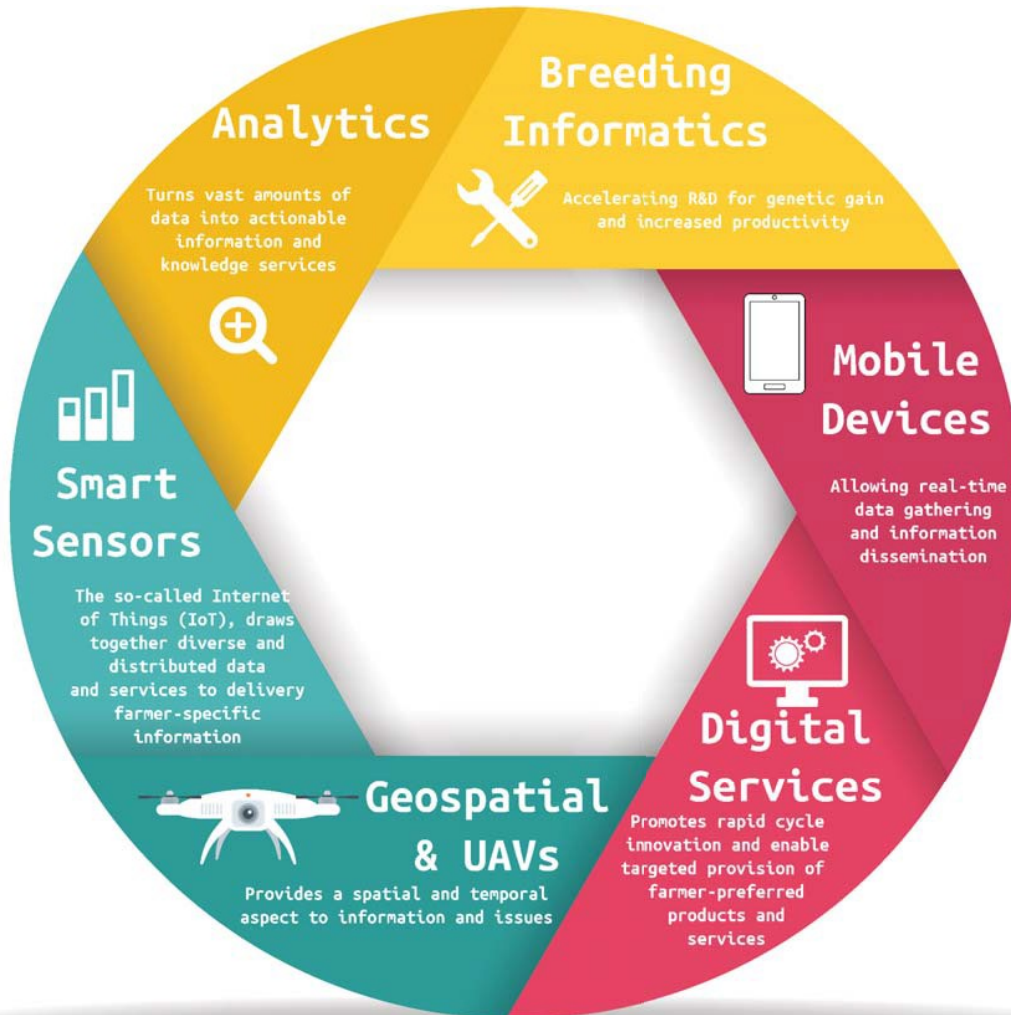
ICTs are especially important in promoting CSA, as they can facilitate access to information for farmers and decision makers, particularly in relation to weather, which enables them to make timely decisions. Farmers can also upload data on various systems, which can then be used by decision makers to better target resources, for example, to control pest/disease outbreaks, or to improve extension service provision by sourcing feedback from smallholders.

Additionally, Consumers’ demand for quality and sustainably produced food products – digital technologies can enable improved traceability of agricultural products, providing peace of mind for consumers and increased value for farmers.

Figure 1 shows the potential uses of various ICTs for agricultural applications. These are becoming increasingly affordable options. Accompanied by widely available mobile and broadband Internet services, these tools can now be connected through cloud computing capabilities. While the reach of mobile technology is expanding, cost, gender and literacy issues are still significant constraints to uptake:

- There are a vast number of local languages in the SADC region, and developing Apps for individual languages is expensive – so most tend to be in English, French, and/or Portuguese
- Low literacy rates, especially among female farmers, limits their access to information
- While many of the Apps are free, the cost of mobile data connections and charging phones is often an issue for smallholder farmers.

Figure 1: Potential uses and interactions of ICT for agriculture.



Source: adapted from ICRISAT 2016, Digital Agriculture; Pathway to Prosperity

ICT can be used in a range of forms to support extension officers and services:

- Identifying farmers' problems and opportunities
 - What do they need and want?
- Promoting behaviour change
 - What is practical and relevant to meet their needs?

- Collect feedback
 - How can each step be improved?

Table 1 summarises options for best uses of ICTs to improve agricultural operations. While these tools are increasing in availability and affordability, they must be combined with traditional approaches (e.g., field demonstrations and field measurements) if they are to be effective.

Table 1: ICT can be used in a range of forms to support extension. Options shaded green are considered best bets.

Extension function	Information and Communication Technology and Tools				
	Radio	TV & video	Mobile phones (text/calls)	Smart devices	Computer & Internet
Identifying farmers' problems and opportunities – What do they need and want?					
Diagnose Problems	Some potential if dealing with general problems, or if capacity for interaction and expertise is available	Visuals are very helpful as 'seeing is believing'. Even better if combined with ways to receive feedback	Some potential if farmers can call or text in, and sufficient expertise is available	Additional potential to a simple cell phone, as it enables Web or App access to special diagnostic tools	Good, comprehensive diagnostic tools are available
Collect Information	Some potential if capacity for interaction		Can use for data collection	Good for data collection with GPS	Some potential if Internet is available
Promoting behaviour change – What is practical and relevant to meet their needs?					
Raise awareness of general opportunities or needs; convince farmers to try something new	Very good, especially with persuasive programming	Visuals are usually very helpful as 'seeing is believing'	Is an option if users are registered to receive such messages (SMS)	Is an option if users are registered to receive such messages (SMS, email)	Is an option if users are registered to receive such messages (email)
Provide specific information needed for change. What is involved? What are the benefits? Demonstrate or train?	Some potential – but limited information delivered. Can be enhanced with call-in	Good option as 'seeing is believing'	Potential if farmers can call or text-in, and enough expertise is available	Additional potential to a simple cell phone, as it enables Web access and plays videos	Good option for intermediaries to seek information and videos (e.g., extension agents)
Facilitate access to credit and inputs	Can be used to inform of available services, but one-way communication	Can be used to inform of available services, but one-way communication	Mobile banking, and to negotiate directly with the suppliers	Mobile banking, and to negotiate directly with the suppliers	Online banking
Link farmers to markets	Good for providing general price reports		Access to price information (call-in, subscription)	Can bring potential buyers and producers together Access to price information	Can bring potential buyers and producers together Price information

Information and Communication Technology and Tools					
Extension function	Radio	TV & video	Mobile phones (text/calls)	Smart devices	Computer & Internet
Collect feedback – How can each step be improved?					
Diagnose Problems	Good if producers can call or text, and sufficient expertise is available	Good if producers can call or text, and sufficient expertise is available	Some potential if farmers can call or text in, and sufficient expertise is available	Good option for intermediaries to seek information (if optimised for smart devices)	Good option for intermediaries to seek information
Assist with business planning	Some potential	Some potential		Simple farm management 'Apps'; record keeping	Farm management tools, record keeping

Source: Feed The Future 2015 MEAS Brief: ICT – Powering Behaviour Change in Agricultural Extension

Appendix 1 outlines nine key factors that should be considered in the design of any ICT solution for CSA.

Example 1: Delivering climate information through mobile devices

In the northern region of Ghana, an ICT for Agriculture (ICT4Ag) initiative delivers tailored climate information services to farmers, which assists their decision-making vis-à-vis climate variability. Up to about 1,000 farmers (33% of whom are women) access and apply seasonal forecast information in their farm management operations, and other livelihood activities. A recent survey showed 97% of farmers were willing to pay for access to climate information.

Primary users include individual farmers and traders, farmers' associations, agri-businesses, and public sector organisations – such as national agricultural ministries. An online platform handles buy and sell offers, agricultural input and crop prices, extension messages, and locations where seeds and fertilisers are available, among others.

Users access content on desktop computers and mobile phones, choosing from a range of applications to create a personalised interface. For example, farmers can sign-up to receive alerts on their mobile phones when new market prices are posted, or send a request for the most recent prices.

Figure 2: In partnership with Esoko Networks, Ghana Meteorological service and the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFA) – West Africa.



Source: KRISAT2016, Digital Agriculture; Pathway to Prosperity

Example 2: sms campaign drives adoption of improved seed varieties in Tanzania

The Centre for Agriculture and Biosciences International (CABI) and Farm Radio International's Upscaling Technologies in Agriculture through Knowledge and Extension (UPTAKE) project use Short Message Service (SMS) messages to increase awareness and adoption of agricultural technologies in maize value chains. The project seeks to strengthen the adoption of improved maize varieties.

Continuous learning and improvement of the SMS campaign strategy is at the foundation of the success of the project. Lessons from farmers, extension agents and the entire maize value chain, are being incorporated in the system regularly.

The beneficiaries are farming communities in the Southern Highlands and Eastern zones of Tanzania. Among the 1 million smallholder farmers (3 ha and less) targeted by the project, 40% percent are women and about 150,000 have adopted good practices.

Key Facts:

- **Location:** Southern Highlands and Eastern zones of Tanzania (focus on Southern Highlands)
- **ICT used:** SMS messages
- **Area of work:** maize value chain
- **Target group:** farmers
- **Stakeholders:** Smallholder farmers, extension agents, research institutes, maize seed companies, government, Esoko, CABI, USAID, AGRA, FRI
- **Timeframe:** 2015–2018 (focus on Nov 2016 to June 2017).

Example 3: A Cross-sector partnership between EcoNet and the Zimbabwe Farmers Union

AgriFin Mobile, a program implemented by Mercy Corps, facilitated a partnership between Econet – the largest mobile network operator in Zimbabwe – and the Zimbabwe Farmers Union (ZFU) to develop a bundled product for smallholder farmers.

The bundle of services costs US\$1 per month and includes:

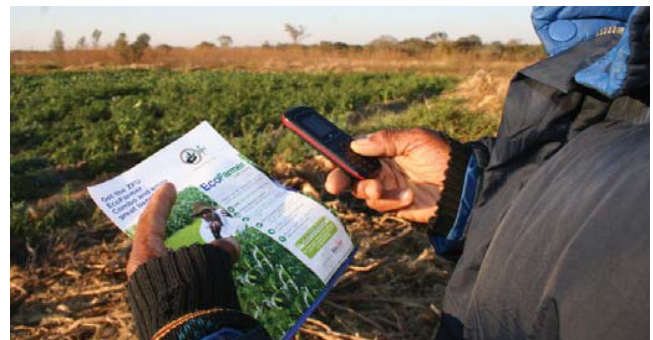
- Weather index insurance (see KP24)
- Funeral insurance
- ZFU membership contribution
- Access to EcoFarmer advisory services.

This bundle is called the ZFU-EcoFarmer-Combo. The-ZFU-EcoFarmer Combo allows ZFU to collect membership dues gradually, and ensures that they can provide advisory services and insurance products to their members.

EcoFarmer is a platform developed by Econet to deliver agriculture services to smallholder farmers via Unstructured

Supplementary Service Data (USSD), and SMS (Short Message Service). Currently, farmers who are signed up to Econet can contact a toll-free call center to learn more about agriculture inputs and market prices. Farmers can also subscribe to EcoFarmer to receive agronomic SMS messages, and eventually access additional mobile-based financial services.

Figure 3: Smallholder farmers in Zimbabwe can benefit from real-time weather information and weather index insurance through the ZFU-Ecofarmer-Combo bundle.



Source: CTA



WHERE CAN I FIND ICT THAT MIGHT BE OF USE TO ME?

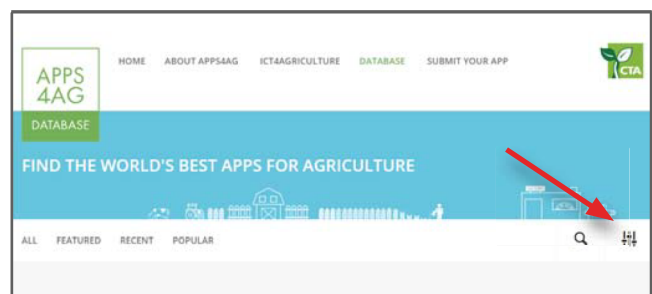
There are many different ICTs available across the SADC region, some of which are summarised in Table 2. Please note that below are just some examples. CCARDESA does not promote any particular application, website or organisation.

Table 2: Some ICT solutions available in the SADC region.

Name	ICT medium	Scope
Digital Green	Video	Multi-country; emphasises farmer-to-farmer learning
Access Agriculture	Video (fact sheets also available)	Multi-country, multi-language. Videos that can be used as an extension aid
Shamba Shape-UP	Video (and leaflets/sms)	Focus on Kenya and Tanzania, but material useful for most farmers and extension workers. All programmes available online
Farm Radio International	Radio	Multi-country. Promotes lots of different agricultural messaging
3-2-1	SMS and voice messages	Multi-country. Standardised agricultural (and other) messages available
IRRI's Rice Knowledge Bank	Internet and mobile app	Global. Everything you need to know about rice production all in one place
Plantix	Mobile app	Multi-country. Use phone to identify pests/diseases of specific crops by taking photos and recommending control options
Plantwise App	Mobile app	Multi-country. Helps you identify pests/diseases of crops and recommends control options
Crop Nutrient Removal Calculators	Mobile app	Multi-country. Different ones available. Make recommendations on soil nutrient requirements based on photos of your crop and/or on agronomic data entered
YouTube	Web-based videos	Global. An excellent resource with a wealth of 'how-to' guides
CCARDESA Mobile Learning App	Mobile app	Focus on SADC countries. Access to Technical Briefs, interactive learning quiz, discussion forum and user directory

The CTA **Apps4Ag** database includes a much larger range of agricultural Apps for use on smart devices. The filter icon on the top-right of the website menu can be used to help you find Apps that best suit your requirements. The site also allows users to review and rate the Apps. Only by receiving reviews will the developers be able to improve their Apps; therefore, users are encouraged to leave reviews on the website.

Figure 4: Use the filter icon to search for Apps.



Source: <https://www.apps4ag.org/database>

WHERE CAN I FIND MORE INFORMATION?

- **CCARDESA Knowledge Hub** – See various Decision Support Tools for reference to ICT specific to CSA practices and technologies (KPs 06–21)
- **CTA – Apps4Ag Database** (www.apps4ag.org)
 - Browse available Apps and leave reviews. Finding what you want can be a bit tricky. The more users who leave reviews, the better the resource will be
 - Focus is on Apps, so access to smart technology and Internet connection is required
- **FAO – e-Agriculture Promising Practice. UPTAKE: Driving adoption of agri-technologies through ICTs**
 - Case Study highlighting the importance of engaging users to give continuous feedback to improve the service
- **ICRISAT – Digital Agriculture Flyer**
 - A brief overview of ICRISAT’s approach to digital agriculture
- **CTA – Lessons for Sustainability: Failing to scale ICT4Ag related services**
 - A review of a number of failed ICT4Ag projects. Important reading for anyone planning a new Digital Agriculture Project
- **Feed the Future – MEAS Brief: ICT – Powering Behaviour Change in Agricultural Extension**
 - A short paper highlighting how behaviour change and marketing approaches can contribute to the success of ICT4Ag initiatives.

APPENDIX 1: NINE ATTRIBUTES OF SUCCESSFUL ICT4AG PROJECTS

CTA conducted an extensive piece of research on why ICT projects fail, and formulated the following list of nine points that should be considered if successful ICT projects are to be implemented.

1. Involve all potential users when assessing demand

Too often, developers look at whether an ICT application is suitable for agricultural use without first assessing demand. No project design should begin without detailed consultations with intended users, such as farmers, traders, and extension workers. Needs must first be identified; only then should project developers consider whether these needs could be met successfully through ICTs. Demand and impact need to be assessed on an ongoing basis through rigorous monitoring and evaluation.

2. Keep it Simple

There is often a tendency to provide all the information and assistance that farmers could possibly need. This can lead to complex, costly, un-workable and unsustainable designs. For example, projects aiming to supply extension information sometimes run into difficulties in sourcing appropriate content. A better approach is to start by providing limited, but valuable core information to address a key problem, with the intention to upgrade and scale-up services if the pilot is successful.



3. Do not pre-commit to any particular ICT solution

The need for the relatively new ICTs (such as mobile phones, the Web, etc.) should not be assumed, as in some cases they may not represent the best solution to farmer problems. To address some issues, more traditional ICTs, such as radios, may be the answer. In other cases, a mixture of new and traditional ICTs may be the best approach. Whichever solution is proposed, it is essential that this is based on cost-effectiveness and sustainability, and not just on the fact that it is desirable and technically possible.

4. Address literacy, gender, and social issues from the outset

The use of mobile phones and the Internet often faces problems associated with illiteracy, and the ability of the target beneficiaries to use the technology. Providing services in languages understood by most people is essential. Beware that women are sometimes denied access to technology, even though they are frequently able to make better use of the information provided than men can.

Communities may have strong traditional information and knowledge-sharing approaches, as well as trust-based marketing relationships with traders. ICTs should promote the continuation of such traditional practices, and not try to replace them.

5. Project cost and sustainability

Project designers need to rigorously examine the capacity of the hosting organisation to continue implementing activities after the project. They should design projects with sustainability in mind, rather than because they have a certain budget to spend. Governments need to say no to donor support if they feel they cannot guarantee sustainability. Exit strategies must also address who will replace consulting firms that may have done much of the initial work in implementing a project.

6. Work with existing service providers

It is essential that extension staff do not feel threatened by the introduction of ICTs. Increased availability of information requires qualified staff able to help farmers to use it. ICTs for extension purposes should not be designed to replace traditional extension methods – but to supplement them, and to help the extension service staff in the field and at headquarters to function more efficiently and effectively.

7. Develop a viable ‘business model’

The profit potential of the proposed ICT solution should be assessed before too much money is invested:

- How will revenue be generated to sustain the system?
- Will users be prepared to pay for the services and if so, how much will they pay?
- Are there opportunities for external contributions?
- Are running costs in-line with revenue generation?

All ICT projects require a business model to be feasible in the longer term.

8. Do not ignore training, promotion and information requirements

Promotion of a service is essential for people to know that it is available, but promotion is often not budgeted. Combining new (Apps/Web based) and traditional ICT (TV/Radio) can be an effective means of promoting new initiatives. Get professional marketing support to ensure the intended users are reached.

Projects also tend to underestimate or ignore the training requirements needed for ICT services to function as intended. Training is required at all levels – from those supervising the service to the farmer receiving the information, and this can involve considerable costs.

9. Define management, operational and regulatory issues during project design

All management and operational issues should be discussed and resolved during the design phase. This includes a clear understanding of the regulatory environment, and how changes may affect the sustainability of the system.