An example of on-demand SMS in a farm field. (ICARDA)

ICT2Scale – supporting smallholder farmers with cellphone-based services via SMS (Tunisia)

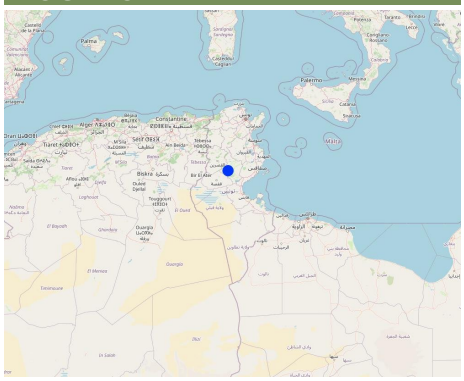
DESCRIPTION

The ICT2Scale project contributes to better land management by supplying smallholder farmers with targeted SMS messages on diverse agricultural practices. This enables them to optimize resources and adopt more sustainable methods, consequently improving livelihoods in remote areas.

In Tunisia, smallholder farmers rely heavily on extension services for information regarding new and sustainable agricultural practices, improved varieties, and market prices. Unfortunately, these services often fall short, particularly in remote areas, due to inadequate financial, human, and logistical resources. Information and Communication Technologies (ICT) can play a crucial role in filling this void. This can strongly contribute to developing the agricultural sector and reducing or preventing land degradation.
The ICT2Scale project aims to address these issues and reach these substantial group of farmers. The project was led by the International Center of Agricultural Research in Dry Areas (ICARDA). It was initiated in 2019 with a survey to identify the information needs of smallholder farmers. Tunisian farming experts crafted 101 technical SMS messages, disseminating them to approximately 1,000 smallholder farmers in Kairouan, Zaghouan, and Jendouba. These messages covered diverse commodities such as cereals, olives, citrus, honey, and livestock, simultaneously aiding farmers in sustainable land management and resource optimization.
A one-day workshop was organized to compile the advisory messages. Thirty specialists from various disciplines gathered, including different National Agricultural Research and Extension Services (NARES) centres. The workshop's estimated cost (including food and per diem) was around $1000 USD. Each SMS “unit” - of one message to one farmer - costs approximately $0.01 USD, totalling $1010 USD to make the 101 SMS available to 1000 farmers. Although the data services were provided free-of-charge by network companies, the overall project cost is still estimated at $3000 USD per year. Similar infrastructure with similar cost was implemented in the projects “Mind the Gap” and "Crop-Livestock and Conservation Agriculture (CLCA)".
A follow-up survey conducted by phone in May and June 2021 involved 421 SMS recipients, revealed that 60% found the messages useful, with 54% claiming to have learned something new. However, only 15% agreed that the messages arrived at the right time. Notably, 41% of farmers expressed a willingness to pay $0.01 USD per message after the project, indicating a potential avenue for the sustainability of this SMS technology. Farmers recommended using SMS for weather alerts and disease outbreaks; employing phone calls or Interactive Voice Responses (IVR); sending messages at the right time; and incorporating information on marketing, training, and livestock vaccination programmes.
Key advantages of an SMS service are:
-More cost-effective than in-person advice via public extension agents
-Particularly effective during the COVID-19 pandemic due to the lack of personal contact
-Immediate reach to thousands of farmers in case of emergencies or opportunities
-Flexible and adaptable for quick information updates
-Useful when extension resources, such as vehicles and funds, are limited or unavailable
-Effective in disseminating information about events like training and seed distribution

However, some weaknesses persist, including a lack of interaction (i.e. a top-down approach), less convincing than personal exchange, and ongoing funding challenges, with the Tunisian government hesitant to invest in the project without more dialogue and convincing arguments. In summary, the ICT2Scale project has proved the viability and cost-effectiveness of employing SMS technology to reach smallholder farmers in remote areas. Consequently, this has the potential to enhance more sustainable and efficient use of land and natural resources, leading to an improvement in rural livelihoods. However, securing sustainable funding remains challenging in order to scale up and maximize impact.
Acknowledgement:

LOCATION



Location: Kairouan, Zaghouan, and Jendouba, Tunisia

No. of Technology sites analysed: 100-1000 sites

Geo-reference of selected sites
- 9.34598, 34.79937

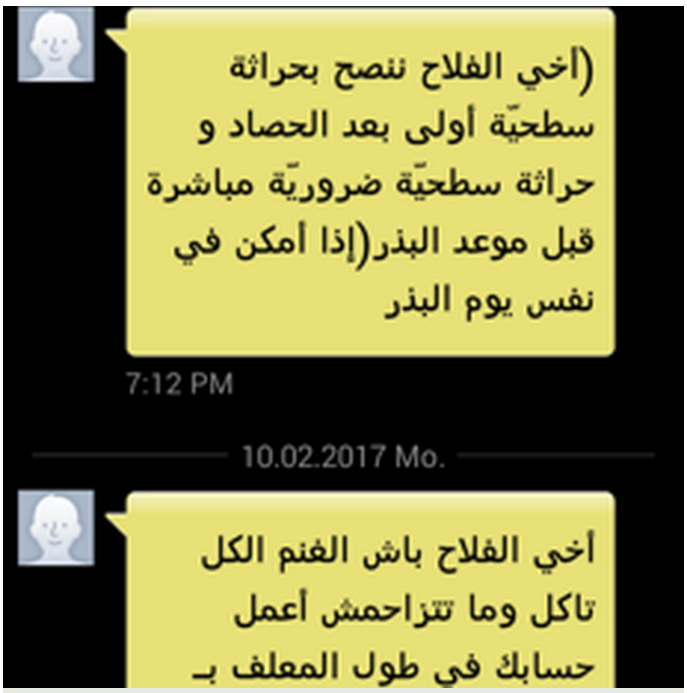
Spread of the Technology: applied at specific points/ concentrated on a small area

In a permanently protected area?: No

Date of implementation: 2019

Type of introduction
- ☐ through land users' innovation
- ☐ as part of a traditional system (> 50 years)
- ☑ during experiments/ research
- ☑ through projects/ external interventions

ICARDA's work on Information and Communication Technologies (ICT) for agricultural development is supported by the German Agency for International Development (GIZ) in Collaboration with National Public Partners (AVFA, OEP, INRAT,ONAGRI, and CRDA) and Private Partners (NG Trend, Tunisie SMS) in Tunisia.



Example of a SMS for technical advice. (ICARDA)


A farmer in Tunisia receiving an SMS message with technical advice (ICARDA)

CLASSIFICATION OF THE TECHNOLOGY

Main purpose

- [x] improve production
- [x] reduce, prevent, restore land degradation
- [ ] conserve ecosystem
- [ ] protect a watershed/ downstream areas – in combination with other Technologies
- [ ] preserve/ improve biodiversity
- [x] reduce risk of disasters
- [ ] adapt to climate change/ extremes and its impacts
- [ ] mitigate climate change and its impacts
- [x] create beneficial economic impact
- [x] create beneficial social impact

Land use

Cropland
- Annual cropping: cereals - barley

Grazing land
- Semi-nomadic pastoralism

Animal type: goats, sheep

Water supply

- [x] rainfed
- [ ] mixed rainfed-irrigated
- [ ] full irrigation

Purpose related to land degradation

- [x] prevent land degradation
- [x] reduce land degradation
- [ ] restore/ rehabilitate severely degraded land
- [ ] adapt to land degradation
- [ ] not applicable

Degradation addressed

soil erosion by water - Wt: loss of topsoil/ surface erosion

soil erosion by wind - Et: loss of topsoil, Ed: deflation and deposition

chemical soil deterioration - Cn: fertility decline and reduced organic matter content (not caused by erosion), Cs: salinization/ alkalinization

biological degradation - Bc: reduction of vegetation cover, Bq: quantity/ biomass decline

SLM group

- agroforestry
- pastoralism and grazing land management
- integrated crop-livestock management
- Digital agriculture

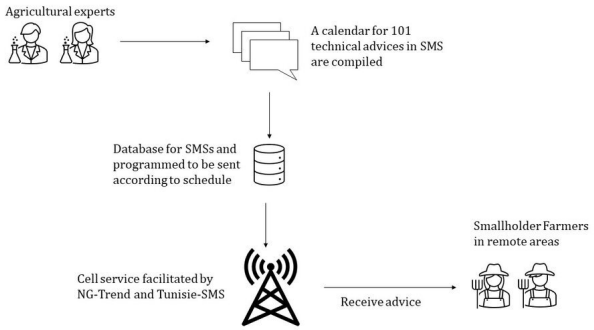
SLM measures

other measures - Digital

TECHNICAL DRAWING

Technical specifications

Agricultural experts from different National Agricultural Research and Extension Services (NARES), lead farmers and ICARDA scientists formulated 101 technical advises in SMS following an elaborated "agricultural" calendar. This way farmers receive technical advice when needed. This is facilitated by NG-Trend and Tunisie-SMS



Author: Joren Verbist & Udo Rudiger

ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs

- Costs are calculated: per Technology unit (unit: **Whole project / infrastructure**)
- Currency used for cost calculation: **USD**
- Exchange rate (to USD): 1 USD = n.a
- Average wage cost of hired labour per day: n.a

Most important factors affecting the costs

...

Establishment activities

1. Workshop to compile technical advice (Timing/ frequency: None)
2. Setting up network (Timing/ frequency: None)

Establishment inputs and costs (per Whole project / infrastructure)

Specify input	Unit	Quantity	Costs per Unit (USD)	Total costs per input (USD)	% of costs borne by land users
Labour					
Workshop to compile 101 SMS advice messages	workshop	1.0	1000.0	1000.0	
Equipment					
SMS unit (101 SMSs to 1000 farmers)	unit	101000.0	0.01	1010.0	
Other					
Remaining		1.0	1000.0	1000.0	
Total costs for establishment of the Technology				**3'010.0**	
Total costs for establishment of the Technology in USD				*3'010.0*	

Maintenance activities

n.a.

NATURAL ENVIRONMENT

Average annual rainfall

- [ ] < 250 mm
- [x] 251-500 mm
- [x] 501-750 mm
- [ ] 751-1,000 mm
- [ ] 1,001-1,500 mm
- [ ] 1,501-2,000 mm
- [ ] 2,001-3,000 mm
- [ ] 3,001-4,000 mm
- [ ] > 4,000 mm

Agro-climatic zone

- [ ] humid
- [ ] sub-humid
- [x] semi-arid
- [x] arid

Specifications on climate

n.a.

Slope

- [ ] flat (0-2%)
- [x] gentle (3-5%)
- [x] moderate (6-10%)
- [ ] rolling (11-15%)
- [ ] hilly (16-30%)
- [ ] steep (31-60%)
- [ ] very steep (>60%)

Landforms

- [ ] plateau/plains
- [ ] ridges
- [ ] mountain slopes
- [ ] hill slopes
- [ ] footslopes
- [ ] valley floors

Altitude

- [ ] 0-100 m a.s.l.
- [x] 101-500 m a.s.l.
- [x] 501-1,000 m a.s.l.
- [ ] 1,001-1,500 m a.s.l.
- [ ] 1,501-2,000 m a.s.l.
- [ ] 2,001-2,500 m a.s.l.
- [ ] 2,501-3,000 m a.s.l.
- [ ] 3,001-4,000 m a.s.l.
- [ ] > 4,000 m a.s.l.

Technology is applied in

- [ ] convex situations
- [ ] concave situations
- [x] not relevant

Soil depth

- [x] very shallow (0-20 cm)
- [x] shallow (21-50 cm)
- [ ] moderately deep (51-80 cm)
- [ ] deep (81-120 cm)
- [ ] very deep (> 120 cm)

Soil texture (topsoil)

- [x] coarse/ light (sandy)
- [x] medium (loamy, silty)
- [ ] fine/ heavy (clay)

Soil texture (> 20 cm below surface)

- [x] coarse/ light (sandy)
- [x] medium (loamy, silty)
- [ ] fine/ heavy (clay)

Topsoil organic matter content

- [ ] high (>3%)
- [ ] medium (1-3%)
- [x] low (<1%)

Groundwater table
- [ ] on surface
- [ ] < 5 m
- [x] 5-50 m
- [ ] > 50 m

Availability of surface water
- [ ] excess
- [ ] good
- [ ] medium
- [x] poor/ none

Water quality (untreated)
- [ ] good drinking water
- [ ] poor drinking water (treatment required)
- [x] for agricultural use only (irrigation)
- [ ] unusable

Water quality refers to: ground water

Is salinity a problem?
- [x] Yes
- [ ] No

Occurrence of flooding
- [ ] Yes
- [x] No

Species diversity
- [ ] high
- [ ] medium
- [x] low

Habitat diversity
- [ ] high
- [ ] medium
- [x] low

CHARACTERISTICS OF LAND USERS APPLYING THE TECHNOLOGY

Market orientation
- [ ] subsistence (self-supply)
- [x] mixed (subsistence/ commercial)
- [ ] commercial/ market

Off-farm income
- [ ] less than 10% of all income
- [x] 10-50% of all income
- [ ] > 50% of all income

Relative level of wealth
- [ ] very poor
- [x] poor
- [x] average
- [ ] rich
- [ ] very rich

Level of mechanization
- [x] manual work
- [ ] animal traction
- [x] mechanized/ motorized

Sedentary or nomadic
- [x] Sedentary
- [ ] Semi-nomadic
- [ ] Nomadic

Individuals or groups
- [x] individual/ household
- [x] groups/ community
- [ ] cooperative
- [ ] employee (company, government)

Gender
- [x] women
- [x] men

Age
- [ ] children
- [ ] youth
- [x] middle-aged
- [x] elderly

Area used per household
- [ ] < 0.5 ha
- [ ] 0.5-1 ha
- [ ] 1-2 ha
- [x] 2-5 ha
- [ ] 5-15 ha
- [ ] 15-50 ha
- [ ] 50-100 ha
- [ ] 100-500 ha
- [ ] 500-1,000 ha
- [ ] 1,000-10,000 ha
- [ ] > 10,000 ha

Scale
- [x] small-scale
- [ ] medium-scale
- [ ] large-scale

Land ownership
- [ ] state
- [ ] company
- [ ] communal/ village
- [ ] group
- [x] individual, not titled
- [x] individual, titled

Land use rights
- [ ] open access (unorganized)
- [ ] communal (organized)
- [ ] leased
- [x] individual

Water use rights
- [ ] open access (unorganized)
- [x] communal (organized)
- [ ] leased
- [x] individual

Access to services and infrastructure

health	poor ✓	good
education	poor	✓ good
technical assistance	poor ✓	good
employment (e.g. off-farm)	poor	✓ good
markets	poor ✓	good
energy	poor ✓	good
roads and transport	poor ✓	good
drinking water and sanitation	poor ✓	good

IMPACTS

Socio-economic impacts

Crop production

decreased ✓ increased

By informing farmers with technical advise, it is expected that the production increases.

crop quality

decreased ✓ increased

By informing farmers with technical advise, it is expected that the quality of production increases.

animal production

decreased ✓ increased

By informing farmers with technical advise, it is expected that the production increases.

expenses on agricultural inputs

increased ✓ decreased

By informing farmers with technical advise and current prices, so they can lower their expenses.

farm income

decreased ✓ increased

By informing farmers with technical advise and current prices, it is expected they can increase their selling prices.

Socio-cultural impacts

Ecological impacts

soil loss

increased ✓ decreased

By informing farmers when the best moment is to plough the field, soil loss through erosion is reduced.

drought impacts

increased ✓ decreased

Informing farmers about management operations and their timing, drought impact decrease

Off-site impacts

COST-BENEFIT ANALYSIS

Benefits compared with establishment costs

Short-term returns: very negative ✓ very positive

Long-term returns: very negative ✓ very positive

Benefits compared with maintenance costs

Short-term returns: very negative ✓ very positive

Long-term returns: very negative ✓ very positive

CLIMATE CHANGE

Gradual climate change

annual temperature increase: not well at all ✓ very well

ADOPTION AND ADAPTATION

Percentage of land users in the area who have adopted the Technology

- [x] single cases/ experimental
- [ ] 1-10%
- [ ] 11-50%
- [ ] > 50%

Number of households and/ or area covered

Around 1000 smallholder farmers

Of all those who have adopted the Technology, how many have done so without receiving material incentives?

- [ ] 0-10%
- [x] 11-50%
- [ ] 51-90%
- [ ] 91-100%

Has the Technology been modified recently to adapt to changing conditions?

- [ ] Yes
- [x] No

To which changing conditions?

- [ ] climatic change/ extremes
- [ ] changing markets
- [ ] labour availability (e.g. due to migration)

CONCLUSIONS AND LESSONS LEARNT

Strengths: land user's view

- The system in SMS-based which does require a smartphone, making it more accessible.
- The technical advises allow to improve production practices.
- The technical advice gives good reference for current practices

Strengths: compiler's or other key resource person's view

- More cost-effective than in-person advice via public extension agents
- Particularly effective during the COVID-19 pandemic due to the lack of personal contact
- Immediate reach to thousands of farmers in case of emergencies or opportunities
- Flexible and adaptable for quick information updates
- Useful when extension resources, such as vehicles and funds, are limited or unavailable
- Effective in disseminating information about upcoming events like training and seed distribution

Weaknesses/ disadvantages/ risks: land user's viewhow to overcome

- SMS is often received at wrong timing.
- SMS messages did not include advice on animal vaccination programs. Include this in the technical advice
- SMS messages did not include early warnings for (weather) hazards. Include this as well in the infrastructure and adding underpinning (weather) forecast models for this.

Weaknesses/ disadvantages/ risks: compiler's or other key resource person's viewhow to overcome

- SMS is not useful for illiterate farmers Education in the rural areas should be improved in general.
- Lack of dialogue (a top-down approach) Include farmers when writing the advice and consider their needs beforehand, which was also done during the project.
- Less convincing than personal exchanges
- Challenging to have ongoing investment By showing to donors and national government that using SMS services is a viable and cost-effective way to improve rural livelihoods and make better use of the land and natural resources.

REFERENCES

Compiler
Joren Verbist

Editors

Reviewer
William Critchley
Rima Mekdaschi Studer
Joana Eichenberger

Date of documentation: Jan. 12, 2024

Last update: May 30, 2024

Resource persons
Udo Rudiger - Agricultural Innovation Specialist
Aymen Frija - Agricultural Economist
Zied Idoudi - Economics and Participatory Methods
Boubaker Dhebibi - Agricultural and Resource Economist
H Oueghemmi - PhD Candidate

Full description in the WOCAT database
https://qcat.wocat.net/en/wocat/technologies/view/technologies_7002/

Linked SLM data
Approaches: Lessons learned from the "Mind the Gap" project: Improving Dissemination Strategies
https://qcat.wocat.net/en/wocat/approaches/view/approaches_7123/

Documentation was faciliated by

Institution
- International Center for Agricultural Research in the Dry Areas (ICARDA) - Lebanon

Project
- ICARDA Institutional Knowledge Management Initiative

Links to relevant information which is available online
- Boubaker Dhehibi, Mohamed Zied Dhraief, Udo Rudiger. (20/9/2021). Lesson learned from the study on "Impact of Information and Communication Technologies (ICTs) on Agricultural Development in Tunisia". Beirut, Lebanon: International Center for Agricultural Research in the Dry Areas (ICARDA).: https://hdl.handle.net/20.500.11766/66236
- Boubaker Dhehibi, Mohamed Zied Dhraief, Aymen Frija, Hassen Ouerghemmi, Barbara Rischkowsky, Udo Rudiger. (26/10/2023). A contextual ICT model to explain adoption of mobile applications in developing countries: A case study of Tunisia. PLoS ONE, 18 (10).: https://hdl.handle.net/20.500.11766/68779
- List of SMS messages to be send to farmers.: https://hdl.handle.net/20.500.11766/10637
- Udo Rudiger, Boubaker Dhehibi. (5/11/2021). General project "ICT2Scale" presentation.: https://hdl.handle.net/20.500.11766/66426