A field of Kounouz Barley (Udo Rudiger)

Drought tolerant barley variety: 'Kounouz' (Tunisia)

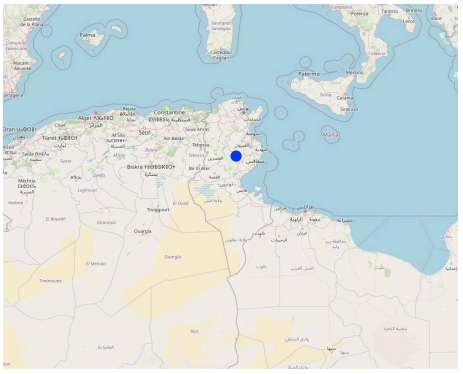
DESCRIPTION

The introduction of 'Kounouz,' a drought-tolerant barley variety, has significantly enhanced farm income and reduced production risks for small-scale farmers in Tunisia.

Tunisia has a semi-arid climate with annual precipitation ranging between 200 and 450 millimetres. Many people are dependent on the agricultural sector. Typically, barley is cultivated and used for fodder or sale. Barley production is increasingly in danger of failure because of droughts worsened by climate change. Therefore, a new and drought tolerant barley variety was sought. NARS developed such seed by using germplasm that was made available by the International Center of Agricultural Research in Dry Areas (ICARDA).
As adoption of technologies is often the most difficult part of the innovation process, special care was put into this. It was found that combining different extension methods ranging from technical training to information through SMS led to the highest adoption. And solely focusing on the technical training was the most cost-effective approach. The targeted beneficiaries were small-scale farmers in central Tunisia. Their farm enterprises consist predominantly of small ruminant and cereal production. On average their farm size is 5 hectares and their flocks comprise 20 to 40 sheep and/or goats.
The benefits of the new, drought tolerant variety 'Kounouz' encompass enhanced farm income through reduced production risks and increased yields because Kounouz is better adapted to the semi-arid conditions. It makes more efficient use of water, therefore, Kounouz can produce grain with 300 millimetres of rainfall, whereas the alternative varieties (e.g., Rihane) need at least 350. Under favourable conditions (around 400 millimetres) Kounouz has higher yields than currently available varieties. Kounouz reaches 3 tonnes per hectare of grain, and 4.5 tonnes of straw.

The adoption of this variety has already made significant strides. By 2019, approximately 617 tonnes of certified seeds were available. This accomplishment was the result of successful collaboration between a large-scale cooperative, COSEM, and a private seed company, TUNIFERT. Presently, two more cooperatives, namely SOSEM and CCSPS, have also become actively involved.
It is worth noting that a mere 5% of the Kounouz seeds are estimated to be sourced from certified suppliers, with the majority being multiplied on individual farms. Consequently, it is estimated that the cultivation of Kounouz now spans over 20,000 hectares.
To further facilitate widespread adoption, the establishment of demonstration plots within target regions is imperative. This approach allows farmers, seed companies, and cooperatives to witness production first-hand and become persuaded of its benefits. However, the provision of adequate technical support and comprehensive coaching to farmers is indispensable.
The recommended cultivation practices for Kounouz are typically outlined as follows:
Field preparation, involving ploughing, is initiated at the onset of the rainy season, which generally occurs between September and October. Sowing activities take place in the months of November to December. In order to effectively manage weed growth, herbicide applications are undertaken from December to January. The quantity of herbicide utilized is contingent upon various factors, including climatic conditions, precipitation levels, and the preceding crop type. Notably, cultivating cereal crops after another cereal crop tends to result in a higher weed population compared to the cultivation of legume-cereal rotations.
Depending on the geographical location of the farm, the application of mineral fertilizer is scheduled for the months of January to February in North-Western Tunisia. This timeline ensures that the fertilizer is strategically administered to optimize crop growth and yield.
We would like to thank BMZ/ GIZ who supported this innovation through their contributions to the “Mind the Gap” project as well as Tunisian NARES (INRAT, AVFA, OEP, CRDA) for co-implementing project activities

LOCATION



Location: Tunisia

No. of Technology sites analysed: 10-100 sites

Geo-reference of selected sites
- 9.82352, 35.11099

Spread of the Technology: evenly spread over an area (approx. 0.1-1 km2)

In a permanently protected area?: Nee

Date of implementation: 2021

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

Women inspecting the Kounouz barley (Udo Rudiger)

A farmer in his field of Kounouz barley, proudly showing the progress (Udo Rudiger)

CLASSIFICATION OF THE TECHNOLOGY

Main purpose

- [x] improve production
- [ ] 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
- [x] 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

Land use mixed within the same land unit: Nee

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

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

Degradation addressed

biological degradation - Bq: quantity/ biomass decline

SLM group

- improved plant varieties/ animal breeds

SLM measures

agronomic measures - A5: Seed management, improved varieties

TECHNICAL DRAWING

Technical specifications

ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs

- Costs are calculated: per Technology area (size and area unit: **1 hectare**)
- Currency used for cost calculation: **Tunisian Dinar**
- Exchange rate (to USD): 1 USD = 3.0 Tunisian Dinar
- Average wage cost of hired labour per day: 25

Most important factors affecting the costs

n.a.

Establishment activities

n.a.

Maintenance activities

1. Field preparation (Timing/ frequency: September - October)
2. Seeding (Timing/ frequency: November - December)
3. Herbicide application (Timing/ frequency: December- January)

4. Fertilizer application (Timing/ frequency: January - February)
5. Harvesting and straw processing (Timing/ frequency: May - June)

Maintenance inputs and costs (per 1 hectare)

Specify input	Unit	Quantity	Costs per Unit (Tunisian Dinar)	Total costs per input (Tunisian Dinar)	% of costs borne by land users
Labour					
Field preparation	Person-hour	6.0	25.0	150.0	
Sowing	Person-hour	1.0	25.0	25.0	
Fertilizer application	Person-hour	0.5	25.0	12.5	
Weeding	Person-hour	0.5	25.0	12.5	
Equipment					
Plow	Machine-hour	8.5	25.0	212.5	
Seeder	Machine-hour	0.5	12.0	6.0	
Spreader	Machine-hour	0.5	12.0	6.0	
Combine	Machine-hour	1.0	80.0	80.0	
Pressor (for straw processing)	Machine-hour	1.0	100.0	100.0	
Sprayer	Machine-hour	2.0	12.0	24.0	
Plant material					
Seed	Kilograms	100.0	0.78	78.0	
Fertilizers and biocides					
DPA	Kilogram	100.0	0.67	67.0	
Ammonite	Liter	100.0	0.54	54.0	
Zoom (Herbicide)	Liter	100.0	0.25	25.0	
Axial (Herbicide)	Liter	1.0	110.0	110.0	
Other					
Herbicide application (labour)	Person-hour	0.5	25.0	12.5	
Harvesting (labour)	Person-hour	1.0	80.0	80.0	
Total costs for maintenance of the Technology				**1'055.0**	
Total costs for maintenance of the Technology in USD				*351.67*	

NATURAL ENVIRONMENT

Average annual rainfall
- [ ] < 250 mm
- [x] 251-500 mm
- [ ] 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
- [x] plateau/plains
- [ ] ridges
- [ ] mountain slopes
- [x] 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)
- [ ] 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
- [x] < 5 m
- [ ] 5-50 m
- [ ] > 50 m

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

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

Is salinity a problem?
- [x] Ja
- [ ] Nee

Occurrence of flooding
- [ ] Ja
- [x] Nee

Water quality refers to: ground water

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
- [ ] 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
financial services	poor	good

IMPACTS

Socio-economic impacts

Crop production	decreased	increased
risk of production failure	increased	decreased
farm income	decreased	increased

Socio-cultural impacts

Ecological impacts

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

seasonal rainfall decrease — not well at all ☑ very well — Season: wet/ rainy season

Climate-related extremes (disasters)
drought — not well at all ☑ very well

ADOPTION AND ADAPTATION

Percentage of land users in the area who have adopted the Technology
- ☐ single cases/ experimental
- ☐ 1-10%
- ☑ 11-50%
- ☐ > 50%

Of all those who have adopted the Technology, how many have done so without receiving material incentives?
- ☐ 0-10%
- ☑ 11-50%
- ☐ 51-90%
- ☐ 91-100%

Has the Technology been modified recently to adapt to changing conditions?
- ☐ Ja
- ☑ Nee

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
- Increased farm income
- Improved yields
- Drought tolerance

Strengths: compiler's or other key resource person's view
- No major changes in land management
- Increased food security

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

Weaknesses/ disadvantages/ risks: compiler's or other key resource person's viewhow to overcome
- The adoption of Kounouz by more farmers Installing more pilot/demonstration field so farmers can experience the benefits firsthand, together with adequate training and coaching.

REFERENCES

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Date of documentation: April 30, 2023

Last update: Okt. 23, 2023

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Full description in the WOCAT database
https://qcat.wocat.net/af/wocat/technologies/view/technologies_6739/

Linked SLM data
n.a.

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
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