


ICARDA Technologies

8 TECHNOLOGIES | CREATED ON JUN 30, 2025 BY TAAT PROFILING TEAM | LAST UPDATED JUL 24, 2025



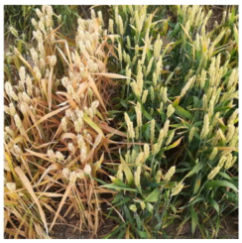

TECHNOLOGIES IN THIS TOOLKIT

- **Heat and Drought Tolerant Wheat Varieties**
- **Hessian Fly Resistant Wheat Varieties**
- **Combine Harvesters for Wheat and Fleet Management tool**
- **Yellow Rust and Stem Rust Resistant wheat**
- **Wheat Cultivation in Dryland through Winter Irrigation**
- **Furrow Irrigated Raised Bed Wheat Production**
- **Conservation agriculture**: Minimal Tillage and Surface…
- **IPM**: Integrated Management of Insects, Diseases and Weeds in…

https://taat.africa/yab

Heat and Drought Tolerant Wheat Varieties

Wheat cultivation in high temperature regions



These wheat varieties mature in 90 days, withstand temperatures 4°C above normal, maintain 75% yield under extreme conditions, resist diseases like yellow stem rust, and have high water use efficiency. They also good for bread flour with a protein content of 14-15%. Ideal for challenging environments like Sub-Saharan Africa.

International Center for Agricultural Research in the Dry Areas (ICARDA)
Zewdie Bishaw

This technology is TAAT1 validated.

7·8 Scaling readiness: idea maturity 7/9; level of use 8/9

Gender assessment 4

Climate impact 7

Problem

- **Heat Stress**: Yield loss due to temperatures 4°C higher than normal.
- **Drought Conditions**: Poor performance with less than 200mm of moisture.
- **Low Productivity**: Traditional varieties yield much less than 6 tons/ha.
- **Limited Cultivation Zones**: Unsuitable for high temperatures and low rainfall areas

Solution

- **Heat Tolerance**: Withstand temperatures 4°C higher than normal.
- **Drought Resistance**: Perform well with less than 200mm of moisture.
- **Higher Yields**: Achieve up to 6 tons/ha.
- **Expanded Cultivation Areas**: Suitable for high-temperature and low-rainfall regions.

Key points to design your project

To integrate this technology

- Calculate seed quantity based on planting rate and cost,
- Consider sourcing logistics,
- Provide training and communication support, and
- Collaborate with agricultural institutes and seed multiplication companies for implementation.

Additionally, it's recommended to combine this technology with other wheat production methods for optimal results.

Cost: $$$

4 - 6 tons/ha	**100** kg/ha	IP
increase in yield	Planting rate	Unknown

Technology from

ProPAS

Commodities

Wheat

Sustainable Development Goals

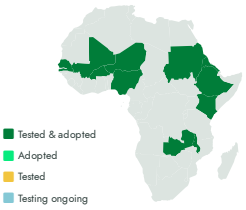
Categories

Production, Improved varieties, Drought tolerance, Heat tolerance

Best used with

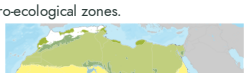
- Wheat Cultivation in Dryland through Winter Irrigation ›
- Furrow Irrigated Raised Bed Wheat Production ›
- Yellow Rust and Stem Rust Resistant wheat ›

Tested/adopted in



Where it can be used

This technology can be used in the colored agro-ecological zones.



Hessian Fly Resistant Wheat Varieties

Reduce wheat losses due to Hessian fly and increase yield

The Hessian Fly Resistant Wheat Varieties are specifically bred wheat plants with a natural ability to resist the Hessian fly, a destructive insect. Created through selective breeding, these varieties are developed to withstand larvae attacks, acting as a protective shield for the wheat.

Hessian fly adult (left) and larvae and damage to wheat (right)

International Center for Agricultural Research in the Dry Areas (ICARDA)
Zewdie Bishaw

This technology is TAAT1 validated.

8·8 Scaling readiness: idea maturity 8/9; level of use 8/9

Gender assessment 4

Climate impact 7

Problem

The wheat production faces infestations by the Hessian fly and lead to substantial losses in many major wheat-producing areas, impacting crop yields.

Solution

- Hessian Fly Resistant Wheat Varieties provides a natural barrier against infestations.
- These varieties significantly decrease damage caused by Hessian fly larvae, ensuring healthier crops.

Key points to design your project

This technology enhances gender inclusion by improving nutrition and food security. To integrate it into your project, estimate seed costs, consider delivery expenses, and collaborate with local institutes and seed companies. Training, monitoring, and communication support are essential for successful implementation.

Cost: $$$ **35—43 USD**
Seed needed per ha

ROI: $$$

79—100 %	**5.5—7.1 tons/ha**	**105 USD**	**IP**
Protection of plants from pests	yield potential	Additional production of forages per ha	Copyright

Technology from

ProPAS

Commodities

Wheat

Sustainable Development Goals

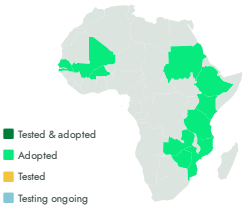
Categories

Production, Improved varieties, Insect resistance

Best used with

- Integrated Management of Insects, Diseases and Weeds in Wheat ›

Tested/adopted in



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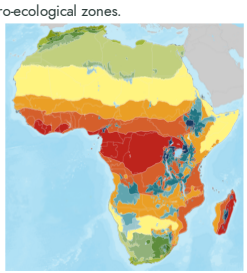


Combine Harvesters for Wheat and Fleet Management tool

Efficient Harvesting, Smarter Fleet Management

The combine harvester is a modern agricultural machinery designed to perform multiple harvesting operations as threshing, gathering, and winnowing, all in a single process. Available in various sizes, its suitable for crops like wheat, maize, rice, soybean, barley, sunflower, and more.

Combine harvester operating in Sudan

International Center for Agricultural Research in the Dry Areas (ICARDA)
Zewdie Bishaw

This technology is TAAT1 validated.

8·8 Scaling readiness: idea maturity 8/9; level of use 8/9

Gender assessment 4

Climate impact 6 1

Problem

- Traditional manual harvesting is time-consuming and demands significant labor.
- Conventional threshing methods are slow and risk potential grain loss.
- Manual separation of grain from chaff is inefficient, leading to impurities.
- Older methods may have limited capacity, resulting in slower operations.

Solution

- Combine harvesters automates the harvesting process, reducing the need for manual labor.
- Its offers threshing mechanisms, minimizing grain loss during harvesting.
- Its incorporate separation technologies, ensuring effective grain separation and reducing impurities.
- Help to increases harvesting capacity.

Key points to design your project

Combine harvesters and fleet management offer transformative solutions to challenges in traditional grain harvesting by minimizing yield losses. Integrating this technology involves:

- Evaluating unit sizes and costs, considering sources.
- Training, communication support, and
- Collaboration with agricultural institutes.

Cost: $$$ **12,000—500,000 USD**
Unit of combine harvesters

35 %
Reduced harvest losses

56—63 USD
harvesting unit cost per Ha

IP
Unknown

Technology from

ProPAS

Commodities

Maize, Rice, Wheat, Soybean

Sustainable Development Goals

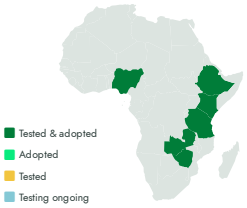
Categories

Harvest, Equipment, Land preparation

Best used with

- Contract mechanization apps ›

Tested/adopted in



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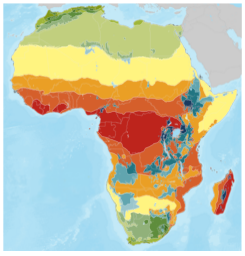


Target groups

Farmers

Yellow Rust and Stem Rust Resistant wheat

Rust-Resistant Wheat for a Flourishing Future

Rust-resistant wheat varieties use All-stage resistance (ASR) and Adult plant resistance (APR) genes to combat rust fungi. ASR provides strong protection but can be overcome by evolving fungi. APR offers partial, longer-lasting, broad-spectrum resistance. Combining ASR and APR enhances resistance.

Symptoms of yellow rust (left) and stem rust (right)

ICARDA
Science for resilient livelihoods in dry areas

International Center for Agricultural Research in the Dry Areas (ICARDA)
Zewdie Bishaw

This technology is TAAT1 validated.

7·7 Scaling readiness: idea maturity 7/9; level of use 7/9

Gender assessment 4

Climate impact 7

Problem

- **Rust Epidemics**: Yellow and stem rust cause significant yield losses and devastate wheat crops in Sub-Saharan Africa.
- **Rapid Spread**: These diseases spread rapidly through wind-borne spores, leading to massive losses.
- **New Strains & Native Infections**: Continuous emergence of new strains and infections in native grasses make control and eradication challenging.

Solution

- **ASR and APR Genes**: Provide strong and broad-spectrum protection against rust fungi at all plant stages.
- **High Yield Potential**: Maintain high yield despite rust resistance.
- **Robustness**: Exhibit resistance to other diseases and environmental stresses like drought.

Key points to design your project

Rust-resistant wheat varieties mitigate climate change effects on wheat production and contribute to SDGs 2, 5, and 13. Adoption involves:

1. **Capacity Building**: Training farmers on the benefits and management of these varieties.
2. **Participatory Variety Selection**: Involving farmers in trials to select suitable varieties.
3. **Seed Multiplication and Distribution**: Producing and distributing seeds, requiring partnerships with seed companies and local governments.
4. **Field Demonstrations**: Showcasing the performance of the varieties.
5. **Monitoring and Evaluation**: Regularly assessing the adoption and impact.
6. **Advocacy**: Promoting policies and practices that support widespread adoption.

These activities may overlap and their sequence can vary based on the project's context and resources.

4.1 Ton/ha
average grain yield

440 USD
Total farming operational costs

Technology from

ProPAS

Commodities

Wheat

Sustainable Development Goals

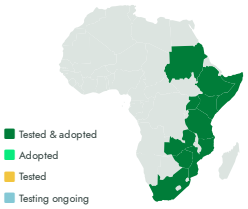
Categories

Production, Improved varieties, Disease resistance, Yield improvement

Best used with

- Integrated Management of Insects, Diseases and Weeds in Wheat ›

Tested/adopted in



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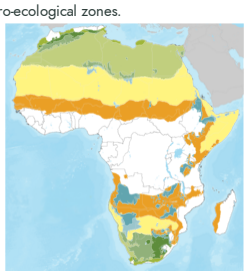


Wheat Cultivation in Dryland through Winter Irrigation

Growing Resilient Wheat, Even in the Hottest Seasons.

Expanded Production of Irrigated Wheat technology, emphases the cultivation of spring wheat varieties and the use of suitable irrigation systems, specific wheat varieties, fertilizers, and pesticides to promote a sustainable and resilient approach to wheat cultivation.

International Center for Agricultural Research in the Dry Areas (ICARDA)
Zewdie Bishaw

This technology is TAAT1 validated.

7·8 Scaling readiness: idea maturity 7/9; level of use 8/9

Gender assessment 4

Climate impact 6 1

Problem

- Decreased wheat yields due to exposure to high diurnal temperatures
- The global climate change, leading to heightened risks of yield losses and crop failure.
- Traditional cultivation of wheat during the hot rainy seasons exposes the crop to adverse effects of heat stress.

Solution

- Promote winter production of wheat in African dryland,
- Develop and implement irrigation systems, including investments in water lifting and drip feed infrastructure,
- Encourage the use of heat-tolerant wheat varieties including fertilizers, and pesticides.

Key points to design your project

This technology improves wheat production. To implement it:

- Provide access to affordable irrigation systems
- Estimate input quantities, consider delivery costs, provide training, and develop communication materials.
- Collaborate with agricultural institutes and seed companies is recommended for successful technology integration

Cost: $$$ **373 USD**

Total cost of a winter production using surface irrigation

4 - 6 ton/ha
Grain yields increased

100,000 - 300,000 Ha
Possible area for cultivation expansion

IP
Open source / open access

Technology from

ProPAS

Commodities

Wheat

Sustainable Development Goals

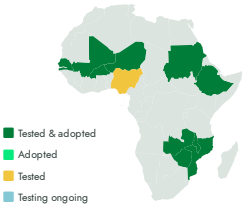
Categories

Production, Practices, Water management

Best used with

- Furrow Irrigated Raised Bed Wheat Production ›

Tested/adopted in



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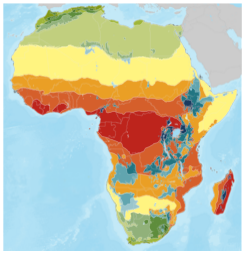

Target groups

Farmers

Furrow Irrigated Raised Bed Wheat Production

Smart Irrigation, Bountiful Harvests

This technique involves creating raised beds with furrows for planting crops, which ensures even irrigation and optimal soil moisture while reducing soil erosion and preventing waterlogging. It is effective with specific irrigated wheat varieties. In Ethiopia, suitable varieties include Amibera, Ga'ambo, Kakaba, Fentale-2, Shorima, Dandaa, and Ogolcho. In Nigeria, the varieties are Attila,...

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This technology is TAAT1 validated.

7·7 Scaling readiness: idea maturity 7/9; level of use 7/9

Gender assessment 4

Climate impact 7

Problem

- **Flooding wastes water:** Raises production costs.
- **Scattered fertilizer:** Costs more, harms environment.
- **Uncontrolled moisture:** Lowers yields, hurts productivity.
- **Limited freshwater:** Weakens drought resistance, hurts yields.

Solution

- **Saves water:** Targets furrows for optimal soil moisture.
- **Protects crops:** Raised beds prevent waterlogging and improve drainage.
- **Reduces waste:** Precise fertilizer application minimizes cost and environmental harm.
- **Boosts harvests:** Rainwater harvesting and controlled irrigation maximize water use for resilient crops.

Key points to design your project

This technology empowers women (less irrigation labor) & promotes climate-smart agriculture (water conservation, reduced erosion) - supports SDGs 2 (Zero Hunger), 5 (Gender Equality), & 13 (Climate Action). To integrate in a project, consider:

1. **Partnerships:** Collaborate with research institutions, extension services, and cooperatives (consider IITA).
2. **Training:** Train farmers on bed construction, furrow management, and best practices (~$50-100/farmer).
3. **Land & Seed Selection:** Evaluate land slope (<3% ideal) and soil texture. Choose drought-resistant, high-yielding wheat varieties.
4. **Cost Estimation:** Seeds (~$5-10/kg), tools (~$10-20/farmer), labor & inputs (~$300/hectare).
5. **Water Management:** Choose efficient method (canals, wells) based on budget and needs.
6. **Implementation:** Construct beds & furrows, monitor water usage. Plan for recurrent bed reconstruction every 3 seasons.

Cost: $$$ **300 USD**
labor and input per ha

360 USD
sheet plastic per ha

100—250 USD
water from planting to harvest

IP
Open source / open access

Technology from

ProPAS

Commodities

Wheat

Sustainable Development Goals

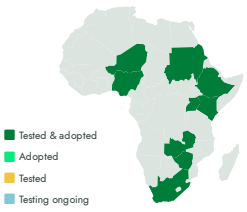
Categories

Production, Practices, Water management

Best used with

- Wheat Cultivation in Dryland through Winter Irrigation ›
- Minimal Tillage and Surface Mulching of Soils ›

Tested/adopted in



Where it can be used

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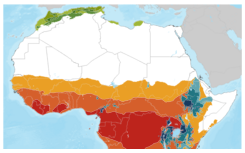


Conservation agriculture: Minimal Tillage and Surface Mulching of Soils

Conservation Agriculture for Sustainable Farming

Later ripening and better grain filling of wheat due to water conservation in no-till system (middle)

International Center for Agricultural Research in the Dry Areas (ICARDA)
Zewdie Bishaw

Conservation agriculture (CA) includes minimal soil disturbance, surface residue retention, and crop rotation, proven effective in dryland wheat farming. It improves soil quality, water use efficiency, and yield stability, while reducing costs and energy. Additionally, CA enhances soil biodiversity, mitigates emissions, and sequesters carbon, benefiting both farmers and the environment.

This technology is TAAT1 validated.

8·7 Scaling readiness: idea maturity 8/9; level of use 7/9

Gender assessment 4

Climate impact 7

Problem

- Excessive tillage and limited organic matter degrade soil quality.
- Droughts, intense rains, and overuse limit water availability.
- Dryland farming yields are low and vulnerable to water scarcity.
- Agriculture contributes to emissions and affects carbon storage.
- Traditional tillage leads to weed competition and yield reduction.

Solution

- Minimal soil disturbance, surface residue retention, and crop rotation.
- Enhanced soil quality, water efficiency, and yield stability.
- Mitigates drought and heat stress on crops.
- Saves water and reduces herbicide usage.
- Manages soil nutrients and pests effectively.
- Suitable for various soil types and water conditions.
- Increases resilience to environmental stresses.

Key points to design your project

The Minimal Tillage and Surface Mulching of Soils technology boosts crop productivity and ensures food security by maintaining consistent yields while conserving water and soil health. This method reduces agriculture's environmental impact, aiding in poverty alleviation and promoting sustainable livelihoods for farmers. To integrate this technology, it is essential to raise awareness of its benefits, ensure equipment accessibility, implement incentives for agroecosystem services, establish connections with food industries for market access, allocate resources for training and ongoing support, collaborate with agricultural institutions, and explore integration with complementary technologies.

Cost: $$$ **740 USD/ha**

Three-year average total production under CA

15 - 22 %	**18 - 21 %**	**20 %**	**923 USD/ha**	**IP**
Increase in yield	water use efficiency	increase in income	Increase in profit from wheat production	Open source / open access

Technology from

ProPAS

Commodities

Wheat

Sustainable Development Goals

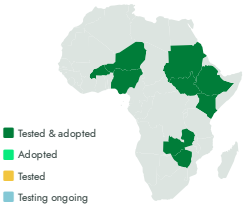
Categories

Production, Practices,
Pest control (excluding weeds),
Water management

Best used with

- Yellow Rust and Stem Rust Resistant wheat ›
- Hessian Fly Resistant Wheat Varieties ›

Tested/adopted in



Where it can be used

This technology can be used in the colored agro-ecological zones.

IPM: Integrated Management of Insects, Diseases and Weeds in Wheat

Balanced Protection for Sustainable Harvests

IPM in wheat combines biological and cultural techniques, releasing beneficial organisms through gradual or immediate methods to control pests and reduce chemical reliance. Key practices like crop rotation, adjusted planting times, increased crop density, and mass trapping target aphids, weeds, whiteflies, and thrips effectively.

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Zewdie Bishaw

This technology is TAAT1 validated.

8·9 Scaling readiness: idea maturity 8/9; level of use 9/9

Gender assessment 5

Climate impact 6

Problem

- **Emergence of Pesticide-Resistant Pests:** Frequent pesticide use leads to resistant pest biotypes, risking crop damage and reducing yields.
- **Distorted Natural Pest Control:** Excessive pesticide application disrupts natural pest predators, leading to uncontrolled pest populations.
- **Environmental Risks with Chemicals:** Overuse of pesticides can harm soil, water, and ecosystems, posing environmental risks.

Solution

- **Preventing Pesticide Resistance:** IPM employs diverse biological and agronomic methods to reduce reliance on chemical agents, preventing the emergence of pesticide-resistant pests.
- **Restoring Natural Pest Control:** IPM balances populations of beneficial and harmful organisms using biological, mechanical/physical, and cultural techniques, restoring natural pest control mechanisms.
- **Sustainable Crop Protection:** IPM minimizes the use of chemical pesticides, promoting sustainable crop protection and safeguarding food safety and environmental health.

Key points to design your project

Integrated Pest Management (IPM) improves crop productivity and food security while minimizing health risks associated with pesticides. To effectively implement IPM, it is essential:

- To identify pests and beneficial organisms, understand the benefits and costs, access control agents, estimate their required quantities, and provide necessary training.
- To develope communication materials and collaborate with agricultural development institutes for successful integration of IPM into agricultural practices.

Cost: $$$ **515 USD**
Full IPM package

ROI: $$$ **30—70 %**
Yield increased

17—33 %
Reduction in beetle damage

<10 %
Rust infestation reduction

35 USD per hectare
Profit generated by IPM

IP
Open source / open access

Technology from

ProPAS

Commodities

Wheat

Sustainable Development Goals

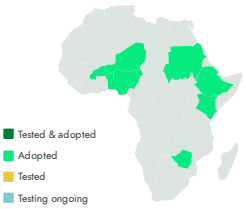
Categories

Production, Practices,
Pest control (excluding weeds),
Weed management

Best used with

- Yellow Rust and Stem Rust Resistant wheat ›
- Hessian Fly Resistant Wheat Varieties ›
- Heat and Drought Tolerant Wheat Varieties ›

Tested/adopted in



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ICARDA Technologies

https://taat.africa/yab

ABOUT US

TAAT

TAAT, Technologies for African Agricultural Transformation, is an African Development Bank initiative to boost agricultural productivity by rapidly rolling out proven technologies to more than 40 million smallholder farmers.

TAAT aims to double crop, livestock, and fish productivity by 2025 by engaging both public and private sectors to expand access to productivity-increasing technologies across the continent.TAAT advises African government who receive funding from international financial institutions such as the African Development Bank to help them integrate the best agricultural technologies in their development projects. TAAT also offers technical assistance for the integration of these technologies, when needed.

TAAT Technologies

TAAT definition of agricultural technologies is very broad: they include improved varieties, inputs, equipment, agricultural infrastructure, practices and agricultural policies. In short, any solution to an agricultural constraint. TAAT technologies have been developed by a wide variety of organizations: the CGIAR, other international research institutions, national research organizations, or the private sector.

TAAT Clearinghouse

Within TAAT, the Clearinghouse has the remit to select, profile and validate agricultural technologies, and showcase them in online catalogs to support the advisory role that the Clearinghouse offers to governments and the private sector. The Clearinghouse strives to be an 'honest broker' of technologies through its selection, profiling, validation and advice.

TAAT e-catalogs

The e-catalogs are designed to be used by decision-makers within governments, private sector companies or development organizations. They facilitate the search for appropriate solutions that are adapted to local conditions and requirements, and provide all necessary information, presented in jargon-free and easy to analyze technology profiles. Once a decision-maker has selected a technology of interest, the e-catalogs facilitate their direct contact with those who can help them implement the technology, whether they are a research group or a private company.

TAAT Technology Toolkits

Technology toolkits are hand-picked selections of technologies from the TAAT e-catalogs. We offer some curated toolkits for specific cases, and registered users can create their own toolkits, showcasing their selection of technologies. Toolkits can be used online and shared as links, as mini e-catalogs, they can also be downloaded, saved, shared or printed as collections of technology pitches in PDF format (pitches are one-page summaries of technology profiles, available for all technologies on the e-catalogs).

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