ICARDA

Science for resilient livelihoods in dry areas

Climate Smart Mechanization in Central Asia

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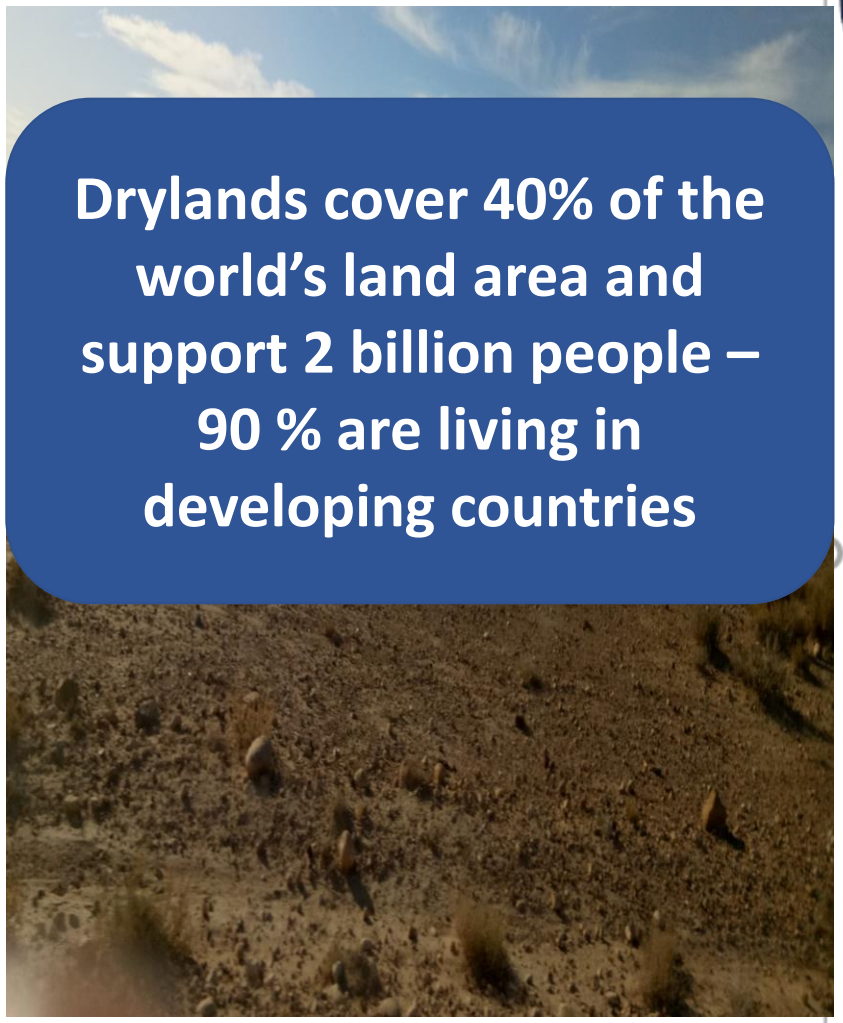
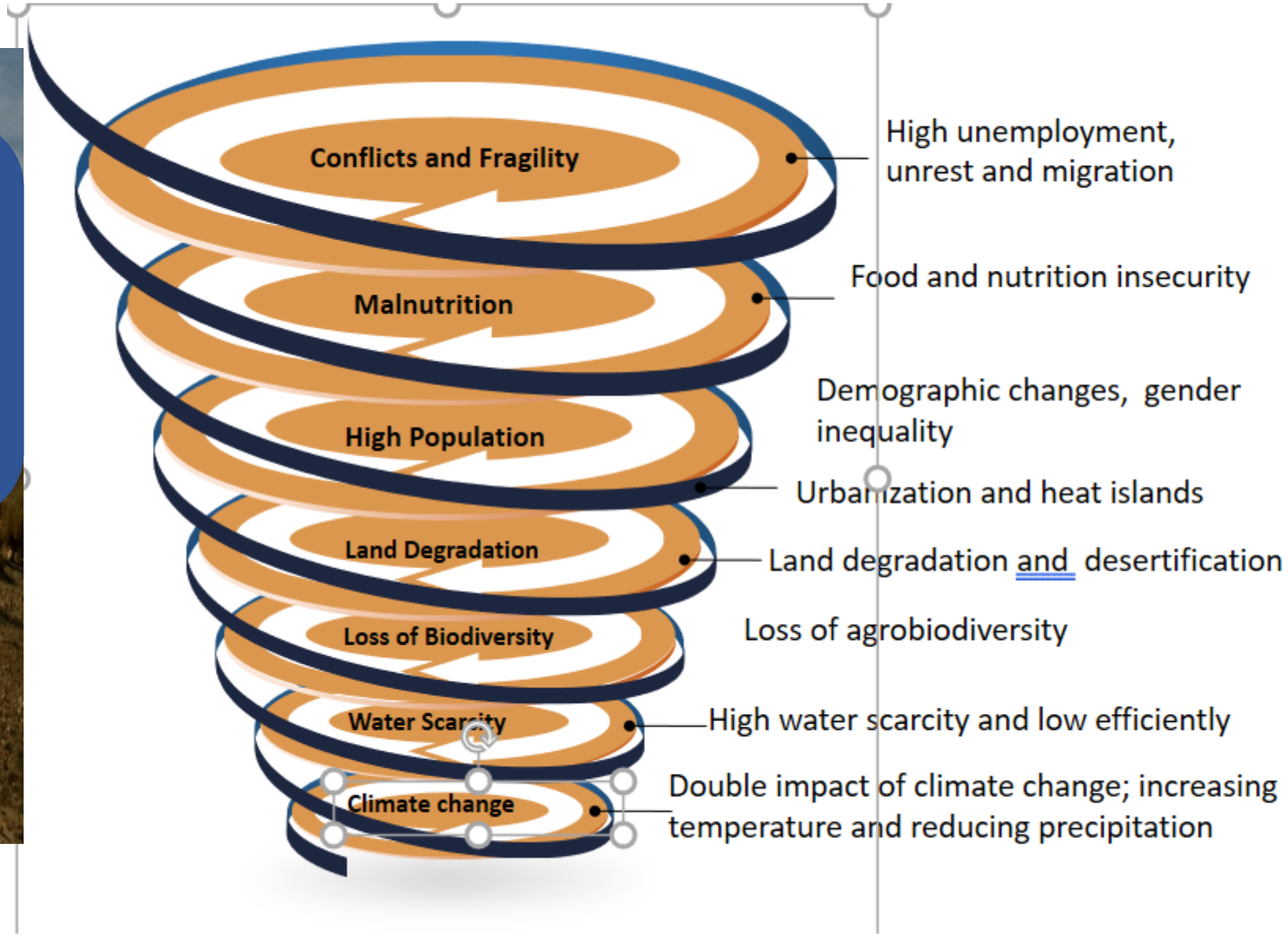
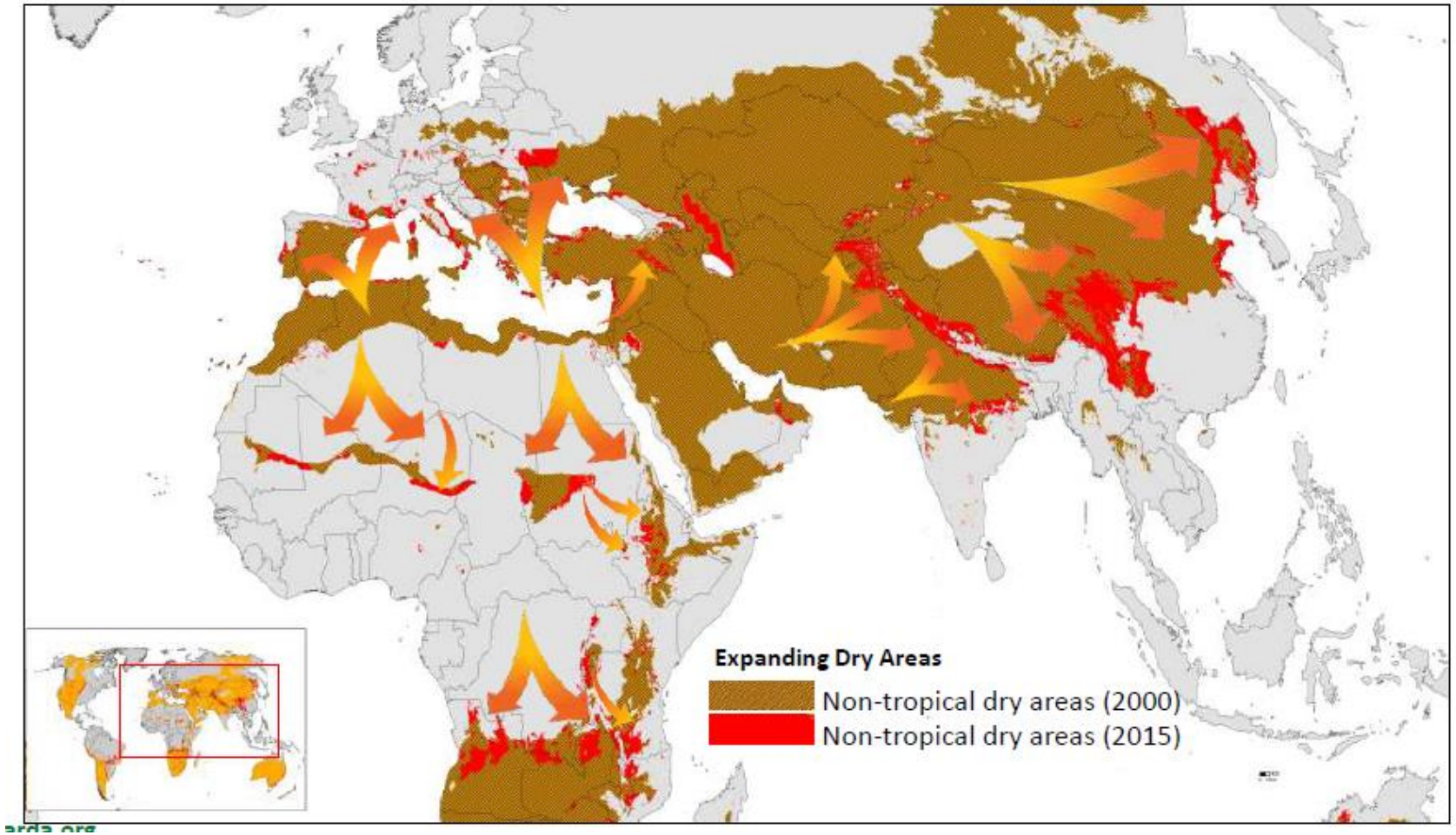
Agriculture in Drylands is more challenging



Drylands cover 40% of the world's land area and support 2 billion people – 90 % are living in developing countries



Drylands are expanding across different continents



Dry areas can occur in any continent

FARMING SYSTEM

Mechanized agriculture (un-sustainable)

Demands smart mechanization: best use of resources

Traditional agriculture (highly labor intensive)

Demands scale appropriate machinery: reducing drudgery

Private-sector driven, environ. compatible & climate smart, affordable, friendly to smallholder farmers, & inclusive of the interests of women & youth

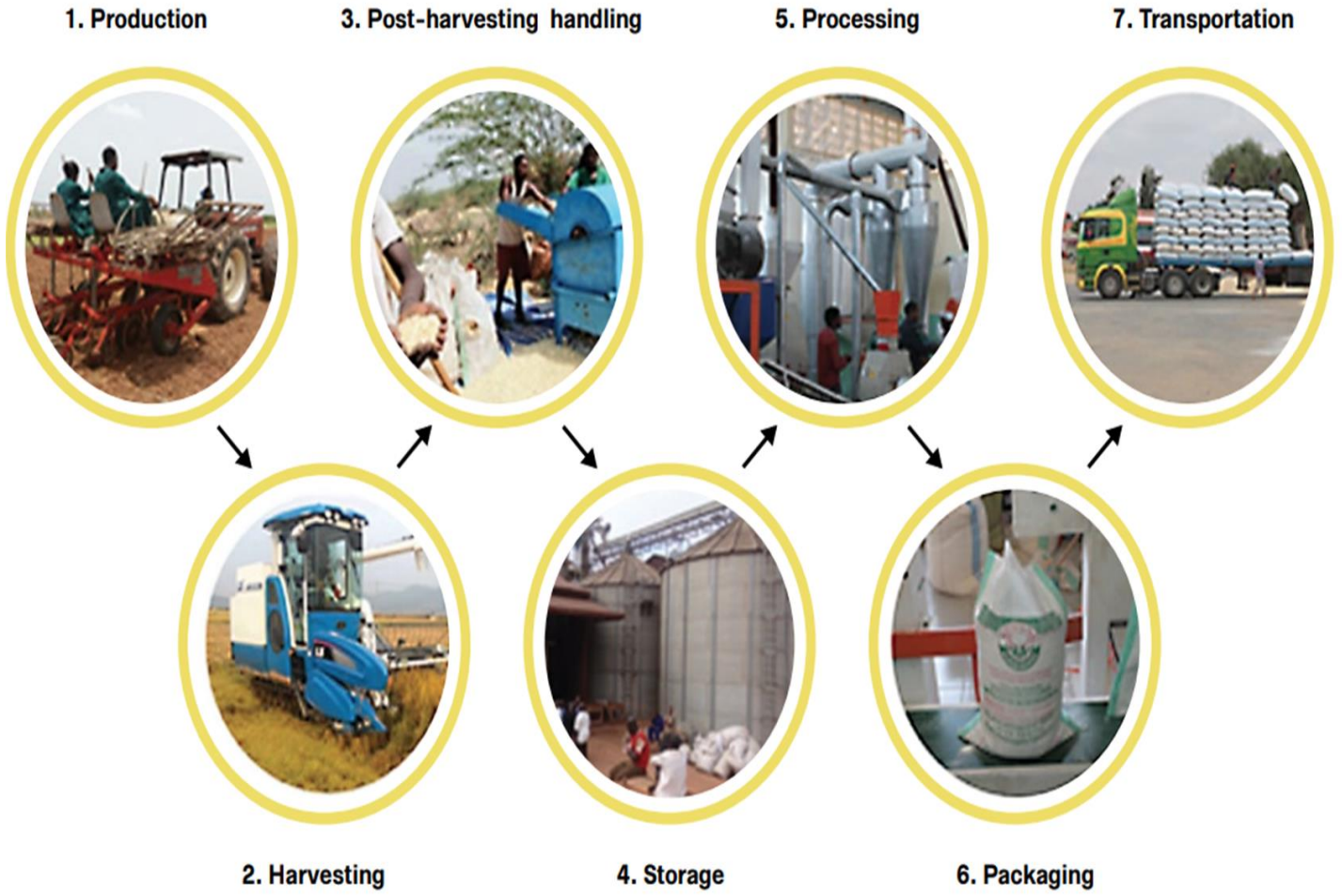
MECHANIZATION IN CENTRAL ASIA

Compared to other developing regions, Most of the collect farms in central Asia are heavily mechanized since Soviet Era

- Machinery replacement is minimal, still dominant in heavy machinery
- Still need to mechanize different agriculture operations: For example, cotton picking in Uzbekistan, …
- With crop diversification, farm machinery has to well fit in the system: for example, wheat seeding in standing cotton for high clearance
- Ownership is not the only means to obtain access to machinery: need to have a strong service delivery system
- Diversifying the machinery market is needed

WHY CLIMATE SMART MECHANIZATION: ACROSS AGRI-FOOD SYSTEM

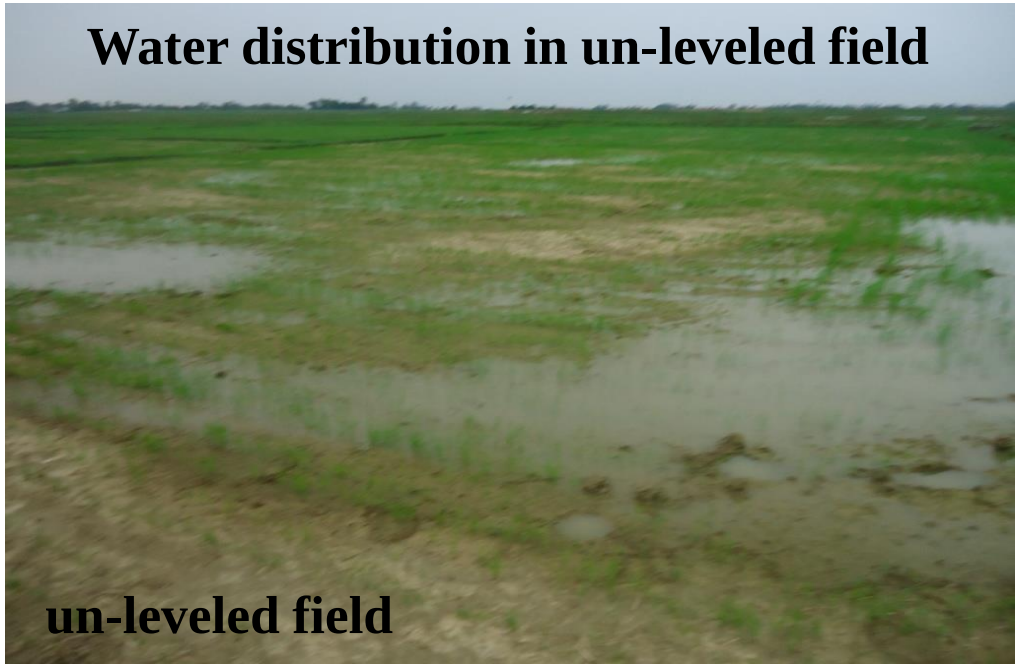
- To reduce production costs and increase farm profitability
- To improve resource use efficiency
- For timely and precise crop establishment
- To cope with extreme climatic events
- To attract youth in agriculture
- Provide business opportunity
- To reduce GHG emissions

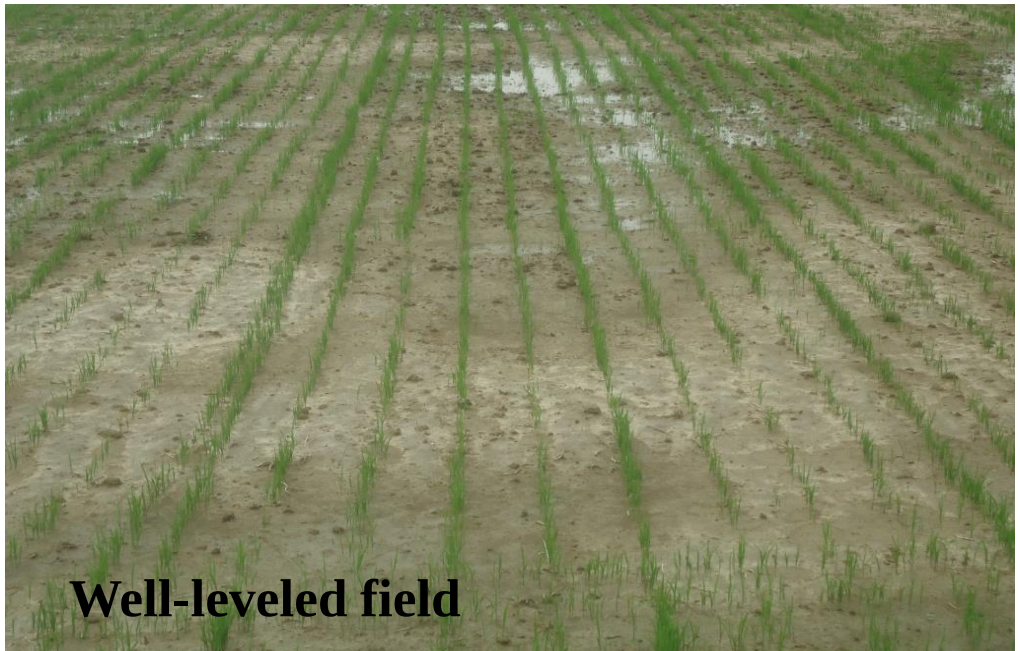


Source: FAO, 1981 (adapted)

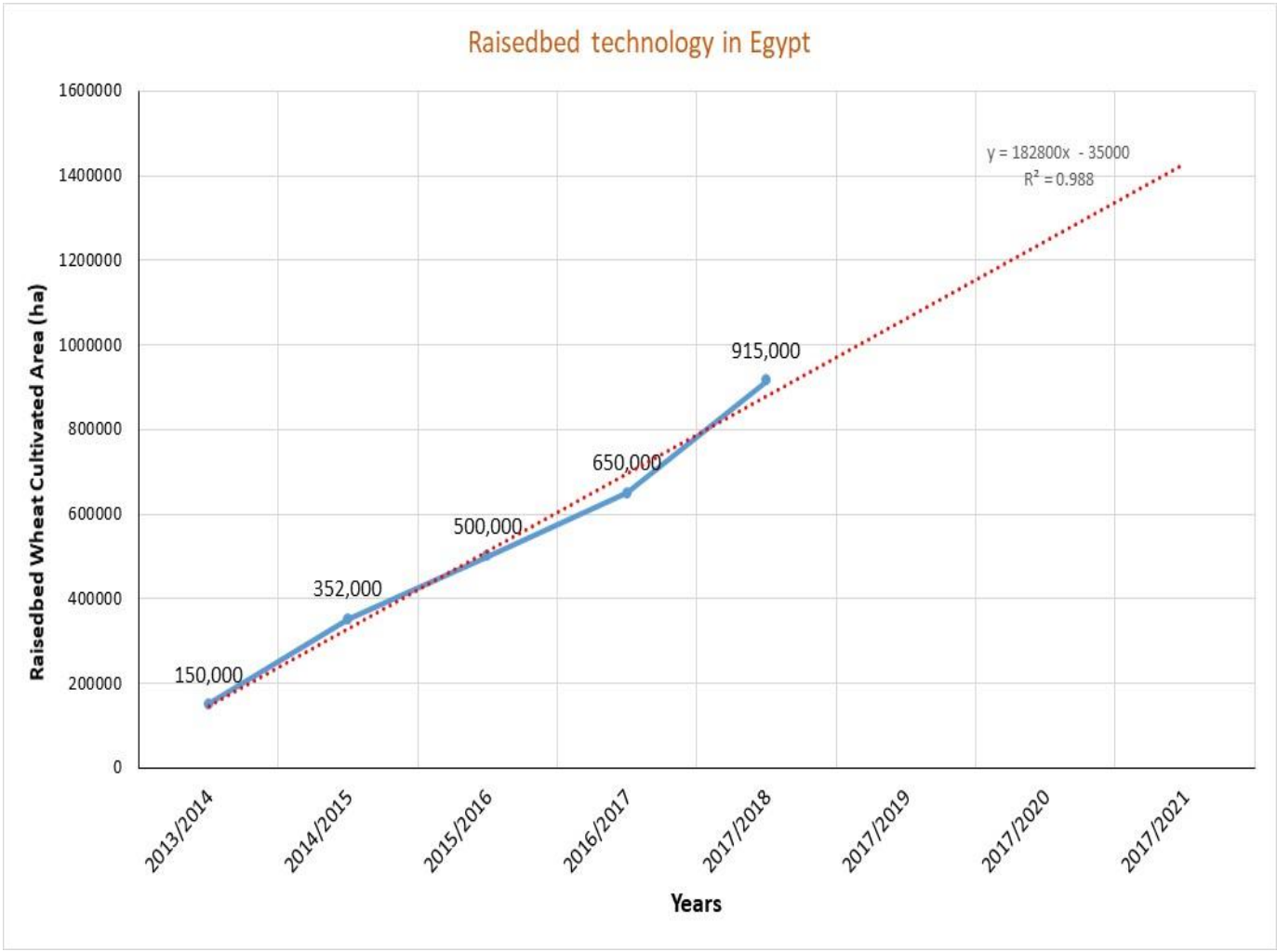
Laser guided land leveler

- Helps uniform crop establishment
- Uniform distribution of water
- Can save 20-25% irrigation water
-Increase crop yield upto 25%

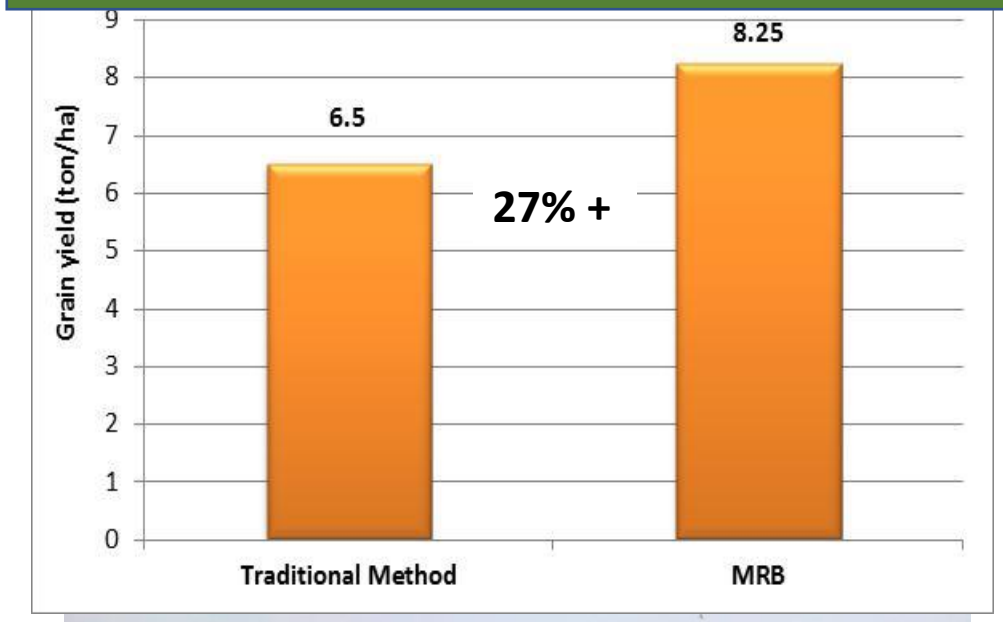


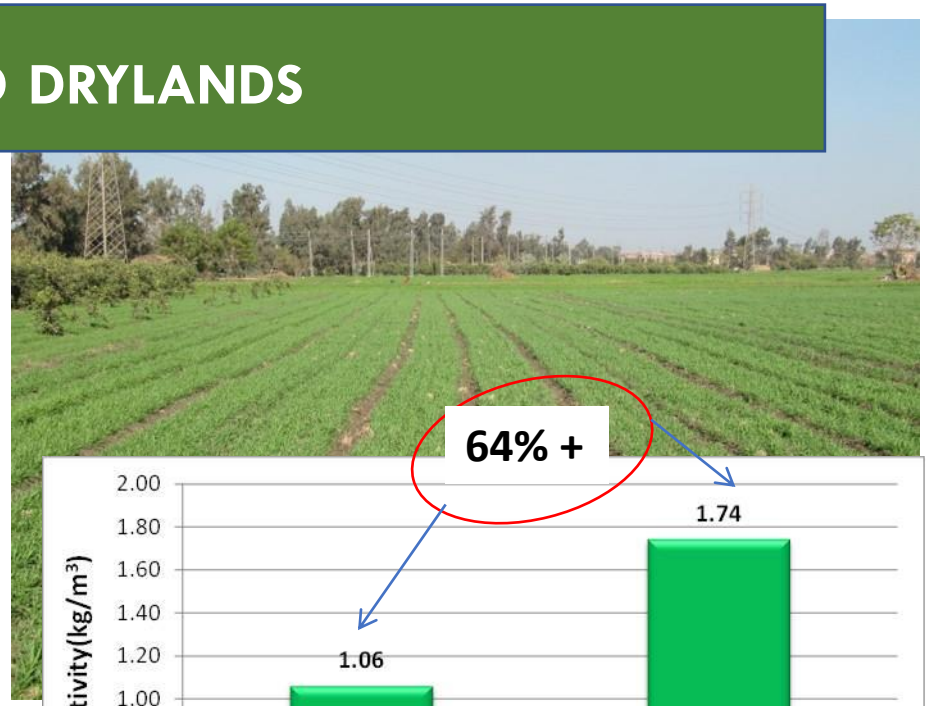


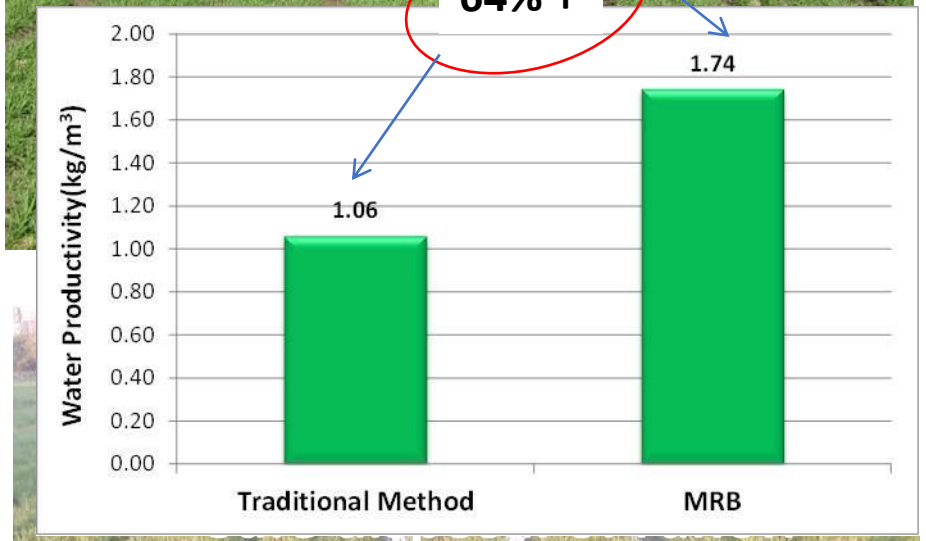
RAISED BED PLANTER: FOR IRRIGATED AREAS

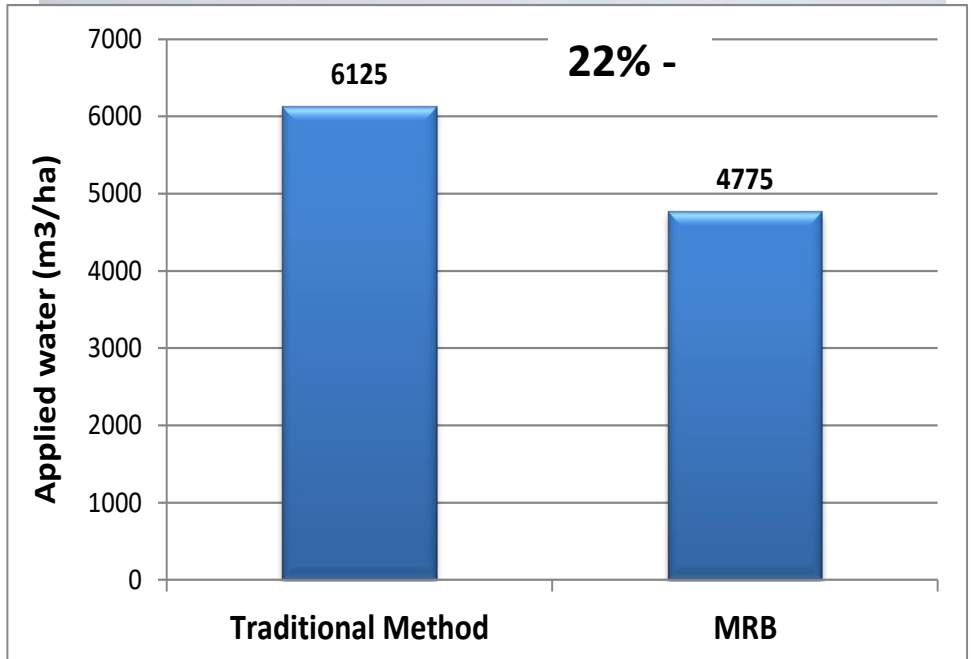


Raised-bed planting in Irrigated drylands



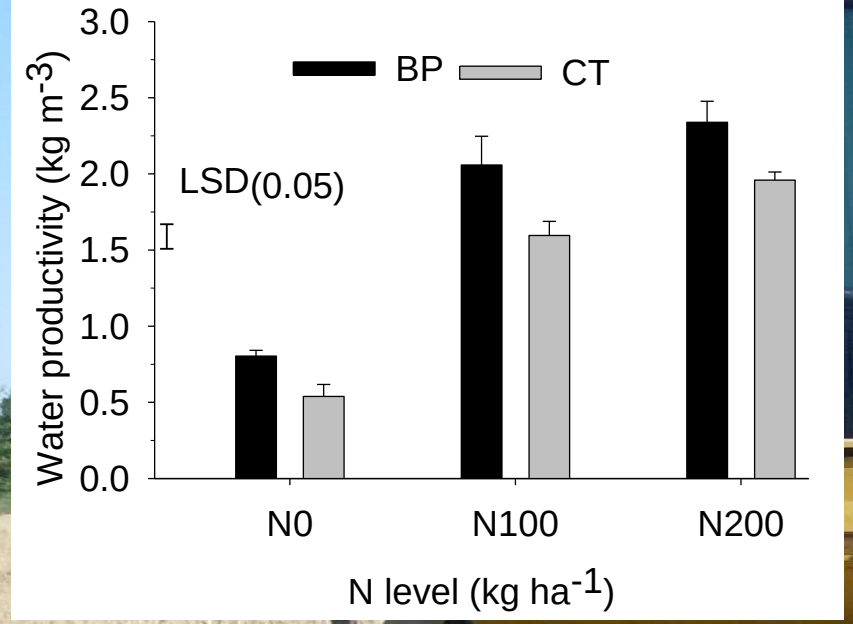




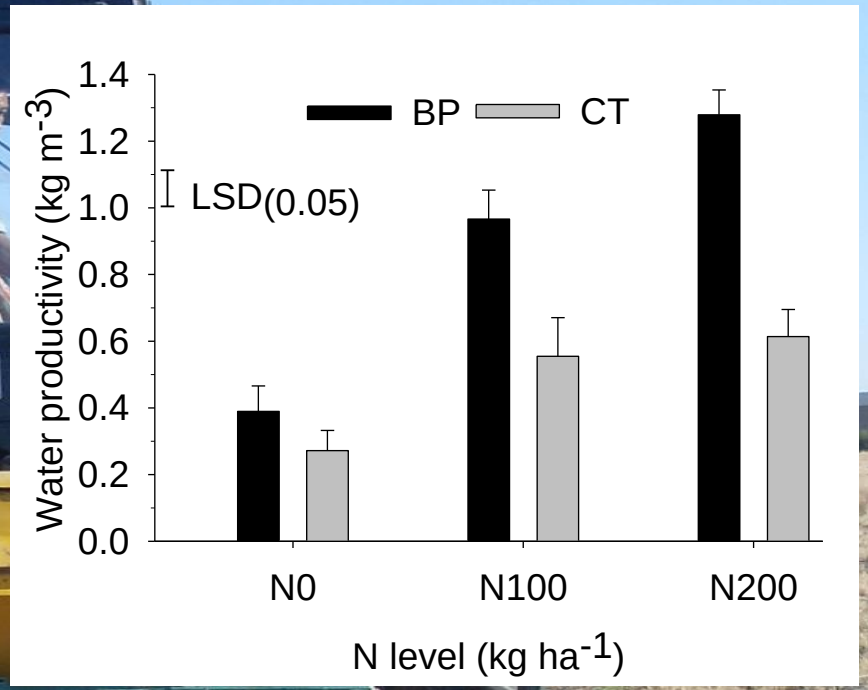


Permanent raised bed: Uzbekistan

In wheat



In Maize



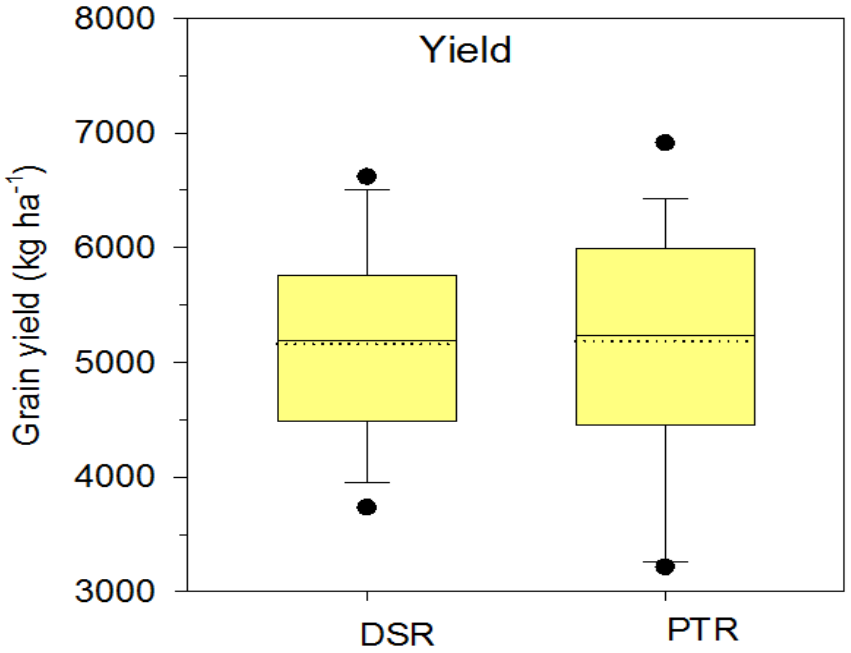
- Higher water productivity in permanent bed (BP) than in conventional tillage (CT) in both crops in all N levels
- BP reduced water application (**12% less in wheat and 23% less in maize**)

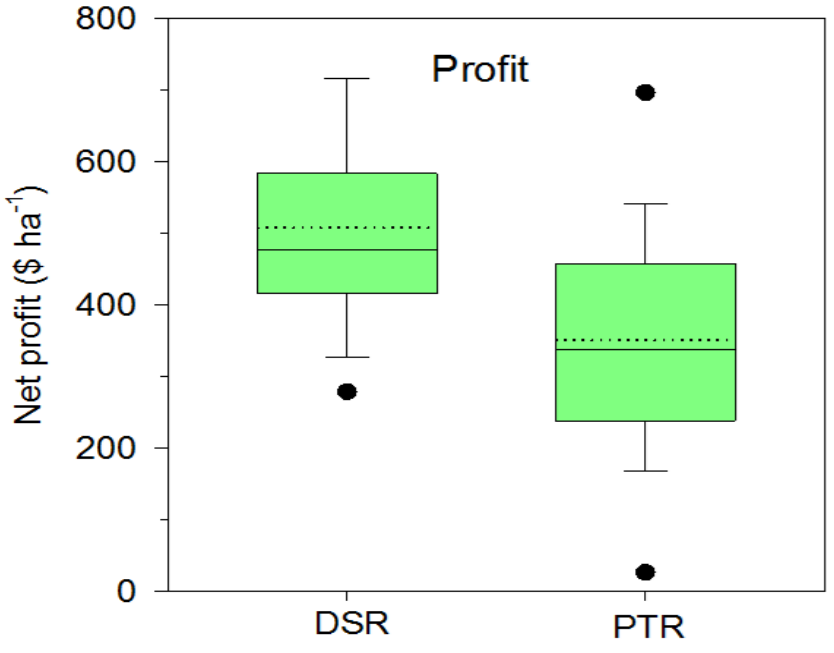
MECHANIZED DIRECT SEEDED RICE

DRY SEEDED VS. TRANSPLANTED RICE

- Avoid puddling
- No yield penalty
- reduced 40% product. cost
- 7-10 days earlier harvest

Dry direct seeded rice has no yield penalty and has higher net profit than transplanted





CONSERVATION AGRICULTURE FOR SUSTAINABLE PRODUCTION SYSTEM

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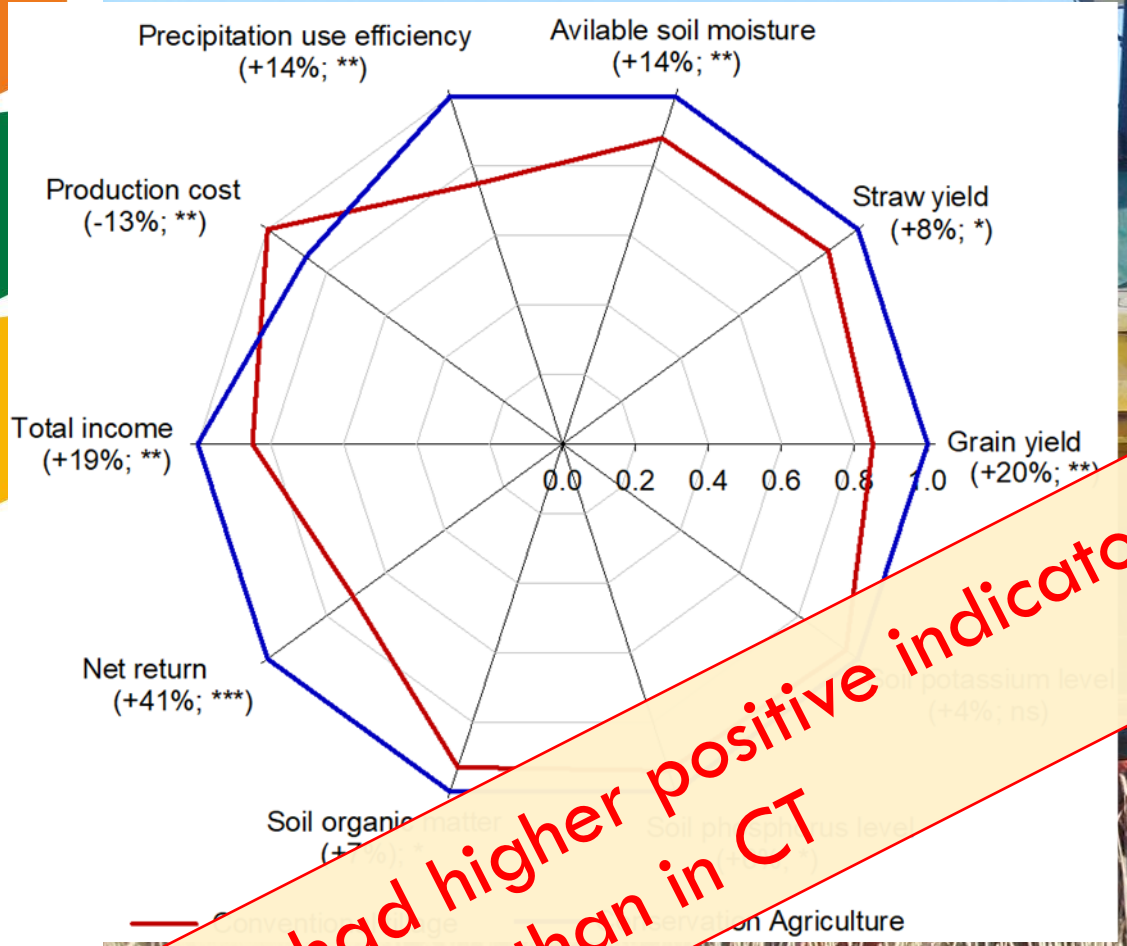
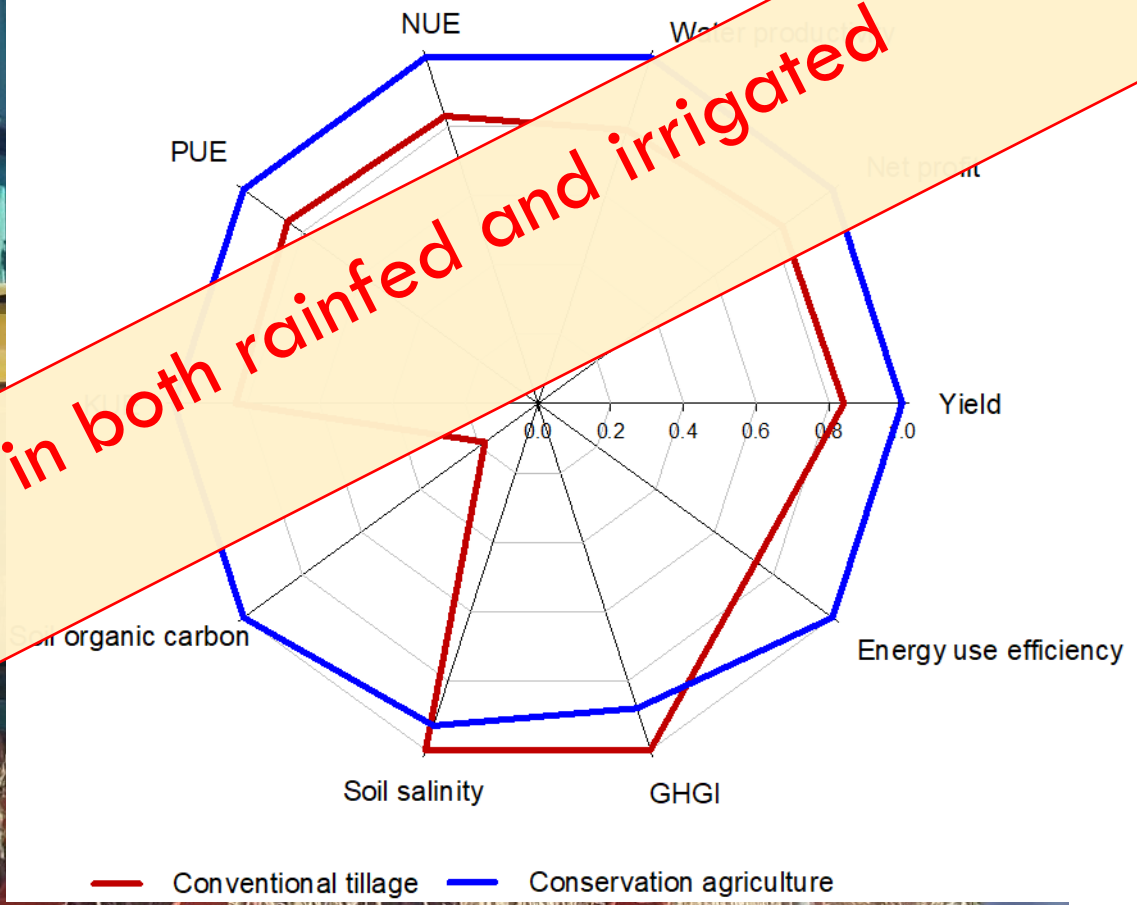
CGIAR

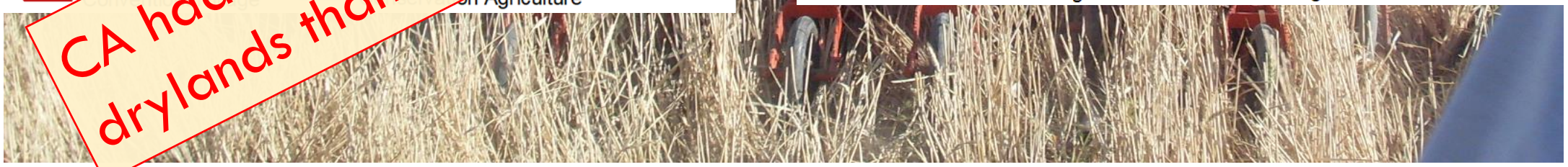
Rainfed drylands



Central Asia: Irrigated drylands



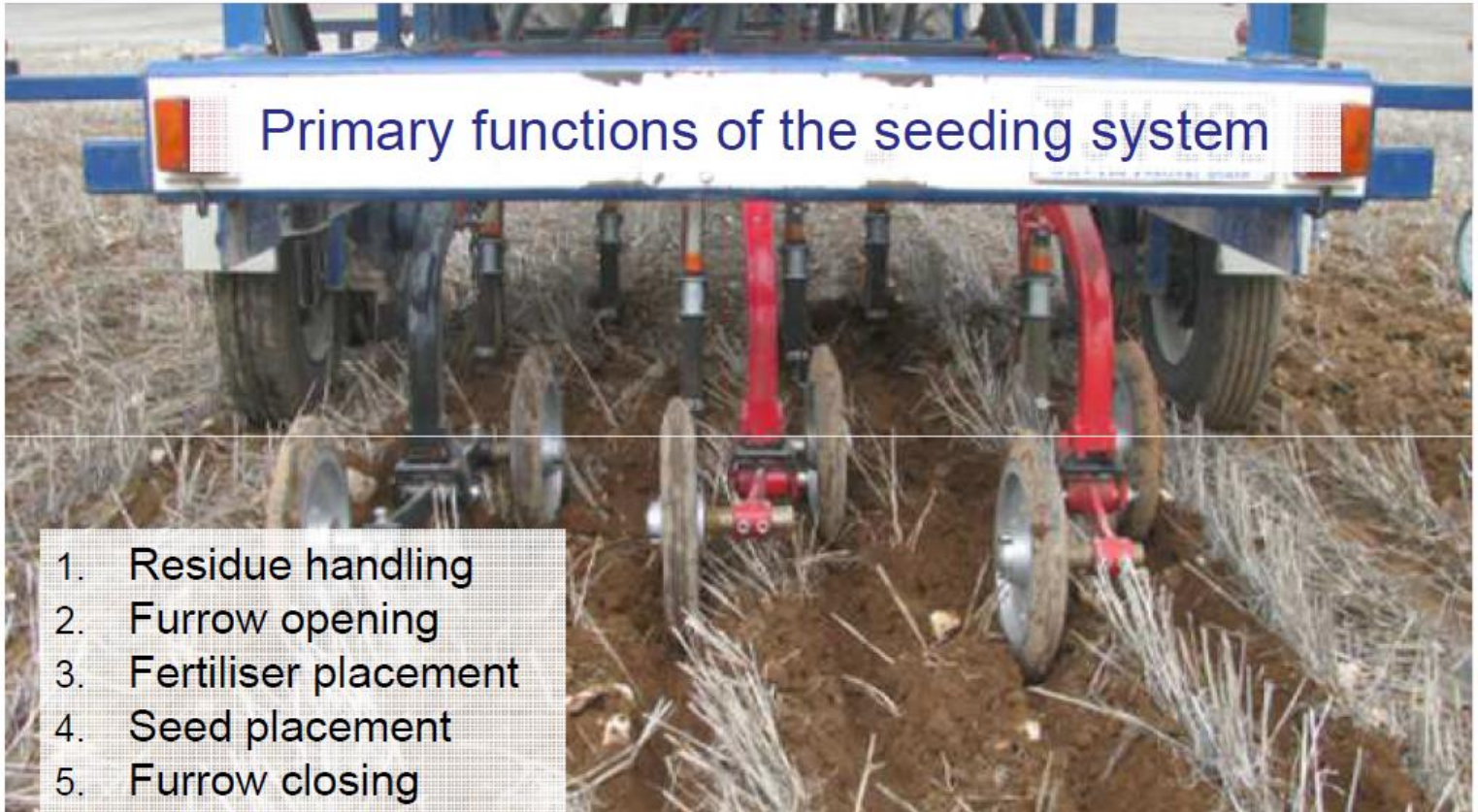
CA had higher positive indicators in both rainfed and irrigated drylands than in CT



IMPORTANCE OF SCALE APPROPRIATE NO-TILL SEEDER FOR CA

Availability of right machinery is key for success of CA

Availability of the scale-appropriate seeder is one of the major constraints for wider adoption of CA.




Al Rasheed, Al Bab

Al Ashbal, Qabbasin

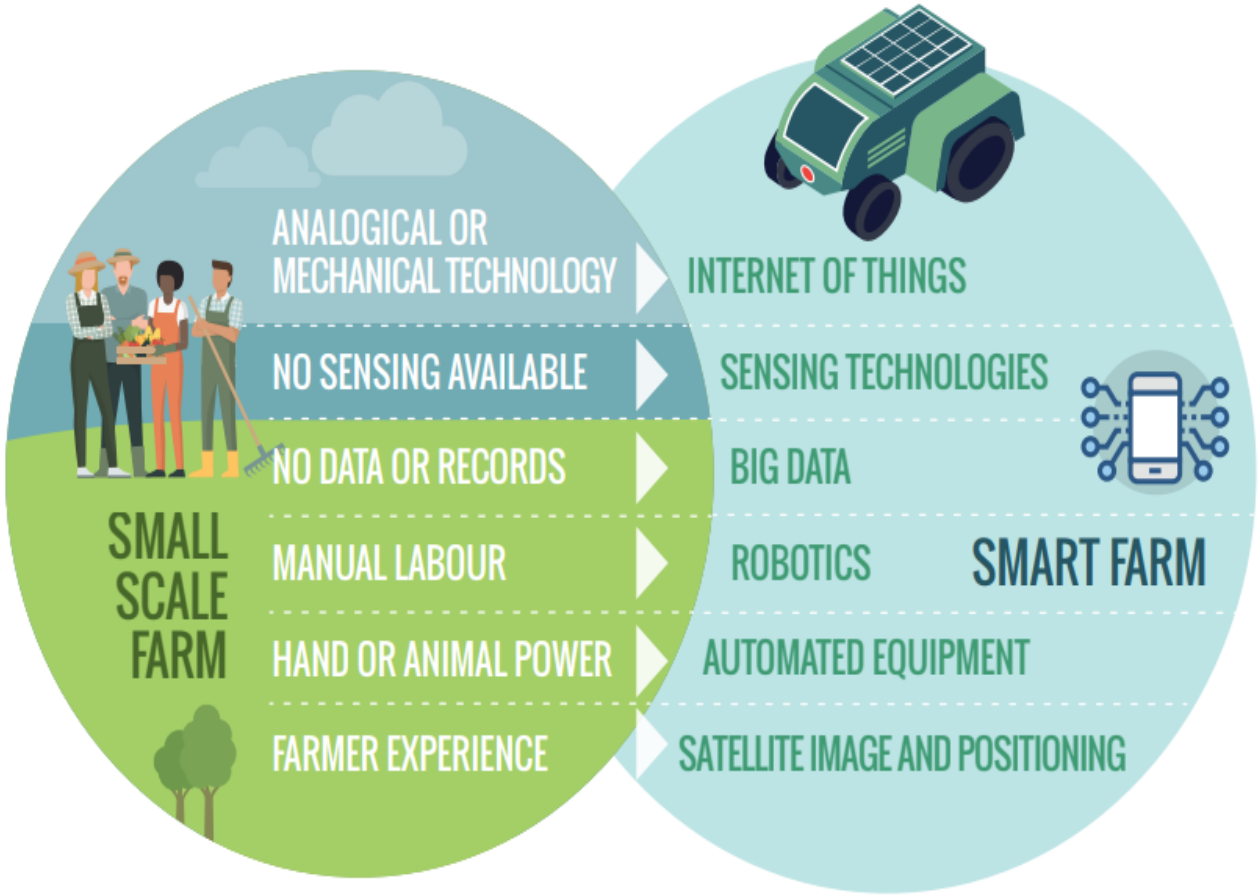

Al Hamza, Al Hassakeh


Al Ashbal, Qabbasin


Al Arous, Kamishly


Al Deyar, Ein Al Arab

Now time for smart mechanization for transforming Agriculture in Drylands



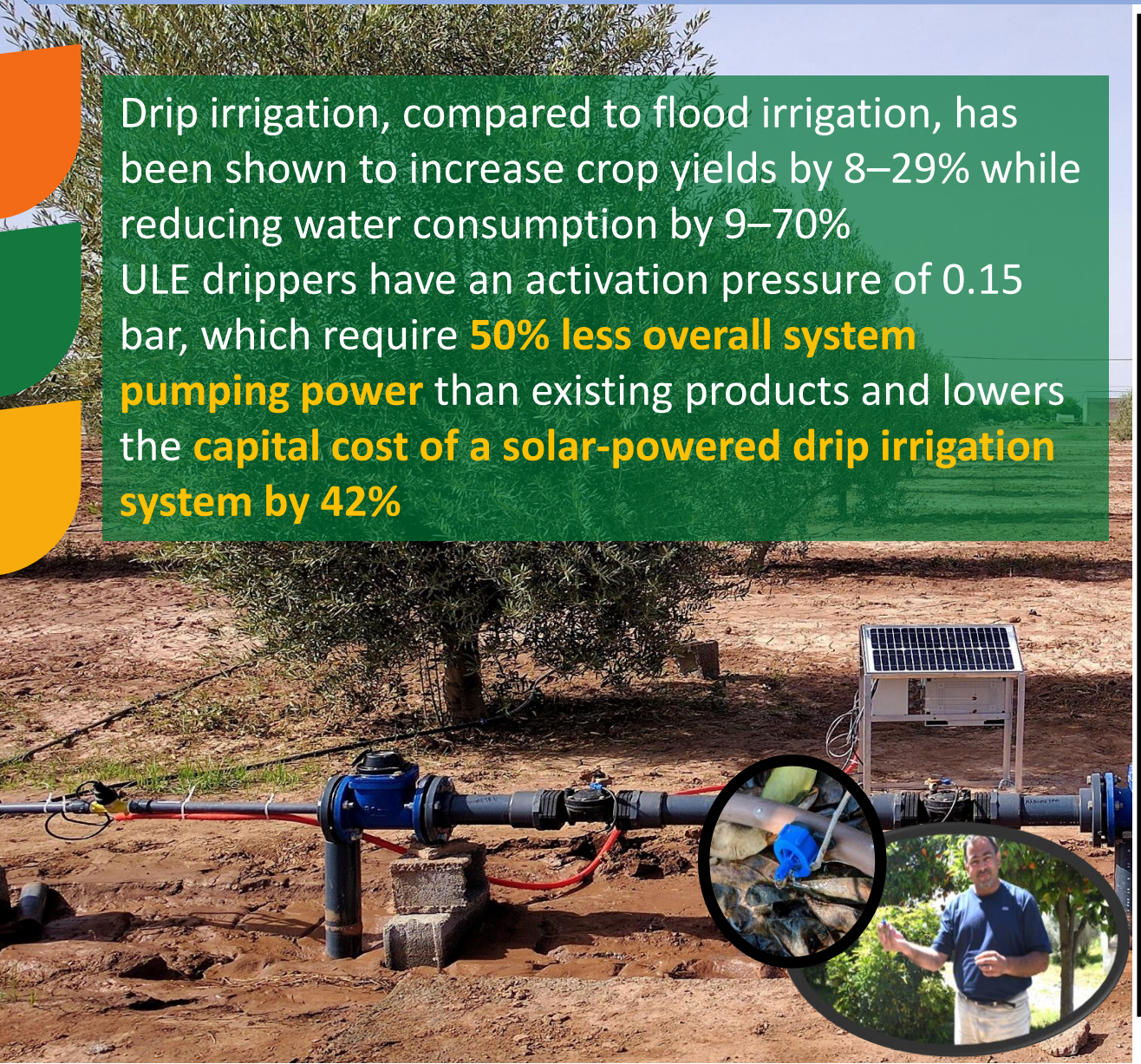
Comparison between a smart farm and conventional agriculture, Source FAO 2020


Precision finger weeder

Climate-smart Agricultural Water Use: Digitalized water efficient technologies

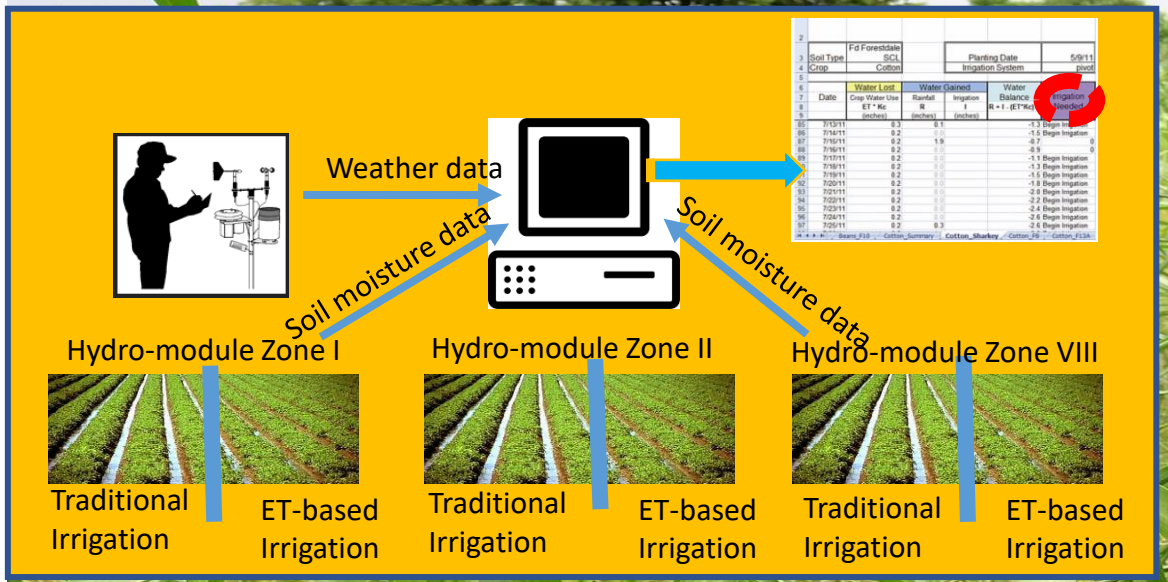
Solar-Powered Ultra-Low Energy Drip Irrigation

Drip irrigation, compared to flood irrigation, has been shown to increase crop yields by 8–29% while reducing water consumption by 9–70%
ULE drippers have an activation pressure of 0.15 bar, which require **50% less overall system pumping power** than existing products and lowers the **capital cost of a solar-powered drip irrigation system by 42%**



Smart Sensor-based Irrigation Scheduling

Switching from traditional flood irrigation scheduling method to ICARDA's smart system, there was on average **32% saving of irrigation** water and **50% increase in water productivity**



USDA United States Department of Agriculture

University of Minnesota

Future for climate smart mechanization in central Asia

- There is unequivocal evidence that there is **no going back from some climate-induced changes in the agriculture system**
- **Declining soil health, increasing production cost and declining youth interest in agriculture production: agri-food system with out appropriate smart mechanization is out of thought**
- **Diversifying the machinery market and advancing research**
- With a young aspirational population, advent of new materials and business models, significant ownership of smartphones and reduction in cost of IoT sensors, drones, remote sensing imageries etc., there is hope that **digital smart mechanization can bring transformative changes** in the livelihoods and food security in the Drylands
- Under the umbrella topic of climate-smart agriculture, **CGIAR and ICARDA are developing scalable solutions** that are embedded in local context, existing enabling environment, adoption barriers and impact-at-scale


Thank You