

Management Options for Increased Agricultural Productivity and Soil Improvement in Central Asia

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Scope of presentation – Management options

Cropping system diversification



Conservation agriculture



Stress tolerant varieties



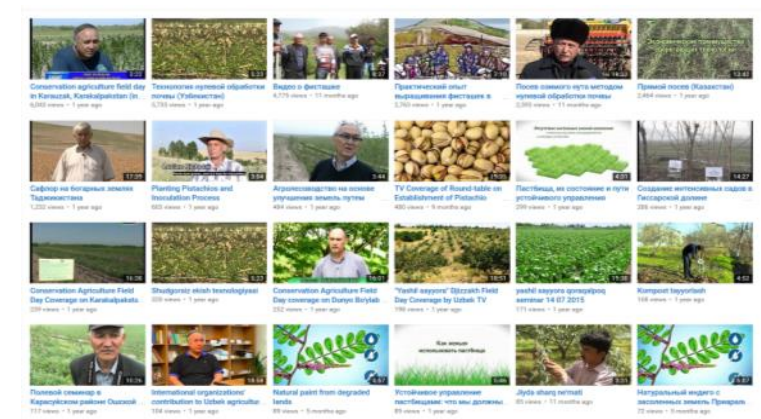
Water Management



Rangeland improvement



Knowledge Management



Cropping system diversification

Many ways of diversification



Food legumes



Cropping geometry



Fodder crops



Crop-livestock integration

Cropping System diversification on irrigated land

Inclusion of leguminous crops in wheat-wheat rotation

Oct	Nov	Dec	Jan	Feb	Mar	Apr	Mai	Jun	Jul	Aug	Sep	Oct	Nov	Dec
winter wheat									Fallow / Mungbean			Winter wheat		



Benefit from
mungbean

- Nutrients added in soil
- Additional income from mungbean crop

Cropping system diversification on irrigated land

Increasing cropping intensity by incorporating legumes – an example with mungbean

	Crop rotation	1st YEAR (Nov-Jun)	1st YEAR (Jul-Sep)	2nd YEAR (Oct-Feb)	2nd YEAR (Mar-Oct)	<i>Cropping intensity</i>
1	Wheat-Cotton	Wheat	Fallow	Fallow	Cotton	2 crops in 2 years (100%), <i>no legume</i>
2	Wheat-Mungbean- Cotton	Wheat	<i>Mungbean</i>	Fallow	Cotton	3 crops in 2 years (150%), <i>once legume</i>
3	Wheat-Mungbean- Green manure-Cotton	Wheat	<i>Mungbean</i>	<i>Green manure</i>	Cotton	4 crops in two years (200%), <i>twice legumes</i>
4	Wheat-Mungbean- Wheat-Mungbean	Wheat	<i>Mungbean</i>	Wheat	Wheat- <i>Mungbean</i>	4 crops in two years (200%), <i>twice legumes</i>

Cropping system diversification on rainfed land

Wheat planted on 16 November



Chickpea planted on 28 February



Chickpea planted on 10 October



Conclusion:

- Replace winter cereals with chickpea on rainfed land
- Plant chickpea in autumn and not in spring

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- 35% higher productivity when planted in autumn
- Higher income from chickpea than growing cereals

Cropping system diversification to prevent soil erosion

Some solutions to prevent erosion and improve soils fertility

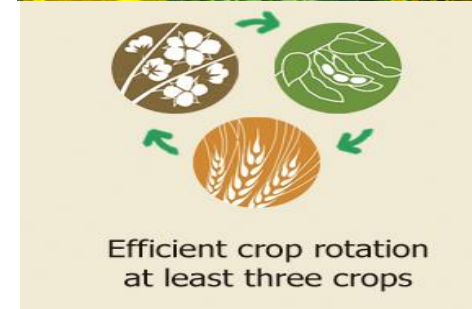
Direct seeding



Soil mulching



Crop rotation



- Erosion control
- Improve soil fertility

Source:
A. Nurbekov,
ICARDA

Cropping system diversification – salinity management

Dynamic nature of salinity can cause complete loss of winter wheat crop

Wheat varieties tolerant to salinity and frost,
Grain yield potential 6.3 t/ha on medium saline field



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Salinity tolerant
wheat

+



Salinity tolerant
mungbean or
other legume

Conservation Agriculture

Benefits

- Lower inputs cost
- Higher stable yields
- Improved soil nutrient exchange
- Enhanced long-run profitability



Conservation Agriculture

Mungbean after wheat using minimum and zero tillage with retention of crop residues in Karshi, Uzbekistan (2011-2013)

Planting method	Spent fuel for planting, l/ha	Root length, cm	Plant height, cm	Yield, t/ ha
Conventional	53.6	25.4	67.2	1.85
One cultivation	13.6	23.5	68.8	1.97
No-till	5.9	23.8	65.4	2.24

- Fuel saving
- Higher yield
- Improves soil health

Source:
A. Nurbekov,
ICARDA



Tillage management

NT= No tillage; CT=Conventional tillage

Benefit-cost ratio for double-cropped mungbean
under no-till and conventional tillage in Uzbekistan

Cost items	NT			CT		
	Durdona	Local	Marjon	Durdona	Local	Marjon
Yield kg/ha	427	250	407	395	237	427
Crop price per kg/usd	2.1	2.1	2.1	2.1	2.1	2.1
Yield USD/ha	897	525	855	830	498	897
Total variable costs, USD/ha	570	570	570	668	668	668
Profit, USD/ha	327	-45	285	162	-170	229

Profitability may
depend on choice of
crop variety

Tillage management

Raised-bed planting: maximizing water use efficiency

- 25% average saving in applied irrigation water
- 30% average increase in grain yield
- 73% average increase in water use efficiency
- 30-50% saving in the quantity of seed used for planting.



Source: ICARDA

<https://www.icarda.org/update/raised-bed-planting-maximizing-water-use-efficiency>

Sustainable land management

Laser technology improves farm productivity

- saves up to 25% irrigation water
- Lowers soil movement during irrigation
- Enhance the effectiveness of salt leaching

Source: ICARDA

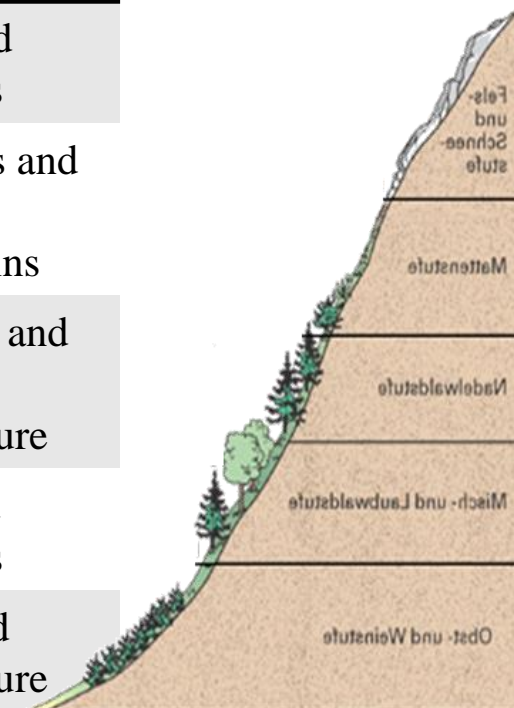
<https://www.icarda.org/blog/%5Bnode%3ABlog%20type%5Dlaser-technology-improves-farm-productivity>



Ecosystem management



Country	Ecosystem	Results / Interventions (Preliminary)
Kyrgyzstan –	highland pastures	Introduction of sustainable rangeland utilization, mitigation of grazing pressure and rehabilitation of pasturelands
Tajikistan	foothills and low mountains	Application of no-till in irrigated agriculture, improved land use (intensive gardens), and rangeland improvement (+protection against natural disasters)
Kazakhstan	forestry and rainfed agriculture	Increased utilization of ecosystem services in desert forests
Turkmenistan	lowland pastures	Development of year-round rangeland plant compositions Introduction of perennial and annual grasses; Pasture rotation.
Uzbekistan	Irrigated agriculture	Introduction of advanced crop production methods: Leave mulch on fields; introduce crop rotation, plant forest belts around fields



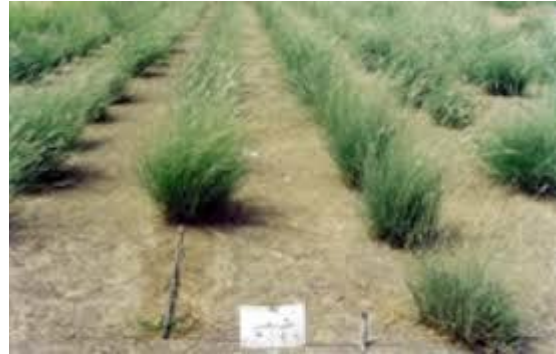
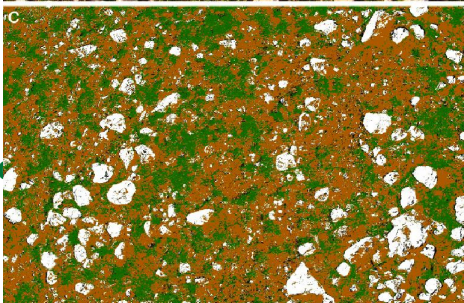
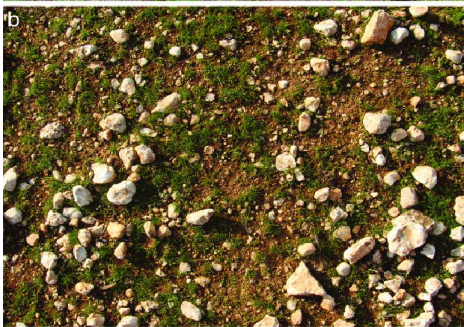
Source: N. Nishanov, ICARDA

Rangeland improvement and diversifying sources of animal feed

- Controlled grazing
- Utilization of desert land for fodder production
- Alternative sources of animal feed and fodder
- Dual purpose crops
- Multipurpose tree species
- Agro-forestry



Rangeland improvement and diversifying sources of animal feed



- Key to sustainable meat production from small ruminants

Knowledge sharing and capacity building

- Formal and informal training
- print materials
- short videos
- website (cacilm.org)
- On-site demonstrations





Management Options for Increased Agricultural Productivity and Soil Improvement in Central Asia

Summary

- Cropping system diversification
- Conservation agriculture
- Tillage practices
- Ecosystem management approach
- Animal and rangeland improvement
- Knowledge sharing / capacity building

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CROSS-CUTTING
OUTCOMES
(CCO)

5

STRATEGIC
RESEARCH
OUTCOMES
(SRO)CGIAR
SLOs

SDGs



ICARDA New Strategy 2017 - 2026

REDUCED
POVERTYFOOD &
NUTRITION
SECURITYSUSTAINABLE
MANAGEMENT
OF NATURAL
RESOURCES

Taking Research to Scale – Partnerships for Impact

SRP1.
Collect, Conserve
and use
**agricultural
biodiversity** in
drylands in order to
meet future climate
and market related
challenges.

**SRP2. Improved
and resilient
crops** for greater
food security in
face of climate
change and
market
volatilities.

SRP3.
Develop
**integrated
drylands farming
systems** for
improved and
resilient
livelihoods.

SRP4.
Support the
establishment of
**functional value
chains** and viable off-
farm activities for
diversified incomes
and improved
livelihoods in drylands.

SRP5: Support
**sustainable use
and management**
of water and land
resources in
drylands.

Climate Change
Adaptation & Mitigation

Gender Equity & Youth

Capacity Development

Big Data & ICT

Step forward

- Change in mindset on integrated production system
- More investment in R4D on SLM and related capacity building
- Enabling policy
- Value chains for commodities
- **NO ACTION IS NOT AN OPTION**

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- Others