KRASS
Khorezm Rural Advisory Support Service

Welcome to
www.KRASS.uz

Khorezm Rural Advisory Support Service
Xorazm Agromaslahat Markazi
Хорезмский Агро-Консультативный центр

Dr. Djumaniyazova Yulduzoy
yulduz.d@gmail.com

KRASS
Khorezm Rural Advisory Support Service

KRASS (Khorezm Rural Advisory Support Service)

- **Is a self-governing, independent, non-governmental, non-profit and non-political organization**
- **Established in November 2008**
- **Mission 'To contribute to *improvement* of rural *livelihoods*, *poverty alleviation* and *increasing* long-term *food security* and *environmental sustainability* in rural Uzbekistan through rendering agricultural support services'**

Established with support of

✓ **Urgench State University**
✓ **ZEF/UNESCO Khorezm Project**
✓ **Center for Development Research**

ZEF/UNESCO Khorezm Project

Center for Development Research

Urgench State University

COOPERATION / PARTNERSHIP

INTERNATIONAL PARTNERS:

- ❑ UNESCO
- ❑ ICARDA, CIMMYT
- ❑ DLR, Germany
- ❑ ZEF, Germany
- ❑ Universities of Bonn and Wuerzburg
- ❑Succow foundation

NATIONAL PARTNERS:

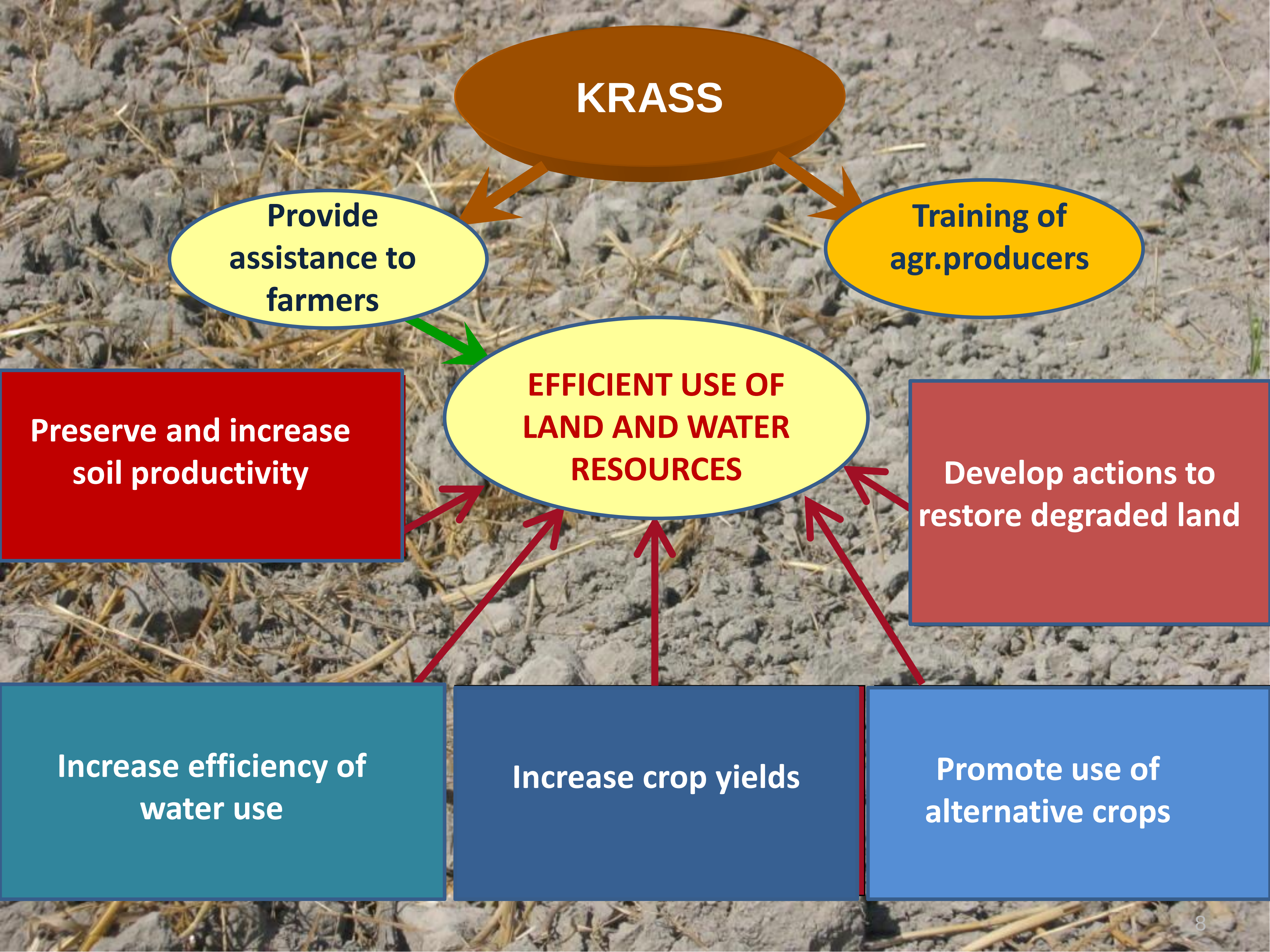
- ❑ Urgench State University
- ❑ Argrochemistry and Soil Science Research Institute
- ❑ Cotton Research Institute
- ❑ Mamun Academy of Khorezm
- ❑ Tashkent Institute of Irrigation and Melioration
- ❑ Uzbek Association of NGOs

⇒ Open for partnership and collaboration

ACTIVITIES

- Cooperation with development projects
- Consultancy, research and implementation
- Provision of agricultural extension services, training of extension staff and producers, preparation and circulation of extension aid materials
- Establishment of community based agricultural service centers for conducting workshops, trainings, and exhibitions on agricultural/farming/ecological topics
- Logistic support to research and development activities
- Consultation and technical assistance on educational programs abroad
- Setting up an open access library and data base on ecology/agriculture





KRASS
Provide assistance to farmers
Training of agr.producers
EFFICIENT USE OF LAND AND WATER RESOURCES
Preserve and increase soil productivity
Develop actions to restore degraded land
Increase efficiency of water use
Increase crop yields
Promote use of alternative crops

DEMAND – DRIVEN EXTENSION ACTIVITIES
Laser levelling in irrigated agriculture

Well-tested and efficient technology
Demanded by farmers, agricultural administration, international projects
Part of innovative technology package
60 Equipment purchased (ca. 6000 ha levelled throughout Uzbekistan)

- Expert's advice with individuals and farmer groups
- Targeted training for farm workers (field preparation, operation)
- Manuals
- Demo days
- Linking private farmers to producers
- Service contract

Farmers

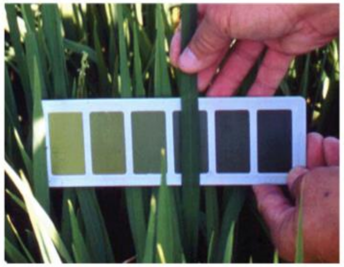
Training of farmers, agricultural specialists upon demand
Agricultural Demo days

Administration

Innovations Fair (local, national)
Awareness raising about resource saving (workshops, training, TV, publications, aid materials)

Wider public

Research-driven technology dissemination



- Improved drought -, cold – resistant crop varieties (winter wheat, leguminous, maize, melons, halophytes)
- Conservation agriculture (reduced tillage, permanent bed, cotton, winter wheat, summer crops)
- Crop rotation, cover and mixed cropping
- New irrigation methods (water saving, scheduling)
- Tools for efficient resource use (GIS, innovative equipment)

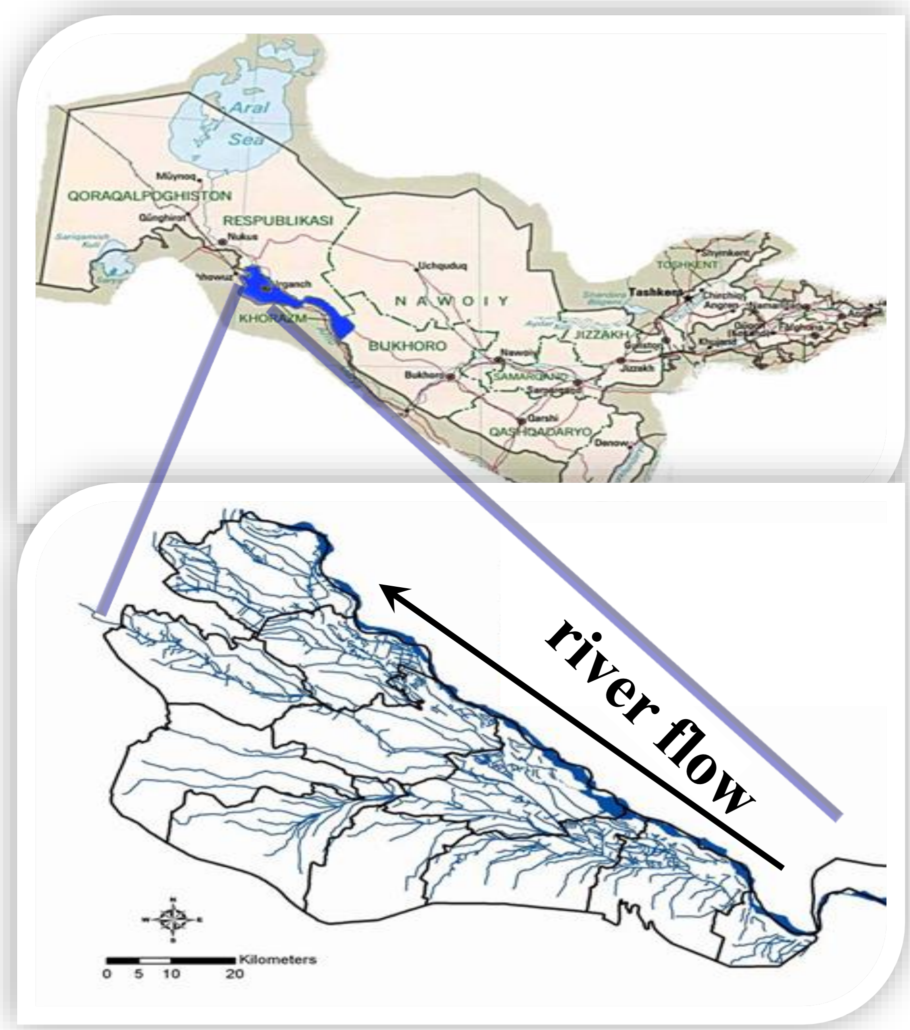
Approach of KRASS

- Advisory work
- Cooperation with research institutes
- On-farm adaptive trials
- Seed bank establishment for dissemination
- Field and Demo days
- Awareness raising (workshops, training, TV, publications, aid materials)

KRASS
Khorezm Rural Advisory Support Service

Khorezm region

- Located at the Amu Darya Delta
- 680,000ha with 270,000ha irrigated land
- Flat topography (elevation 60 – 150 m a.s.l.)
- Irrigated alluvial meadow soil

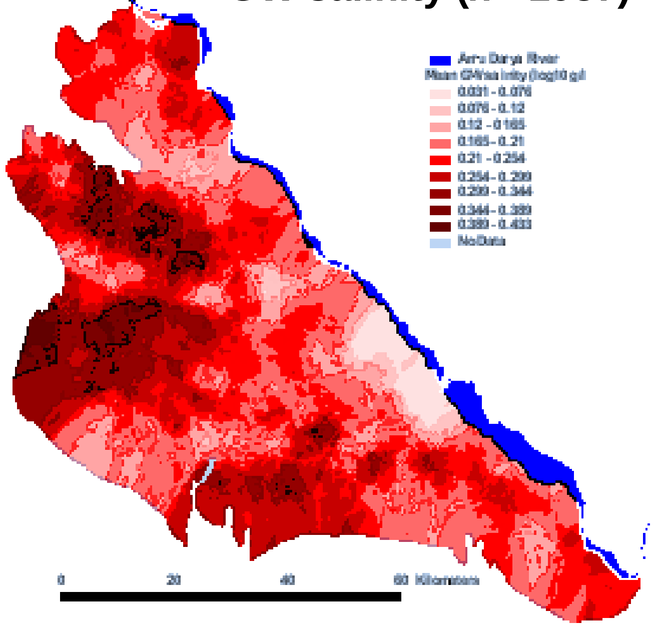


Khorezm climate and soil

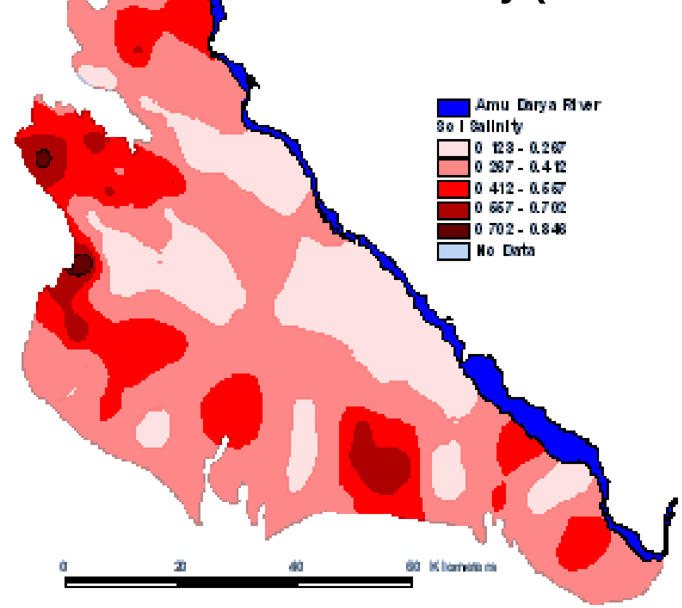
Climate

- Arid and continental climate
- Precipitation <100 mm annum^{-1}
- ET_{pot} ~1,500 mm annum^{-1}
- Agriculture is highly dependent on irrigation

GW salinity (*n*= 1987)



Soil Salinity (*n* = 108)



Soil

- Calcaric gleysoils
- Low soil organic matter
- Nitrogen is limiting
- Saline soil

Source: ZEF/UNESCO
www.zef.de

Land degradation

Area of degraded land in the Khorezm Province - 20,000 ha

Soil organic matter (humus) is very low 0,4-1,2 %, total content of organic matter in depth of 0-50 cm is 29 -70 t/ha.

Main crops

Winter Wheat

Cotton

Mungbean

Maize

Rice

A Crop-Soil Simulation model is...

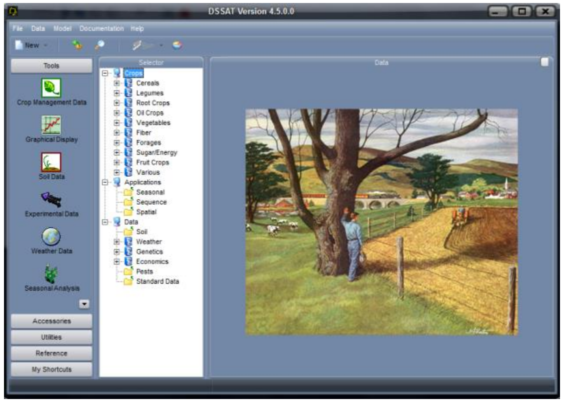
"… the dynamic simulation of crop growth by numerical integration of constituent processes with the aid of a computer."

Sinclair&Seligman, 1996

$$r_{cNS} = \frac{r_c}{\left[1 - \frac{N_{crit} - N_c}{N_{crit} - N_{min}}\right]} \qquad T_N = T_P \frac{+\gamma(1 + r_c/r_a)}{\Delta + \gamma(1 + r_{cNS}/r_a)}$$

$$B_T = B_P\left[\frac{T_A}{T_P}\right] \quad B_N = B_T\left[1 - \frac{N_{crit} - N_c}{N_{crit} - N_{min}}\right] \quad Y = B_{PM}\mathrm{HI}$$

$$\mathrm{LAI} = \frac{\mathrm{SLA}B}{1 + pB} \qquad B_{PT} = \frac{K_{BT}T_P}{\mathrm{VPD}} \qquad B_{IPAR} = e\mathrm{IPAR}$$



Crop model

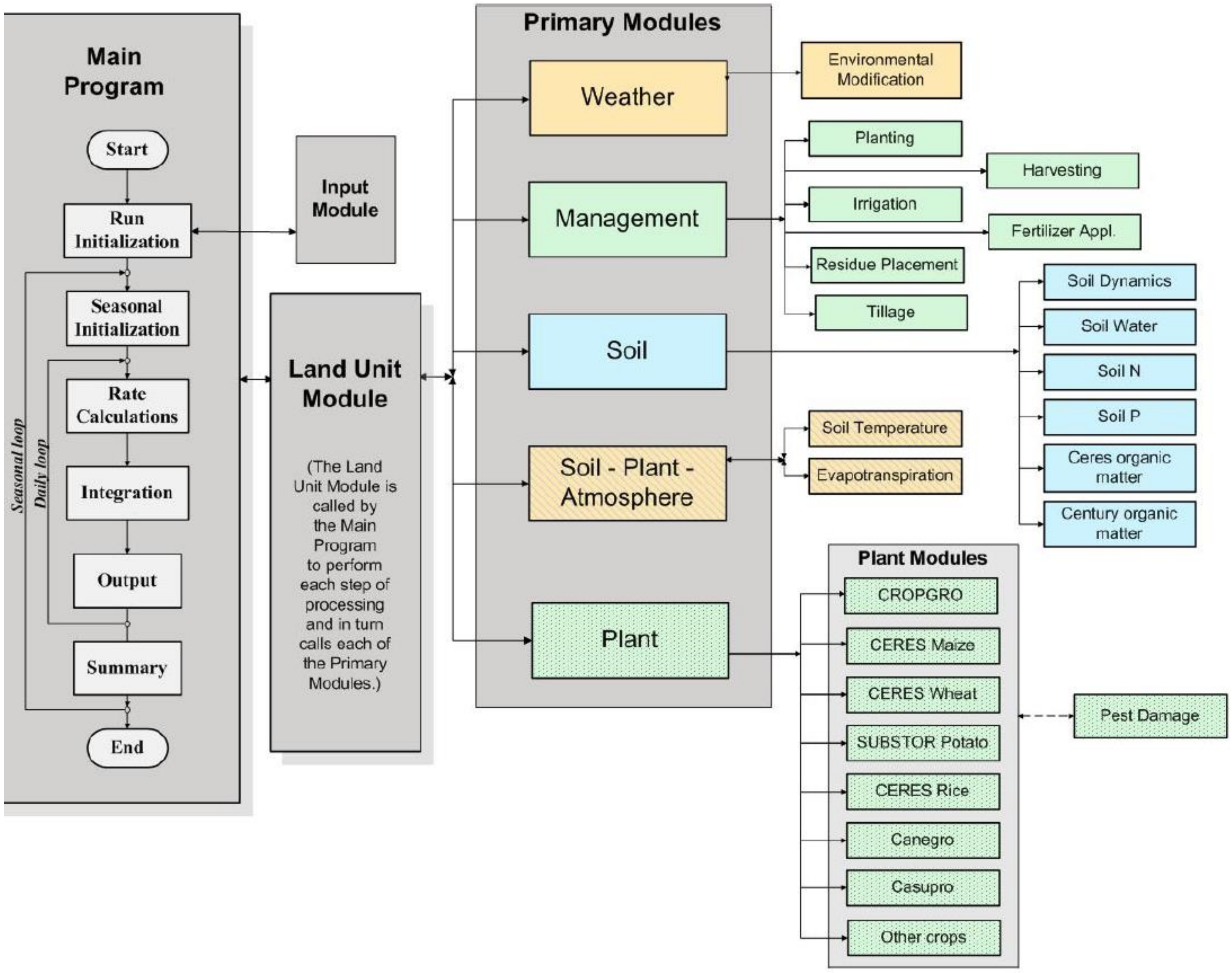


Figure 1. Overview of the components and modular structure of DSSAT-CSM.

KRASS
Khorezm Rural Advisory Support Service

Data requirements

Constant:

Soil:
- Description
- Texture
- Hydraulic properties

Changing in time:

Soil:
- Soil moisture
- NO_3-N and NH_4-N
- P
- SOM
- Chemistry

Weather:
- Precipitation
- Tmax, Tmin
- RHmax, RHmin
- Solar radiation
- Wind speed

Management:
- Tillage
- Irrigation
- Fertilization
- Harvest

Used for calibration:

Crop:
- Phenology
- N-uptake
- AGB
- Yield

Model

KRASS
Khorezm Rural Advisory Support Service

Application of modelling

The CropSyst model (Stockle et al., 2003), version 4.19.06, was used to simulate the impact of different soil and ecological factors and climate change on crops in the irrigated agro-ecological condition in Uzbekistan.

Climate change scenarios comprised the IPCC (2013) CMIP5 scenarios RCP 2.6, RCP4.5-6.0 and RCP 8.5 and three different futures, namely immediate-future (2016-2030), medium-term future (2031-2050) and long-term future (2051-2100).

Different soil fertility scenarios

Soil layer (cm)	Sand (%)	Clay (%)	Silt (%)	SOM (%)	NO_3-N (kg/ha)	NH_4-N (kg/ha)
0-5	47	16	37	1.224	4.5	0.9
5-30	47	16	37	0.626	22.5	4.5
30-50	43	14	43	0.527	17.7	3.5
50-70	47	17	36	0.369	20.4	4.1
70-100	47	17	36	0.318	16.6	3.3

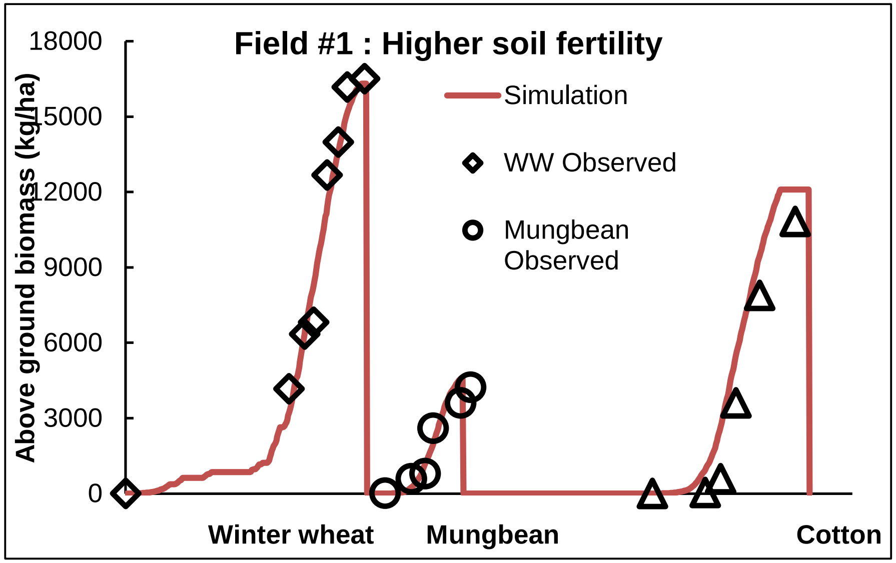
Soil texture and chemical characteristics of the Calcic Xerosol in Khorezm (Field #1)

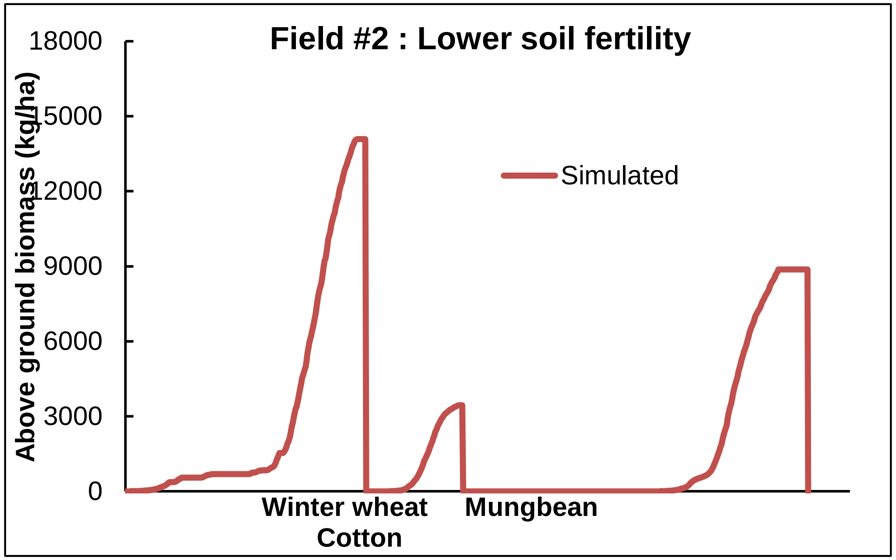
Soil layer (cm)	Sand (%)	Clay (%)	Silt (%)	SOM (%)	NO_3-N (kg/ha)	NH_4-N (kg/ha)
0-5	36	10	54	0.424	3.6	3.6
5-30	37	8	55	0.420	5.5	12.9
30-50	19	14	67	0.220	12.2	16.8
50-70	21	12	67	0.170	8.2	6.1
70-100	23	19	58	0.090	8.6	6.9

Soil texture and chemical characteristics of the Calcic Xerosol in Khorezm (Field #2)

Results

Observed (points) and simulated (line) above ground biomass of rotation crops in the fields with higher (Field #1) and lower (Field #2) soil fertility

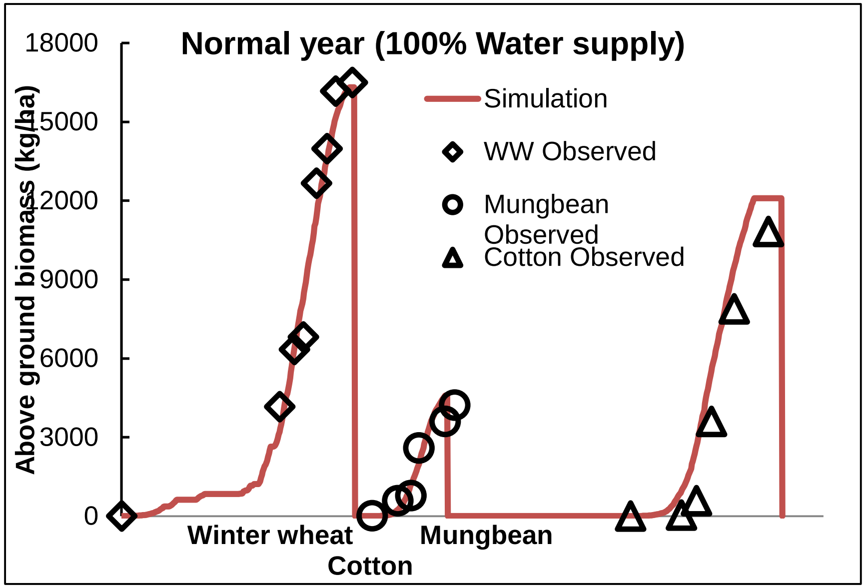


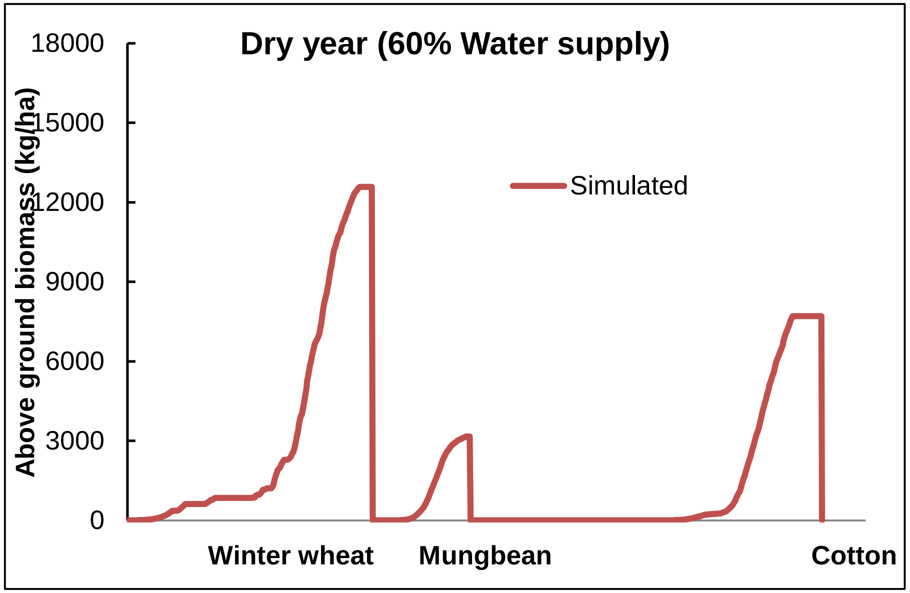


KRASS
Khorezm Rural Advisory Support Service

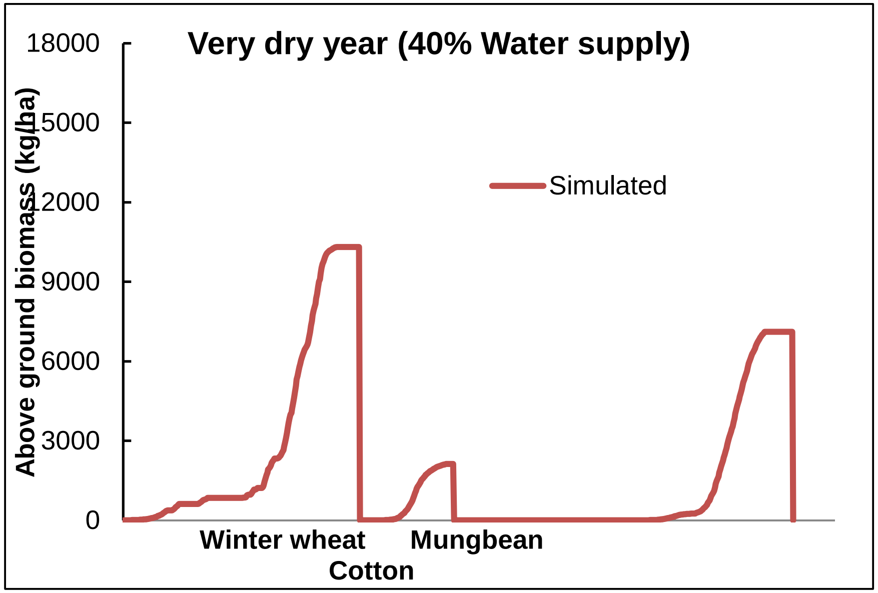
Results

The fits between the simulated and empirical values for the various parameters examined in the treble crop rotation "winter wheat - summer green gram – cotton" provided the necessary confidence for using CropSyst in a number of scenario analyses

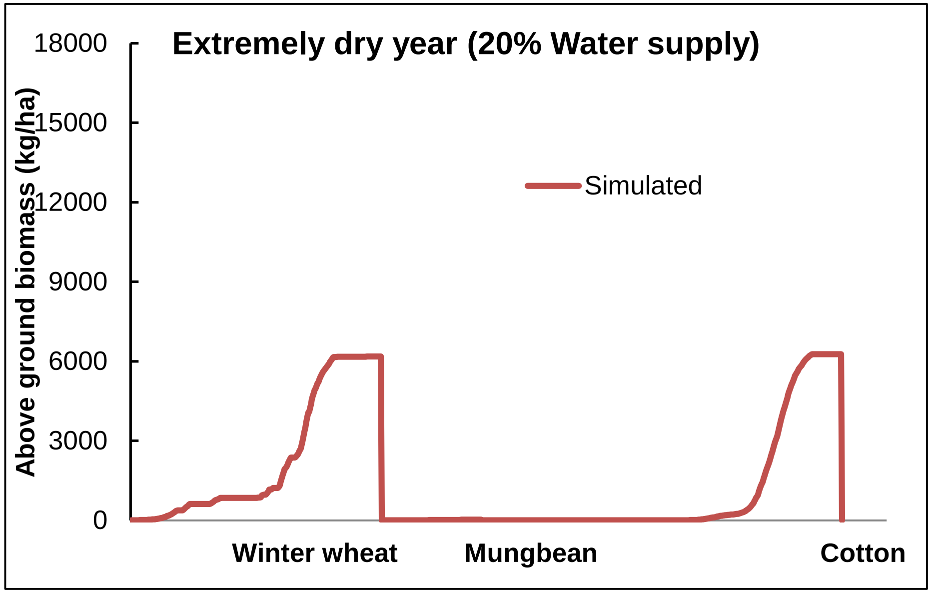




Results



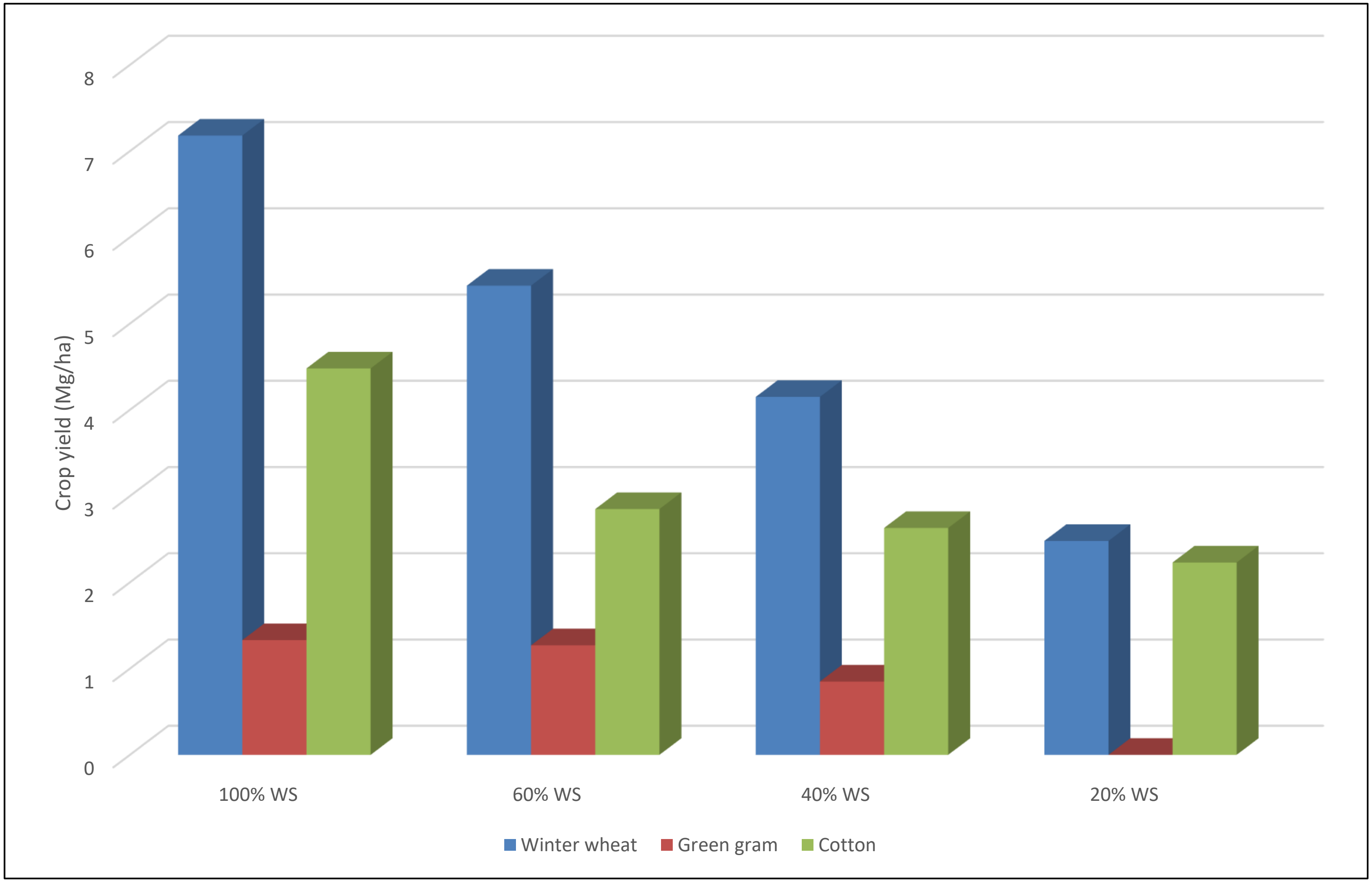
Very dry year (40% Water supply)
18000
15000
12000
9000
6000
3000
0
Above ground biomass (kg/ha)
Simulated
Winter wheat
Mungbean
Cotton



Extremely dry year (20% Water supply)
18000
15000
12000
9000
6000
3000
0
Above ground biomass (kg/ha)
Simulated
Winter wheat
Mungbean
Cotton

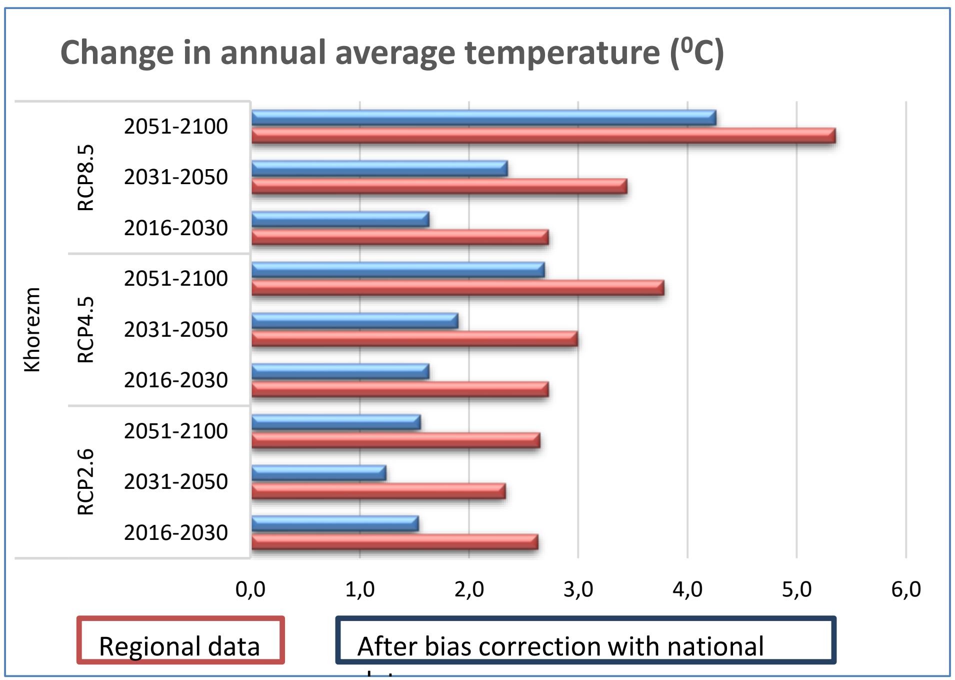
Results

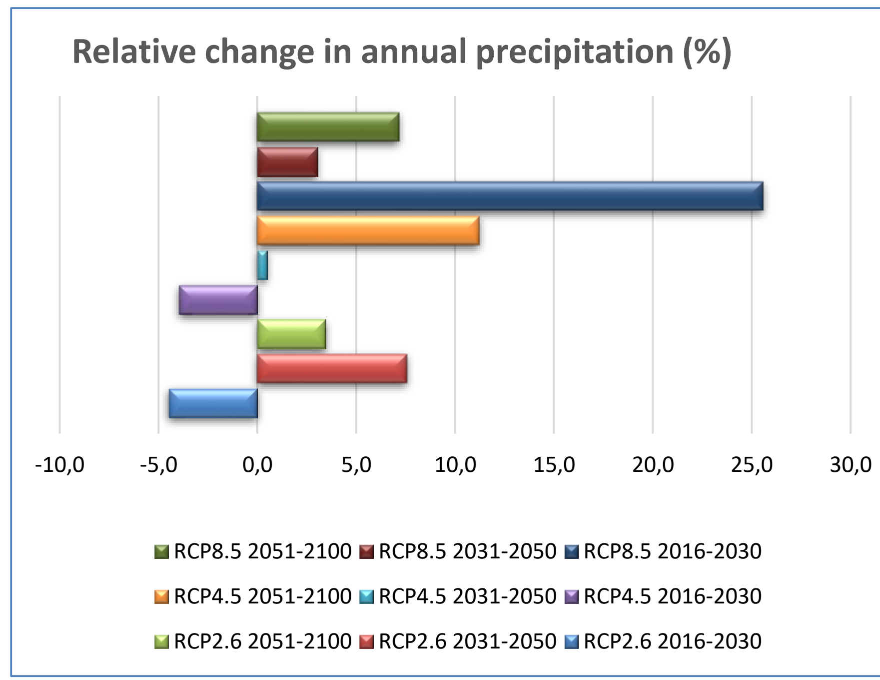
Crop yield in the treble rotation under different irrigation water availability scenarios



Next Step: Climate change impact on crops yield

Climate change scenarios comprised the IPCC (2013) CMIP5 scenarios RCP 2.6, RCP4.5-6.0 and RCP 8.5 and three different futures





Conclusion

- Model estimated higher yields of winter wheat and cotton on the higher fertility soil compared to the soil with lower fertility. The higher fertility soil produced 7.2 t ha^{-1} of wheat grain and 4.5 t ha^{-1} of seed-lint cotton while on the soil with lower fertility the crops yields reduced for 12% (wheat) and 31% (cotton).
- Grain yields of green gram were 1.33 and 1.38 t ha^{-1} in the Field #1 and Field #2 respectively. Equal yields of green gram in the Field #2 in comparison with the Field #2 is apparently attributed with nitrogen fixation ability of the leguminous crop which substantially contributes to the crop nutrition

Conclusion

- The findings should increase the understanding of whether or not to concentrate or to spread-out (thin) the available irrigation water resources in such dryer years. At the same time this distinction mimicked differing levels of access to water (up-stream vs. down-stream)

- Deficits of irrigation (40 and 20% of ‘normal’, respectively) could decrease yields up to 65%. A shallow groundwater could mitigate to some extent the yield losses caused by lack of irrigation water. However, if groundwater is always below 2 m, as was simulated for the very dry and extremely dry year scenario, and if irrigation water is scarce, a substantial yield decrease can be expected. Shallow groundwater, thus, plays an important role and contributes considerably to ET in Khorezm. Thus, whenever irrigation water is scarce, a shallow groundwater – if still present – acts as a safety-net and sustains yields

KRASS
Khorezm Rural Advisory Support Service

Thank you!

KRASS members, supporters, collaborators

Urgench State University
Khamid Olimjan street 14,
220100 Urgench, Khorezm
Tel: +998 62 224 66 71
Fax: +998 62 224 66 72

e-mail: kkrass@ymail.com

Web: www.KRASS.uz