

CGIAR Research Program 1.1

“Dryland Systems”

- (1) Rationale for “Dryland Systems” research in Central Asia and the Caucasus Region (CAC)
- (2) Identification and characterization of Action Sites
- (3) Proposed research hypotheses
- (4) Regional Inception Workshop

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The CGIAR in Central Asia and the Caucasus

- Consortium of international agricultural research centers:
 - Bioversity International
 - International Center for Biosaline Agriculture (ICBA)
 - International Center for Agricultural Research in the Dry Areas (ICARDA) – convening Center
 - International Maize and Wheat Improvement Center (CIMMYT)
 - International Potato Center (CIP)
 - International Water Management Institute (IWMI)
 - Michigan State University
 - World Vegetable Center – AVRDC
- Increased productivity
- Food and nutritional security
- Environmental sustainability
- Strong partnerships with national research organizations, policy makers, universities, farmers' associations





The CGIAR Regional Program

- Established in 1998
- Each Center has own mandate and available, global expertise – transfer, testing and development of technologies in CAC
- Complementarities and synergies
- Governance by Program Steering Committee
- Program Facilitation Unit in Tashkent - providing technical, policy and administrative support
- Research problems inter-related, integration of crops, livestock, natural resource management and the necessary policies to support improvements
- CGIAR Research Programs becoming operational in 2012
- Policy linkages through CACAARI, CACILM





Tackling the challenges through collaborative applied research



Productivity of Agricultural Systems

Germplasm Enhancement
Strengthening National Seed Supply Systems
Cropping Systems Management and Agricultural Diversification
Livestock Production Systems and Integrated Feed/ Livestock Management



Natural Resource Conservation and Management

Irrigation, Drainage, and Water Basin Analysis
On-Farm Soil and Water Management
Rangeland Rehabilitation and Management



Conservation and Evaluation of Genetic Resources

Plant Genetic Resources
Animal Genetic Resources



Socioeconomic and Public Policy Research

STRENGTHENING OF NATIONAL PROGRAMS

The Aral Sea Basin

is among the most ancient cradles of civilization

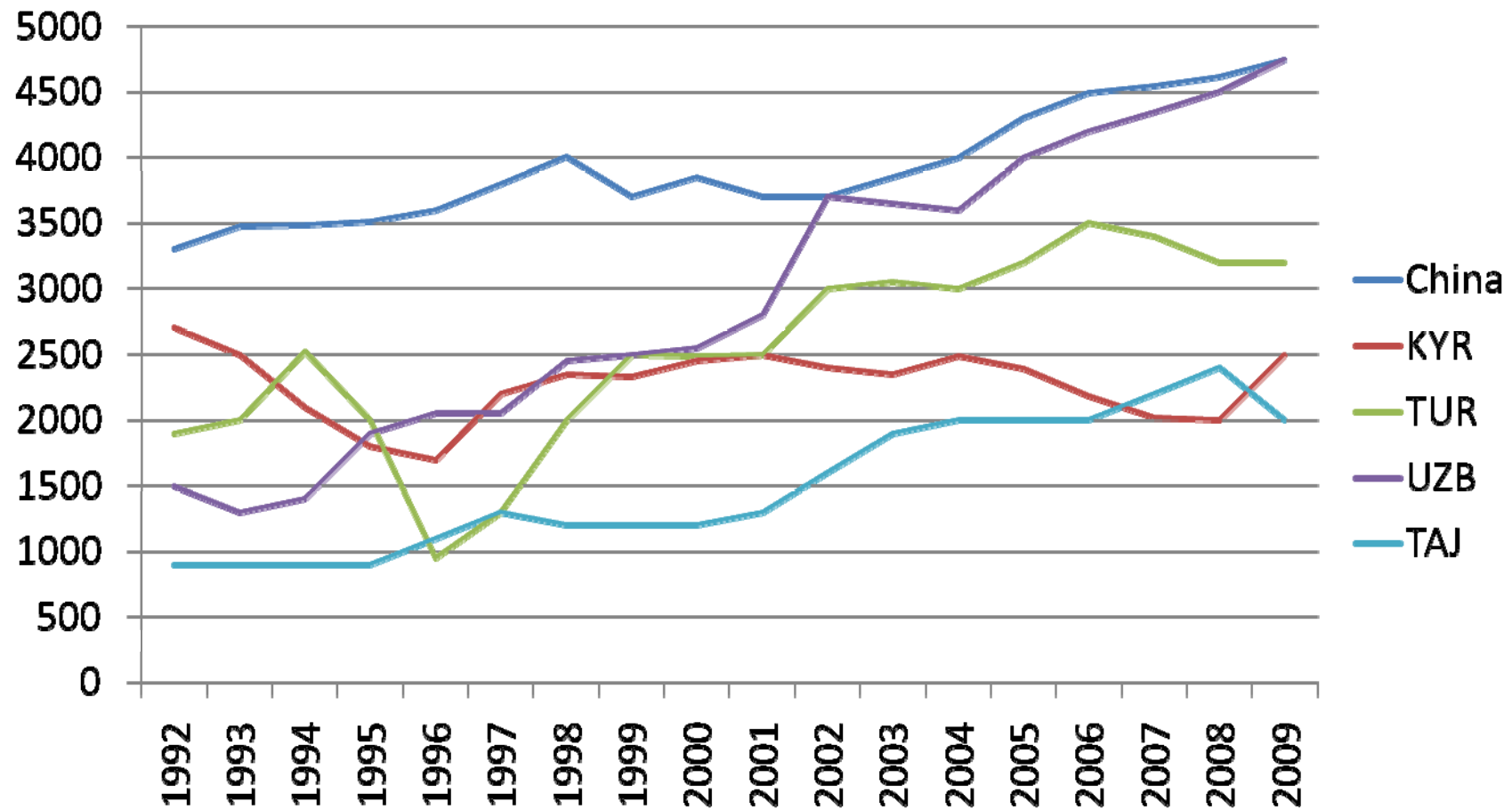


- 70 % of the population of CAC
- Land area about 4.1 million square km, of which 14% under arable and permanent crops
- About two-thirds are drylands with low rainfall
- Deserts, mountains and steppes
- Extreme rainfall variability, severe heat and cold
- Predicted temperature increase above global average
- About 30% of the cultivated area in Central Asia is irrigated
- Largest irrigation area in the world

Economic and policy drivers

- Independence from the former Soviet Union 20 years ago
- All countries adopted a new course towards market economy, with different models – and experiences – of socio-economic development
- Land reforms with varying scope and depth
- Property rights reform and farm restructuring
- High labor migration
- Old infrastructures (especially irrigation)
- The state policy of each of the countries includes as a strategic goal food security associated with self-sufficiency in wheat production to secure the economic sovereignty

Potential to improve crop yields (kg/ha)



(Z. Akramov & Shreedhar, IFPRI, 2012)

Rural populations

- Agriculture employs between **20-50%** of the population
- Farming is the primary source of income in rural areas
- Farm privatization: a new class of farmers with limited access to knowledge, skills and capital
- Difficult access to markets
- Access to machinery, fertilizers and other inputs has deteriorated
- Limited agricultural extension services
- Growing and predominantly rural populations expect secure income options, stable and healthy food supply under the changing environmental and socio-economic conditions

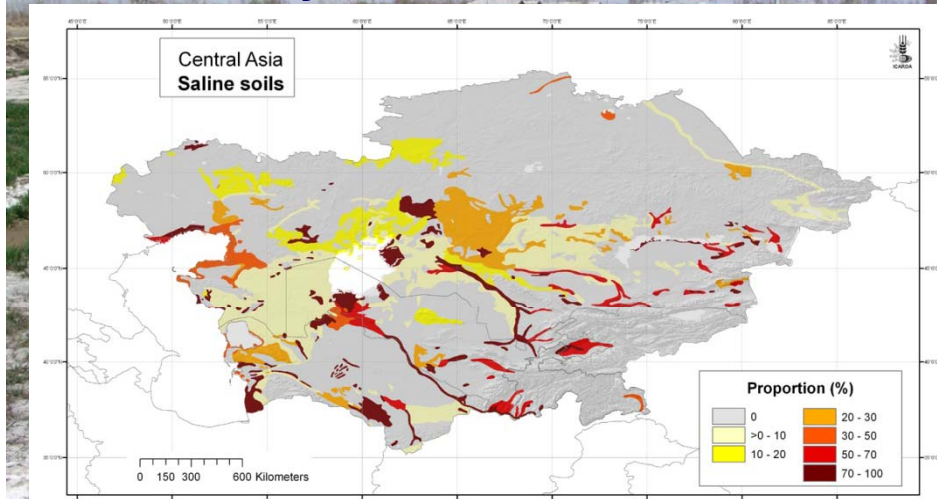
Degradation of land and water resources

- Land degradation occurs widely and is associated with soil erosion, low soil fertility and high salinity of soils
- In the lower Amudarya basin, the specific problems of waterlogging and salinity cover almost 90% of the area that is under irrigation
- The yields of wheat, the main food crop, are very low due to the secondary salinization of the soils, caused by seepage losses from earthen canals, very low permeability of the sub-soils, poor natural drainage of excess water, and inadequate artificial drainage infrastructure
- Over-irrigation leads to almost 50% of the water lost to either open drainage system or the shallow watertable

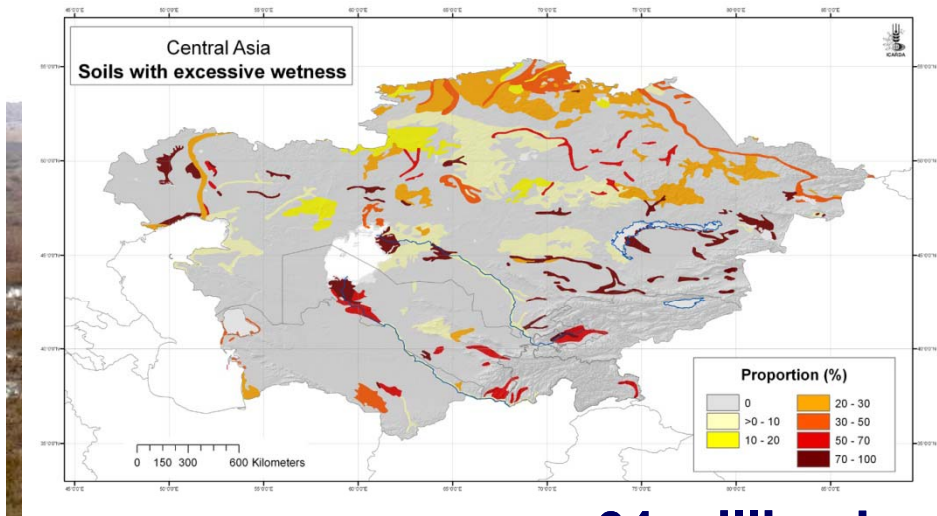
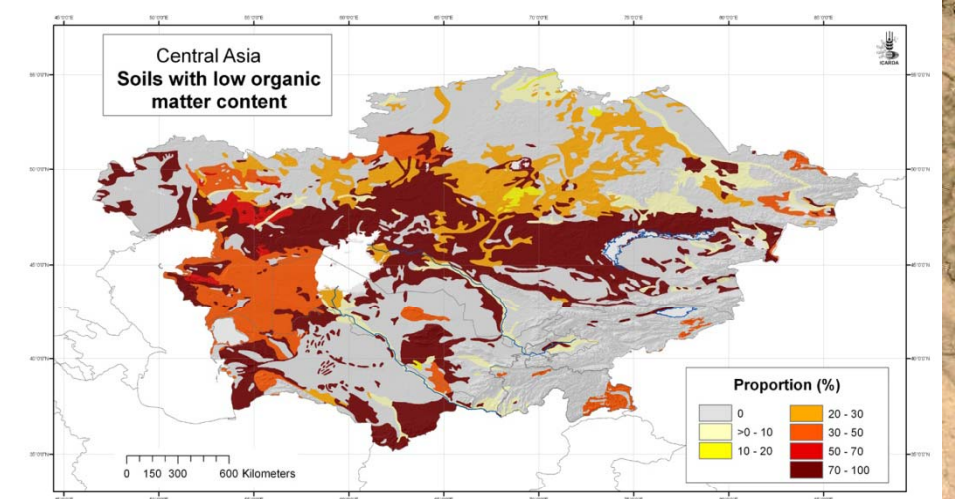
Land degradation

Soil salinity

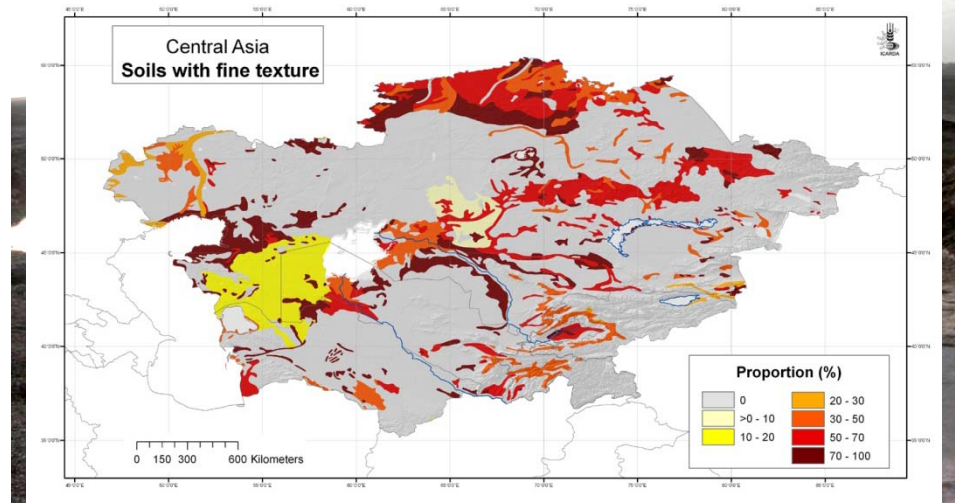
36 million ha



Low soil fertility



64 million ha



19 million ha

Soil erosion

Shallow groundwater

(E. de Pauw, ICARDA 2008)

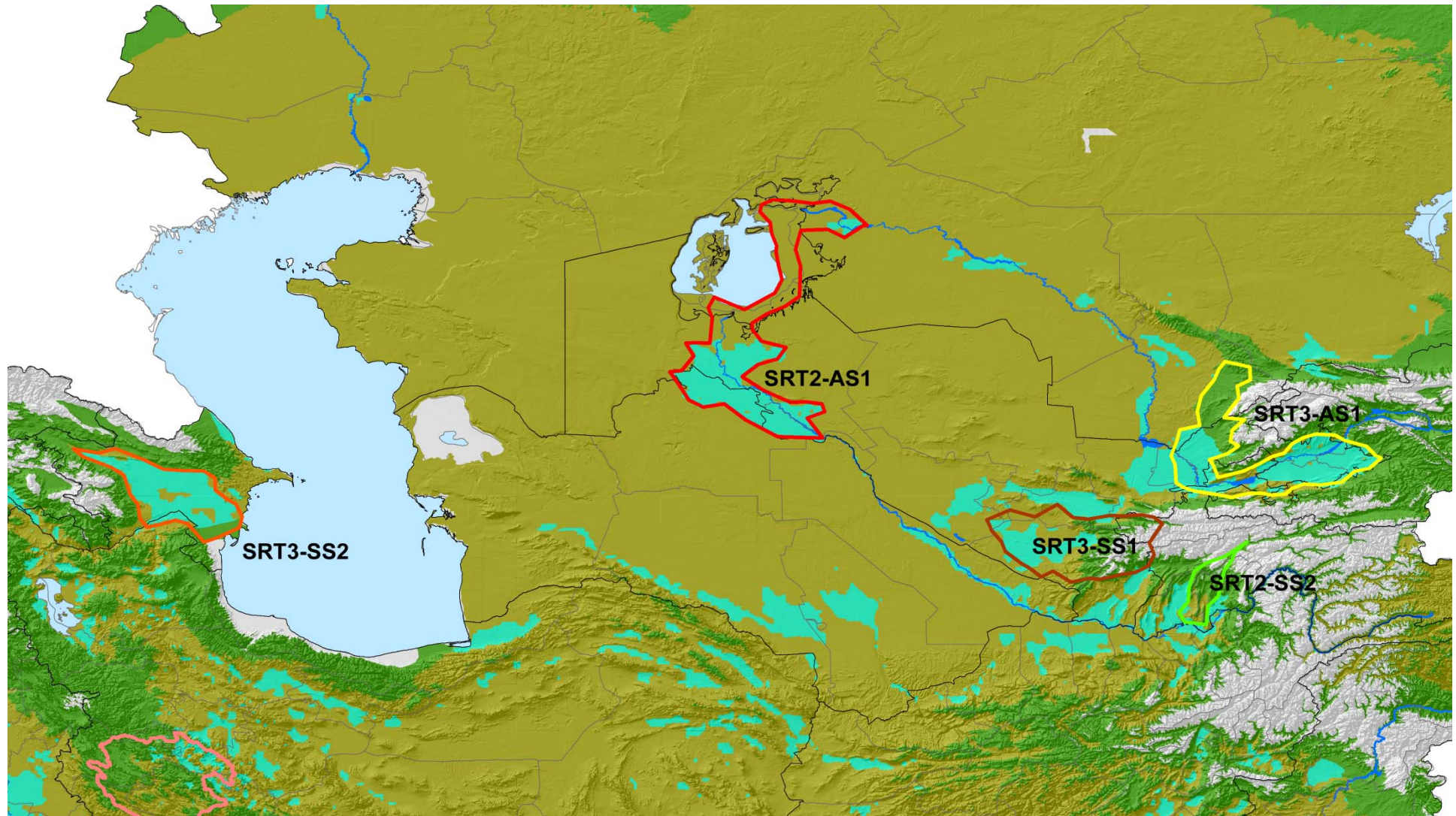
Feasible solutions

- **Under these harsh conditions, the application of water-use efficient techniques and proper soil and crop management practices becomes essential.**
- **It is also necessary to use highly productive crop varieties that can be grown under local production systems, are tolerant to biotic and abiotic stress and meet market requirements of the local population.**
- **An enabling policy and institutional environment is key factor for their implementation**
- **Access of farmers to new technologies**

CRP 1.1 “Dryland Systems”: What is new?

- **The CRP1.1 sees it as its prime objective to study and provide options for reducing vulnerability and managing risk in the production systems characterized by land degradation, severe socio-economic conditions, health risks and no viable development alternatives.**
- **The CRP1.1 will also seek most effective ways of improving the competitiveness of small production systems by sustainable intensification and by diversification.**
- **In the process, it will consider the opportunities for woman in these transitions.**
- **Multilateral and interdisciplinary approach combined with site-specific implementation plans**
- **Action Sites: broad and diverse enough to capture a significant part of the diversity within the benchmark area**
- **Gradients within Sites**

Action Sites and Satellite Sites



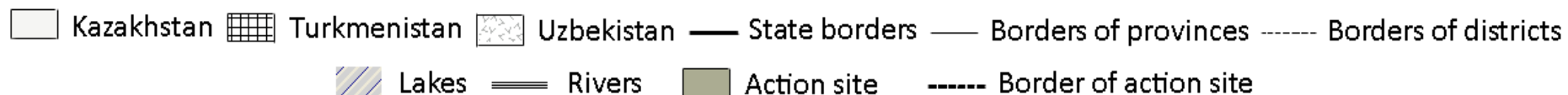
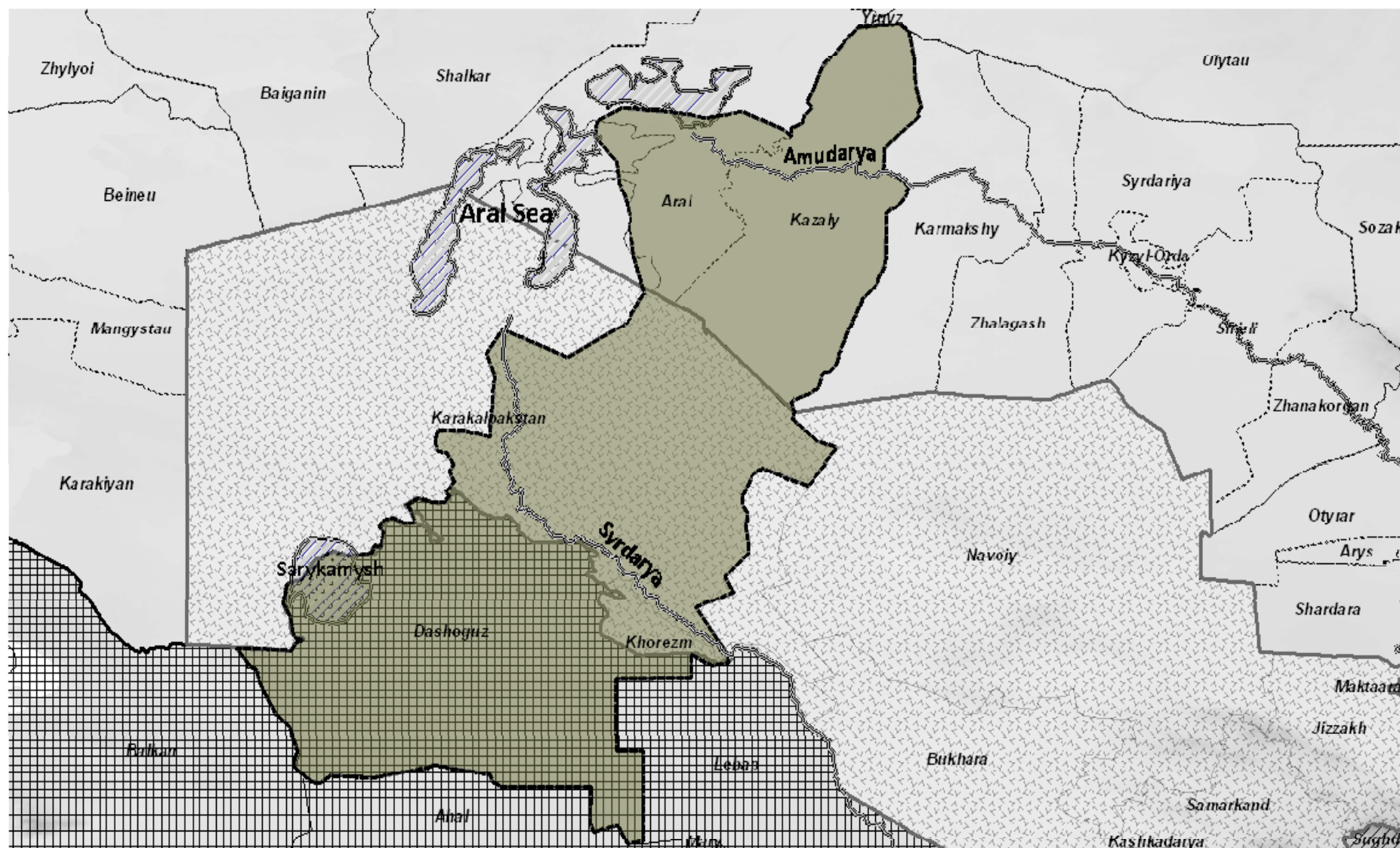
Population in Action Sites

Site	Population, 000'	% of rural population
Fergana Valley	12 957.4	50.2
Rasht Valley	286.9	97
Aral Sea	5 238.2	55.3

Action Sites under “SRT-2”

- **Two trans-boundary Action Sites meeting the conditions of Strategic Research Theme 2 (SRT-2 “Reducing vulnerability”) were identified, namely the Aral Sea Region and the Rasht Valley**
- **They constitute the upper reaches of Amudarya river (Rasht Valley in Tajikistan and to a small extent in Kyrgyzstan) and the lower reaches of both Amudarya and Syrdarya rivers (Aral Sea Region stretching from Turkmenistan through Uzbekistan to Kazakhstan)**

SRT2. Action site 1: Aral Sea region



Key characteristics

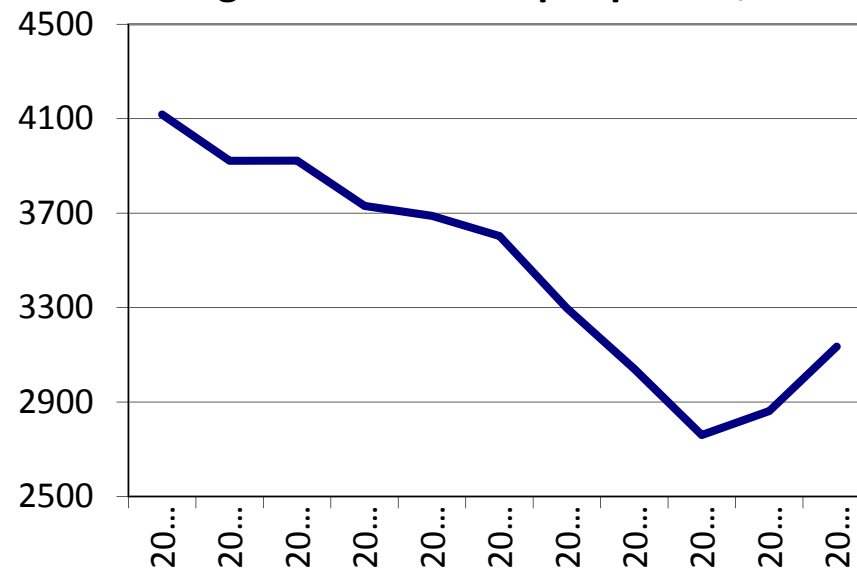
- High degree of desertification, salinization of soils
- Research infrastructures available
- High potential for support and up-take of research outputs by Governments, international development cooperation agencies
- Large trans-boundary area representative for the Aral Sea Basin (lowland)
- High relevance for similar systems in other Regions
- ***Soils: Results of chemical compound analysis for 2007-2009 have shown following properties of salinity: 0-30 cm - low salinity on 25% from total area; average salinity 35%, high salinity 20%, very high salinity 20%. In these areas reclamation of soils for agriculture would be very difficult [from CRP1.1 Site Characterization Data].***

Types of agricultural / non agricultural land in Aral Sea Region site, 000 ha

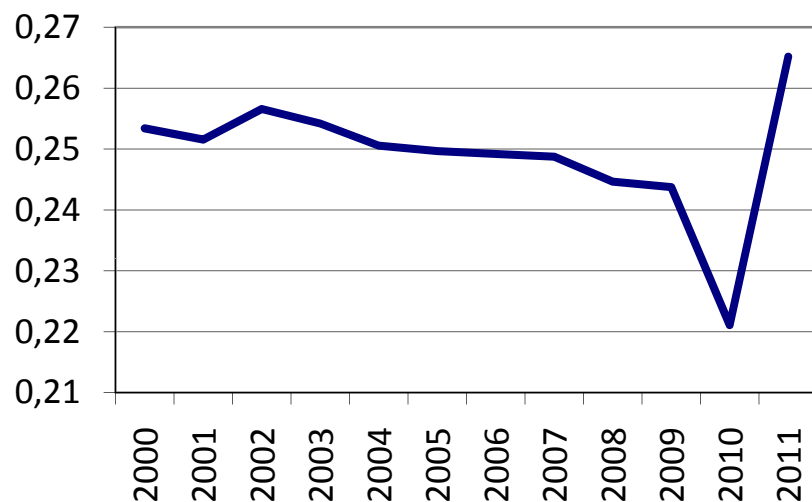
Total area	43478.8
Farmlands	1448.5
Arable land	616
Perennial plantings	521.5
Pastures	9588.6
Rivers and water reservoirs, canals	10815.6
Roads	510.5
Buildings and settlements	1044
Unused land	18934.1

***Water and land use in
Aral Sea Region [from
CRP1.1 Site
Characterization Data]***

Irrigation water use per person, m3



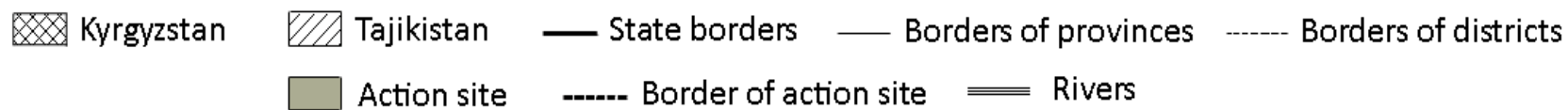
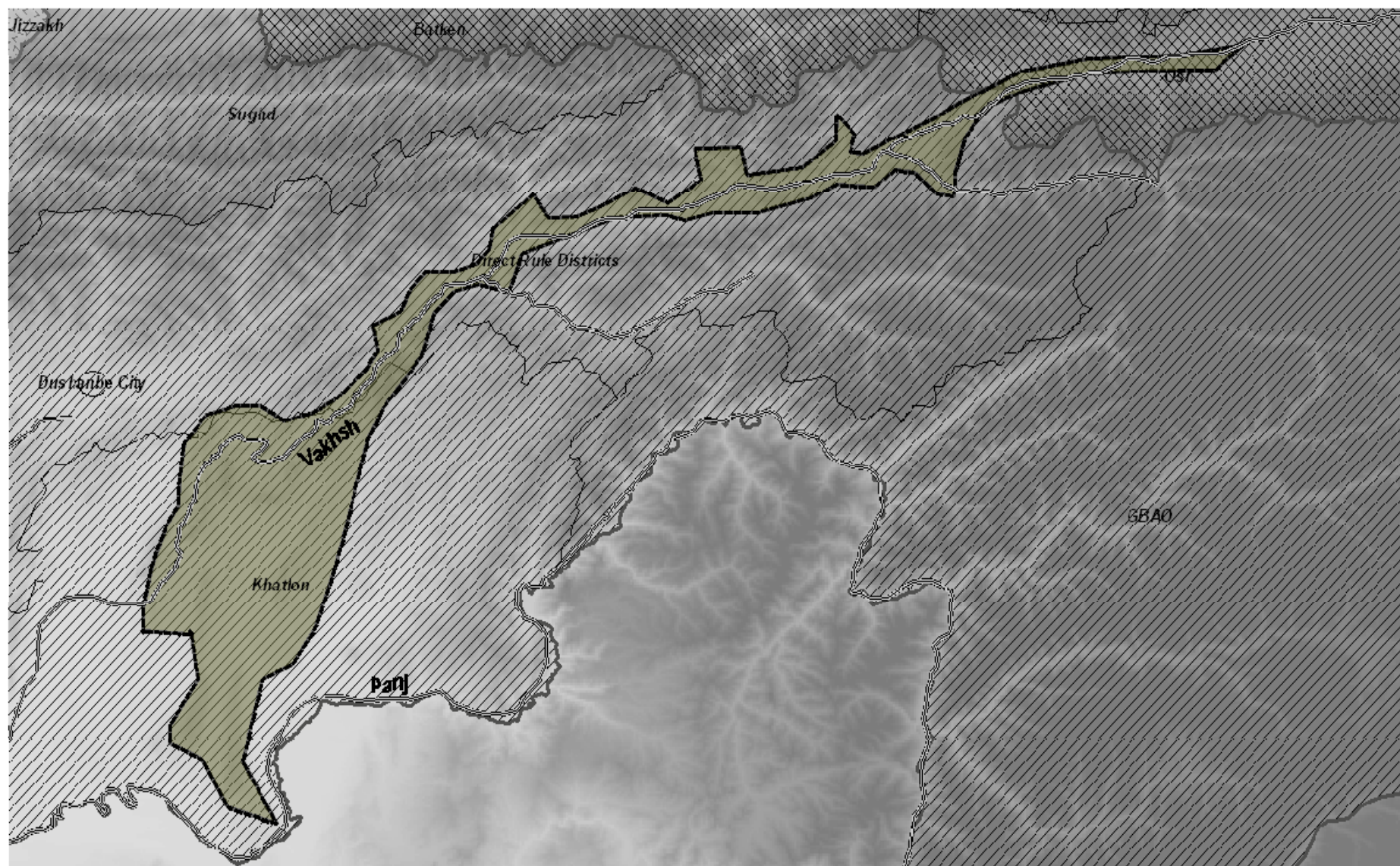
Irrigated area per person, ha



Irrigation norm, m3/ha



SRT2. Action site 2: Rasht Valley



Key characteristics

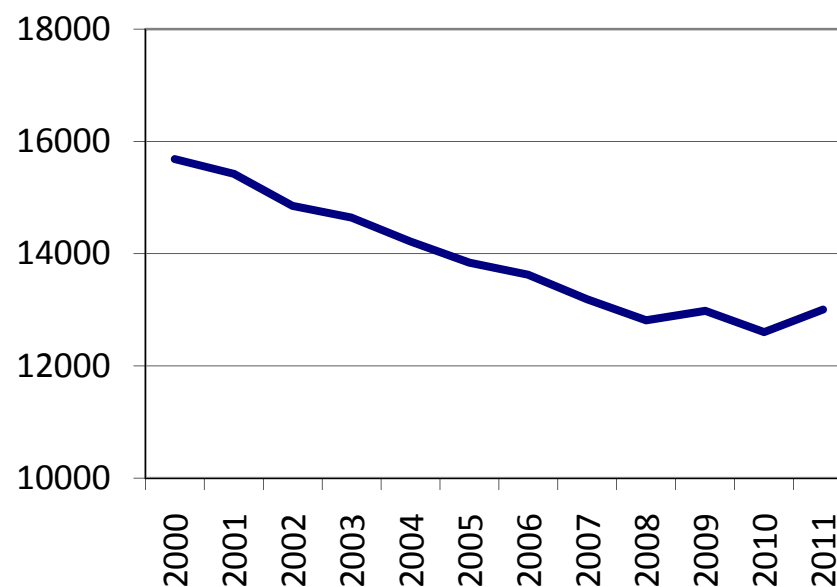
- Severe socio-economic conditions, high migration of men labor, barter trade, effects of glacier melting accelerated by climate change, large-scale erosion
- Local research station, good accessibility
- High attention from Government and development agencies
- Typical of arid mountains, vertical zonation with degraded pastures
- High relevance for mountain agro-ecosystems globally. Seed multiplication hub for potato, alfalfa and other crops.

Types of agricultural / non agricultural land in Rasht Valley site, 000 ha

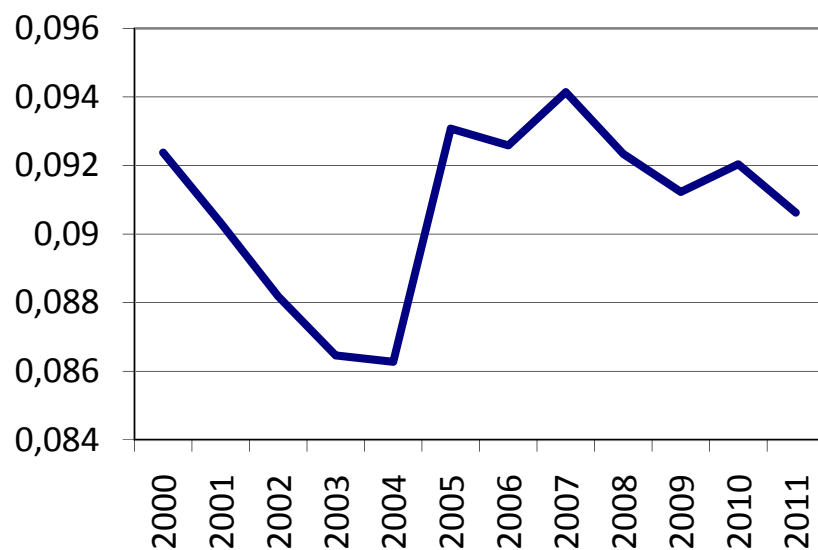
Total area	1682.9.
Agricultural land total	586.1
Arable land	13.5
Perennial plantings	3.1
Pastures	516.2
Hay making	2.2
Rivers	21.4
Roads	2.8
Buildings and settlements	3.2

***Water and land use in
Rasht Valley [from
CRP1.1 Site
Characterization Data]***

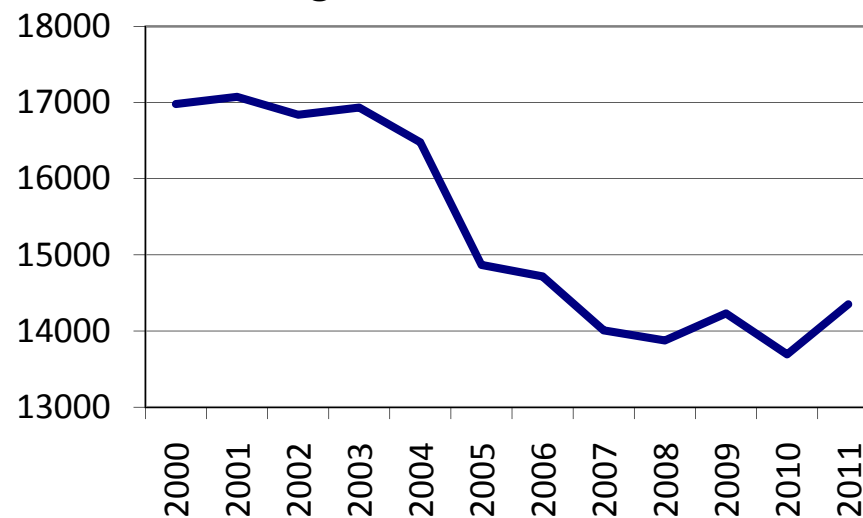
Irrigation water use per person, m3



Irrigated area per person, ha



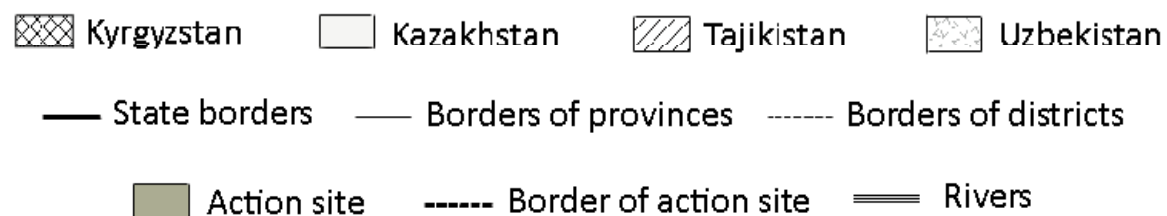
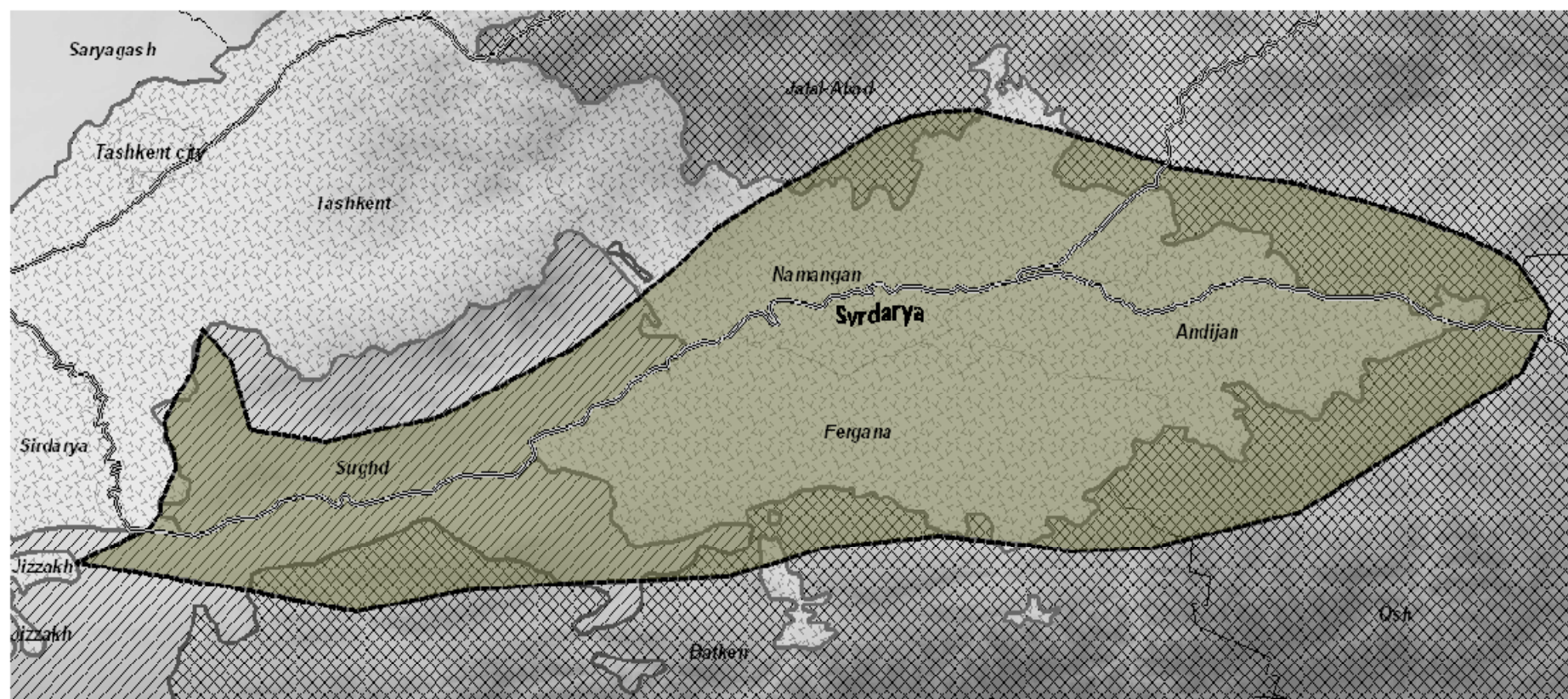
Irrigation norm, m3/ha



Action Site under “SRT-3”

- **Fergana Valley was identified as the Action Site where most impact can be achieved in terms of sustainable intensification (SRT-3). It is a trans-boundary valley between Kyrgyzstan, Tajikistan and Uzbekistan, characterized by environmental and socio-economic conditions that could lead to generating significant income for the local population.**
- **Water available for irrigation, the options to diversify cotton-wheat-livestock production system with vegetable and fruit growing characterized by high and unique agrobiodiversity, along with good research infrastructures and transport facilities are some of the factors that could lead to increasing livelihoods of the local population.**

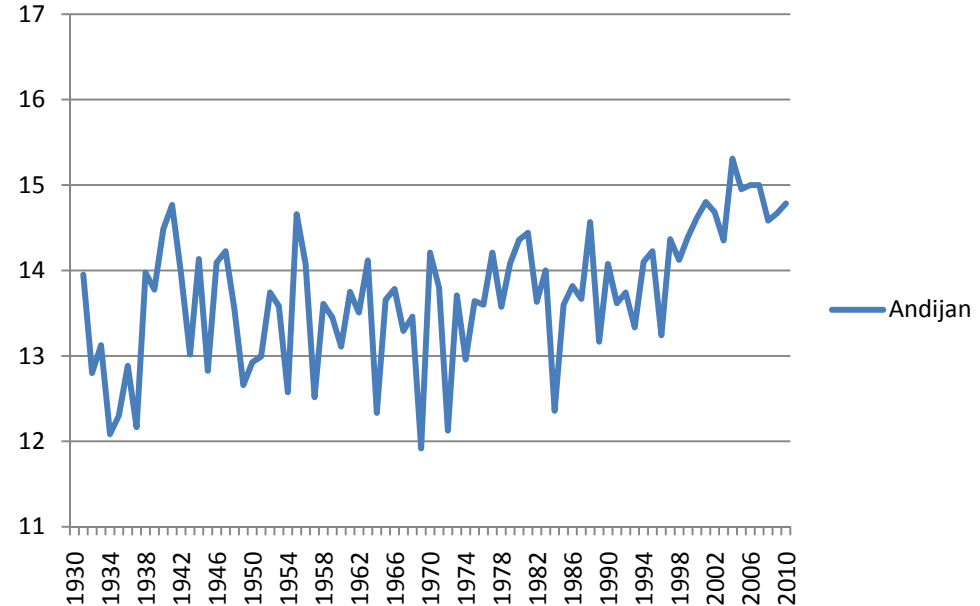
SRT3. Action site 1: Fergana Valley



Key characteristics

- Specific, favorable environmental conditions, productive area, availability of water
- High number of institutes and research stations
- Good transport infrastructure
- High potential for out-scaling of research outputs, synergies with many ongoing projects

***Mean annual
temperature series
in Andijan province
[from CRP1.1 Site
Characterization
Data].***

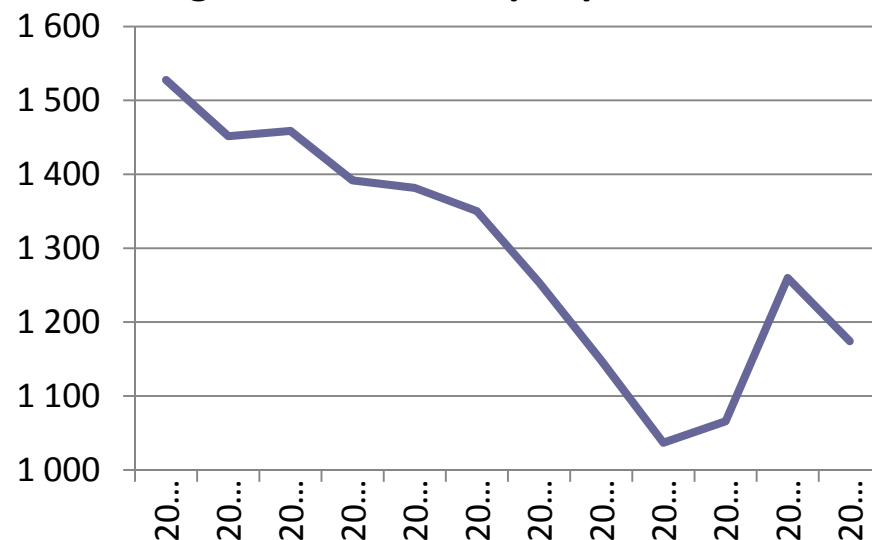


Types of agricultural / non agricultural land in Fergana Valley site, 000 ha

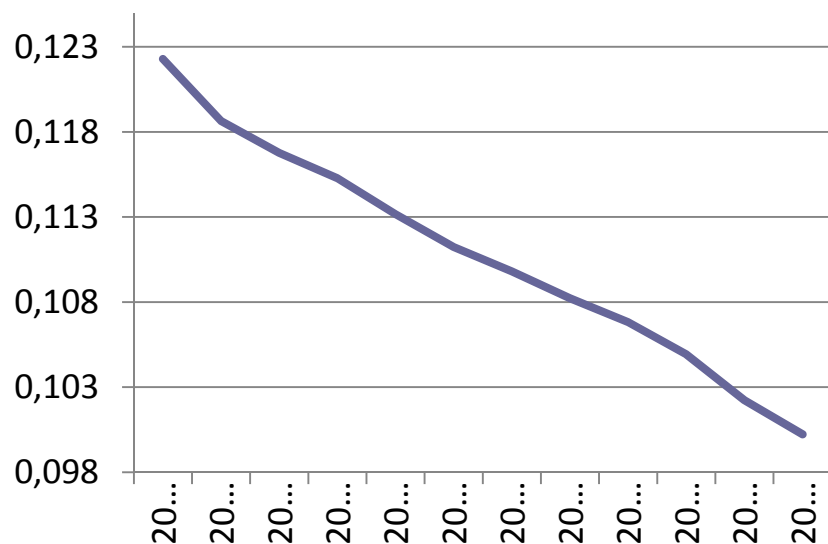
Total area	8858.3
Arable land	1342.4
Perennial plantings	112.1
Pastures	3800.4
Rivers and reservoirs. canals	90.3
Roads	36.1
Buildings and settlements	61.0
Unused lands	5950.6

***Water and land use in
Fergana Valley [from
CRP1.1 Site
Characterization Data]***

Irrigation water use per person, m3



Irrigated area per person, ha



Irrigation norm, m3/ha



Research Hypothesis 1

- **Development and adoption of an innovative knowledge platform for integrated land conservation, watersheds management in upper and lower reaches of the Amudarya and the lower reaches of Syrdarya will lead to improved institutional functioning and responses in addressing agricultural constraints (for rangelands and irrigated agriculture).**

Research Hypothesis 2

- **Improved options and practices for integrated water and land resources management, increased diversity portfolio (including neglected and underutilized species) adapted to soil salinity in target cotton-wheat-rice-livestock production system will increase soil and environmental health, sustainable agriculture productivity, improve diets and food nutrition, and increase employment in the Aral Sea Region.**

Research Hypothesis 3

- **Increased diversification of the mixed production system integrating horticulture, agro-forestry, value addition and market access will enhance water productivity, human nutrition and livelihood of rural women and men, thus increasing employment in Rasht Valley and in neighboring areas.**

Research Hypothesis 4

- **In addition, a system analysis integrating bio-economic modeling for optimum scenarios will enable out-scaling for agro-pastoral and mixed most vulnerable production systems.**

Research Hypothesis 5

- **Development and adaptation of an innovative knowledge platform for addressing constraints in agricultural production will increase institutional functioning and livelihoods in Fergana Valley.**

Research Hypothesis 6

- **A policy framework ensuring land security of agricultural producers, improved access to market, information, technologies will promote sustainable agriculture and improve rural welfare.**

Research Hypothesis 7

- **Innovative and combined policy, institutional and technological approaches to optimize water productivity and equitable allocation will lead to sustainable intensification of the cotton-wheat-livestock production system in Fergana Valley.**

Research Hypothesis 8

- **Diversification of the characteristic vegetable-horticultural-potato production system through IPPM, improved seed and processing systems, marketing and adequate policies will increase nutrition and livelihoods of rural women and men and reduce environmental and social risks in Fergana Valley.**

Research Hypothesis 9

- **Integrating environmental and socio-economic analysis will help to develop optimal scenarios for trade-off resolution and up- and out-scaling in similar production systems of the CAC Region and globally.**

Moving towards implementation

- **Establishing a solid baseline:**
 - **Inventory of stakeholders and institutions**
 - **Market systems**
 - **Database of natural resources**
 - **Development of watershed map, maps of water user associations and rangeland boundaries**
 - **Analyses of the baseline data and impact studies**
- **The factors influencing an effective uptake of a given technology will be examined and impacts established using quantitative analyses through randomized control trials, wherever possible.**

Regional Inception Workshop

- **Action and Satellite Sites initially identified at global workshop in Nairobi, in June 2011**
- **Site Characterization form translated into Russian, adapted for terminology and conceptual differences, electronic format**
- **Interim Interdisciplinary Research Team constituted**
- **Focal points/ information sources (13) identified**
- **CRP1.1 consultant with the focal points collected, collated data**
- **Preparatory meeting 14-16 May 2012**
- **Resources:**
 - **USD 0.3 million in ongoing projects**
 - **USD 5.5 million in 'pipeline' projects (submitted to donors)**
 - **USD 1.5 million per annum new funding for CRP1.1 implementation in Central Asia (Russian Federation)**

Regional Inception Workshop

- 1. Discussion and adoption of specific research hypotheses for the Action Sites, based upon a problem analysis of the key constraints and challenges**
- 2. Review of impact pathways based upon problem analysis, successful interventions, and identified research-for-development gaps**
- 3. Validation of Action Sites and Satellite Sites**
- 4. Review and agreement on initial activities for three years proposed in each Action Site**
- 5. Confirmation of partners' roles**
- 6. Validation of implementation plan with impact indicators;**
- 7. Review and completion of CRP1.1 Site Characterization Data**

Regional Inception Workshop

Documentation:

- **Action Site Characterization Data including maps (CD-ROM)**
- **Rationale and Research Hypotheses**
- **Outputs and Activities**