Poverty and Environment Initiative (PEI)

THE ECONOMICS OF LAND DEGRADATION FOR THE AGRICULTURAL SECTOR IN TAJIKISTAN

Consultation on findings & recommendations

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Outline of talk

- Objectives of Study
- Overview of Land Degradation in Tajikistan & Implications for Agriculture
- Conceptual methodology framework
- Macro assessment of costs of land degradation
- Pilot studies
- Recommendations

Objectives of study

- Develop a methodological framework for assessing the economic impact of land degradation, with a focus on the agricultural sector
- Collate data relevant to economic assessment (national, regional, sample districts)
- Undertake an initial assessment of the costs of land degradation 6 districts
- Make recommendations for future research

The agricultural sector - key indicators

- Accounted for more than one-third of overall economic growth 1998-1994
- Contributed 18% to GDP in 2010
- Contributed 18% to export revenue
- Is the country's main employer (60%)
- Agriculture is the platform for improving local livelihoods and tackling poverty
  - 43% of rural population is living below US$2.15 per day
  - Undernourishment rates are 30%

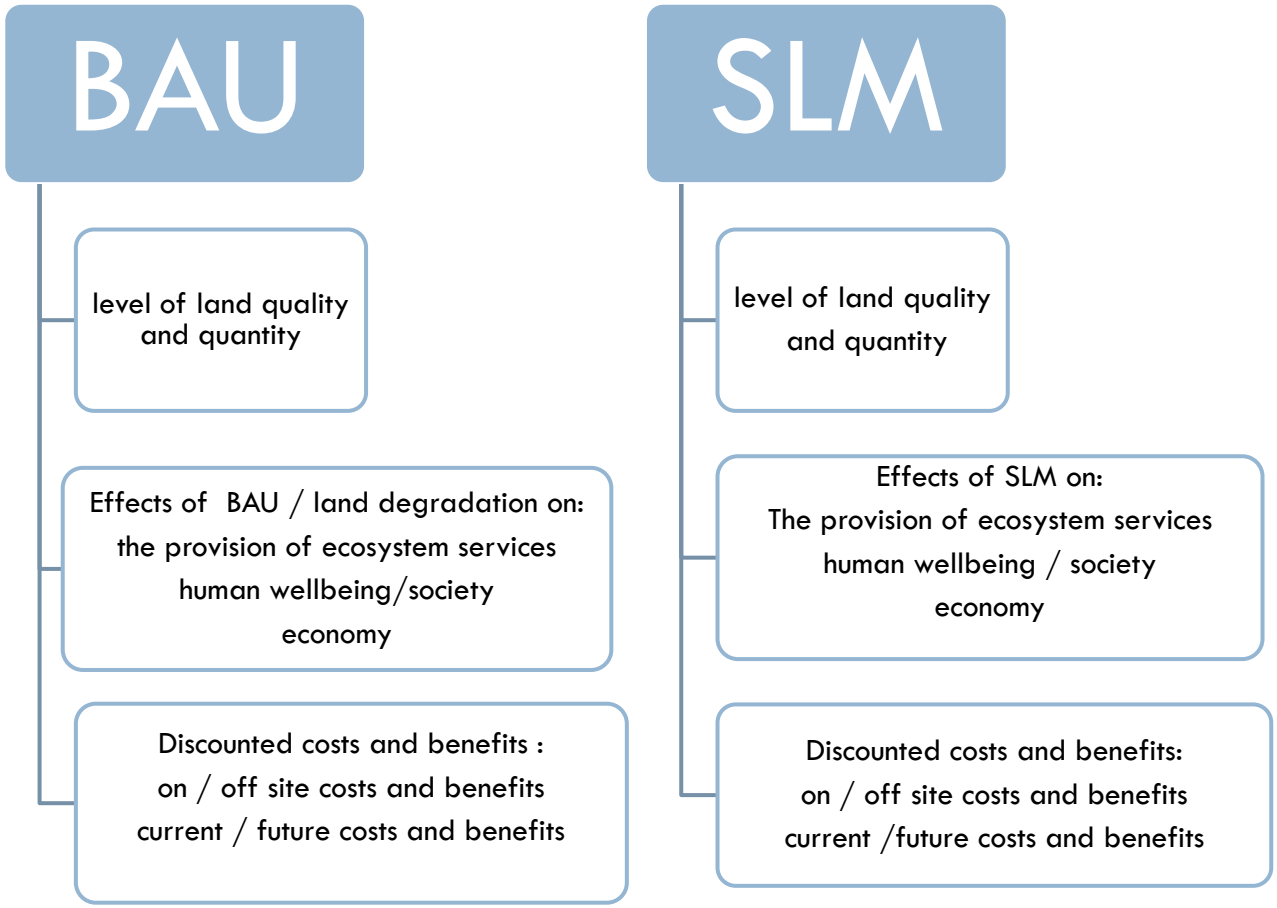
Agricultural land degradation

- Only 7% of country suitable for agriculture
- 97% of agricultural land suffers some levels of erosion
- '..the current situation with regard to the extent and degree of degraded land in Tajikistan is unknown and that despite continued reports of massive land degradation there is no statistical evidence of significant abandonment of agricultural land' Wolfgramm et al, 2011

Main causes on land degradation

- Unsustainable agricultural practices:
  - Agricultural production on steep slopes / marginal land
  - Poor water management / irrigation practices (water-logging & salinization)
  - Overgrazing
- Deforestation

Conceptual framework - the costs of land degradation / benefits of sustainable land management



Key features of methodology

- Ecosystem Services Approach
- Consideration of economic, social and environmental impacts ***on and off site***
- Recognises the importance of temporal aspects
- Applicable at different scales
- Recommends reporting of key macro indicators

Preliminary macro assessment of the economic cost of land degradation

- What is the current cost to the economy of agricultural land degradation?

On-site and offsite costs of land degradation

On site costs	Off-site costs
Losses of crop yield Increased costs of remedial measures • Increased use of fertilizers to replace lost nutrients • Adoption of less erosive but more costly management practices • Repairs of damaged structures • Disruption to site operations Loss of soil carbon	Property damage Run-off, sedimentation and nitrification • Deterioration of water quality • Sedimentation of hydropower reservoirs and irrigation reservoirs • Treatment costs of downstream users • Impact of flow modulation and frequency resulting in flood damage • Impacts on navigation • Health impacts related to reduced water quality • Deterioration of recreation and amenity values • Habitat degradation Dust nuisance Visual detraction

Utilization of arable land 1980-2009
Source: Wolfgramm *et al*, 2011

	Total sown, ‘000ha	Arable land (incl fallow) 000 ha	Ratio of sown to arable, %
1980	763.6	845	90
1985	802.8	859	93
1990	824.2	873.3	94
1995	758.0	865.1	88
1998	827.6	879.1	94
2000	864.3	881.7	98
2003	886.9	865.3	102
2006	900.2	897.7	100
2007	891.1	891.4	100
2008	888.9	889.0	100
2009	875.1	884.6	99

Land out of production - GOSKOMZEM (State Committee on Land Management of Tajikistan)

	Area out of use (ha)		Reason why land is out of use								
	Total	Irrigated Land	Salinization & over watering	Irrigation infrastructure damage	Flooding	Lack of amelioration activities	Repairing of water supply equipment	Water shortage	Drought	Inappropriate farming practices	
										Total	Irrigated land
RRS	2,044	241	0	10	0	0	0	103	1,194	738	128
Sughd Region	8,751	7,716	136	105	9	0	38	6,123	0	2,340	1,305
Khatlon Region	11,128	6,922	1,595	1,782	27	898	0	1,646	1,629	3,550	974
Total in Republic 2011	**21,923**	**14,880**	**1,731**	**1,897**	**36**	**898**	**38**	**7,872**	**2,822**	**6,628**	**2,407**
Total 2009-10	19,290	15,297	2,114	3,245	148	880	166	6,426	na	6,311	2,518
Total 2007-8	14,272	12,209	1,280	1,914	32	704	0	7,526	n.a	2,816	753
Total 2005-6	6,256	5,220	480	39	601	0	0	4,653	n.a	483	0

Value of production lost due to degraded land out

	Productivity tons per ha / year	price per ton / Somoni, 2010 prices	value per ha / year (Somoni)	ha unused	Value of lost production Sonmoni (year)	Value of lost production US$ (year)
Cotton	2	3,734	7,468	218,232	1,629,756,576	370,399,211
Grain	3	1,400	4200	218,232	916,574,400	208,312,364

Value of lost productivity on cultivated land

- Data from the Ministry of Agriculture shows an increase in the productivity for the majority of crops over the period 2005-2009, including cotton.
- Based on the crops seen to suffer a fall in productivity over the period – that is corn for seed, rice, other grains and tobacco, the value of lost production is estimated at **607million Somoni per year (US$138 million) in 2009.**

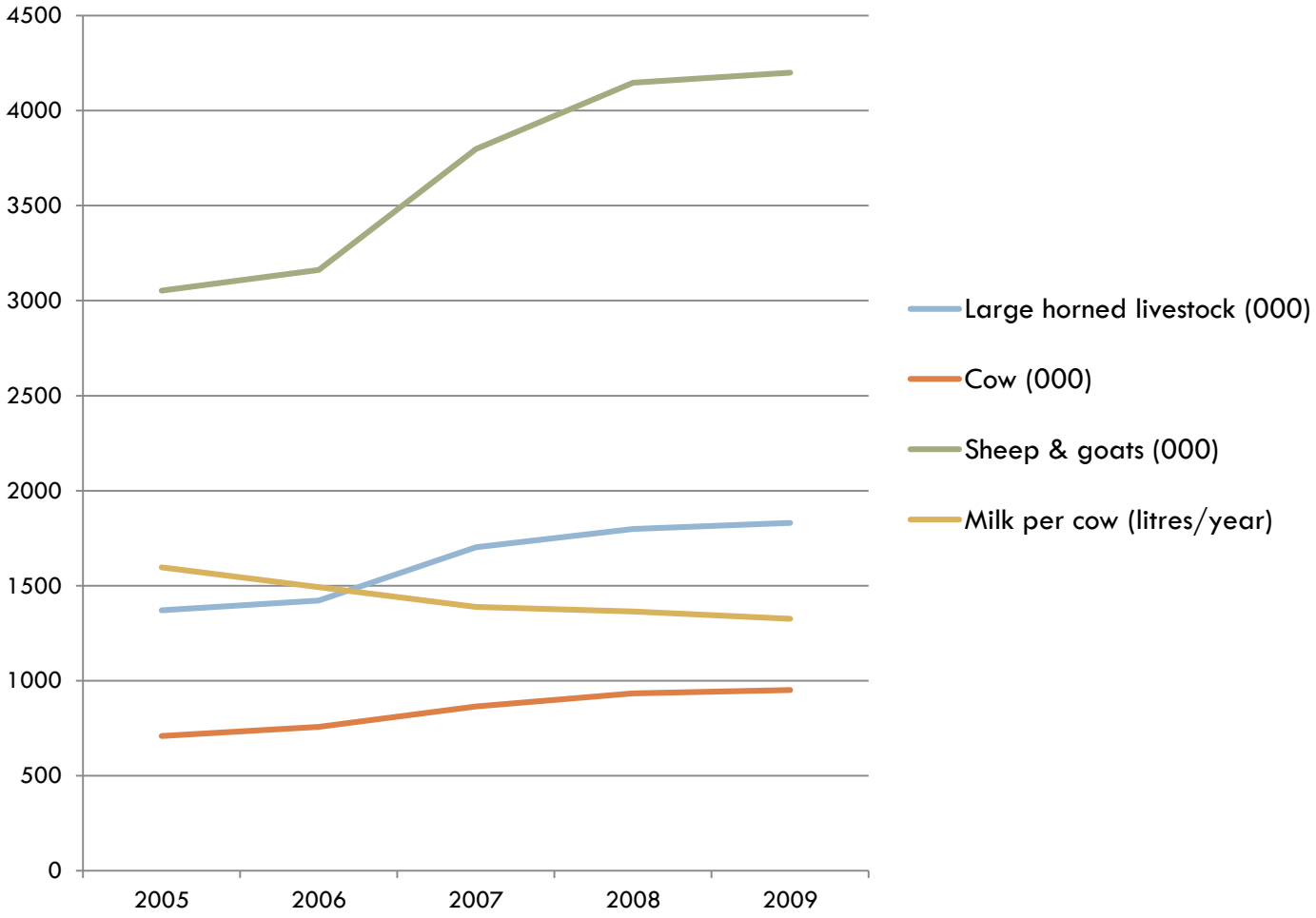
Key Indicators of the MWRLR's Preventative Improvements Programme for 2010-2014

Regions and oblasts	Total area of lands in poor condition before 01.01.2005 (ha)	Area of lands subject to ameliorative condition improvement (ha)	Total cost of works (TJS / '000)	Financing Sources		
				Water supply services (TJS / '000)	Central budget (TJS / '000)	Local budget (TJS / '000
Kurgan-Tyube zone	17,840	17,840	12,488	2,498	3,747	6,244
Kulyab zone	4,340	4,340	3,038	607	911	1,519
Khatlon oblast	22,180	22,180	15,526	3,105	4,658	7,763
Sughd oblast	20,020	20,020	14,014	2,803	4,204	7,007
RRS	6,800	6,800	4,760	952	1,428	2,380
Total in the republic	**49,000**	**49,000**	34,300 (US$7,795)	6,860	**10,290**	**17,150**
Total in the republic, %	100	100	100	20	30	50

Area of pasture (hectares) 2005-2010. (Ministry of Agriculture)

Type of pastures / year	2005	2006	2007	2008	2009	2010
Total	3,806,241	3,806,241	3,857,776	3,856,246	3,856,246	3,854,742
Irrigated	3,407	3,407	3,407	3,404	3,404	3,623
Dry	3,802,834	3,802,834	3,854,369	3,852,842	3,852,842	3,851,119

Livestock numbers & milk productivity 2005-9 (Ministry of Agriculture)



Value of Lost Milk Productivity

- Milk production has declined by 271 liters a cow per year over the period 2005-2009.
- The value of this lost production is estimated at US$95, 924, 700 per year.
- This assumes: lost milk production of 271 liters per cow per year * 951,000 cows = 257, 721 liters = 265, 452 metric tons * market price = 1,590 somoni per ton = 422, 068, 680 somoni (US$95,924, 700)

Preliminary cost of land degradation

- **Total annual on-site costs amount to 1,946 million Somoni (US$346 million) *or 7.8% of GDP based on the Tajikistan's GDP for 2010 of 24,704 million***
- In addition an expenditure of US$7.8 million is planned to improved 49,000 hectares of degraded agricultural lands between 2010-2014 (US$159 per hectare).
- Does not include off-site costs

Pilot Studies

Pilot Study - Zafarobod, Ghonchi, Istaravshan Objectives

- Undertaken a qualitative characterization of the impact of land degradation on agriculture for each district.
- Collate available data that can be used to inform an economic assessment of land degradation for each district
- Where possible undertaken an assessment of the cost of the different types of land degradation for each district
- Identify key data gaps and priority areas for future research

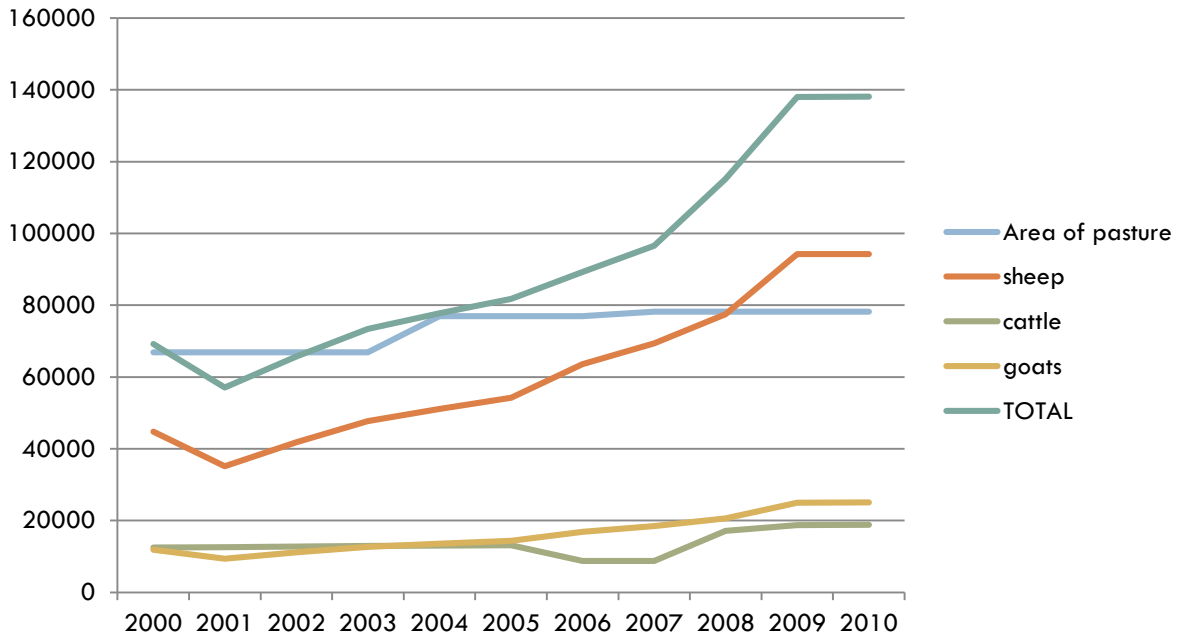
Key findings

- Returns on labour are low (Hannah and Orr 2011)
- No statistical evidence of declines in productivity & area under production has increase in 2 of the districts
- Number of livestock has seen dramatic increase – but this has not affected productivity
- Water management is a key issue

Pilot Study – summary of results

	Zafarabod	Istaravshan	Ghonchi
Arable land			
Area of area 2000-2010	↑ 20%	↓ 1.3%	↑ 26%
Productivity of key crops 2000-2010	↑	↑	↑
Value of lost productivity on unused land / 2010	US$646,265 (1,209 hectares)	US$401,443 (751 hectares)	US$259,554 ((682 hectares)
Pasture			
Area of pasture 2000 - 2010	↓ 6.5%	↓ 25%	↑ 17%
Number of livestock 2000-2010	↑ Sheep 30% Cattle/goats 10%	↑ Sheep 104% Cattle/goats 1.7%	↑ Sheep 100% Cattle/goats 50%
Milk productivity 2000-2010	*stable*	↑	↑
Meat productivity 2000-2010	n.a	↓	↑

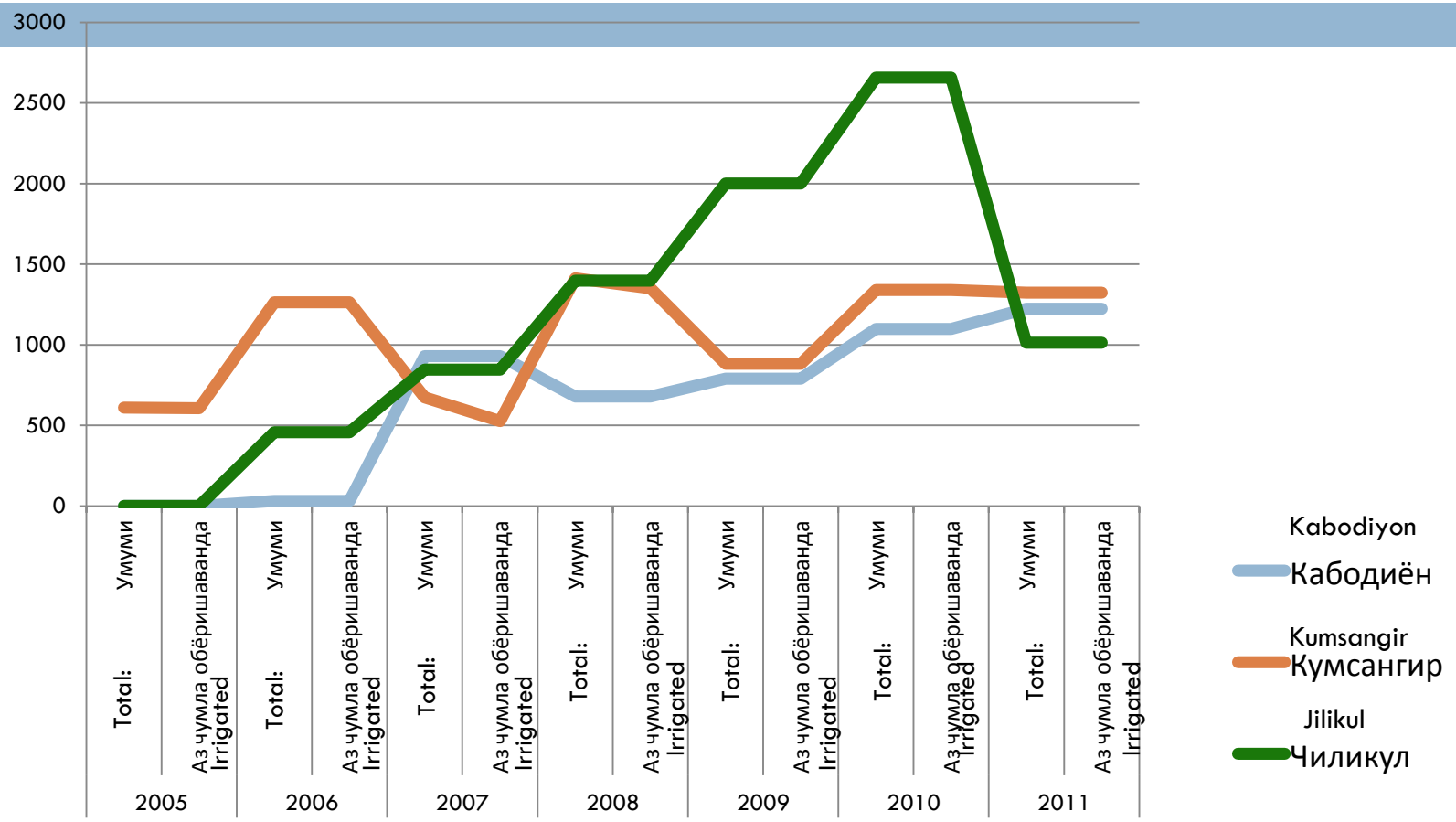
Ghonchi - Area of pasture and livestock numbers 2000-2010



LAND DEGRADATION AND FARMERS INCOME DECREASE

Rahmon Shukurov, National Consultant

Area of arable lands out of use, hectare

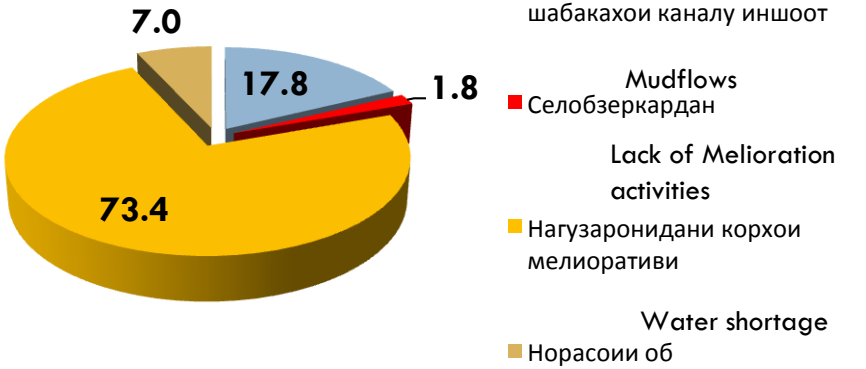


Main causes of arable land out of use

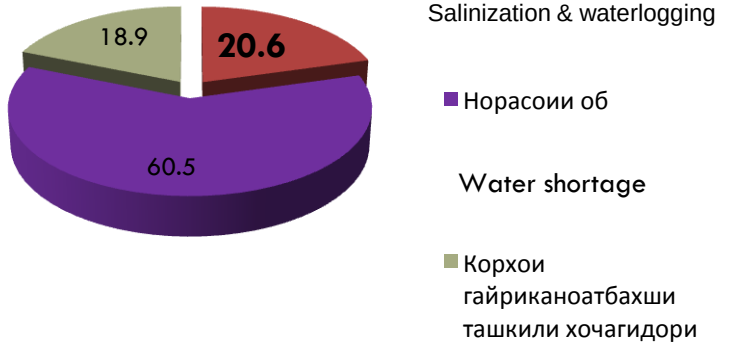
- Salinization & water logging
- Mudflows
- Lack of melioration activities
- Irrigation infrastructure under reconstruction
- Irrigation infrastructure out of order
- Water shortage
- Drought
- Inappropriate farming practices

Main causes:

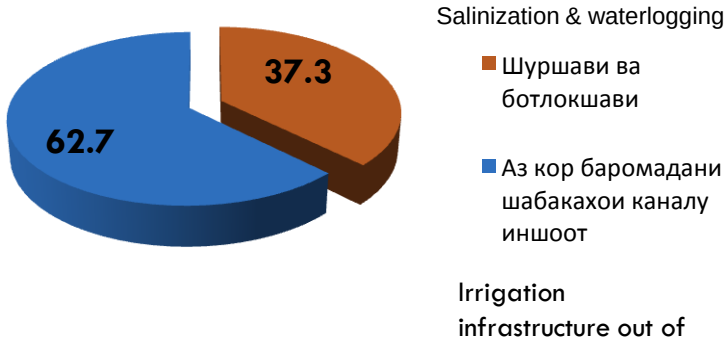
Qubodiyon, %



Qumsangir, %



Jilikul, %



Prognosis on lost income from degraded lands, 2009

District	Qubodiyon	Qumsangir	Jilikul
Area of out use lands, hectare	1223	1323	1013

		Cotton	Wheat	Vegetable
Productivity, 100kg/hectare		14,9	32,0	174,0
Price for 100kg per unit, Somoni		360	140	77
Income form hectare, thousand TJS		5,364	4,48	13,398
Loss Income, thousand TJS	Qubodiyon	6560	5479	16386
	Qumsangir	7097	5927	17726
	Jilikul	5434	4538	13572
Expense, total, thousand TJS	Qubodiyon	4586	1835	6247
	Qumsangir	4961	1985	6758
	Jilikul	3799	1520	5174
Net income, thousand TJS	Qubodiyon	1974	3645	10139
	Qumsangir	2135	3943	10968
	Jilikul	1635	3019	8398

Key Findings and Recommendations

Key findings

- **Tajikistan's economy and the livelihoods of rural communities is underpinned by the agriculture sector.** Therefore the quality of agricultural land in Tajikistan is of paramount concern.
- **Agriculture has been, and could continue to be, the engine for growth.** This is illustrated through the pilot studies – in Istaravshan agriculture has contributed 70% of GDP over the period 2000-2010; GDP of the district has grown by 74%.
- Available estimates suggest that **erosion and soil degradation are important problems in** Tajikistan but data difficult to access

Key findings - national level assessment

- Based on a high level assessment the **on-site costs** of land degradation associated with lost productivity on unused lands and declines in the productivity of four crops and milk production is **US$212.8 million per year – *7.8% of GDP based on the Tajikistan's GDP for 2010 of 24,704 million.***
- Overestimate - gross rather than net value
- Underestimate due to:
  - many crops in Tajikistan demonstrate low average production levels relative to international standards, this may be partly as a result of land degradation and so losses in production across all crop types (including those that have shown an increase in recent years) could be included
  - farmers may be undertaking **expenditures** on fertiliser to offset declines in productivity and some of the declines in productivity may also be being offset by expenditure by International Organisations
  - Does not include the **off-site costs** of agricultural land degradation – these include the contribution of degraded pastures to floods and landslides which have imposed significant costs to land, property and human life over the past decade and are set to increase, and the cost of siltation of reservoirs used for irrigation and electricity production.
- Further research is required to refine these estimates

Recommendations to improve the economic evidence base

- **Data management**
- **Generation of key physical data**
  - the rate of soil loss across the country and factors contributing to this soil loss
  - the relationship between soil loss and crop productivity
  - soil fertility levels and relationship to crop productivity
  - carbon sequestration rates of different soils and under different management practices
  - bio-physical impacts of soil erosion and sedimentation. For example, the proportion of flood damage that can be directly attributed to soil erosion
  - The carrying capacity of different types of pasture

Recommendations (Continued)

- Determining marginal benefits
  - Data on the costs of production
  - Assessment of the economic benefits of SLM
- Analysis for agro-ecologic regions
- More detailed economic analysis
- Farm surveys
- Inclusion of other sectors (e.g., energy, forestry, infrastructure)
- Institutional analysis
- Capacity building
- Inter-disciplinary working

Thank You

- Additional backup slides used in November 1 presentation so already translated

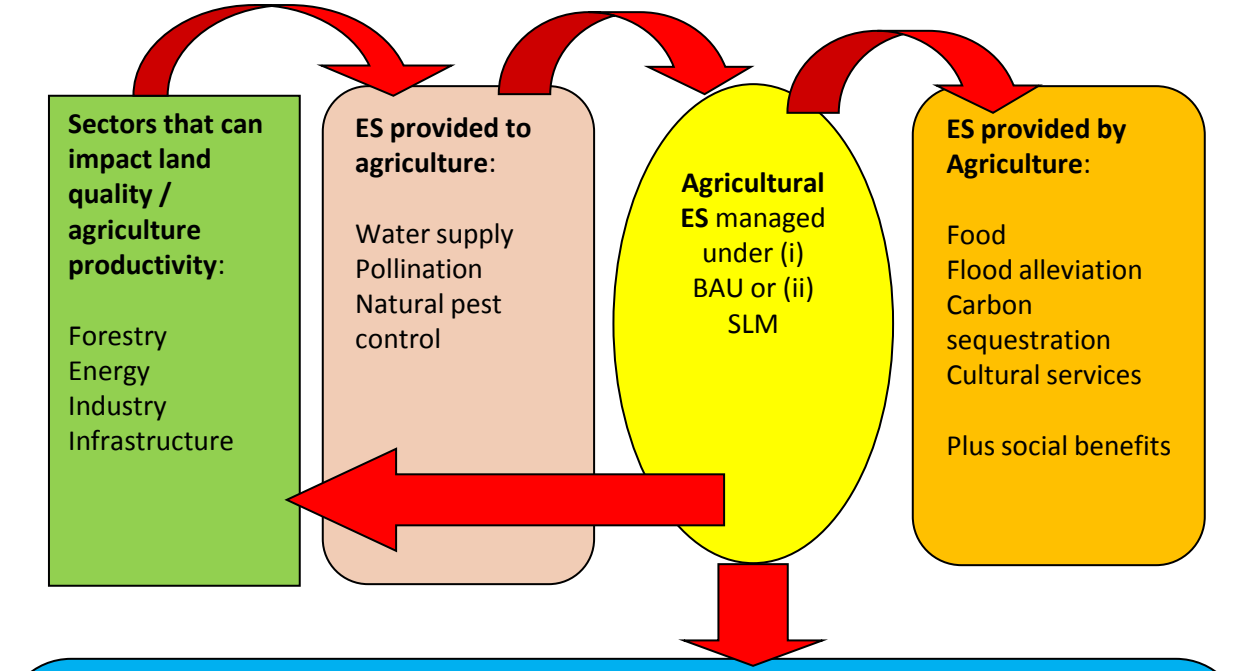
Factors contributing to land degradation

Natural factors	Direct anthropogenic factors	Underlying causes
Heavy rains Steep slopes Acidic soils (that result in soil fertility decline) Arid climates (contribute to salinisation and lowering of the water table)	Overcutting of vegetation Deforestation Overgrazing Inappropriate use of fertilizers Non-adoption of soil conservation practices Mismanagement of canal irrigation Overpumping of groundwater	Inappropriate land tenure Land shortage Population growth Poverty

Typology of Ecosystem Services provided by Agricultural Ecosystems

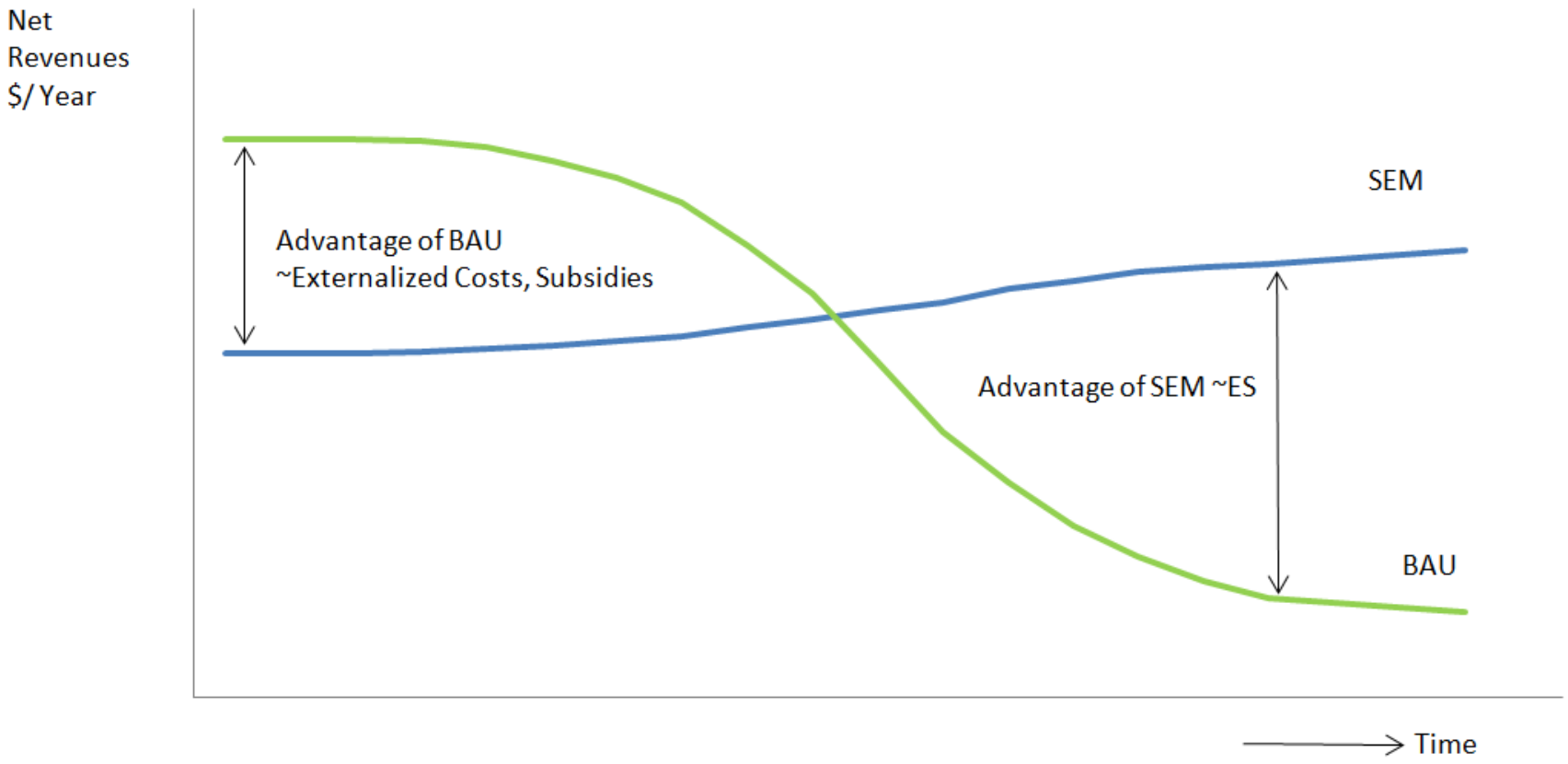
Ecosystem Service category	Service	Benefit / outcome
Provisioning Services	Food	Food
	Fodder	Fodder (Including grass from pastures)
	Biochemical and medicinal resources	Biochemical and medicinal resources
	Genetic resources	Genetic resources
	Amenity service	Provision of attractive housing and living conditions
Regulating Services	Sink for atmospheric carbon dioxide	Carbon capture
	Hydrological services / flood risk regulation	Protection of property, agricultural land, human lives
	Protection against storms	Protection of property, agricultural land, human lives
	Control of erosion and sediments	Maintenance of soil fertility
	Regulation of pest and pathogens	Natural pest control service
Cultural Services	Cultural, spiritual, religious,	Cultural, spiritual, religious, l
	Scientific and educational information	Education
	Tourism and recreation	Tourism and recreation

Interactions between on-site and off-site management practices, the provision of ES and agricultural productivity and land degradation



Step 1: Characterize the land area and determine the context for the assessment	1a. Develop a conceptual understanding of the physical characteristics of the area
	1b. Define the issues.
	1c. Define the BAU and SLM option to be analyzed.
Step 2: Define the scope of the economic assessment	2a. Select ecosystem services for valuation . (qualitative assessment)
Step 3: Quantification of impacts	3 Quantify (in bio physical terms) the impacts of BAU and SLM, taking into consideration both on-site and off-site impacts
Step 4: Undertake valuation of ecosystem services	Derive monetary estimates of the ecosystem services under BAU and SLM using an appropriate valuation approach
Step 5: Analysis of valuation evidence	Aggregation, discounting, sensitivity analysis and distributional analysis
Step 6: Understanding the institutional requirements	Specify the institutional barriers to achieving the optional economic land use

The importance of time



Overgrazing

High level physical impact	Specific impacts	Possible monetary approaches
Loss of soil cover Soil loss	**On site**: • Reduced fodder available leading to lower milk / livestock productivity • Loss of land available for grazing • Reduced carbon sequestration	• Cost of substitute fodder • Δ in milk production × market price • Δ in meat production × market price • Δ in carbon sequestration function × market price of carbon
	Off site: • Siltation of reservoirs resulting in loss energy output or water supply • Changes in runoff leading to flooding / landslides	• Loss of energy output as a result of the reduce life time of reservoir × market price of energy • Impact of flooding on property damage / loss of agricultural land / human life estimated based on replacement cost/ market prices/ Value of life assessments

Poor water management / inadequate drainage infrastructure

High level physical impact	Specific impacts	Possible monetary approaches
Salinization and water logging which affect soil fertility & land available for agriculture	**On site**: • Reduced productivity due to reduce soil fertility • Reduced productivity due to loss of area available for agricultural production	• Δ in productivity × market price of affected crop • Cost of replacing loss nutrients to maintain soil fertility
	Off site: • Siltation of reservoirs resulting in loss energy output and water supply • Low flow rivers resulting in impacts on biodiversity	• Loss of energy output as a result of the reduce life time of reservoir × market price of energy • Loss of water supply × Δ in productivity × market price of affected crop

Intensive agriculture on steep slopes / marginal lands

High level physical impact	Specific impacts	Possible monetary approaches
Soil erosion	**On site**: • Reduced productivity due to reduce soil fertility • Loss of area available for agricultural production	• Δ in productivity × market price of affected crop • Cost of replacing loss nutrients to maintain soil fertility
	Off-site: • Siltation of reservoirs resulting in lost energy output and water supply	• Loss of energy output as a result of the reduce life time of reservoir × market price of energy • Loss of water supply × Δ in productivity × market price of affected crop

Donors

Belgian Development Cooperation	Danish Ministry of Foreign Affairs (DANIDA)
European Commission	Irish Aid
Norwegian Ministry of Foreign Affairs (MFA Norway)	Swedish Environmental Protection Agency (Swedish EPA)
Swedish International Development Cooperation Agency (SIDA)	UK Department for International Development (DFID)
Spanish Ministry of Foreign Affairs and Cooperation	Department of State United States of America