Central Asia experiences In drought management

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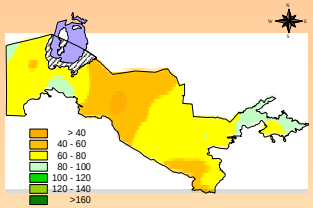
Central Asia

Central Asia is region, where drought is routine condition of life and crop production and agricultural production are adapted to such enormous climatic conditions.

The Basic Indicators of Water and Land Resources Development in the Aral Sea Basin

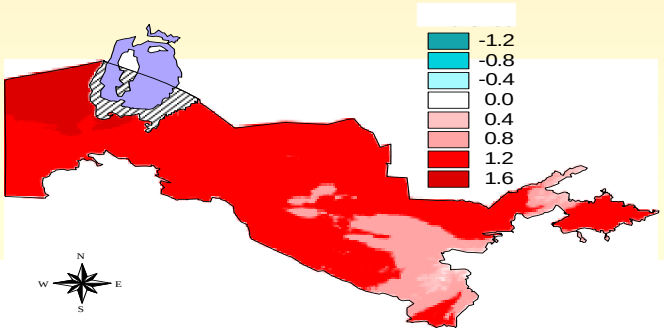
Indicator	Unit	1960	1980	1990	2010	Forecast (2020)	
						Optimistic	Pessimistic
Population	*million*	14,4	26,8	33,6	48.5	54,0	70,0
Irrigated area	*thousand hectares*	4510	6920	7600	8201	9330	9300
Irrigated area per capita	*ha/capita*	0,32	0,26	0,23	0.17	0,17	0,12
Total water withdrawal	*km^3/year*	60,61	120,69	116,27	109.5	104,5	117,0
Including for irrigation	*km^3/year*	56,15	106,79	106,4	91.6	86,8	96,7
Specific withdrawal per 1 hectare	*m^3/ha*	12450	15430	14000	11171	9300	10400
Specific withdrawal per capita	*m^3/capita*	4270	4500	3460	2259	1935	1670
GNP	*bln.USD*	16,1	48,1	74,0	76.7	109	77,0

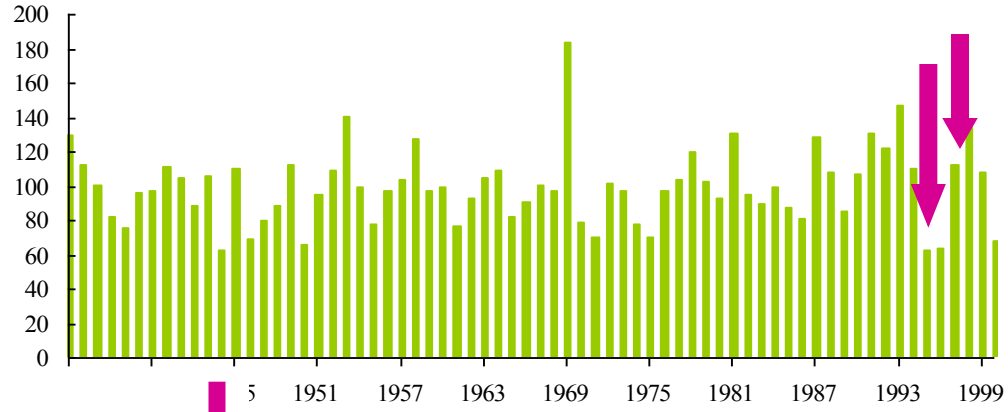
b) Climate change Uzhydromet

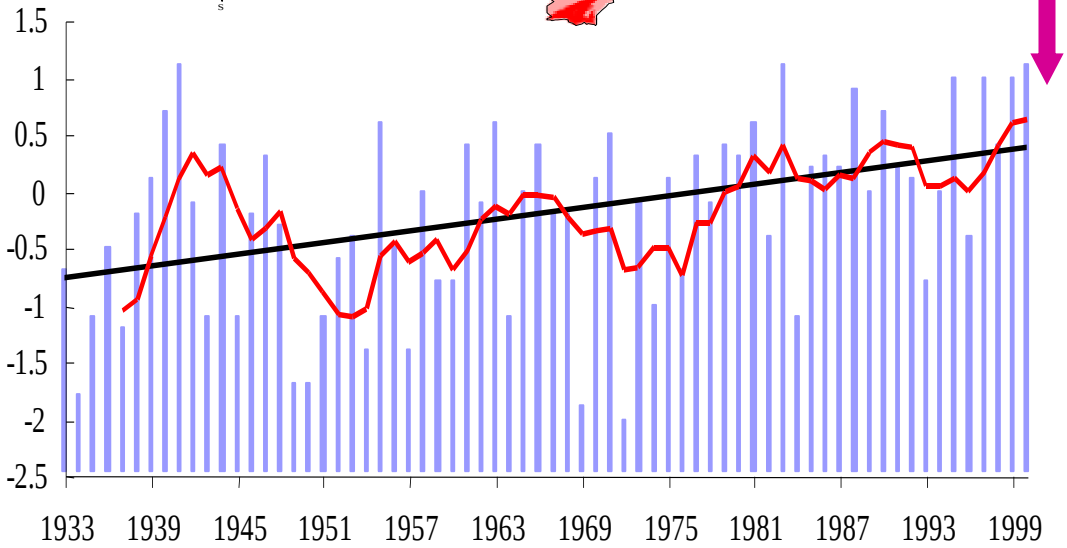


Long-term changes of the annual sums of precipitations

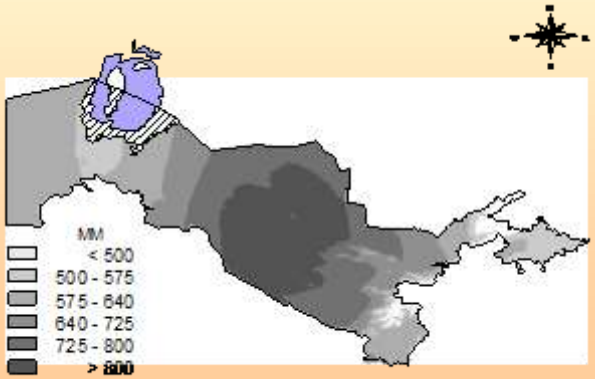
Regional indicators of change of a climate







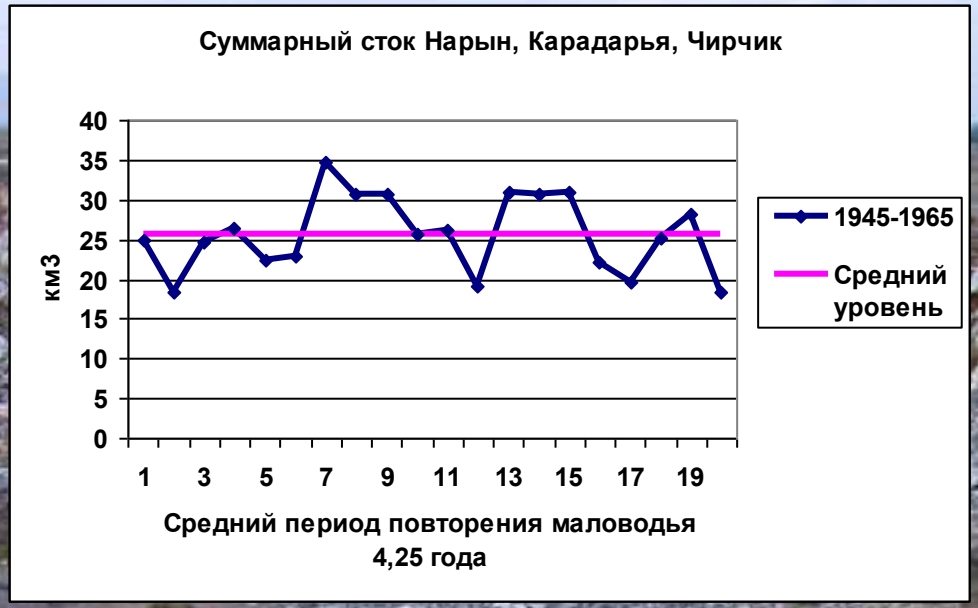
evaporation



Annual national temperatures increased by:

- 0.29 0C every 10 years in Uzbekistan (1950–2005);
- 0.26 0C every 10 years in Kazakhstan (1936–2005);
- 0.18 0C every 10 years in Turkmenistan (1961–1995);
- 0.10 0C every 10 years in Tajikistan (1940–2005);
- 0.08 0C every 10 years in Kyrgyzstan (1883–2005).

Extreme events occurrence

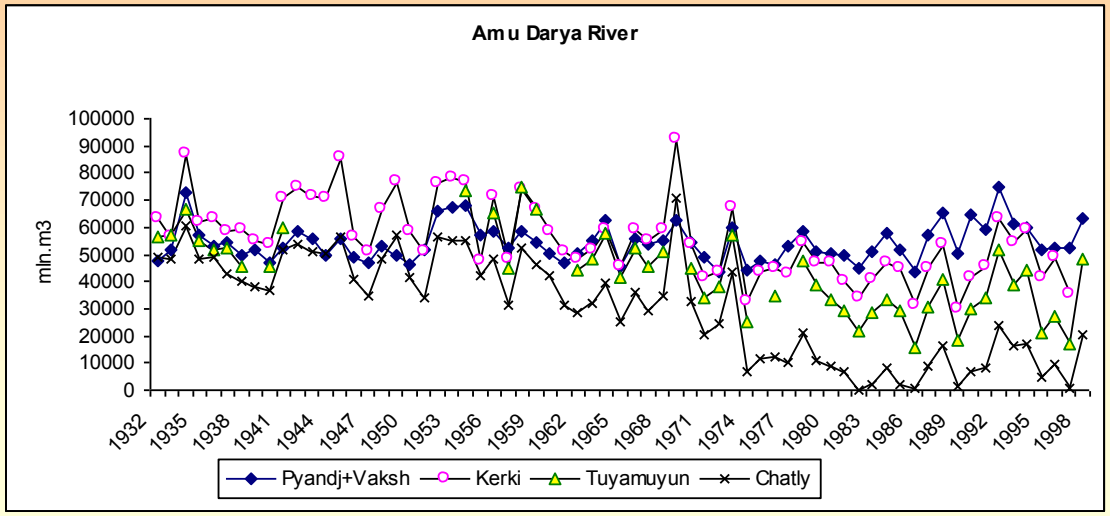


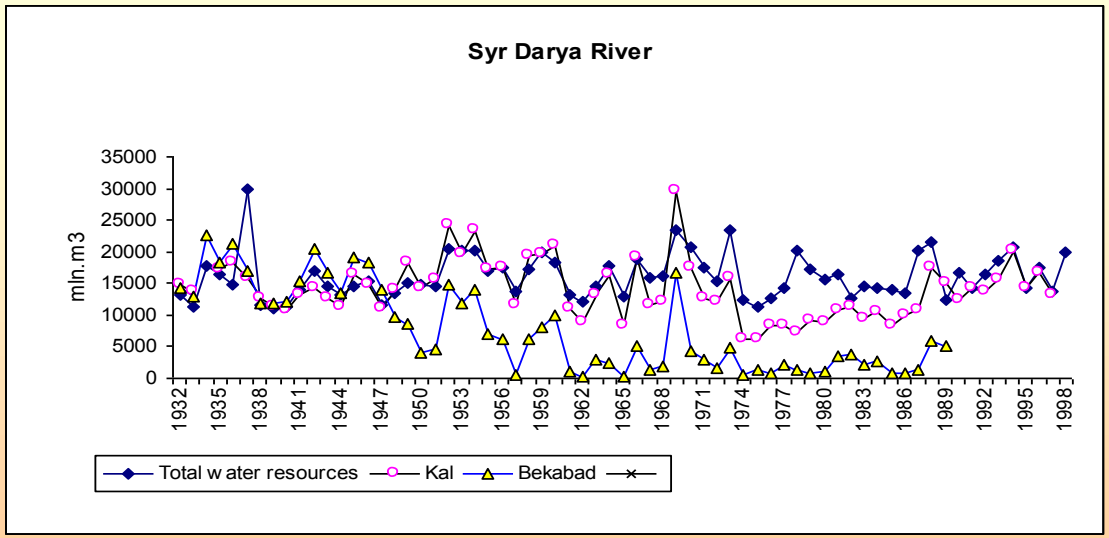
Total Runoff of Naryn, Karadarya and Chirchik Rivers

Frequency of dry year occurrence is 4.25 year on average

Frequency of dry year occurrence is 3 year on average

c) Anthropogenic drought





Most dangerous type of drought it's anthropogenic, manmade, which is caused by wrong methods of water managing, allocation and operation.

Change in landscape on the exposed bed of the Aral Sea

Amudarya channel

Populus Asiana

Tamarix

Change in vegetation. Withered trees and bushes

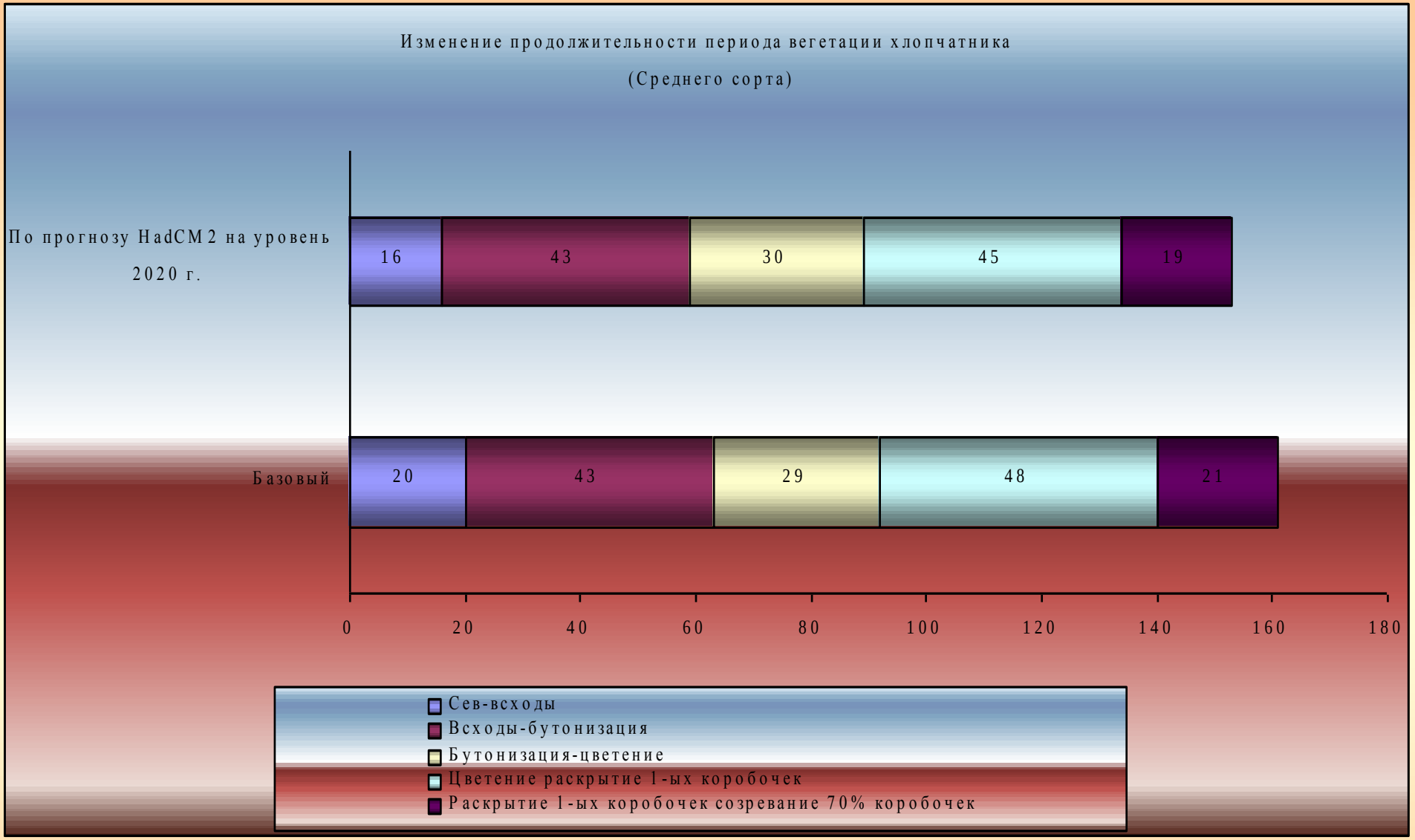
Principal directions of Climate changes program in Central Asia

- Public Awareness
- Adaptation

Forecasting activity and broad information allow designing and implementing adaptive complex.

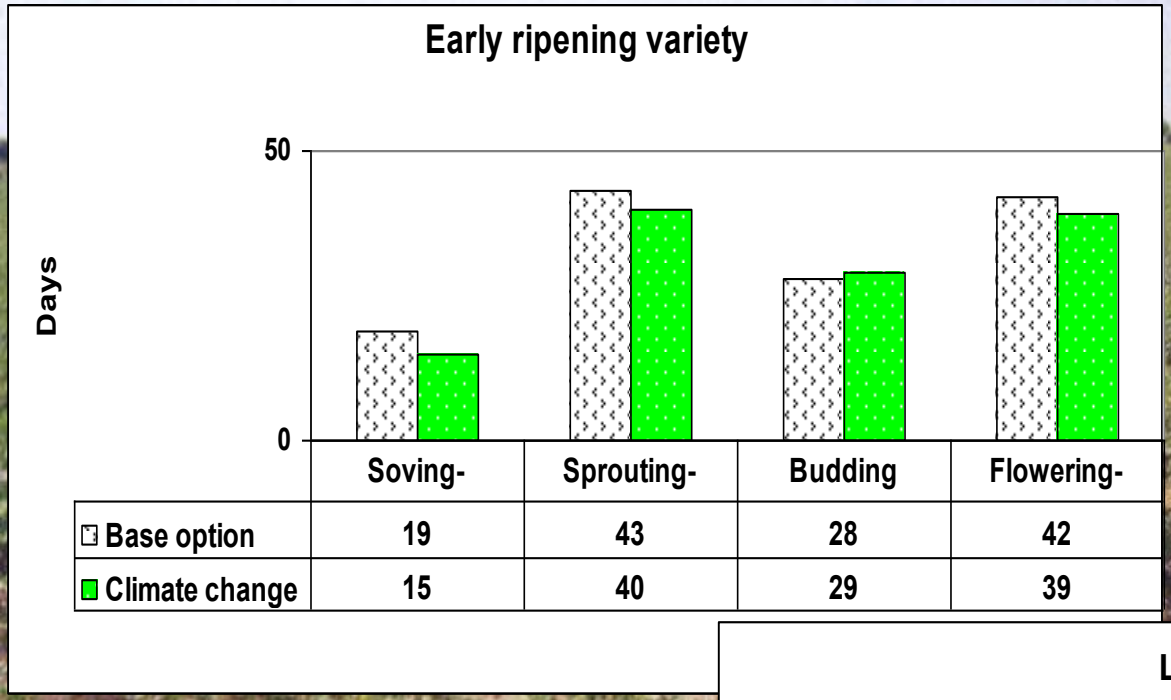
All adaptation measures related to agriculture and water should be divided on three levels:

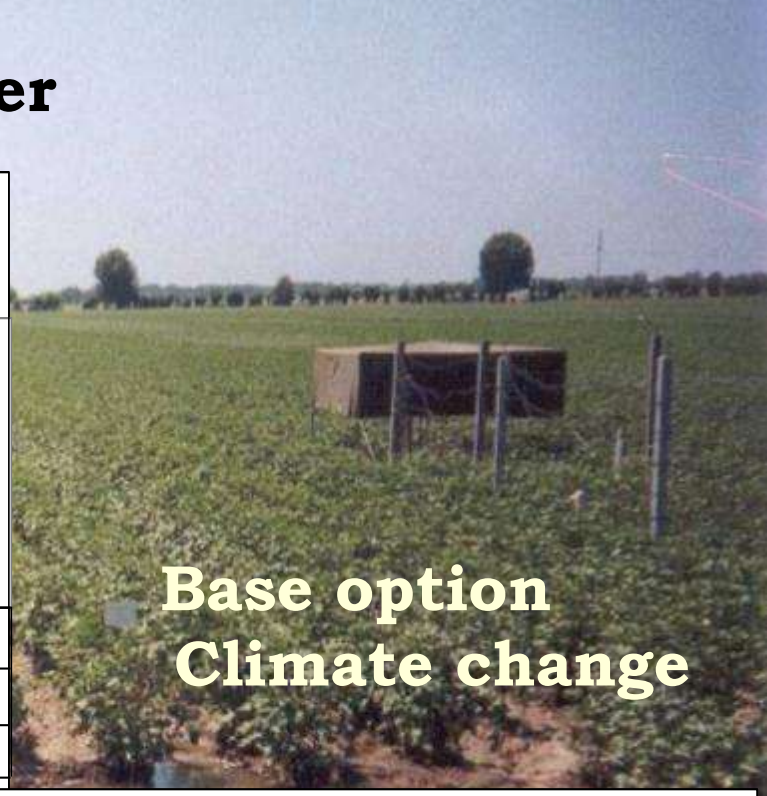
- **national measures, including strategy;**
- **regional measures (taking into account transboundary waters);**
- **local level, especially farm level - adaptive response.**

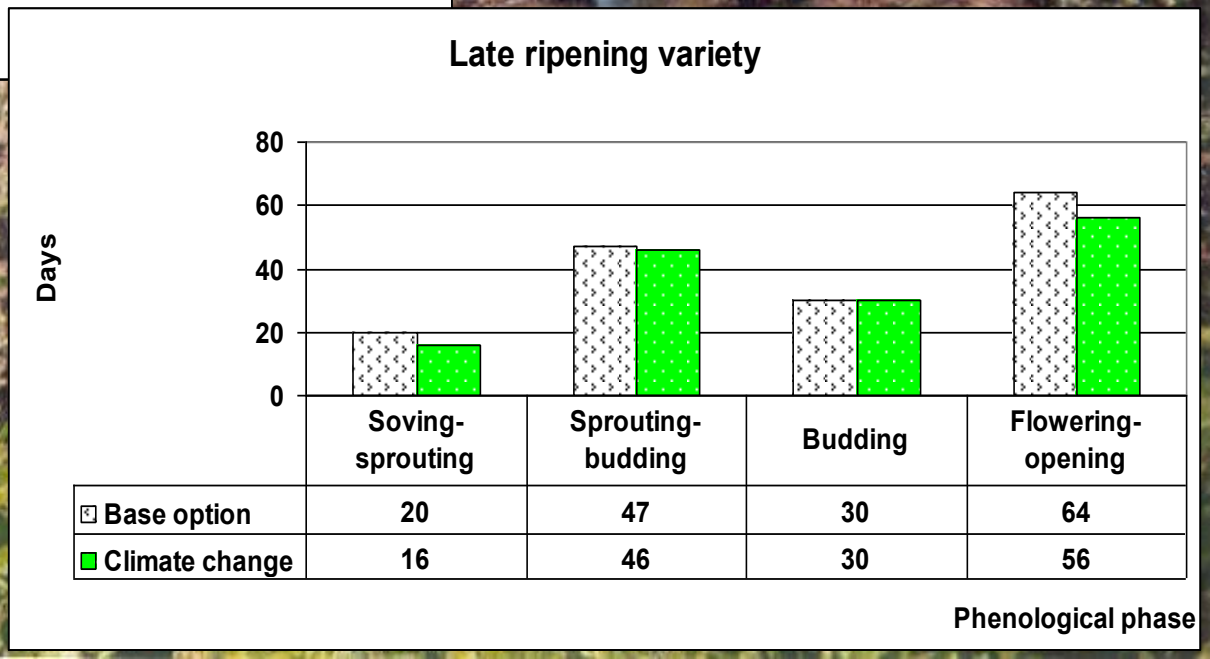


Change of growing period

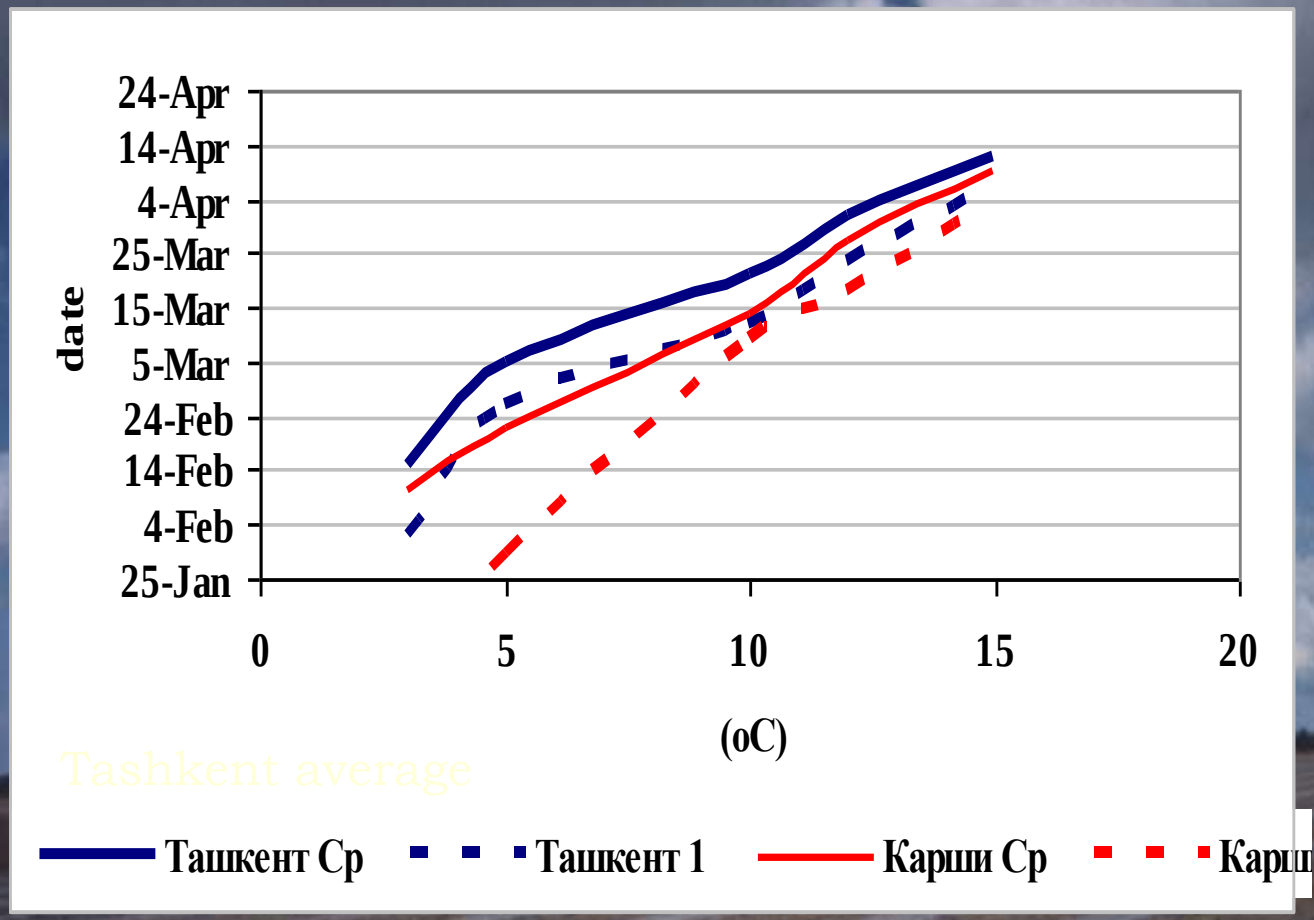
Change in vegetation cover







Crossing over the Limits Established for Air Temperatures



Ср – present conditions, 1 – under climate changes: using data of weather stations in Tashkent and Kashkadarya provinces)

Practices used by farmers

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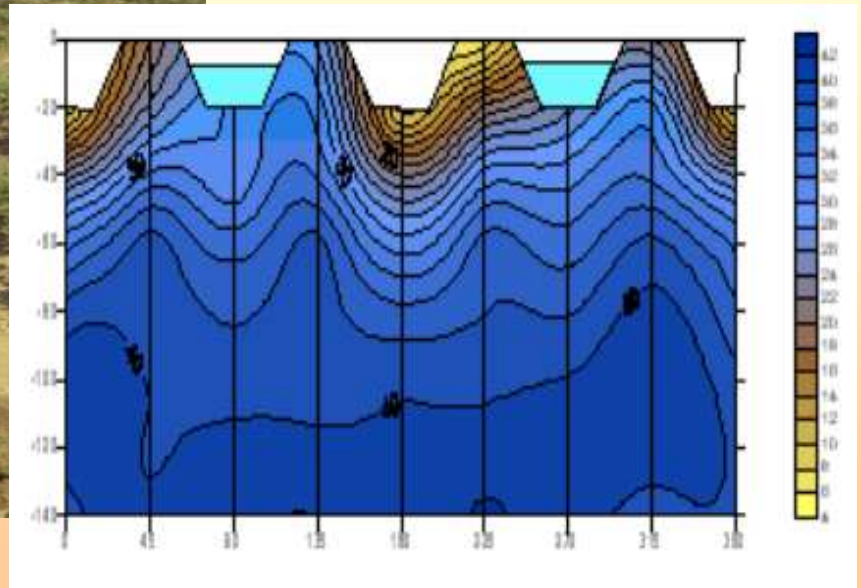
Flow Measurement

Water monitoring and management

Traditional method of water saving in time of drought is “alternative” irrigation - water is applied not to each furrow, but to every other one



Water productivity

Irrigation schemes	Inflow (growing season)	Inflow changes against the control	Yield	Yield changes against the control	Irrigation water productivity	Productivity changes against the control
	m3/ha		kg/ha			
Alternate irrigation (with filmy)	725	-20	5400	35	7.4	69
Every furrow irrigation (with filmy)	915	1	5520	38	6.0	37
Alternate irrigation (without filmy)	730	-20	3400	-15	4.7	6
Every furrow irrigation (without filmy)	907	0	4000	0	4.4	0

Irrigation by water mixed with manure (local name “sharvat”). Water to irrigated field flows through a big hole, in which manure is put preliminary for proper mixing with water and following delivery to furrow

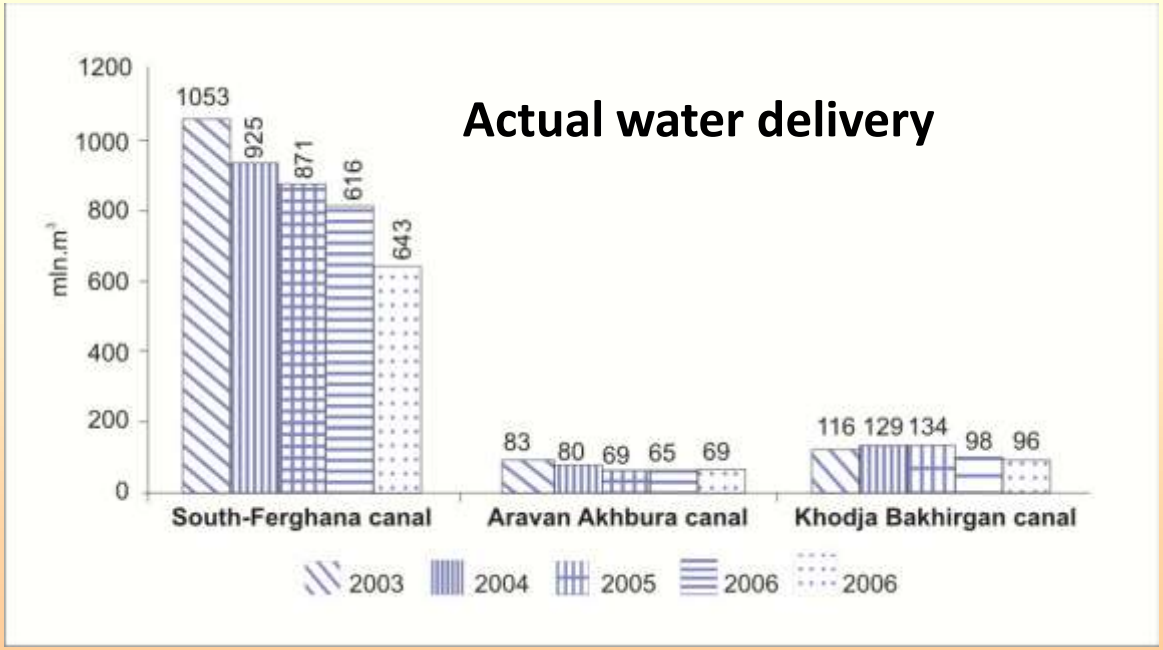
30% attempted to reduce losses by mulching of furrow or installation of polyethylene strip in head of furrow.

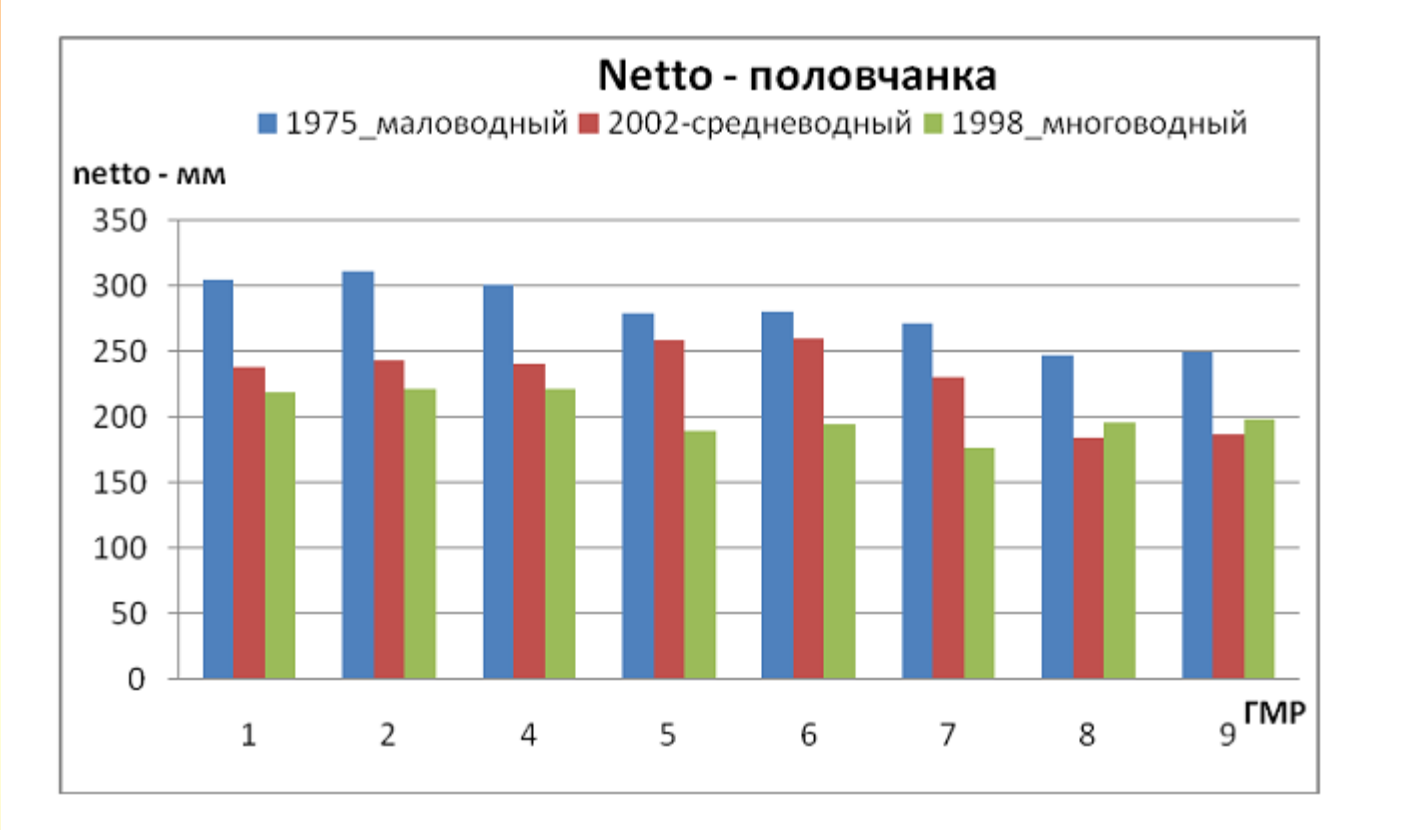
No.	Applied water conservation technology	Nature of technology	Water conservation effect, in comparison with usual irrigation technology	Are widely used on irrigation objects of oblsts:
1	Concentrated irrigation and water rotation	Plot canal discharge is directed in concentrated form to next irrigation plot. Water rotation is used under irrigation of large water use objects.	At the expense of concentrated water supply, by 10-20 % (of water supply) organizational losses are reduced, constituting under water supply «disperse» on majority of anabranches up to 30-35% of water supply to irrigated contour.	• Fergana, • Sogd • Osh, • Jalalabad.
2	Irrigation with alternating irrigated and dry row-spacing	Non-irrigated row-spacing is maintained by cultivation in loose state, hereunder providing favorable air-gas exchange in crop root-zone. Fertilizer application in non-irrigated row-spacing prevents its opportunity to be washed out root-zone limits, providing its effective use.	At the expense of reducing physical evaporation from soil surface total water consumption decreases. In comparison with water supply to each furrow irrigation water saving reaches 20-25 %. Irrigation missing row-spacing promotes balance of crop growth and development.	• Fergana, • Sogd • Osh, • Jalalabad.
3	Tier furrow irrigation with in-contour use of releases	Irrigation on short 60-100 m furrows is started with the first tier, on the next tier furrow heads are constructed. After irrigation current advance to output furrow of the second tier forming release is directed to output furrow and supplements discharge, diverted from «shokh»-aryk. In such order irrigation is carried out on next tiers.	Water conservation effect reveals in reduction by 15-20 % (of water supply) losses for surface release outside irrigated field, because surface release not used in given irrigated contour forms only on the last tier. Tier irrigation provides uniform moistening of irrigated plot.	• Fergana, • Sogd • Osh, • Jalalabad.
4	Alternate stream irrigation	Under alternate stream irrigation after irrigation stream advance front to furrow end the stream is double reduced in accordance with decreasing infiltration rate.	Water conservation effect reveals in reduction by 15-20 % (of water supply) losses for surface release outside irrigated field. Moistening uniformity increases along furrow length. Conditions are created for stable crop development.	• Fergana, • Sogd • Osh, • Jalalabad.

Improving accuracy of water delivery from ±10% to ±2%

Change in area of water-allowance zones

Groundwater level, m	>3		2-3		1-2
Water-allowance zone		Water-allowance zone		Water-allowance zone	
I	-691.82	IV	2283.01	VII	2894.49
II	-18192	V	8490.92	VIII	14224.5
III	-14096	VI	2071.08	IX	3015.73
Total	**-32980**		**12845**		**20134.7**





Use of water by winter wheat, depending on year's water availability

Regional (transboundary) management

SCADA system of automation control

Farmer training in adapting to climate change

Stabilization and use of the dried Aral Sea bed

- **Central Asian countries have to develop their own National Policies to deal with climate change, where the development of alternative environmentally friendly energy sources and energy efficiency should become key priorities. They should also take responsibility for financing the implementation of these policies.**
- **Policies and activities for preventing climate change and climate change adaptation should be integrated into the socioeconomic development policies. The countries of the region should improve intersectoral and interdepartmental coordination.**

- **The transfer of new techniques and methods for climate change adaptation and emissions reduction should be combined with the transfer of relevant knowledge and skills to local experts in order to develop and establish local production, service industry, and to build capacity in whole.**
- **The process of development and implementation of policy in the sphere of climate change should be open and transparent. Governments and governmental bodies need to hold broad consultations with communities and take into account opinions of public organizations while making decisions.**