GROUNDWATER DEVELOPMENT IN THE FERGANA VALLEY

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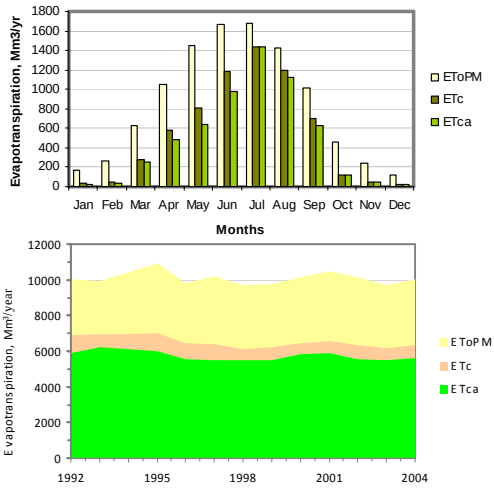
Content:

- Current water use in the Fergana Valley and potential for more productive use
- Framework for groundwater development
- Results of the Field and Modeling studies
- Conclusions

Water depletions for crop production in the Fergana Valley



Thermal resources -9,600-11,000 Mm^3/yr

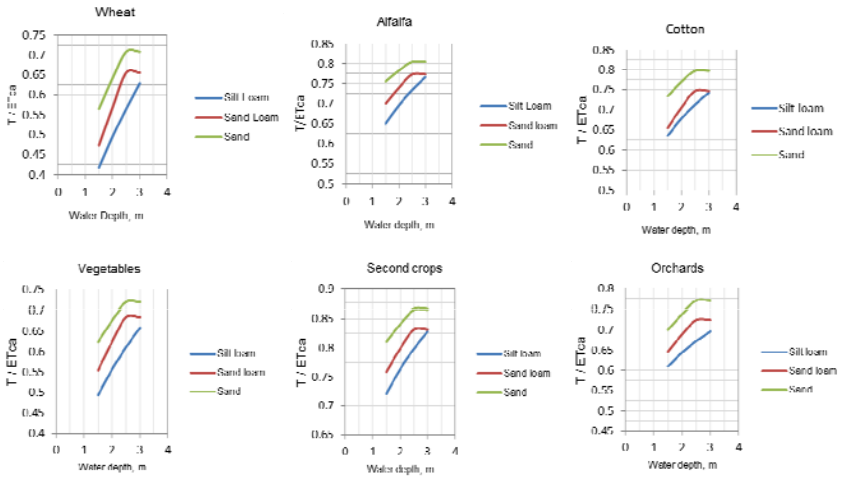
Potential ET crop – 6,000-7,000 Mm^3/yr

Actual ET crop - 5,400-6,200 Mm^3/yr

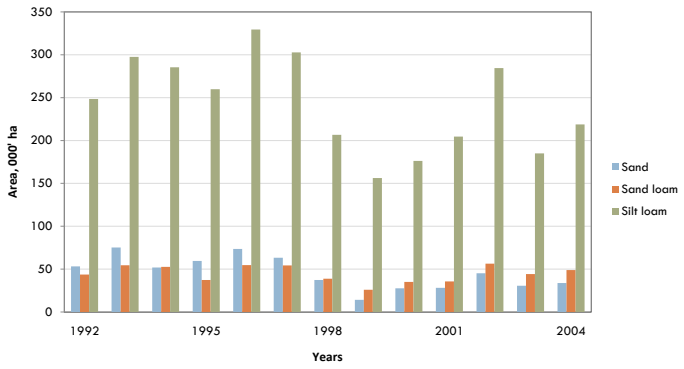
Crop production

- Cotton – 862,000 t
- Wheat grain – 1,374,000 t
- Vegetables – 1,028,000 t
- Orchards and grapevines – 452,000 t

Relative value of transpiration as affected by shallow water table



Changes of the area of land with shallow water table : Fergana Valley (Uzbek part)

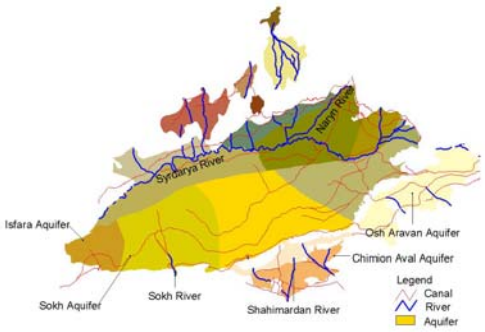


None-beneficial depletions in crop production in the Fergana Valley

Evaporation from none-irrigated soils ~ 200 Mm³/year
Evaporation from shallow water table and irrigated soils - 1,500-1,700 Mm³/year

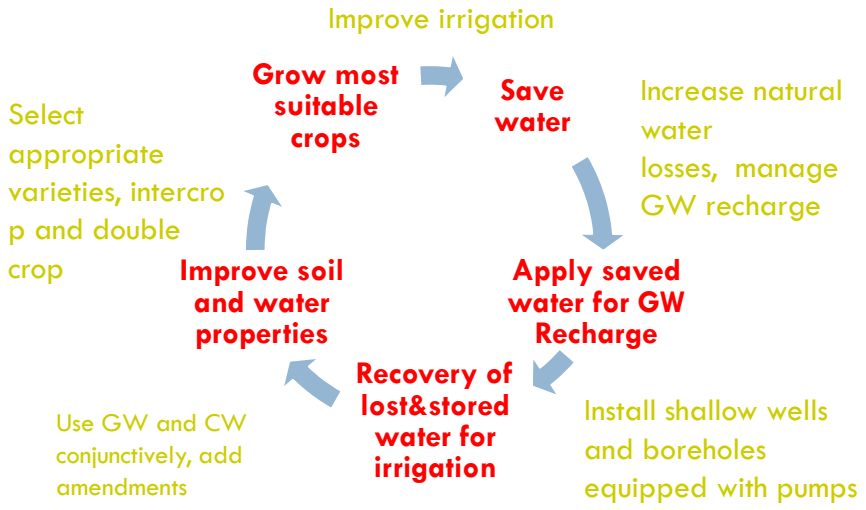
Deficit of water supply in the first half of the year - 500-1,000 Mm³/year

Lowering the water table by abstracting the groundwater and applying its for irrigation



Aquifers of the Fergana Valley

Framework for groundwater development for irrigation in the Fergana Valley



Groundwater recovery technologies

Deep wells:

Depth – 60-100 m
Yield - 15-50 l/s
Cost - 15,000-25,000 USD

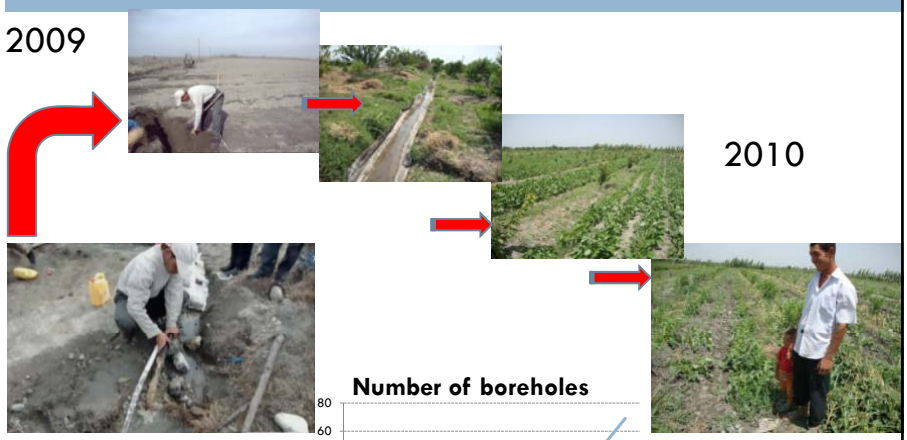
Boreholes:

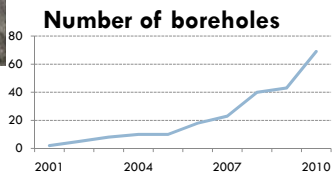
Depth – 20-30 m
Yield - 1-2.5 l/s
Cost - 300-500 USD

Shallow wells:

Depth – 25-40 m
Yield - 2-4 l/s
Cost - 2,000-4,000 USD

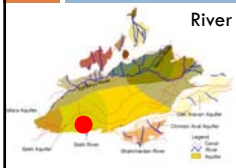
Simple technology of groundwater irrigation at the pilot small farm in Uzbekistan district



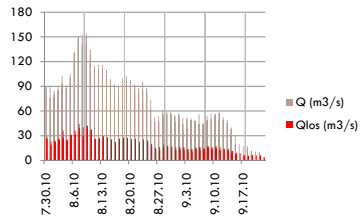


IWMI and AWRDC studies

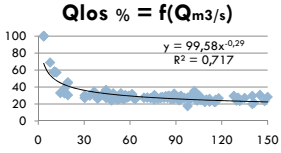
Enhancing natural recharge from river floodplain in Sokh River Basin



River flow discharge (Q) and losses (Qlos) , m³/s

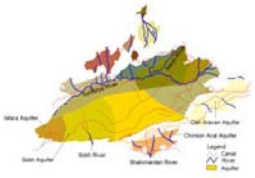


Qlos % = f(Qm3/s)

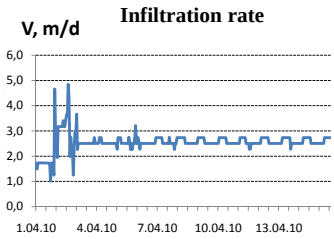


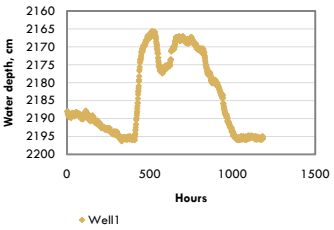
About 33% of the river flow released from the main dam to the floodplain infiltrates and supplies the groundwater

Managed aquifer recharge in the Isfara River basin

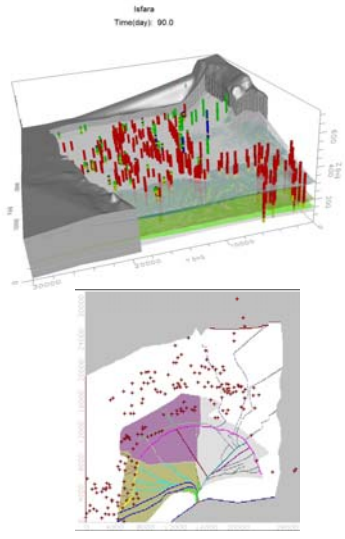


Over 38,000 m³ was infiltrated during 14 days experiment in April, 2010 and 20,200 m³ at the 30 days experiment in April,2011 from the trench of 0.1 ha area





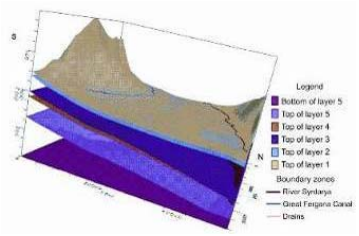
Groundwater modeling: Isfara River Basin

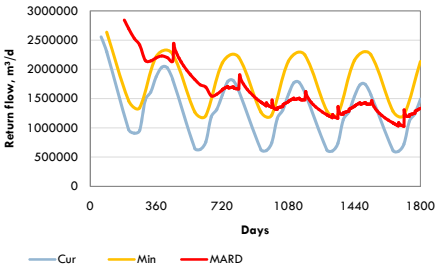


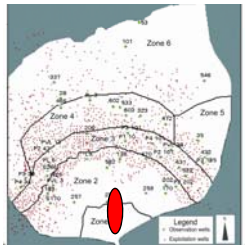
Increasing the extraction of the GW from 1.7 to 11.7 m³/s (from 53 to 363 Mm³/yr):

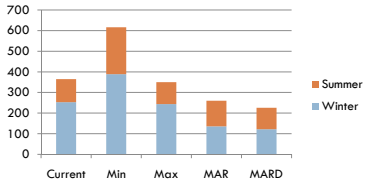
- allows banking the flow of Naryn River up to 100 Mm³/yr in the Isfara aquifer
- reduces return flow from 111 to 6 Mm³/year (53 to 4 Mm³/yr in winter)
- ET from groundwater level will reduce from 57 to 32 Mm³/year

Groundwater modeling: The Sokh River Basin









-Improves water quality
- Reduces winter return flow to the Syrdarya by 54%

Sc. Cur = GW extraction at level of 657 Mm³/yr
Sc. Min = Reducing GW extractions to level of 117 Mm³/yr
Sc. MARD = Water saving, managed aquifer recharge and shallow wells in the discharge zone

Main benefits of groundwater development in the Fergana Valley

- Potential storing at 500 Mm³/yr of flow of small rivers in the subsurface aquifers
- Potential storing winter flow of Naryn River at 500 Mm³/yr
- Reducing drainage flow to Syrdarya in winter by 50%
- Reducing none productive evaporation at least by 500 Mm³/year
- Increasing agricultural water productivity
- Improved quality of river flow to the downstream

Main risks associated with groundwater development

- Poor quality of pumps available for farmers
- High cost of electricity for groundwater irrigation
- Lack of supportive agricultural and water policy

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Рахмат