REGISTER OF RESEARCH ON IRRIGATION AND DRAINAGE

QUESTIONNAIRE

A	**Project title:**
	Study of furrow irrigation technique and technology, test of irrigation equipment on subsidence soils of Karshy Steppe.

B	**Topic n^{o} :1**	Sub-topic n^{o}: 4
1)	4	Technical field n^{o}: 4
2)	Category n^{o}: 01	

C	**Project location:**		
	Country: Republic of Uzbekistan	Area: 1,5 ha (net)	
Kashkadarya province, Kasan district, state farm 52			

D	**Duration of the project**		
	Year in which the project was started: 1987	Project completed:	1989
		Dates of Expertise:	1989

E	**Organizations and technical staff involved**	
1	Supervisor/project coordinator: Zhigareva Yelena	%
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Other counterparts:	Organizations Surname First name	
1	A. Bukinga, Uzmelovodhoz	25%
2	G. Volkina, Uzmelivodhoz	25%
3		%
4		%
Other collaborators:	man-years	

F	**Funding agencies**	
	Full name or acronym	Percentage of project finance provided
1	Ministry for Land Reclamation and Water Management	100%
2		%
3		%

G	Summary of research project

1 *Objective and technical fields:*

Prevention of irregular soil subsidence under field moistening during the irrigation.

Objectives: provision of regularity of subsident deformations during irrigated land development, cultivated crop yield increase and expenditures reduction.

2 *Scientific and technical approaches:*

For provision of regularity of subsident deformations it is necessary to use irrigation technique providing high uniformity of moistening over field surface. Under furrow irrigation it is irrigation on short furrow (30-50m) and by optimal length of jet which does not permit irrigation erosion; due selection of irrigation regime elements (irrigation norm, number and date of irrigation). Irrigation technology should not allow surface releases leading to water accumulation within lower places.

Technological schemes of irrigation should be connected with location microrelief and should be enough flexible. Irrigation equipment should be highly reliable and flexible as to regulation of jet flow.

Meaning: Elaboration of set of measures on irrigation technique and technology on subsident soils with purpose to increase irrigated lands productivity, water saving and expedintures reduction.

3 *Environment characteristics:*

Climate is continental. Its particularity is hot long summer and short winter. Average monthly temperature is 25,4 ^{0}C, maximum is 50 ^{0}C, minimum is 10 ^{0}C. Duration of frost-free period is 215 days.

Precipitation is 146-300mm. Relative air humudity is 48-55%, during growing period 35-44%. Summ of effective temperatures is 2980 ^{0}C.

Evaporativity is 1573 mm. Wind speed is 2-4 m/sec in north-wets direction.

Geomorphology: proluvial hilly plain with average slope 0,001-0,005 (seldom 0,02-0,03). Common inclination is to north-west.

Relief is subjected to erosion under irrigation, subsidence and wind erosion.

Soils: light serozems, serozem-takir, meadow-takir-salines.

Mechanical composition corresponds to sandy loam-silty, light loam, middle loam soils.

Groundwater table depth is more than 10m and does not impact soils. Groundwater are brachish, sulfate-choride.

Coefficient of permeability is equal to: 1m/day (sandstone); 5m/day (sand) and 0,01 m/day (clay).

Soil volume weight is 1,33-1,55 g/cu.m, porosity is 37,4-49%. Subsidence to depth of 8m is 38,3-13,9 cm.

Physical properties of soils: moisture at the limit of fluidity is 0,18-0,26 of full field moisture capacity (FFMC) , number of plasticity is 0,04-0,17. Gypsum content (0,17-14,9%) promotes suffosion process. Soil particles cohesion is 0,006-0,026 MPA. Coefficient of permeability chnges within 0,001-8,4 m/day; infiltration intensity is 1,1-1,2 cm/hour.

4 *Projects and Technical Solutions:*

Pilot plot area is 1,5ha and dedicated to cotton growing. The plot is located within canal Y-16 command zone with slope 0,006-0,0005. Furrow length is 220m. Water distribution to the furrows is executed by earthen ditches. Inclinations between transects, where all hydraulic elements were measured are 0,003-0,0005 m/m; ditch efficiency is 0,87-0,89;Its technical state is satisfactory. Drainage network is close, drying up norm is 2,4m. The following designed irrigation norms are foreseen within the initial period of development 9800-6800 cu.m/ha (cotton), 11200-9100 cu.m/ha (alfalfa), 8100-5800 cu.m/ha (corn in cotton rotation).

Stable fertilization according to soil layers was: 0,0022 m/hour (up to 2m); 0,00135 m/hour (2,5m); 0,00145 m/hour (3m); 0,00057 m/hour (6m).

Irrigation active influence zone is 5-6m and subsidence can constitute 0,30-0,55cm within 1 m layer of loess soil.

Taking into account soil moisture in the 1st day after irrigation equal to 30% to depth of 50 cm, at the end of the 1st day it decraeses to 22%; in the 2nd day it reduces down to 19%, in the 3rd day -17,2% of dry soil weight within 1 m layer and the fact that irrigation depth should be less than 870-1225 cu.m/ha, we can determine depth of irrigation.

Subsidence occures during the first irrigations. On the selected sites with inclination 0,002 (stripes of irrigation with discharge of 0.085-0,125 l/sec (version 1); 0,1456-0,2 l/sec (version 2) and 0,248-0,298 l/sec (version 3), irrigations were made 3 times during season with furrow length 28 m. Subsidence during irrigations provoked changes in absorption parameters.

Due to soil compaction irregularity subsidence uniformity is also broken.

Absorbtion parameters decrease under discharge more than 0,2 l/sec and less than 0,156 l/sec.

Irrigators tried to accelerate subsidence by means of high irrigation depth (up to 6690 cm.m/ha for one irrigation).

5 *Methodology:*

Field observations were made on irrigation technique and technology, soil subsidence.

Experimental plot with medium-subsident soil was selected within site 2 of state farm 52. The following processes were studied:

- furrow irrigation technique and technology;
- soil moisture regime under different irrigation technique;
- subsidence values along the furrow under irrigation by different jets flow;
- soil washing out by different jets;
- phenological observations over cotton growth and harvesting.

6 *Results:*

The following results were obtained:

- regulation of jets flow can provoke subsidence processes acceleration;
- high water expenses can be explained by moistening of deep soil layers.

Accepting stable duration of watering equal to 48 hours and watering depth-1200 cu.m/ha other values such as furrow length and discharge were studied.

Observations before and after irrigation show changes of subsidence according to norm and time of irrigation. All irrigations were made under pre-irrigation moisture 60% of minimum moisture capacity, but by high depth.

Under soil subsidence large stock of moisture within the soil can not be created until subsidence achieves lower soil layers.

Phenological observations showed that better cotton development occures under irrigations by large jet providing ridge of the furrow moistening.

Analysis of field investigations allow to come to the following conclusions:

- moistening uniformity along the furrow length is disroyed;
- subsidence is accelerated under large jet flow and high irrigation depth;
- subsidence prevents to use potential fertility of loess soils under irrigation;
- for subsident soils annual leveling is necessary;
- additional expedintures are needed for regulation of discharge in each furrow ;
- during the first years of irrigation to achieve maximum uniformity of field moistening it is expedient to use irrigation over shortened furrows.

H	Suggested key-words		
1	Irrigation technique and technology	4	Subsident deformation
2	Irrigation equipment	5	Irrigation depth
3	Irrigation norm	6	

I	Most recent publications (maximum 3)			
1	Author(s): N. Luchinin, A. Drobot			
	Title: Study of furrow irrigation technique and technology, test of irrigation equipment on subsident soils.			
	Publication details: Irrigation technique and technology impact on soil subsidence. Recommendations on different irrigation system modification in order to achieve field moistening and subsidence uniformity.			
	Year of publication: 1989	free access [•]	restricted [ ]	confidential [ ]
2	Author(s):			
	Title:			
	Publication details:			
	Year of publication:	free access [ ]	restricted [ ]	confidential [ ]
3	Author(s):			
	Title:			
	Publication details:			
	Year of publication:	free access [ ]	restricted [ ]	confidential [ ]