

# REGISTER OF RESEARCH ON IRRIGATION AND DRAINAGE

## QUESTIONNAIRE

<b>A</b>	<b>Project title:</b>	Test-production investigations of a new long-jet sprinkler machine of frontal irrigation DDF-100
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<b>B</b>	<b>Topic n° : 1</b>	Sub-topic n°: 4
<b>1)</b>	Category 01	Technical field n°:

<b>C</b>	<b>Project location:</b> Tashkent province, Kalinin district, farm "NISTO"	
	Country: Republic of Uzbekistan	Area: 23 ha (gross)
	<b>Precise details if possible</b>	
	Country(ies):	Locality(ies):
	City(ies):	Others(s):

<b>D</b>	<b>Duration of the project:</b>	
	Year in which the project was started: 1972	Project completed: 1982
		Expected completion date:

<b>E</b>	<b>Organizations and technical staff involved</b>		
1	Supervisor/project coordinator (SURNAME, First name): Sevrygin Vitaliy		100 %
	Organization: SANIIRI		Staff resources
	Address: 11, Karasy-4, Tashkent, telephone: 7 (3712) 65-05-55 E-mail: fax:		
	Other counterparts:	Organizations	2)
	First name	Surname	
	(full name or acronym)		
1	Ministry for Land Reclamation and Water Management		100 %
2			%
3			%
4			%
	Other collaborators:	man-	
	years		

<b>F</b>	<b>Funding agencies</b>	
	Full name or acronym	Percentage of project finance provided

1		%
2		%
3		%

<b>G</b>	<b>Summary of research project (see instruction on page 1)</b>
<p><i>1 Objective and technical fields:</i> To develop new cheap and mobile sprinkler machine suitable for small (10 ha) and middle (30-60 ha) fields to irrigate cotton, vegetables, gardens, vineyards, grain.</p>	
<p><i>2 Scientific and technical approach:</i> Development of technology of sprinkler, streams disintegration processes management to obtain rain of high quality; Development of irrigation network elements, providing water intake under low losses; development of long-jet sprinklers.</p>	
<p><i>3 Environment characteristics:</i> Test-production investigations of a new sprinkler since 1980 till 1982 within farm NISTO. Climate is sharply continental. Average annual temperature is 13 °C, maximum - 40 °C, minimum - 30 °C. Sum of positive temperatures is 4745 °C. Frost-free period is 203 days. Precipitation is 270 mm, including 30 % in winter, 40-45 % in spring, 25 % in autumn and 5 % in summer. Relative air humidity is 40-50 % in summer and 75 % on the average. Wind velocity sometimes achieves 5-7 m/sec but more frequently does not exceed 3 m/sec. Irrigation scheme is properly drained. Collector-drainage network is absent. Bedrock is loess with water permeability 15 mm/hour. Groundwater level is 10-18 m, its salinity does not exceed 1 g/l. Soils: typical serozems, non-saline; mechanical composition shows middle and heavy loam. Soil volume mass is 1,439 g/cu. cm, full field moisture capacity is 20,3. Relief: complex, corrugated, previously graded, surface slope is 0,003-0,05. On-farm irrigation network is earthen. Water is supplied by canal with capacity 180-200 l/sec, by pipelines. In points of water diversion automatic valves are installed.</p>	
<p><i>4 Parameters of Pilot Projects and Technical Solutions</i> DDF-100 is a long-jet sprinkler operating similarly to sprinkler boats (West Germany), Bin Skruit (USA) and machine of Jidkov (USSR). Machine moves along the road parallel to canal and takes water out from it providing working sprinklers. It is mounted on tractor DT-75 (90 h.p), has a special pump 13 K-6 and special unit for stream desintegration. Along with DDF-100 sprinkler its prototype DDF-70 m was tested. Irrigated area is 23 ha, land use efficiency is 0,96. Temporary canals length is 240-360 m, their efficiency is 0,75-0,8. Sprinkler was tested on cotton irrigation in comparison with serial DDA-100 MA sprinkler and furrow irrigation. Furrow length is 500 m. Field was splitted in 3 tots with length of 170 m.</p>	
<p><i>5 Methodology:</i> Soil air-water regime was studied by thermostat-weight method, water balance-according to commonly accepted methodology, agrotechnical characteristics of sprinkler -according to standard. Technological irrigation schemes were assigned by experiment. Irrigation norms were calculated according to necessary moistening of given layer. Mathematical statistics and theory of chance were used for data processing.</p>	
<p><i>6 Results:</i> Sprinkler DDF-100 is characterized by the following parameters: width of seizure is 100-110 mm; mean drop diameter is 1,33 mm; efficient irrigation coefficient is 0,6; discharge is 80 l/sec; consumed capacity is 83,5 h.p.; jet diameter is 43 mm; head over jet is 48 m of water post; Average time of drop staying in the air is 3 sec.</p>	

Drop evaporation within initial period was 3,2 %; after 5-7 minutes it was 0,22 %, on the leaves about 2 % of water settled.

Transpiration within the time of leaves drying fully ceased.

Drop structural composition varied from 0,125 to 3 mm. Only drops with diameter less than 0,5 mm were removed by wind. Only 1 % drops were removed out of field.

Average evaporation from the field during growing season (150 days) was 5,4 mm/day or 0,037 mm/min. Water duty intensity was 240 m (0,18 mm/min).

Water consumption during irrigation was 20,5 %, sprinkler efficiency without regard to water consumption during irrigation was 0,94, and with regard to it was 0,735.

Cotton yield was 1,93 t/ha and varied within 25-20 % on field width and 15-19 % on the length.

Within the control field under sprinkler irrigation by DDA-100 MA yield variation on the field width was 17-20 %, on the length - 1 %. Under furrow irrigation cotton yield was 1,43 t/ha and it varied on the width 12 % on the length - 50 %. Yield growth under sprinkler irrigation was 0,5 t/ha.

There were 7 waterings under sprinkler irrigation. Water requirement was 8070 cu. m/ha (100%) including: rainfall - 1183 cu. m/ha (15 %); soil moisture stock depletion - 1373 cu. m/ha (17 %); irrigation norm net 5484 cu. m/ha.

Surface release was absent.

Downward overflow beneath 1m layer was 5 % of norm net. Preirrigation moisture was 50-57 % of FFMC before irrigation and 75-100 % after it.

Average moisture content within 1 m layer during growing season was 78 %, depth of moistening was 133 cm.

On the field under furrow irrigation distance between rows was 0,6 m, length - 170 m, depth - 22 cm, slope - 0,02-0,05, discharge into the furrow - 0,1-0,2 l/sec.

Total time of running was 12 hours, time of additional moistening was 28 hours.

Water requirement under 4 waterings was 7078 cu. m/ha (100 %) including: rainfall - 1188 cu. m/ha (17 %), soil moisture stock depletion - 45 cu. m/ha (0,6 %), irrigation norm net - 5912 cu. m/ha (83,4 %), surface release was 1777 cu. m/ha (25 % of norm net) and 23 % of norm gross (7690 cu. m/ha).

Depth of moistening was 163 cm, deep release was 20 % of norm net.

Average evaporation during vegetation was 4,7 mm/day. Irrigation efficiency without regard to evaporation was 0,55, with regard to - 0,365.

Comparison shows that yield regularity on the field width under sprinkler was on 15 % higher than under furrow irrigation, on the length - on 38 %. Field irrigation efficiency was 0,55, under furrow irrigation - 0,21. Water requirement was 14 % higher. Irrigation water saving was 40 %. Specific operational expenditures were 427 rouble/ha to compare with 711,4 rouble/ha under furrow irrigation. Annual economic efficiency was 5310 rouble/ha.

<b>H</b>	<b>Suggested key-words</b>		
1	Sprinklers	4	moisture dynamics
2	irrigation network	5	water balance
3	trolley water conductor	6	

<b>I</b>	<b>Most recent publications (maximum 3)</b>			
1	Author(s): V.Sevryugin			
	Title: About technological schemes of long-jet sprinkler of frontal action and making up their working characteristics.			
	Publication details: Different modifications of long-yet frontal sprinkler are given; their agrotechnical parameters are evaluated.			
	Year of publication: 1985	free access	<input checked="" type="checkbox"/> restricted	<input type="checkbox"/> confidential <input type="checkbox"/>

2	Author(s): V. Sevryugin		
	Title: Mechanized watering and yield increase		
	Publication details: Problems of mechanized watering are described; main types of sprinkler including DDF-100 with trolley conductor are shown		
	Year of publication: 1986	free access <input checked="" type="checkbox"/>	restricted <input type="checkbox"/> confidential <input type="checkbox"/>
3	Author(s):		
	Title:		
	Publication details:		
	Year of publication:	free access <input checked="" type="checkbox"/>	restricted <input type="checkbox"/> confidential <input type="checkbox"/>