

Presentation
On
Improved Water Use Efficiency through
adoption of Drip/ Sprinkler Irrigation

By
B K Labh



World Resource Availability

Resource	India	USA	Per Capita Availability in USA
Land mass	2.40%	7.00%	11 times
Fresh water	4.00%	6.00%	5 times
Population	17.00%	4.50%	-

- We are a disadvantaged Nation!
- Nothing except science & technology can make a difference!!
- Our human capital can make it happen!!!

Some Of The Hard Facts

- We have not given proper weightage to very valuable natural resources i.e. Water.
- Technology has not been properly used in the field of Agriculture.
- As more than 70% water is being used in Agriculture, conservation of water in Agriculture is a matter of concern and all of us should contribute for this cause.
- Vast area of Wasteland is available with us. With the proper use of Irrigation System most of the land can be made cultivable.
- Cash and Horticulture Crops cultivation is more beneficial.

SCENARIO- WATER

- Gross Water Requirement increases to 1200 BMC from the present 700 BMC.
- Available water remain at 1137 BMC
- Water deficit will force us to take **extreme measures** by 2030-2050.
- Before that happens conservation of water would help us survive better.
- Irrigation is the largest water user (+ 83%)
- **Reducing water use in irrigation by increasing use efficiency will generate more water for irrigating more land area.**

Sprinkler & Drip Irrigated Area

Country	Total Irrigated Area (Mha)	Micro-Irrigation			Percentage of Total Irrigated Area
		Sprinkler	Micro Irrigation	Total Sprinkler And Micro Irrigation	
USA	21,400	338,000	105,000	443,000	21
China	53,300	120,000	26,700	146,700	27
France	1,600			145,000	90
Spain	3,200	800,000	56,285	136,375	40
Austria	0,000	76,000	300	76,300	100
Mexico	6,200			600,000	10
Egypt	3,300	450,000	104,000	554,000	17
Germany	0,900	53,000	200	53,200	100
Italy	2,700	345,000	80,000	425,000	16
Slovak Rep.	0,300	31,000	265	31,265	99
Den	8,000	199,077	53,711	252,788	31
Israel	0,200	7,000	16,100	23,100	100
Qatar (Arab)	0,800	15,000	200	15,200	99
Saudi	1,200	9,300	6,200	15,500	12
Czech Rep.	0,500	15,100	122	15,222	99
Macedonia	0,000	10,000	50	10,050	58
Australia	2,000			100,000	5
Finland	0,100	8,100	800	8,900	83
Hungary	0,100	8,500	420	8,920	65
Portugal	0,600	4,000	25,000	29,000	10
Mali	0,000	43,19	5,45	48,64	87
Jordan	0,000	5,10	38,30	43,40	62
China	0,800	200	23,00	23,800	49
Chinese Main	0,600	850	18,10	26,650	51
Ethiopia	0,000	812		812	100

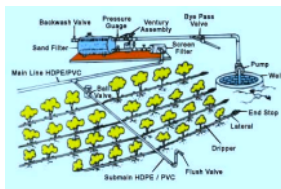
Source : icid@icid.org

Why Modern Irrigation Technologies?

- The productivity of irrigated land is low compared to its potential.
- The productivity per unit of water is very low.
- Water available for irrigation is becoming scarcer.
- Increasing cost of generating water source.
- The predominance of soils with low water retention capacities and very low hydraulic conductivities makes an ideal case for light and frequent irrigations i.e. Micro irrigation.
- Micro Irrigation will increase the irrigation coverage using the existing available water.
- Micro-irrigation with fertigation will enhance production per unit input in nutrient poor and low fertility soils.

What is Micro (Drip) Irrigation?

Micro Irrigation is a method of irrigation in which:



- Water is applied directly to the root zone of plants.
- Water is applied in frequent intervals (daily) in precise quantities as per the crop water requirement.

DRIP FERTIGATION TECHNOLOGY

- Drip Irrigation reduces water consumption
- Drip-fertigation enhances fertilizer use efficiency.
- Drip irrigation enhances yield.
- Productivity increase with lesser and more efficient resource use
- This would be the Crux for future green revolution and food security through water and energy security.

Product Range - Drippers/Emitters

J-TURBO KEY™



Flow: 2lph, 4lph, 8lph, 14lph

J-SCPC™



Flow: 2lph, 4lph, 8lph

J-TURBO PLUS



J-Turbo Key Plus - 2lph, 4lph, 8lph, 14lph
J-SCPC Plus - 2 lph, 4lph & 8 lph

J-GRIP



Flow: 1lph, 8lph, 16lph & 25lph



Flow: 4lph, 8lph, 16 lph



Flow: 4lph, 8lph



Flow: 2lph, Sulbbh tube size: 12 mm



Flow: 2lph, 4lph



Flow: 2lph, 4lph, 8lph



Flow: 2lph, Sulbbh tube size: 12 mm



Flow: 2lph, Sulbbh tube size: 12 mm



Flow: 2lph, 4lph

Contd...

Jain Super Clean™ - 'L' Type



Flow Range: 15 m³/hr to 50 m³/hr
Inlet/Outlet Connection: 1/2" to 3"

Jain Super Clean™ - 'Y' Type



Flow Range: 27 m³/hr to 50 m³/hr
Inlet/Outlet Connection: 2" to 6"

J-Turbo Clean



Flow Range: 25 m³/hr to 40 m³/hr
Inlet/Outlet Connection: 2" to 4"

J-Bush Clean 'L' Type



Flow Range: 50 m³/hr
Inlet/Outlet Connection

J-Bush Clean 'Y' Type



Flow Range: 50 m³/hr
Inlet/Outlet Connection: 3"

J-Super Clean Disc Filter - 'L' Type



Flow Range: 15 m³/hr
Inlet/Outlet Connection

J-Super Clean Disc Filter - 'Y' Type



Flow Range: 25 m³/hr & 40 m³/hr
Inlet/Outlet Connection: 2" & 3"

Contd...

Jain CleanMaster™ - S



Flow Range: 18 m³/hr, 27 m³/hr & 40 m³/hr
Inlet/Outlet Connection: 2" to 3"

Jain CleanMaster™ - M



Flow Range: Any Multiples of Single Unit

Jain FilterMaster -



Flow Range: 10 m³/hr to 40 m³/hr
Inlet/Outlet Connection: 1/2" to 3"

Jain FilterMaster - M

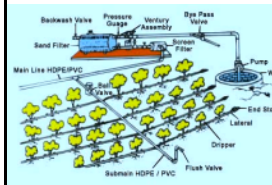


Flow Range: Any Multiples of Single Unit

Advantages of Micro Irrigation

ADVANTAGES :

- Low Application Rate
- Uniformity of Water Application
- Precision Placement of Water
- Efficient Fertilizer and Chemical Application
- Better Control of Root Zone Environment
- Crop Yield Enhancement
- Quality Improvement of Produce
- Improved Disease Control
- Discourages Weed Growth
- Effective Saving of Irrigation Water
- Lesser use of Power
- Reduced Labor Costs
- Suitable for Difficult Land Terrain
- Ideal for Marginal Lands
- Maintains Soil Health
- Suitable for inferior quality water.



Drip Irrigation Systems - Benefits

Crop	Location	Yield (t/ha)			Water use (mm)		
		TRD	MIS	% diff.	TRD	MIS	% diff.
Ashgourd	Jodhpur	10.8	12	11	84	74	12
Bottle gourd	Jodhpur	3.8	55.8	31.8	84	74	12
Tomato	Udaipur	14.2	17.5	17	41	28	17.7
Watermelon	Jodhpur	29.2	38.2	66	80	80	0
Corn	Dudh	28	34.2	18	52	26	50
Coke	Dudh	3	48	78	43	26	38.8
Cotton	Coimbatore	2.6	3.26	20	86	30	64.7
Sugarcane	Dudh	9.7	119	22	136	92	32.2
Sugarcane	Pune	12.8	170	24	215	94	56.3
Groundnut	Warananagar	70	116	66	119	85	28
Groundnut	Udaipur	9	24.7	73	87	53	42.9
Bananas	Warananagar	3	6.7	49	27	16	73.8
Papaya	Coimbatore	1.3	23	43	228	73	68.5
Banana	Warananagar	2.3	46	77	109	106	0
Banana	Bhawanisagar	27	32.9	15	186	172	7.5
Guava	Jodhpur	57	87.2	51	177	87	50
Grapes	Ludhiana	26.4	32.5	18	53	28	47.7

Extracted from H.P. Singh, J. C. Samuel and A. Kumar, INDIAN HORTICULTURE, April - June 2000

TRD - Traditional Irrigation, MIS - Microirrigation

Sprinkler Irrigation Systems - Benefits

Crops	Yield (t/ha)		% Increase	Water Used (mm/ha)		% Decrease
	Conventional	Sprinkler		Conventional	Sprinkler	
1. Wheat	1.5	3.0	100	600	450	25
2. Maize	1.5	2.5	66	600	450	25
3. Vegetable	6.0	10	66	600	450	25
5. Wheat*	3.84	3.84	-	303	167	45
6. Groundnut*	0.77	0.855	11	475	225	52
7. Coffee**	4.0	7.8	95	600	300	50

* These are result of experiment conducted on various research station viz. Hanumanagar, Bore and Lunkansar in Indira Gandhi Canal Area. Paper presented by S.K. Mathur & M.S. Shekawat, Kishu Bhawan, Bikaner, Rajasthan during June 1996 at Institution of Engineers, Bangalore - Sprinkler workshop.

** Result of the experiment conducted at Regional Coffee Research Station, Chundale, Wynad, Kerala.

Designing Drip Irrigation System

CONSIDERATIONS

- Location of Water Source
- Area and Survey Map of the Field
- Elevation of the Field
- Crop Type
- Spacing
- Row direction
- Age of the Crop
- Soil Type
- Evaporation of the Location
- Estimate of the Peak water requirement
- Drip emitter selection
- Lateral size and optimum Length
- Submain selection
- Mainline selection
- Pump selection

Crops Covered under MIS by Jains

FRUIT CROPS:

Almond, Apple, Amra, Ber, Banana, Cashewnut, Custard Apple, Cherry, Durian, Fig, Guava, Grape, Litchi, Lemon, Sweet Lime, Mango, Orange, Olive, Papaya, Pomegranate, Pear, Peach, Pistachio, Pineapple, Sapota, Strawberry, Star Fruit, Jack Fruit, Water Melon, Musk Melon.

VEGETABLE CROPS:

Bottle gourd, Cucumber, Carrot, Capsicum, Lettuce, Pepper, Potato, Pea, Tomato.

FIELD & OTHER CROPS:

Wheat, Paddy, Maize, Corn, Bellwine, Mulberry.

CASH CROPS:

Cotton, Sugarcane, Tobacco.

OIL SEEDS:

Groundnut, Sunflower, Jujube, Castor.

FORAGE CROPS:

Lucerne, Pastures, Turf, Fodder.

PLANTATION CROPS:

Cardamom, Coffee, Tea, Rubber, Spices, Oil Palm, Coconut, Arecanut.

ORNAMENTALS:

Floricultural Plants, Rose, Gerbera, Camellia, Gladiolus, Poinsettias, Chrysanthemum.

AGROFORESTRY TREES:

Eucalyptus, Casuarina, Teak, Tamarind, Acacia, Bamboo, Neem, Shisam.

Limitations of Micro Irrigation



- Needs a proper quality filtration system.
- Initial high capital investment.
- Hardware is based upon costly plastic petroleum-based products.
- More suitable & economically viable for cash and high value crops.
- Relatively young technology in the third world.
- Need initial support of subsidization.
- Needs dependable power supply and pressurized water.
- Requires certain degree of skill to operate and maintain the system.
- Subsidy related problems.



Application flexibility of MIS



CHAPIN DRIP TAPE

TWINWALL - BTF :: TWINWALL - DELUXE :: TWINWALL - MARATHON









TOMATO, STRAWBERRIES, PEPPER, VEGETABLES, COTTON, SUGARCANE, PINEAPPLE, MELON, CUT FLOWERS

THE BEST IRRIGATION SOLUTION FOR ALL ROW CROPS

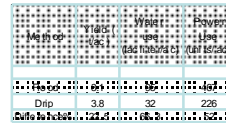
Efficiency of Conveyance



IRRIGATION EFFICIENCY

• Conveyance efficiency	: Open field channels	70%
	: Piped distribution	80 - 85%
• Field application efficiency (Irrigation Efficiency)	: Surface methods	50
	: Sprinkler	70%
	: Micro-irrigation	80 - 90%
• Overall efficiency	: Surface methods	35
	: Sprinkler	57%
	: Micro irrigation	70%

PADDY WITH DRIP at UDUMALPET, TAMIL NADU JAIN R & D FARM



FOOD AND WATER SECURITY THRU DRIP

"... If a minimum ten per cent (especially rainfed area) of the total paddy area of 43.5 million hectares is brought under drip irrigation, then rice output can increase to 130 million tonnes by 2020."

4.35 million ha under drip will result in irrigation water for an additional 4.8m ha

Sprinkler Irrigation



- Micro Sprinkler Systems
- Floppy Sprinkler System
- Pop-up Sprinkler Systems
- Rotor Systems
- Linear move Systems
- Rotating Impact sprinkler systems
- Central Pivot Systems
- Rain guns
- Hose Reel traveller systems
- LEPA (Low Energy Precision Application) Systems

Types of Sprinkler System

1. Portable Sprinkler System.

- In this system main / submains, laterals, sprinklers head are shifted by hand. Entire system is shiftable or movable.

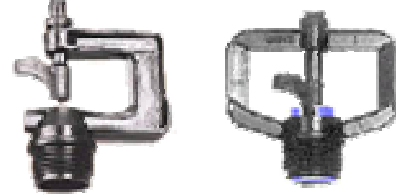
2. Semi Portable Sprinkler System.

- In this system, main / submains pipes are permanent (buried in ground) and laterals and sprinkler heads are shiftable or moveble.

3. Solid Set (Fixed) Sprinkler System.

- In this system, entire system is permanent and buried in ground. It is very expensive in cost.

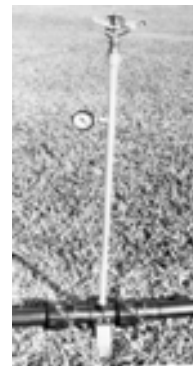
Jain Micro/Mini Sprinkler



Jain Overhead Sprinkler



Jain Overhead Sprinkler



Jain Rain Gun Sprinkler



Features



- (1) Great operation at all pressure levels
- (2) High performance
- (3) Distribution
- (4) Heavy duty - maintenance free
- (5) Automatic brake system
- (6) Large nozzle selection for max. throw
- (7) Arc setting
- (8) Reduced weight



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Irrigation

TWIN 95

Nozzle	Ø 12 - 24 mm / G47" - 094"
Flow	7.8 - 564 m ³ /h / 40 - 288 gpm



The Twin 95 joins the successful Kometbig volume guns program.

It was developed to satisfy the demand for a high performance gun for solid-set applications and other mechanically moved irrigation systems. With its innovative design, proven technology and outstanding operational features, the Twin 95 sets a new standard in regard to performance, reliability and ease of operation.

It operates superbly at all pressure levels within its flow range.

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Jain Rain Gun Sprinkler for Sugarcane



Centre Pivot / Linear



Advantages of SIS

- Water Saving Achieves - 40 - 70%.
- Increase in yield - 40 - 60%.
- Can achieve irrigation efficiency 60-80%.
- Undulating lands, hilly area can be irrigated
- Crops in sandy soils can be irrigated.
- Requires less labours. Saving in labour cost.
- Can achieve more than 90% germination.
- Fertilizer can be easily applied.
- Soil Amendments / treatment can be done.
- Saline soils can be reclaimed.
- Frost Protection in cold climate.
- Maintain humidity level and micro climate.
- Cooling the crops is possible.

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- Frost Protection in cold climate.
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- Cooling the crops is possible.

Relative Performance of Micro-Irrigation Compared to Traditional Irrigation System on some crops

Crop	Location	Yield (t/ha)		Water use (cm)			
		TRI	MIS	% diff.	TRI	MIS	% diff.
Ashgourd	Jodhpur	10.8	12	10	84	74	12
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Tomato	Udaipur	14.4	17.5	17.7	41	28	17.7
Watermelon	Jodhpur	29.4	88.2	66.8	80	80	0
Onion	Delhi	28.4	34.2	17	52	26	50
Okra	Delhi	36	48	25	42	26	38.1
Cotton	Coimbatore	2.6	3.26	20.2	86	30	64.7
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Sugarcane	Narasari	70.6	116.1	39.2	142	105	34
Groundnut	Udaipur	9.1	34.7	73.8	87	54	37.9
Pomegranate	Hyderabad	3.4	6.7	49.3	21	16	23.8
Papaya	Coimbatore	13	23	43.5	228	73	68.5
Banana	Kharanpur	79	41	93.6	114	114	0
Banana	Bhawanisagar	27.7	32.9	15.8	186	172	7.5
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Grapes	Ludhiana	26.4	32.5	18.8	53	28	47.2

Green House Irrigation

- NaanDanJain Irrigation company is the oldest in the world with having very high quality Micro Sprinkler, Modular Micro Sprinkler, Jets, Foggers etc.
- Irristand modular sprinklers are best suitable for some of the vegetable crops like potato, onion etc. These type of systems are having relatively lower cost in comparison to Drip Irrigation System. In certain cases where the chances of frost are very high, the sprinklers are more suitable.

RAINGUN IRRIGATION SYSTEMS
AT
HARYANA AGRICULTURE UNIVERSITY, HISAR, HARYANA



INTRODUCTION OF DRIP IRRIGATION SYSTEMS IN WHEAT CROPS



Chandigarh Golf Club



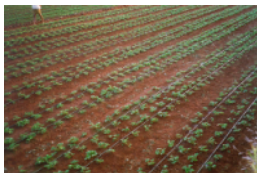
Head Unit at Chandigarh Golf Club



System for Aero phonic



IRRIGATION (Drip System)



It will generally found best to do the watering early in the morning and on the warm, bright days when syringing is necessary. It should be done early enough so that the plants will dry of before night.



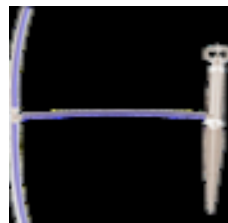
FERTIGATION :



- Compact model
- Electric dosing Fertilizer pump
- EC/pH sensors are also incorporated



Mini Sprinkler



Cooling and humidity control system



Components required for cooling:

- Fan & Pad system
- Fogging system: An efficient fogging system can lower the temperature by 4-6°C.

Cooling system continued...



Selection of fogging system:

- Fine droplets (average 90 microns)
- Leakage prevention device
- Simple maintenance and reliable operation
- Uniform water coverage
- Resistance to clogging

Cooling and humidity control system

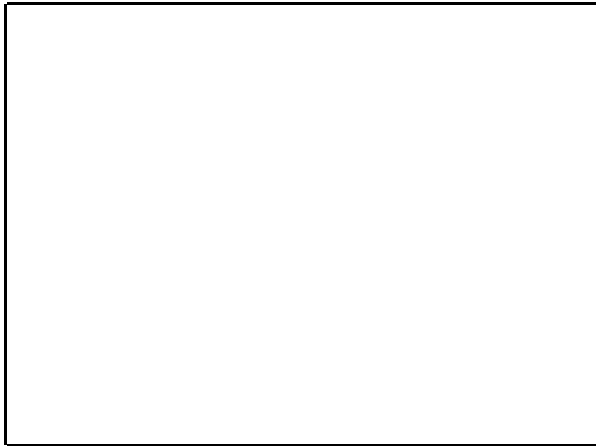


Installation of Jain Fogger

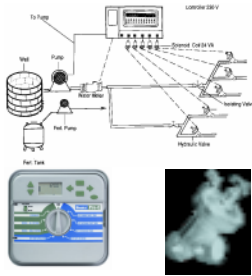
- Distance between lines: 2-3m
- Distance between foggers: 1.5-2m
- The foggers should be installed as high as possible above the ground
- The foggers should be mounted on polytube or PVC pipe in a criss-cross fashion as shown,







AUTOMATION



Ben efits:

- Conservation of water, labour and energy
- Flexibility of operation
- Precision and ease in operation
- Adoption of advance crop system and new technologies.
- Use of water from different source.
- System can be operated at night.



Thank You