A photograph of several green leafy plants growing in a greenhouse, with a soft-focus background. The plants are in the foreground, and their leaves are vibrant green. The background shows the structure of the greenhouse and other plants, slightly out of focus.

# GREENHOUSE IRRIGATION SOLUTIONS & CLIMATE CONTROL

For many years NaanDanJain has been deeply involved in developing advanced irrigation solutions for greenhouses, nurseries and tunnels. This brochure summarizes and highlights the range of products for various applications.

**NAANDANJAIN**  
A JAIN IRRIGATION COMPANY

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# GREENHOUSE & NET HOUSE IRRIGATION

## TOTAL COVERAGE, OVERLAP CONCEPT

### INVERTED SYSTEM

The inverted micro-sprinkler with optional LPD (leakage prevention device) is used for intensive full irrigation or as a pulsating system for the direct cooling of plants.

The LPD allows the immediate opening of the whole section at the same time and the pipes remain full of water between two operations. The surface level is free for cultivation and all other internal activities.



## HADAR 7110



7110 inverted model with low-pressure LPD

PERFORMANCE TABLE 7110 (INVERTED ROTOR) AT 2 BAR PRESSURE

Nozzle color	Nozzle (mm)	Flow rate (l/h)	Diameter (m)	Precipitation (mm/h) Spacing (m)											
				3x3	3x4	3x5	4x4	4x5	4x6	5x5	5x6	6x6			
Red	1.1	61	8.0	6.8	5.1	4.1									
Green	1.3	87	9.5	9.7	7.3	5.8	5.4	4.4		3.5					
Blue	1.4	103	10.0	11.4	8.6	6.9	6.4	5.2							
Yellow	1.6	128	10.2	14.2	10.7	8.5	8.0	6.4	5.3	5.1	4.3	3.6			
Bright Green	1.8	166	10.6	18.7	14.0	11.2	10.5	8.4	7.0	6.7	5.6	4.7			
White	2.0	199	11.0	22.1	16.6	13.3	12.4	10.0	8.3	8.0	6.6	5.5			

## MODULAR



PERFORMANCE TABLE MODULAR (INVERTED) AT 2 BAR PRESSURE

Nozzle color	Nozzle (mm)	Flow rate (l/h)	Diameter (m)	Precipitation rate (mm/h) Spacing (m)						
				3x3	3x4	3x5	4x4	4x5	5x5	
Grey	1.16	70	7.5	7	5.9		4.4			
Green	1.41	105	8.5	11.6	8.7	7.0	6.5			
Orange	1.50	120	9.0	13.4	10.1	8.1	7.6			
Yellow	1.73	160	9.5	17.7	13.3	10.6	10.0	8.0	6.4	
Blue	1.92	200	10.0	22.3	16.7	13.4	12.5	10.0	8.0	

## AQUAMASTER 2005



PERFORMANCE TABLE AQUAMASTER 2005 (INVERTED) AT 2 BAR PRESSURE

Nozzle color	Nozzle (mm)	Flow rate (l/h)	Diameter (m)	Precipitation rate (mm/h) Spacing (m)				
				3 x 3	4 x 4	4 x 6	5 x 5	6 x 6
Grey	1.14	70	9.0	7.7	4.4	2.9	2.8	
Green	1.40	105	10.0	11.7	6.6	4.4	4.2	2.9
Orange	1.50	120	10.5	14.0	7.9	5.3	5.1	3.5
Black	1.74	160	11.0	17.5	9.9	6.6	6.3	4.4

## GREEN SPIN

### COMPONENTS

color-coded nozzle



color-coded swivel



PERFORMANCE TABLE GREEN SPIN AT 2 BAR PRESSURE

Swivel color	Nozzle color	Flow rate (l/h)	Diameter (m)	Precipitation rate (mm/h) Spacing (m)											
				1.5x3	2x3	3x3	2x4	3x4	4x4	3x5	5x5	3x6			
Grey	Brown	43	8.0	9.4	7	4.7									
	Grey	70	9.0	15.5	11.6	7.7	8.7	5.8	4.4						
	Green	105	9.0	23.4	17.5	11.7	13.2	8.8	6.6	7					
	Orange	120	9.5	26.4	19.8	13.2	14.8	9.9	7.4	7.9	4.7				
Black	Black	160	9.0	35.4	26.5	17.7	19.9	13.3	9.9	10.6	6.4	8.8			
	Blue	200	9.5	44.3	33.3	22.2	24.9	16.6	12.5	13.3	8	11.1			

Tested at laboratory conditions 2.0 m above ground

Color code distribution uniformity	CU>92%	CU=89-92%	CU=85-88%	CU<85%

## TUNNEL IRRIGATION

The inverted irrigation system is commonly recommended to keep the surface level free of obstacles.

NaanDanJain has developed a unique concept—the side-by-side Anti-Mist—to achieve the highest uniformity of water distribution in the cultivated area, with minimal wetting of the tunnel walls.

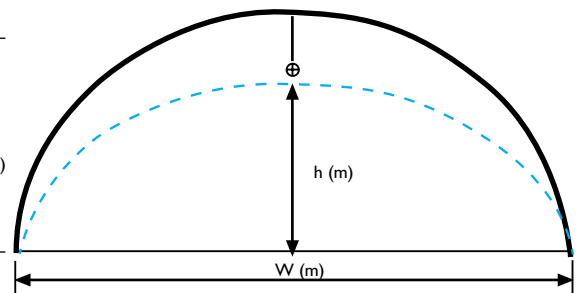
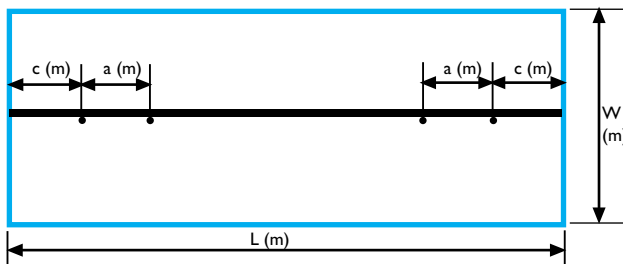
The most suitable product, with optimal components (nozzle and swivel) and installation spacing (number of laterals, distance between micros on the lateral), should be decided on according to tunnel width and crop needs.

Contact our experts and design departments to find the best solutions for your specific irrigation needs.

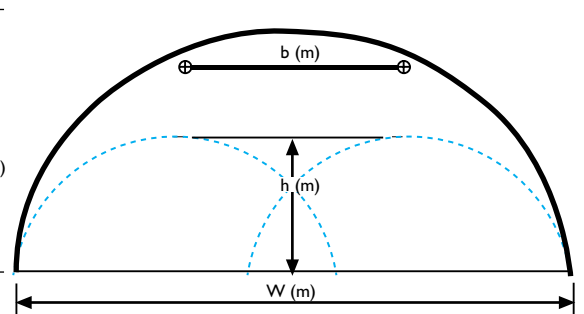
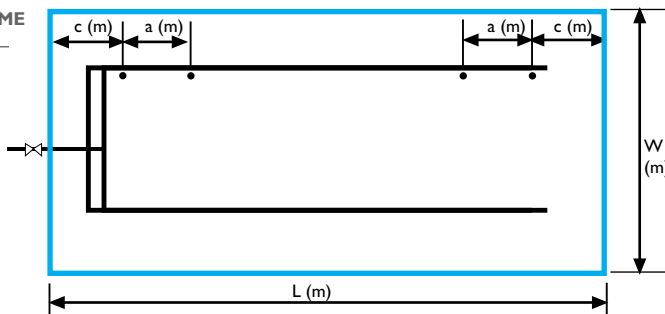


### SINGLE LINE SCHEME

a	Distance between micros on the lateral
b	Distance between laterals
c	Distance of first micro from wall
W	Tunnel width
L	Tunnel length
h	Height of Micro product above crop



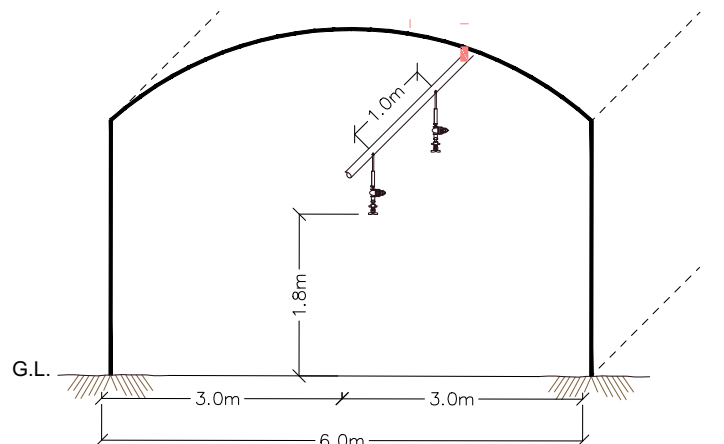
### DOUBLE LINE SCHEME



Example:

### GreenSpin

blue nozzle / blue anti-mist 120 lph + super LPD



CU	DU	SC	mm/hr	Water in pattern
94%	91%	1.1	17.7 mm/hr	89%

# PROPAGATION AND ROOTING

The task of supplying controlled moisture and humidity means taking into consideration the various needs of the propagated seed and cutting at various substrates.

Our range of foggers and micro-sprinklers, with various droplet sizes, help maintain the desired conditions in the nursery and the propagated tables.



Hadar 7110 mist sprayer with low-pressure Super LPD bayonet



Modular flat spreader with low-pressure Super LPD



Green Mist with low-pressure Super LPD



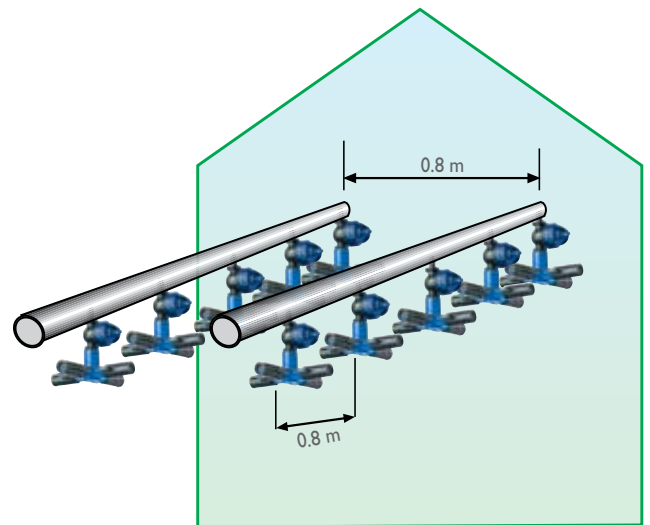
4 Foggers on cross with high-pressure Super LPD



Super Fogger 4.0 bar LPD 24 l/h

## PRODUCT SELECTION TABLE FOR A GIVEN APPLICATION

Characteristics	Emitter					
	Hadar 7110 mist		Modular	Green Mist	Fogger on cross	Super Fogger x 4
Flow rate (l/h)	30	60	43	30	4 x 5.3 l/h 4 x 7 l/h	24
Spacing (m)	1.0 x 1.0	1.2 x 1.2	1.0 x 1.0	0.8 x 0.8	0.8 x 0.8	0.8 x 0.8
Lateral location from table edge* (m)	0.2	0.2	0.1	0.1	0.2	0.2
Minimal height installation (m)	0.6	0.6	1.0	1.0	0.8	0.8
Operating pressure (bar)	2-3	2-3	2-3	2-3	4-5	4-5
Main advantage	High uniformity	High uniformity	High uniformity	Free of drops	High uniformity and small droplets	High uniformity and small droplets



## CLIMATE CONTROL HUMIDITY AND COOLING SYSTEMS

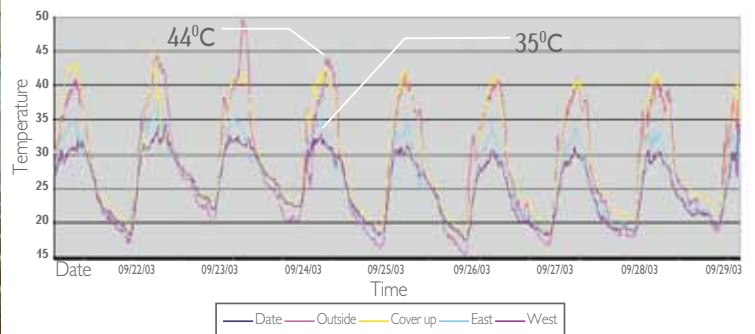
Our Fogger and Super Fogger systems achieve optimal control of humidity and cooling in the greenhouse.

This low-pressure system requires only 3.0/4.0 bar at the fogger inlet. The concept is based on natural air exchange and circulation. (The use of fans for circulation can improve results, but they're not essential). Temperatures are reduced by up to 10° C on hot, dry days.



### TEST RESULTS FOR TOMATO GREENHOUSE IN BEIT SHEAN, ISRAEL

The graph indicates temperature reduction of 10° C inside the greenhouse.



### GUIDELINES\* FOR DESIGN AND INSTALLATION OF COOLING SYSTEM

Fogger model	Flow rate (l/hr)	Spacing (m)	Fogger height above surface (m)	Pressure at fogger inlet (bar)	Pulse duration (sec)	Time between pulses (sec)	Average water consumption (l/hr/ha)	Daily water consumption (m <sup>3</sup> /ha) 09:00-17:00
2 Foggers on T	9-14	3.0 x 3.0	2.5-4.0	3.0/4.0	2.0-4.0	20-60	3,000-6,000	2.4-4.8
4 Foggers on cross	18-28	3.0 x 3.0	2.5-4.0	3.0/4.0	2.0-4.0	20-40	3,000-6,000	2.4-4.8
Super Fogger x 2	11-13	3.0 x 3.0	2.5-4.0	3.0/4.0	2.0-4.0	20-60	2,300-5,300	2.1-4.3
Super Fogger x 4	21/24	3.0 x 3.0	2.5-4.0	3.0/4.0	2.0-4.0	20-40	2,300-5,300	2.1-4.3

\*For optimal results, prepare a fully detailed design.

## WET PAD COOLING SYSTEM WITH AIR SUCTION

This concept is based on air exchange. The external dry air sucked in through a water drop screen. The screen is made of triple layers of net (instead of the original, expensive, wet pad construction). A set of fans mounted on the opposite wall create the air suction. The result is enriched moist air flow through the greenhouse, cooling the growing plants, without the salinity effect. The water distribution system is based on a half-circle (180°) Modular sprayer, with a completely closed circulation of water.



Modular half-circle sprayer 100 l/h mounted every 1.0 m



## PESTICIDE SPRAY SYSTEM

The pesticide spray system is based on the Fogger cooling system: one system with two tasks. This preventative spray concept is operated by a single person who doesn't enter the greenhouse and is therefore protected from the pesticides. The spray takes 1-2 minutes for each valve/section. It facilitates immediate response to newly developed diseases.



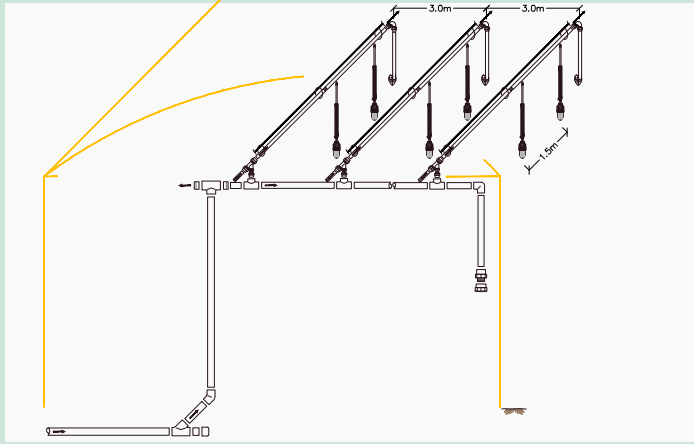
### SUPER FOGGER DESIGN DATA

Spacing		Unit flow rate (l/h)	Working pressure (bar)	Flow rate (l/hr/ha)	Minimal operation time (min.)	Recommended filtration grade
On the line (m)	Between the lines (m)					
1.5	3.0	13.0	4.0	500	1.0	120

The pesticides and insecticides, commonly used in liquid or powder form, can be used in solution form too. Flush the fogger system with water at the end of the process.



SCHEMATIC LAYOUT OF SUPER FOGGER SYSTEM FOR CLIMATE CONTROL AND/OR SPRAYING



Cucumber spraying

## FROST PROTECTION

Frost protection can be achieved by NaanDanJain micro-sprinklers, which are designed to create an ice cover on the greenhouse or tunnel plastic cover. In a net house this works under net, above the plants. The ice formation isolates the greenhouse from the low temperatures outside. The concept entails continuous operation rather than in pulses. The system can work at temperatures as low as  $-6^{\circ}\text{C}$ .



Mamkad 16  
180 l/h, spacing 6-8 m



Tomato greenhouse, Mamkad 16 sprinklers on the roof along the gutters



Frost damage to tomato bushes after a night of frost



Undamaged tomato bushes in nearby greenhouse with Mamkad 16 frost protection



Hadar 7110 Inverted, 60 l/h as frost protection in an asparagus net house



# DRIP IRRIGATION

Drip irrigation systems ensure high irrigation accuracy and water use efficiency. They also provide a precise solution for fertigation. In many greenhouses the crop is grown in a soilless medium and in small volume receptacles that requires high frequency irrigation. To achieve uniformity in such cases, it is recommended to use CNL (compensating non-leakage) drippers that keep the system full and ensure that all drippers start and stop simultaneously.



## ClickTif HD

Heavy-duty, pressure-compensating and PC non-leakage button drippers for irrigation of pot plants and growing systems in bags and in gutters

Taper lock outlet

Barb outlet 3/5



PC

CNL

PC

CNL



1.3 l/h

2.0 l/h

3.0 l/h

4.0 l/h

8.0 l/h

12.0 l/h

### TECHNICAL DATA

- Nominal discharge: 1.3, 2.0, 3.0, 4.0, 8.0, 12.0 l/h
- Regulating pressure range: 0.5-4.0 bar  
CNL: 1.0-4.0 bar
- CV: less than 4%
- Minimum recommended pressure 1.0 Bar
- Non-leakage (CNL): - Opening pressure: 8.0 m  
- Closing pressure: 3.0 m



## ClickTif HD ACCESSORIES AND ASSEMBLIES

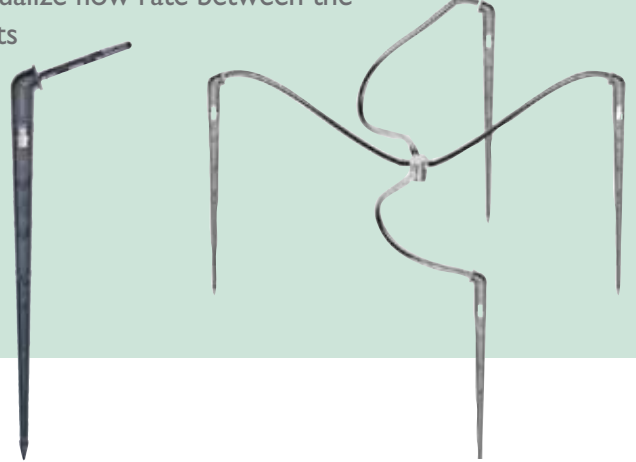
### Drop Guide

Used for single outlet installations



### Labyrinth Stake

Used for multiple outlet installations to equalize flow rate between the outlets



All assemblies and stakes are available in black or grey



### When working with multiple outlets:

1. Use labyrinth stakes to improve uniformity
2. Minimum recommended working pressure: 1 bar
3. Maximum recommended flow per outlet: 2.0 l/h
4. Minimum recommended flow per outlet:
  - On a flat surface with uniform tube length - 0.5 l/h
  - On a slope or uneven elevation - 1.0 l/h

### Recommended combinations:

Number of outlets	Dripper flow rate l/h					
	1.3	2	3	4	8	12
2	●	●	●	●	-	-
3	-	●	●	●	-	-
4	-	●	●	●	●	-
5	-	-	●	●	●	-
6	-	-	●	●	●	●

- Only on flat surfaces and with uniform tube length
- For all conditions, including slopes and uneven elevations

## AmnonDrip CNL

Pressure-compensating, non-leakage integral dripline for irrigation of substrate beds or soil-grown crops



0.5, 1.1, 1.6, 2.0, 2.2, 3.8 l/h



### TECHNICAL DATA

- Flow rate: 0.5, 1.1, 1.6, 2.0, 2.2, 3.8 l/h
- CNL: Opening pressure - 1.0 bar  
Closing pressure - 0.20 bar
- Pressure regulating range:  
PC CNL - 1.0-4.0 bar
- Filtration recommended: 130 micron (120 mesh)

## NDJ PE DL PIPES

Double-layered, polyethylene pipes for micro-sprinkler and button dripper installation. Featuring a UV-protected white external coating. Why White?

When working with non-leakage emitters, such as button drippers or micro-sprinklers, the system remains full and the water inside the pipes tends to heat up. Irrigating small plants with hot water can damage the plants. NaanDanJain's PE DL PIPES (with a double layer, external white and internal black) reduce water temperature by up to 8°C, while also ensuring that light doesn't penetrate and promote algae formation in the pipe. Using light-colored pipes and accessories also allows optimal radiation for photosynthesis.

### TECHNICAL DATA

Diameter (mm)	PN (bar)	Wall thickness (mm)
16 20 25	2.5	1.0
16 20 25	4	1.2 - 1.3





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