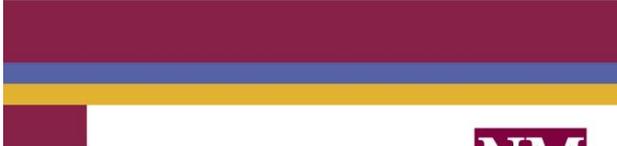


# Variety of Point Source Emitters w/ Flow Rates



Typical Flow Rate Range:  
0.5 to 4 gallons per hour (gph)



# Materials and Methods (2011)

- 20 different point source emitter models were evaluated.
- Emitters were inserted into a ½ inch ID polyethylene (PE) lateral at a spacing of 2 feet in 8 sets (replicates) of 5 emitter models in each of 4 separate laterals.
- Total length of each lateral = 80 feet (40 emitters)
- Water level was maintained at heights of 5.5 feet (study 1) and 3.5 feet (study 2) above emitters with a float valve in water tank.

# Materials and Methods

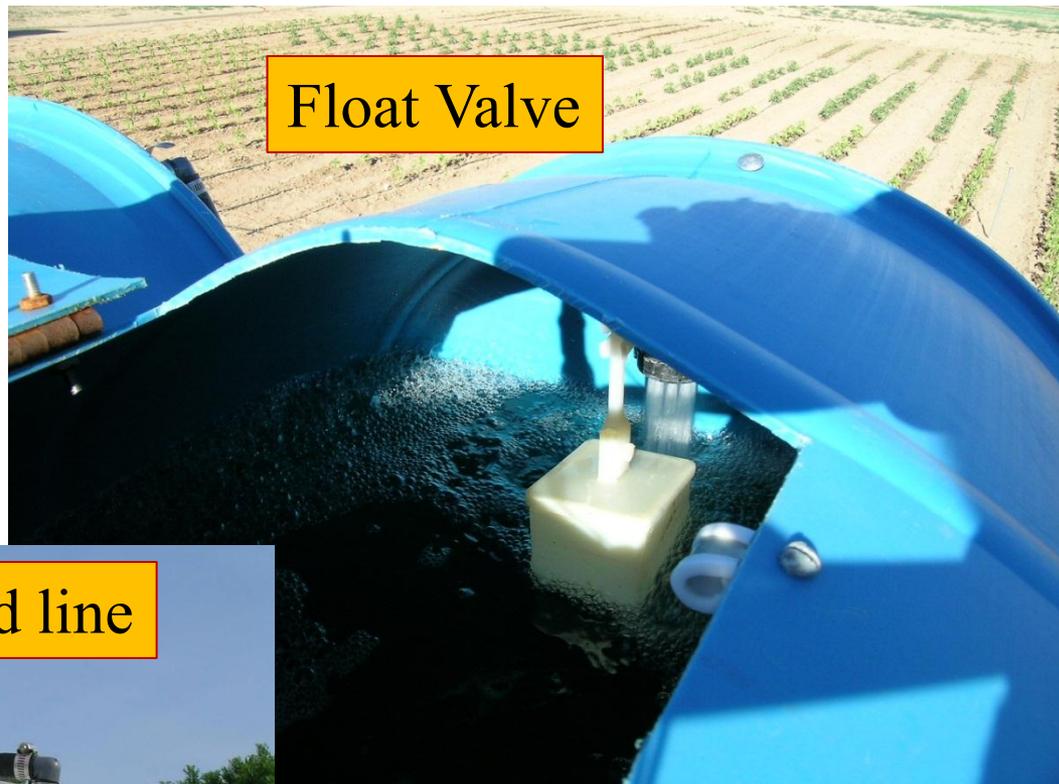


Water tank (at 3.5 ft height) and drip line with point-source emitters hanging on level fence for flow rate measurements.



Graduated cylinder, timer, and emitter flow catch cup & stand used to measure flow rate.

Float Valve



Pressurized line



# Flow Rate (FR) and Water Application Uniformity (WAU)

- $FR \text{ (gph)} = \text{ml/min} \times 60 \div 3785$
- WAU
  - How uniformly water is applied to all plants along a drip line (lateral)
  - Ideally, we'd like each plant along a lateral to receive the same amount of water during a given irrigation event

# Water Application Uniformity

- In this study:

$$\text{WAU} = 1 - \text{cv (coefficient of variability)}$$

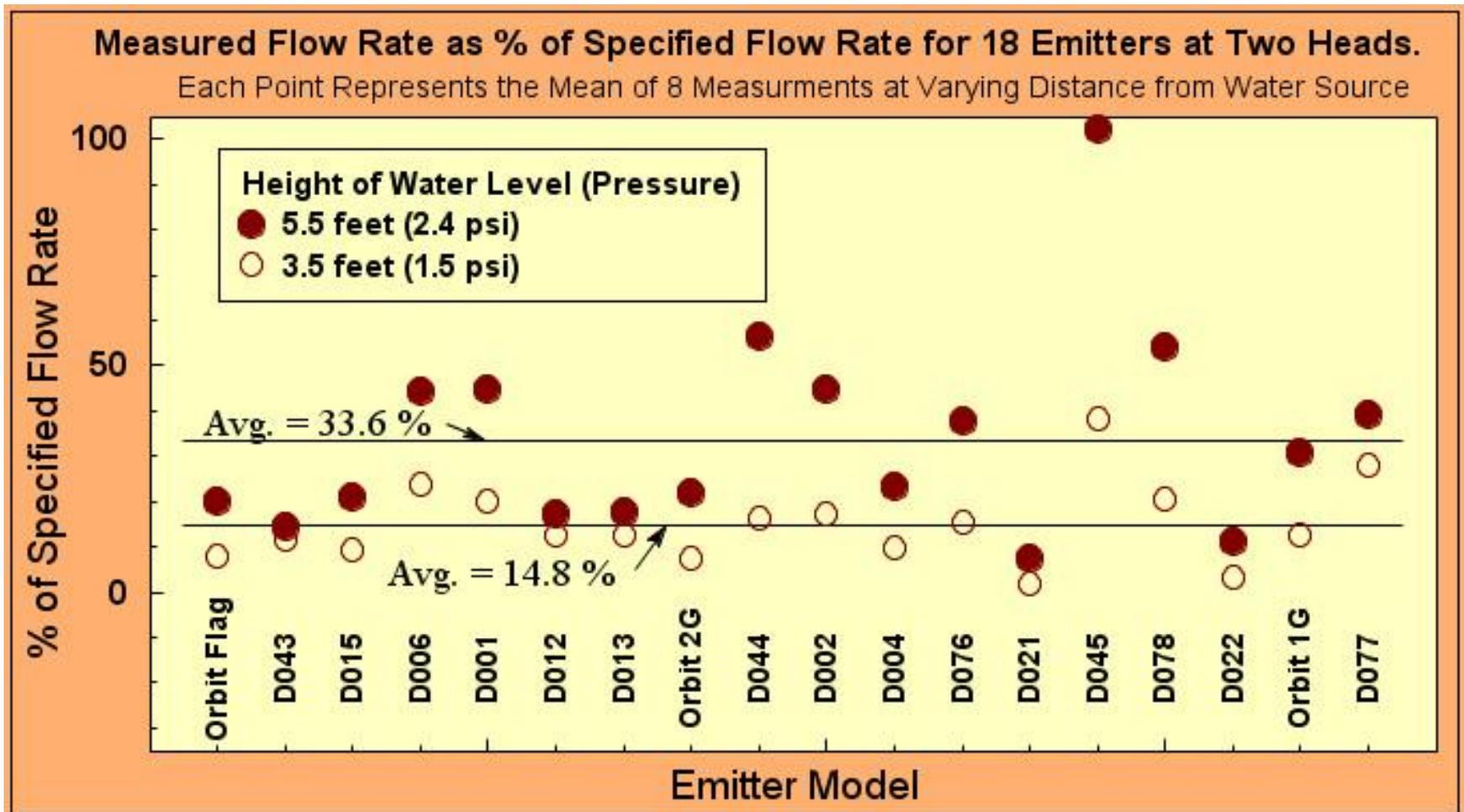
- $\text{cv} = \text{standard deviation} / \text{mean (average)}$   
of 8 measurements for each emitter model

A WAU of 1.0 (100%) indicates perfect uniformity.

- Generally, an acceptable WAU would be greater than 0.85 (85%).

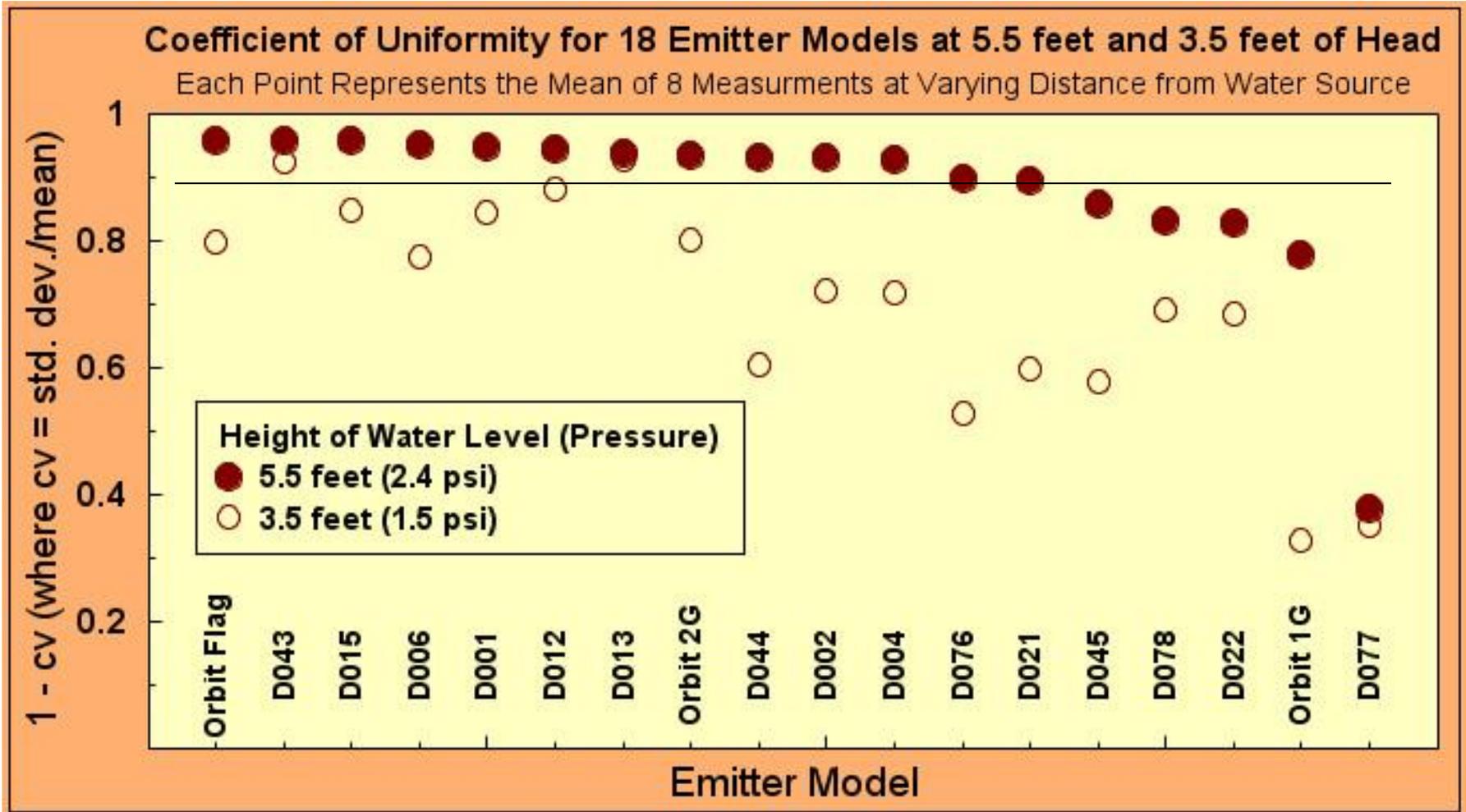
# Results

# Flow Rate as % of Specified



Note: Avg. FR not shown for emitters D079 and D080 – no flow in some units

# Water Application Uniformity



Note: Avg. WAU not shown for emitters D079 and D080 – no flow in some units

# Summary – Flow Rate

- Overall, measured emitter FR at heads of 5.5 feet and 3.5 feet averaged 33.6 % and 14.8 % of manufacturer specified FR, respectively.
- The average FR of one emitter (D045) at 5.5 feet of head (2.4 psi) was about equal to the specified FR of 1 gph at the recommended head range of 23 to 115 feet (10 to 50 psi).

# Summary – Water Application Uniformity

- Twelve of the 20 emitters exhibited WAUs of  $> 0.9$  at a head of 5.5 feet.
- But only two of these 12 emitters (D013 and D043) exhibited WAUs  $> 0.9$  at a head of 3.5 feet.

Emitters exhibiting water application uniformities of  $> 0.9$  and flow rates of  $> 0.3$  gph at 5.5 ft of head (and WAUs of  $> 0.9$  at 3.5 ft of head)

Emitter*		Flow Rate (gph)	Water App. Uniformity	FR/WAU @ 3.5 feet
Orbit 4G (flag)		0.79	0.96	
D 043	 → 	0.48	0.96	0.38/0.92
D 006		0.44	0.95	
D 001	 → 	0.45	0.95	
D 013		0.35	0.94	0.25/0.93
Orbit 2G	 → 	0.44	0.93	
D 044		1.12	0.93	
D 002	 → 	0.89	0.93	
D 004		0.76	0.93	

\*Orbit models from Home Depot; 'D' model numbers from 'The Drip Store'

# Conclusions/Recommendations

- The actual flow rates of point source emitters at substandard pressure will be less than those specified by the manufacturer and this must be considered when designing and setting up a low pressure drip irrigation system.
- While the results of our study provide an indication of emitters that may perform well at low pressure, the irrigators should measure the actual flow rates of the selected emitters after setting up their systems. This is because even slight differences in lateral lengths, emitters per lateral, height of water level (head) above emitters, etc. between the actual system and the system that generated the tabular values in our study will affect flow rate.
- The irrigator should foremostly select an emitter that exhibits a high water application uniformity (i.e.  $> 0.9$ ) and then consider a flow rate that will satisfy the plant's maximum daily water requirement.