Example Drip Studies: Why are they Challenging?

1) Different Equipment (i.e. not a spray boom)

2) Two rate Dilemma
    1) Rate of water delivery
    2) Rate of ai delivery

3) What is your sprayer?
    1) Injector
    2) Drip System
    3) Both?

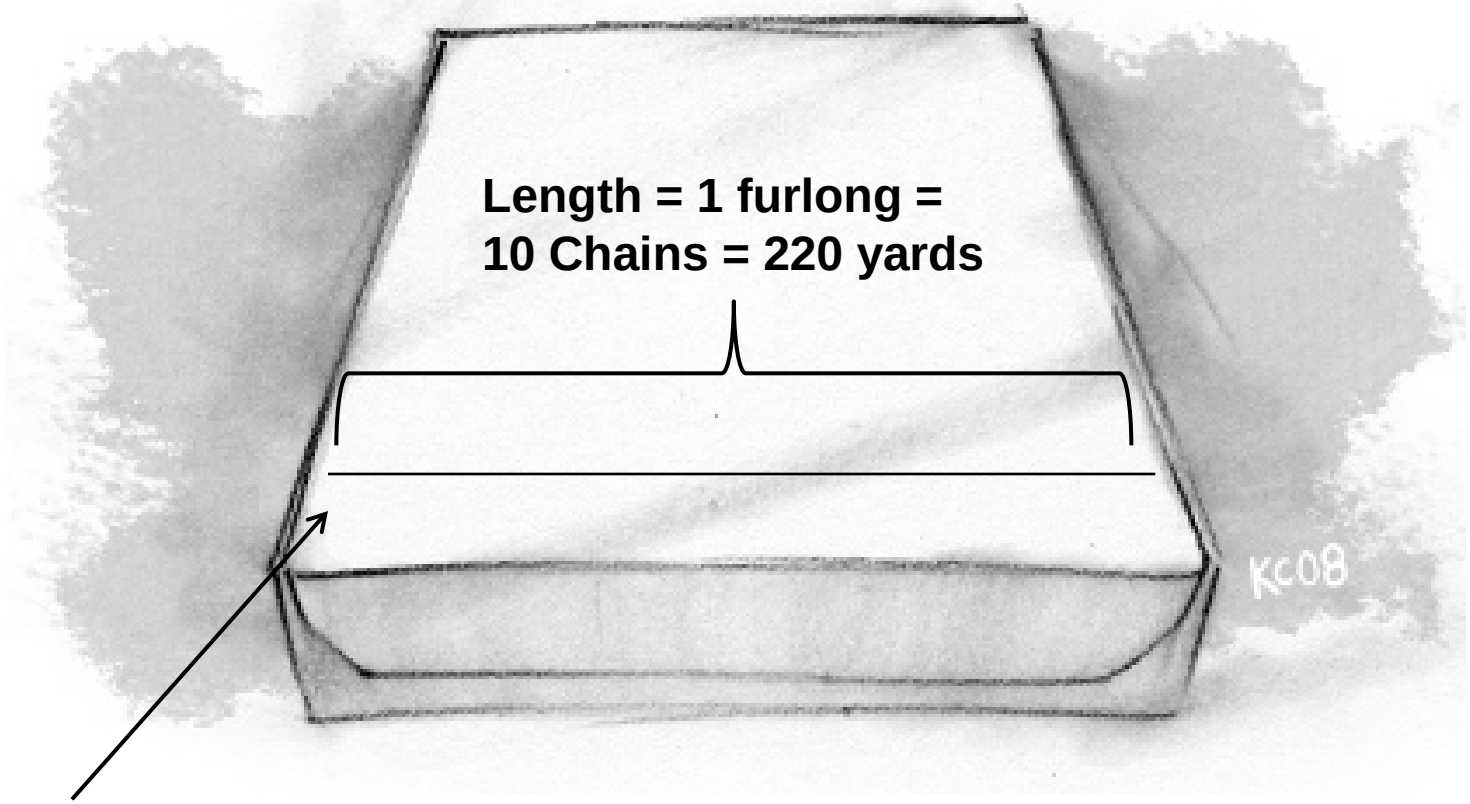
Protocol Language:

Two parts: ai and water

Trt#	Treatment	Target Rate of active ingredient	Target Rate of formulated product*	Application Type	Spray Volume Range**
01	Untreated	Not Applicable	Not Applicable	Not Applicable	Not Applicable
02	DPX-QGU42 OD (100 g ai/L)	0.5 oz a.i./A = 0.03125 lb a.i./A or 14.175 grams a.i./A (35 grams ai/hectare)	142 ml/acre +NIS or COC *** (350 ml/hectare)	Foliar spray	20 to 50 GPA (76 to 190 L/Ha)
03	DPX-QGU42 SC (200 g ai/L)	4 oz a.i./A or 0.25 lb a.i./A or 113.4 g a.i./acre (280 grams ai/hectare)	570 ml/acre (1400 ml/hectare)	Soil drench or through drip irrigation	80 ml fungicide solution per plant or as appropriate through the drip irrigation system.

If drip irrigation is used to make the application in Trt#03 then: Apply in 0.5 acre inches of water (±10%). Apply irrigation water and test substance as follows: first 1/4-1/3 of irrigation water with test substance, final 2/3-3/4 of irrigation water without test substance. The fractions are not exact requirements but rather guidance as to how to apply.

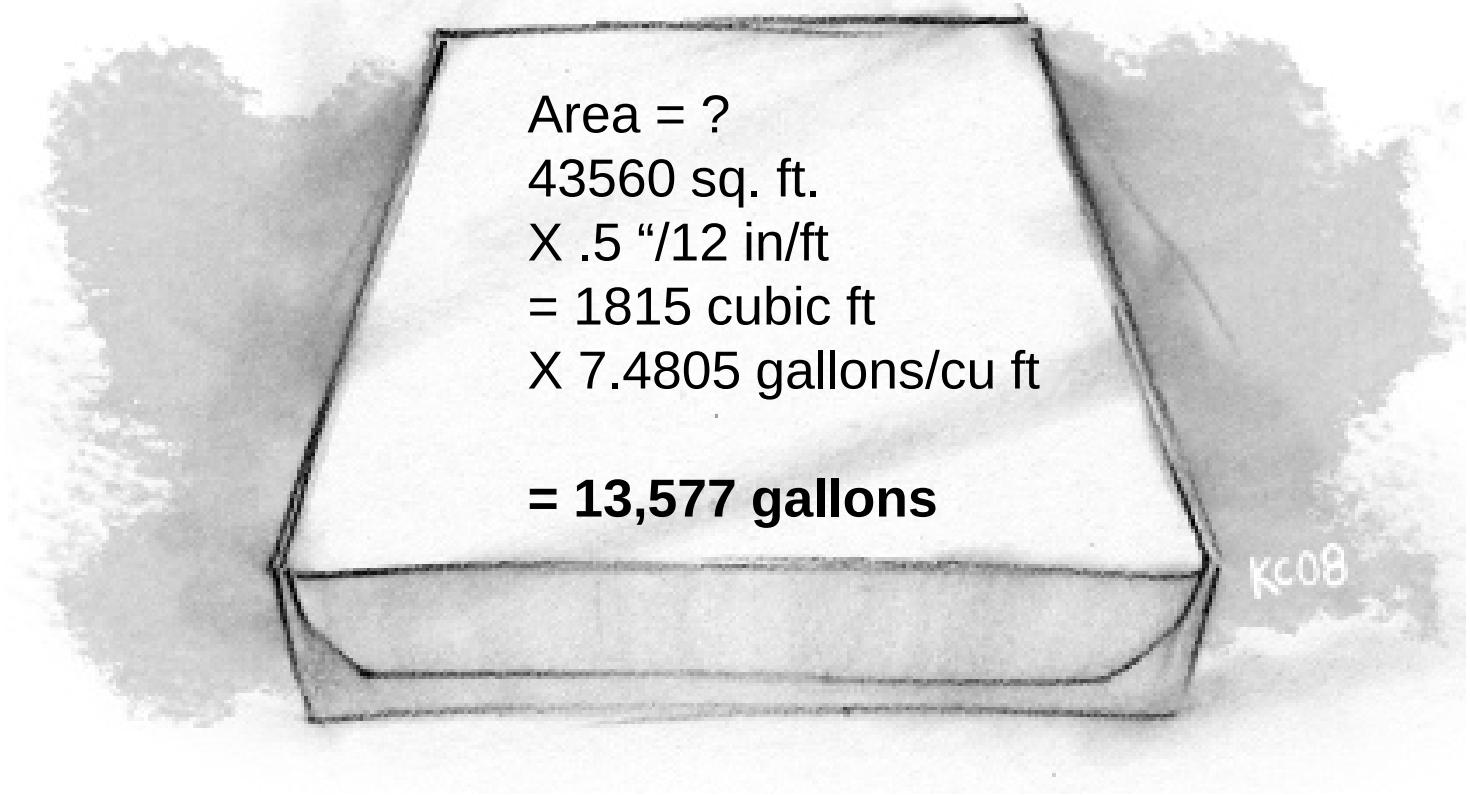
Aggie Trivia: What's an Acre?



So… 66' x 660' = 43,560 sq ft

Water Calculations:

Two parts: 0.5 Acre Inch



Water Calculations (continued):

Irrigation Volume/Plot: 0.5 Acre Inch = 13,577 gallons

Your plot: smaller (say 5x5'rows x 50') = 1250 sq ft

Volume to apply: 1250 sq ft /43560 sq ft/A * 13,577ga = ~390ga

Test Substance in first 1/4 to 1/3 of application, or

.25 * 390 ga = 98 ga
.33 * 390 ga = 129 ga

Test Substance rate = 570 mls/A
= 570 mls/A* 1250 sqft/plot / 43560 sq ft / A

= 16.4 mls

Three Methods:

Bulk Tank

Mazzei

Dosatron

Three Methods: Bulk Tank

Bulk Tank

Relatively Straightforward

1) **Calculate ts & add to calculated 1/4 to 1/3 water volume**
2) **Apply ts + water mix**
3) **Apply remaining water**

Specific Example:

110 ga + 16.4 mls ts

followed by 280 ga

Three Methods: Injectors

Mazzei

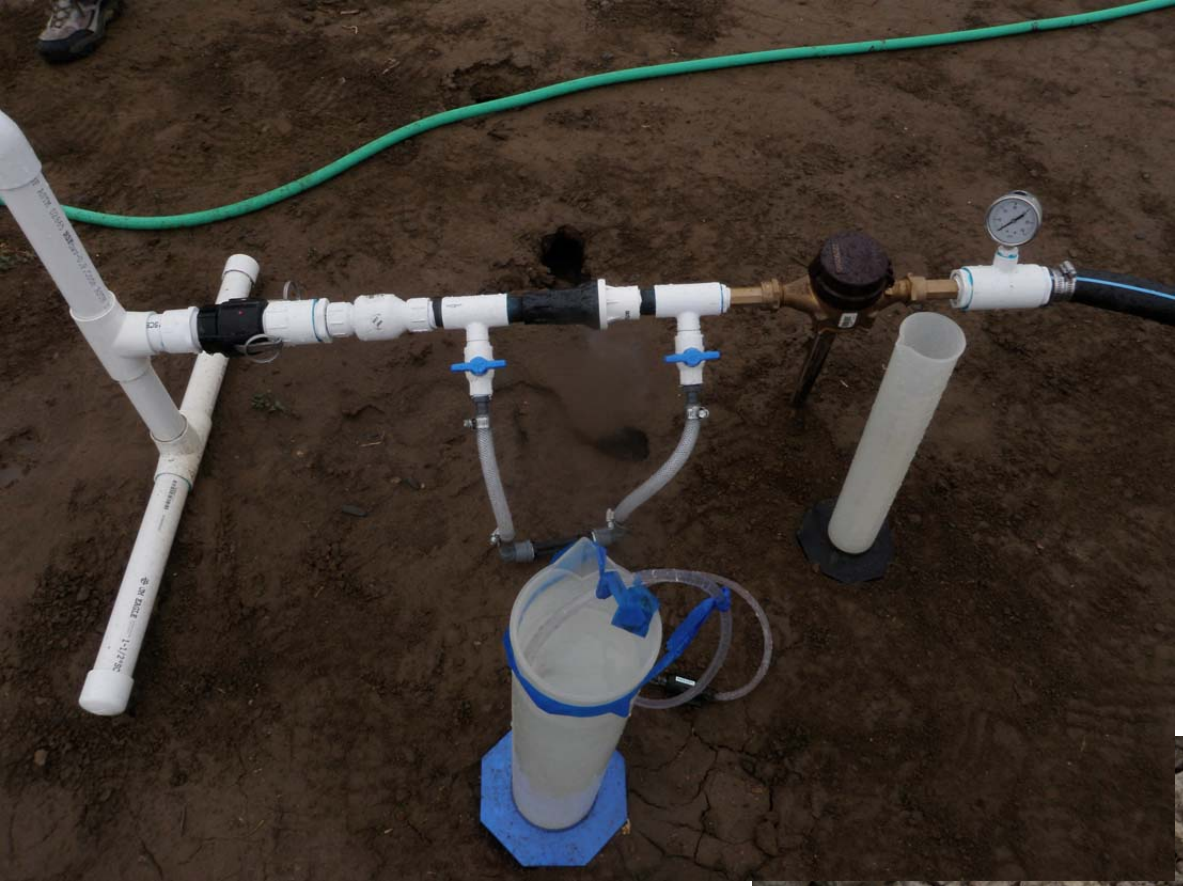
Somewhat more complicated

1) **Measure injector rate**
2) **Measure system rate**
3) **Adjust ts mix volume so injection occurs for 1/4 to 1/3 of total irrigation time**

UCD example:

Q_{mazzei} = 4.3 L/hr
Q_{system} = 732 L/hr
V_{plot} = 4719 L

Total Time	**= 4719L / 732L/hr = 6.4 hrs**
25% Time	**= .25 * 6.4 hrs = 1.6 hrs**
25% Volume	**= 4.3 L/hr * 1.6 hrs = 6.8L**
ts Mix Volume	**= 7L**



Documentation

App 1,2 Tnt03 **EMITTER DISCHARGE VERIFICATION**

QGU42/Pepper
(Bell & Non-Bell)
ID No. 10621.11-NM09

Prior to first application with drip applicator, record timed discharge from approximately equidistant emitters in near(N), middle(M) and far(F) thirds of each drip line. Rows are numbered from left to right when facing plot from main line.

DISCHARGE IN MILLILITERS (ML) AVG = overall average for 24 emitters per run

RUN 1	Run time ~5 min		Pressure: 21 psi					
Row	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**TOT.**
N	275	275	280	260	260	285	300	290	2225
M	265	250	270	290	280	270	285	275	2185
F	x ①	280	275	250	255	280	270	280	1890
TOT.	540	805	825	800	795	835	855	845	6300
		AVG:	274 ②	**-10%:**	247	**+10%:**	301		

① Catch device was not placed correctly under emitter – no discharge was caught
② Avg. discharge/emitter calculated for 23 emitters

Drip System Output:

Rows: 4

Emitters/Row: 200

Total Emitters/Plot: 800 x 14.91 mls/min (from output check)

= 11928 mls/min (for whole plot)

+ 3785 mls/gal

x 60 min/hr

= 189.08 gals/hr

Plot 4000 sq. ft. (from Part 5C/6A)

+ 43560 sq. ft. / ac

= .091827 acres

x 13577 gallons/1/2 Acre-Inch

= 1247 gallons

Time to apply Irrigation = 6.6 hours (dividing gals by gals/hr above)

x 0.25 x 60 min/hr

= 99 minutes for first 1/4 of irrigation

x 0.33 x 60 min/hr

= 131 minutes for first 1/3 of irrigation

Injecter System Output & ts Dilution volume

Start Volume: 4000 mls

End Volume: 1900 mls

Difference: 2100 mls 33.17 minutes

Injecter Output 63.31 mls/min

Volume for 1/4 irrigation time: 6268 mls (multiplying 1/4 time x injecter output)

Volume for 1/3 irrigation time: 8294 mls (multiplying 1/3 time x injecter output)

Test Substance rate: 570 mls/acre (from protocol)

Chosen Dilution Volume: 7000 mls

Test Substance amt (Rate x Acres): 52.54 mls

Estimated Injection Time (Chosen Volume/Injecter Output) 110 min

Note: Chosen Dilution volume falls between amounts required for 1/4 to 1/3 of irrigation, per protocol requirements.

A R Flanagan

Data entered by:

12/1/2011

Date:

Website has this example form and an excel template which can be modified to match your system.

http://wrir4.ucdavis.edu/resources/docs/DripInjectionPage.pdf

Photographs of Injection Manifold

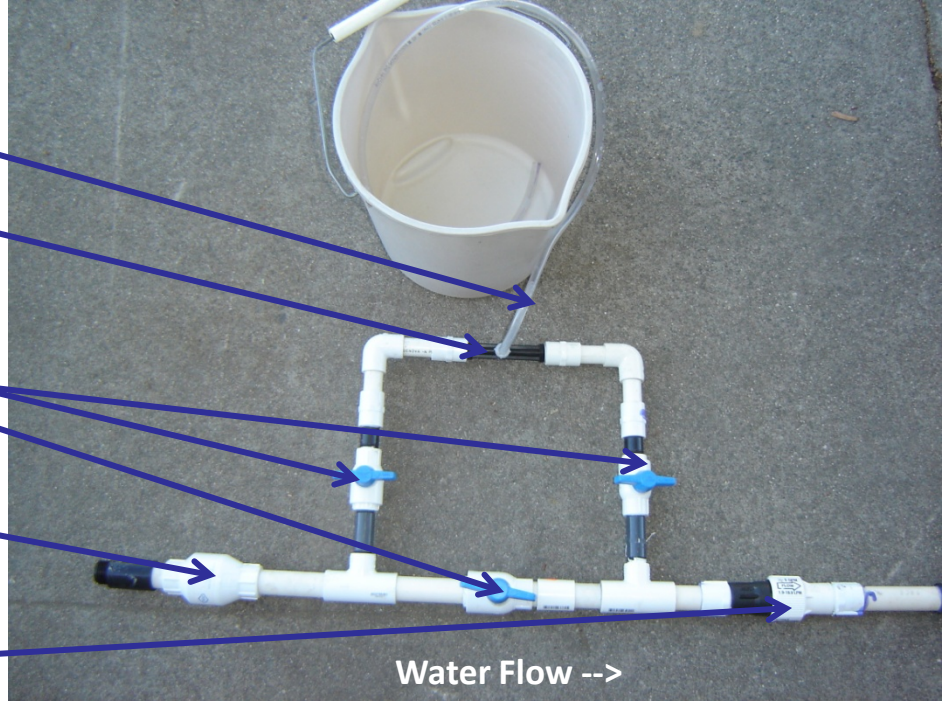
¼” ID vinyl tubing for uptake of test substance solution

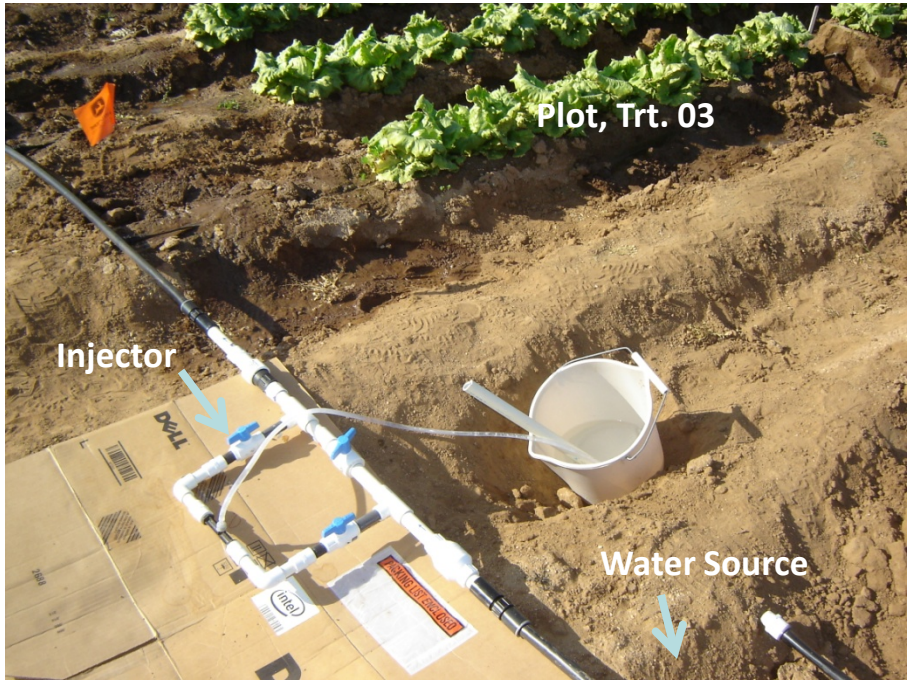
½” Injector
(Model 283, Mazzei Injector Company, LLC, Bakersfield, CA)

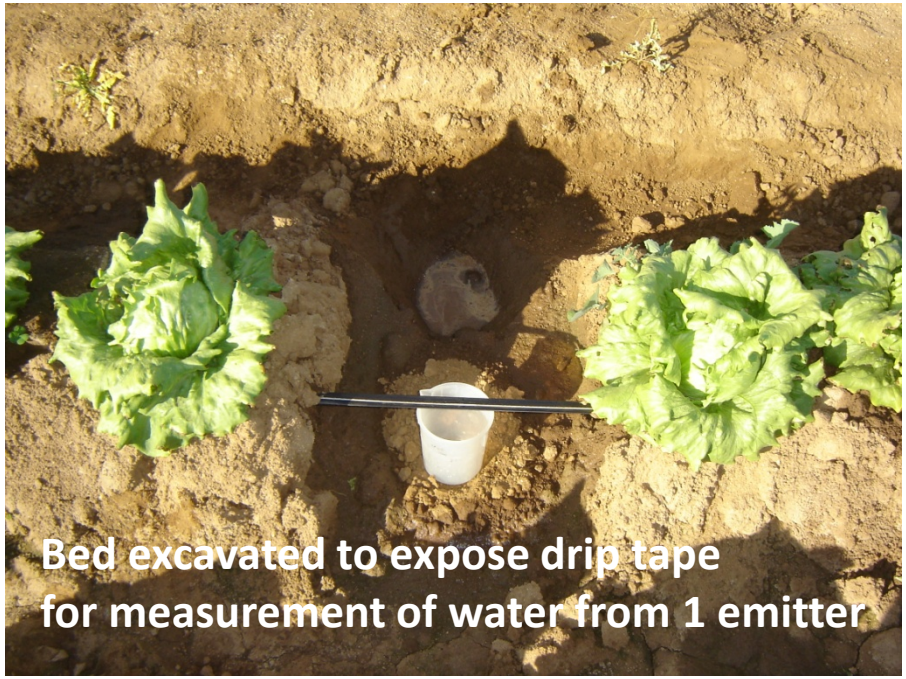
½” Utility Ball Valve
¾” Utility Ball Valve
(Spears Manufacturing Company, Sylmar, CA)

¾” In-line Spring Check Valve
(Dura Plastic Products, Beaumont, CA)

10 PSI Pressure Regulator
(Senninger Irrigation Company, Clermont, FL)







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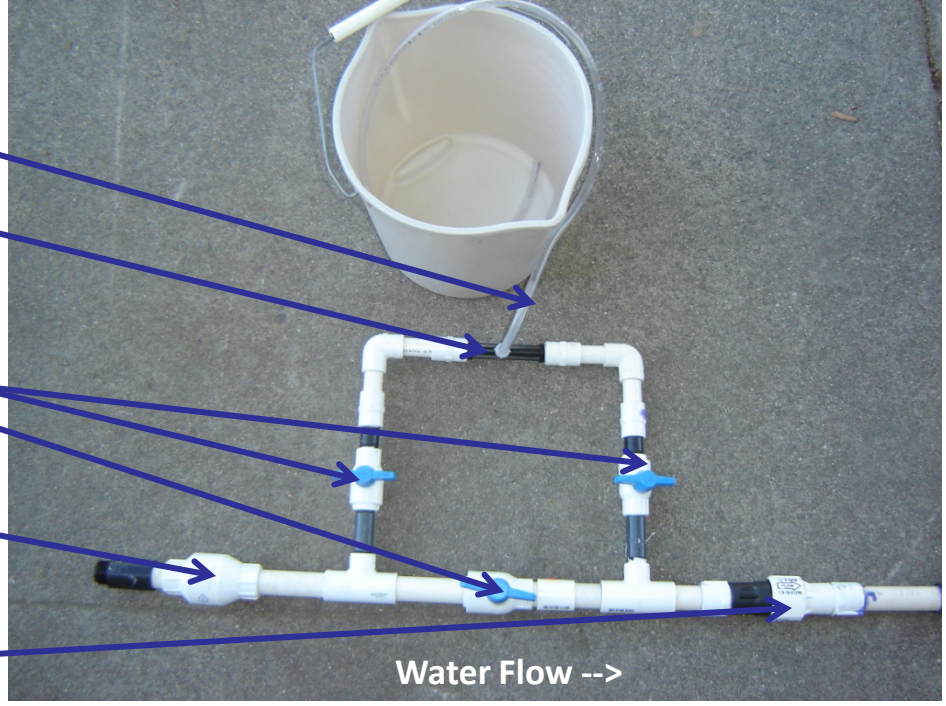

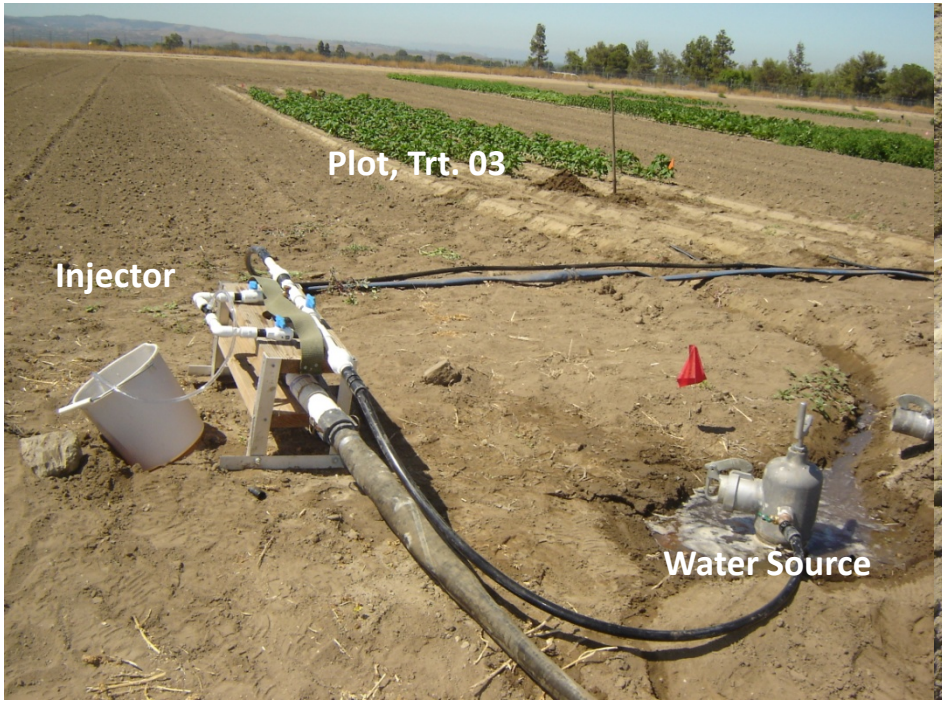

Photograph of Mazzei Injection Manifold ‘Mazzei Injector’

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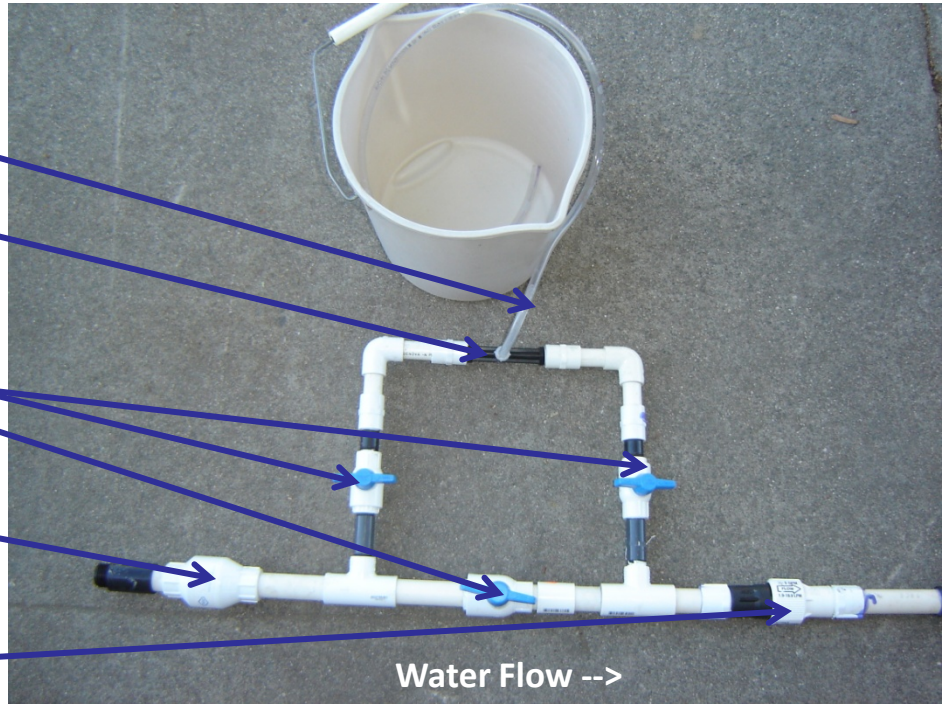
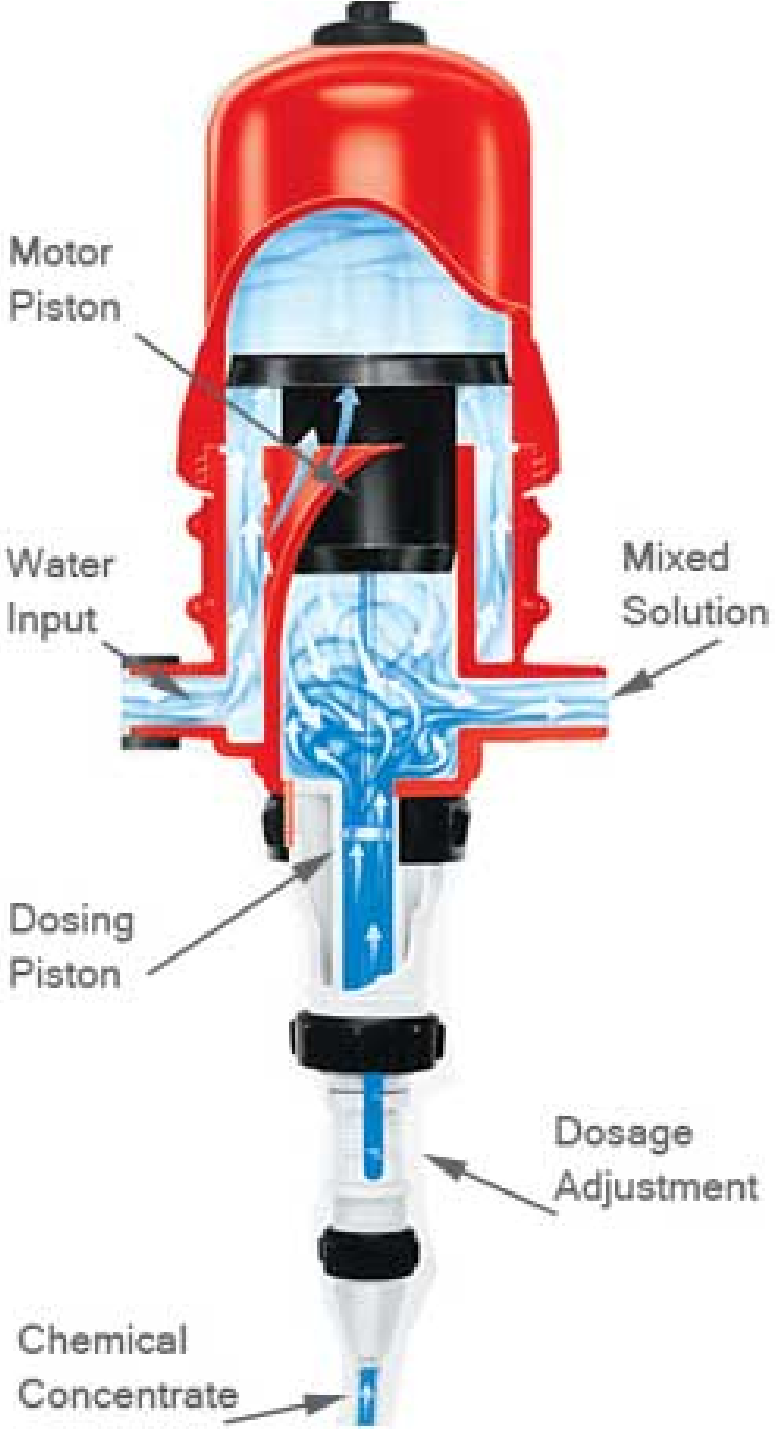


WSU – Wasabi setup
with multiple Dosatrons



Dosatron Diagram

Device needs to be sized for your flow rate

http://www.dosatronusa.com/

The rest of the calculations & calibrations follow the same procedure as the Mazzei