ZD Farms SARE Grant

FW19-351

Year #2 Report

Effects of Subsurface Micro-irrigation on Water Use Efficiency and Hazelnut Tree Growth

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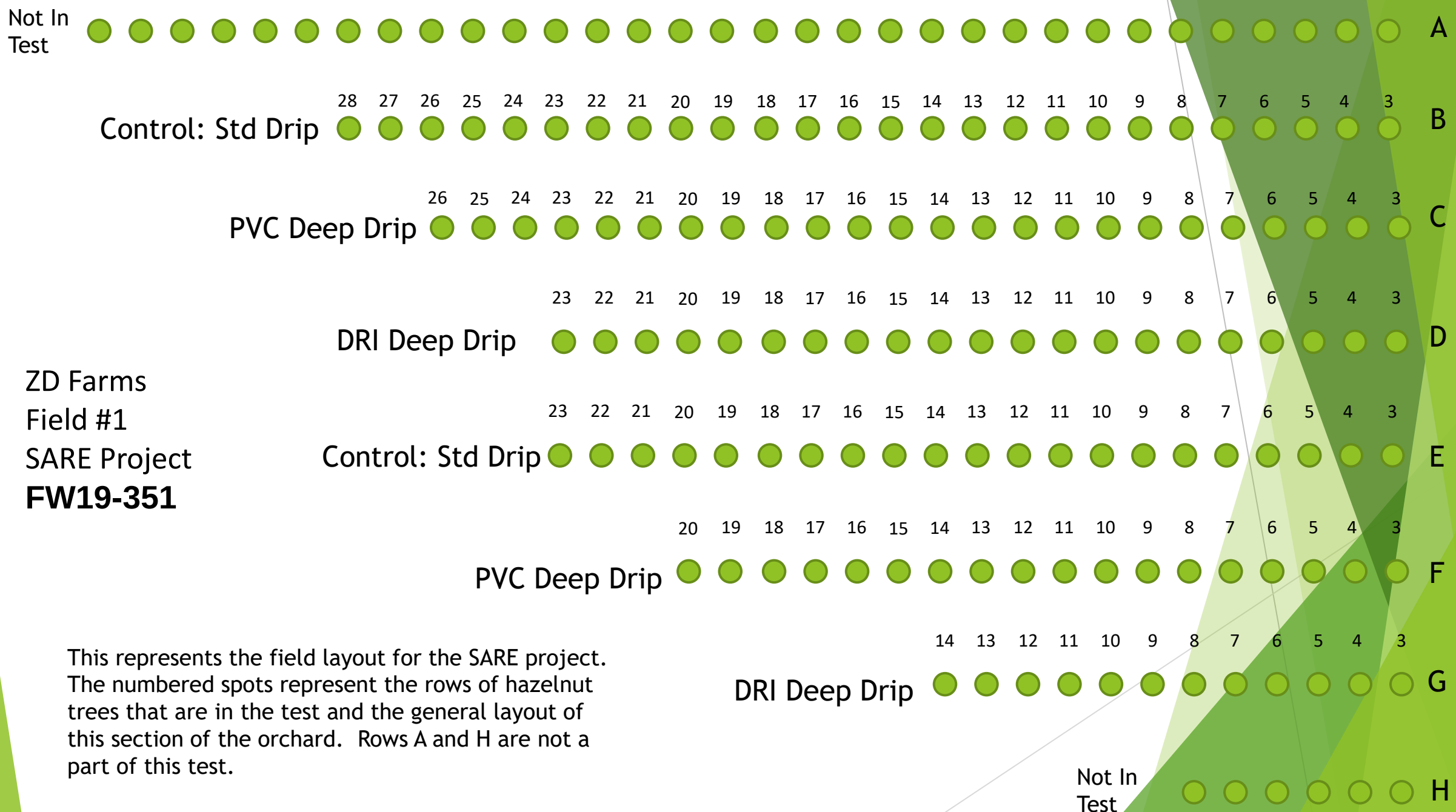
- Obj 1: Evaluate efficiency of our subsurface micro-irrigation strategy on water conservation
- Obj 2: Measure the impact of our new subsurface micro-irrigation strategy on hazelnut growth and nut quality
- Obj 3: Educate hazelnut producers and engage community members on irrigation water conservation and hazelnut quality improvement



This represents the field layout for the SARE project. The numbered spots represent the rows of hazelnut trees that are in the test and the general layout of this section of the orchard. Rows A and H are not a part of this test.

Table of Rows and Emitter Configuration

Row	Status	# Trees	Drip Type	Emitters/Tree	Emitters Size
A	Not in Test	34	Standard	1	2.5 GPH
B	In Test	28	Standard	2	2.5 GPH
C	In Test	26	PVC Deep Drip	2	2.5 GPH
D	In Test	23	DRI Deep Drip	2	2.5 GPH
E	In Test	23	Standard	2	2.5 GPH
F	In Test	20	PVC Deep Drip	2	2.5 GPH
G	In Test	14	DRI Deep Drip	2	2.5 GPH
H	Not In Test	5	Standard	2	2.5 GPH

Trenching was done to install a 1 ½” PVC pipe header to feed all rows in Field #1.

This header is pressurized before the opening of the valves for each row to supply irrigation water to the trees.

This arrangement has the ability of being fed by well water, rain captured water or fertilized water.

In the future there will be a direct connection to this system from a settling system using natural (fish) fertilizer to test this portion of the drip systems.

We used a portable generator to power the electric drills used for preparing the holes for each deep drip line.

A heavy-duty drill was required as the work was attempted in mid-summer, a time where the ground is harder to penetrate.

Water was applied from a sprinkler system to attempt to soften the ground, but this proved to be largely ineffective.

Some holes had to be attempted several times to get a satisfactory depth.

The long drill bits sheared several times during the process and had to be rewelded.

Ideally this work should be done early in the year when the ground is softer which would result in less time and less wear and tear on the equipment.

The 30” drip pipes were installed at about 45 deg angle pointing towards the center of the tree on either side and at a depth of about 24”.

These are ¾” sch 40 PVC pipe with the bottom ends slit about 12” up from the bottom to aid in dispersing the water to the root system.

The DRI drip tubes were installed in a similar 45 deg angle but at a slightly less depth than the PVC deep drip tubes.

These drip tubes are a foam tube with a closed end, so the water collects and the permeates through the tube to the soil.

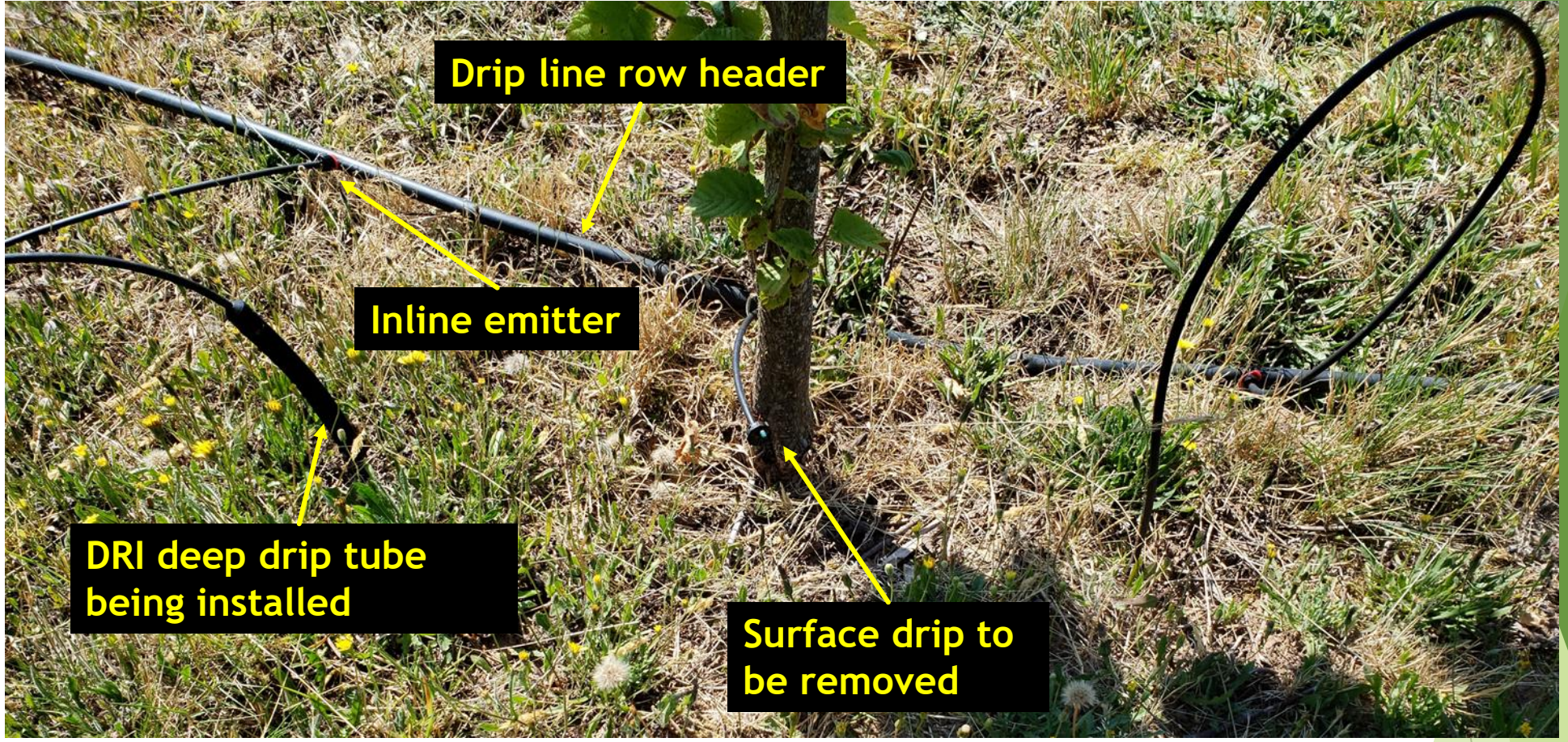
These come with a length of tubing that is connected to the drip emitter on the row plastic feed line.

The DRI deep drip units can be seen here installed and connected to the incoming row supply line.

These are installed one on either side of the tree at about the width of the tree canopy.

As the tree grows and the canopy expands it’s expected that there will be additional drip units installed to support the expanding root system.

The drip emitters are installed inline with each deep drip unit but are not shown in this picture.



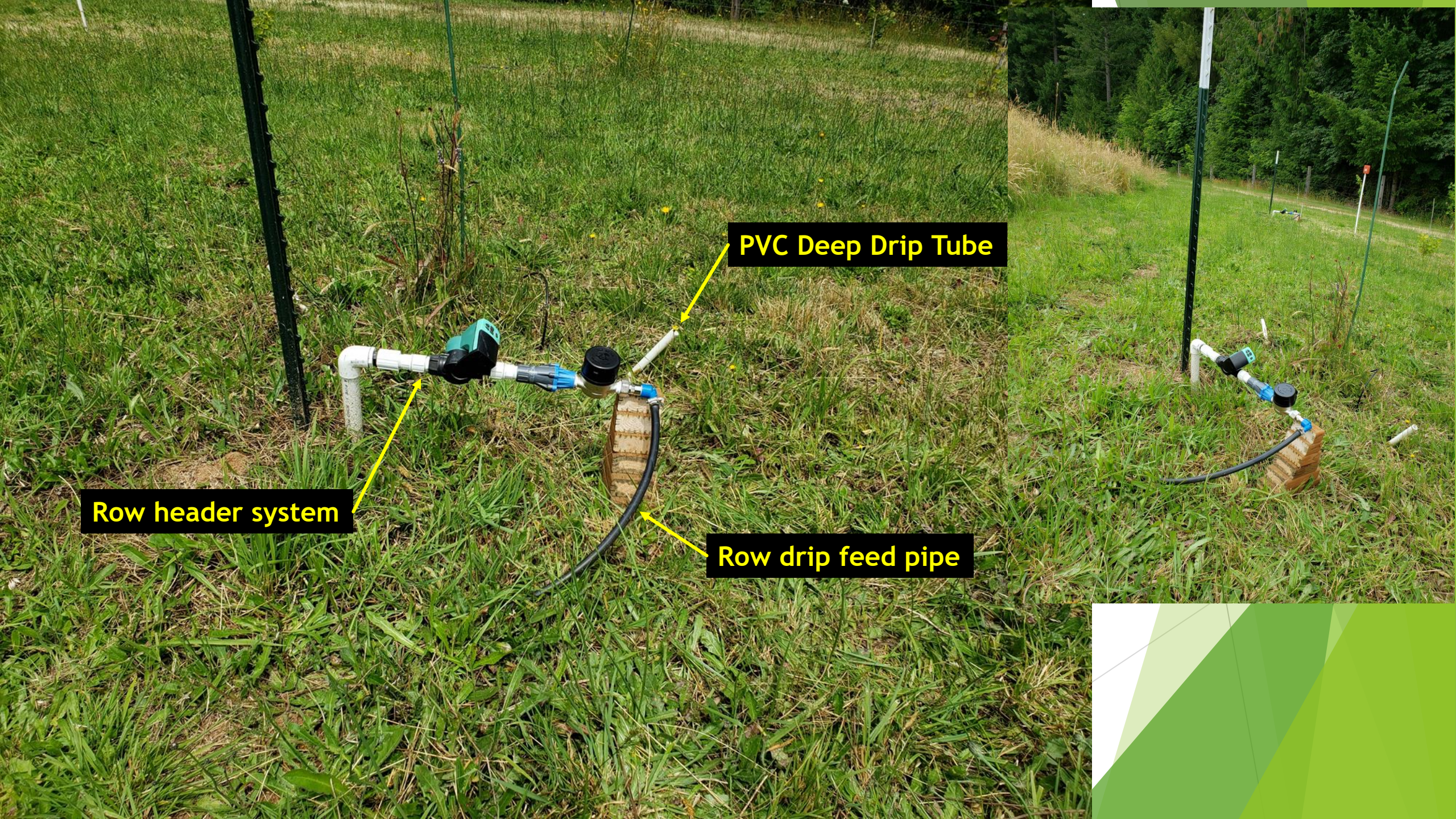
This is the typical arrangement for the DRI deep drip units. Arranged on both sides of the tree and about the width of the current canopy.

The surface drip was removed once the system was installed and operating.

At the main drip feeder line has the drip emitter supplying the irrigation water through the DRI deep drip unit line.

The tree row piping system is shown here.

- Coming off of the header following the elbow is a pressure regulator.
- Next inline is solenoid valve with timer to control the on time and off time.
- Following the valve is a check valve to maintain proper flow direction.
- After the check valve is the flow meter to measure actual irrigation water flow.


PVC Deep Drip Tube
Row header system
Row drip feed pipe

The flow meters are easy to read and meet the objectives of this SARE project.