Gravity Drip Irrigation in the Navajo Nation

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Is this sustainable?

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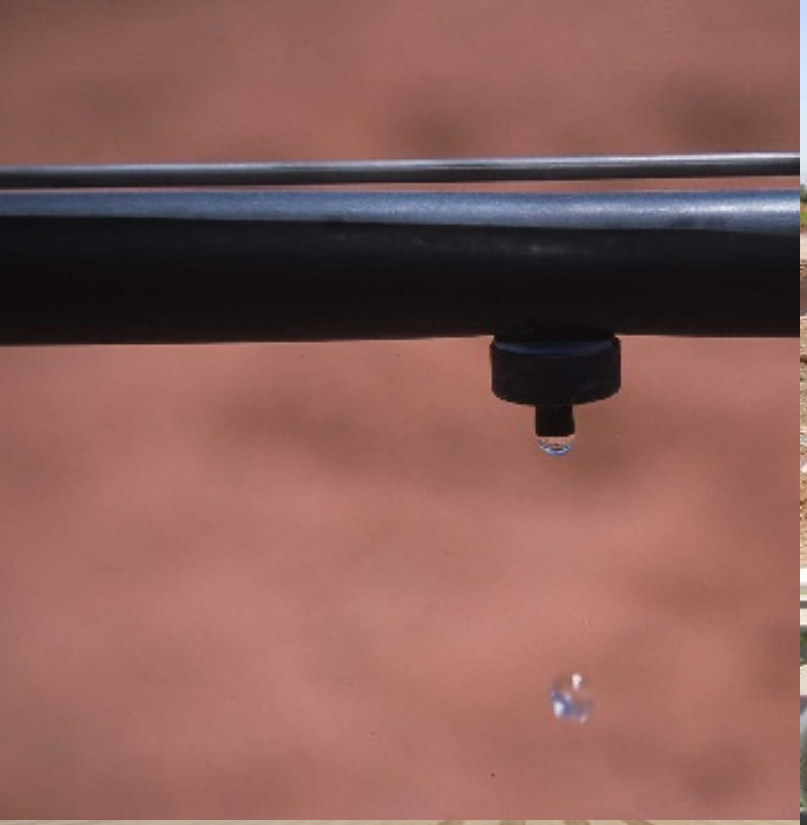


Is this sustainable?

Sustainable Irrigation

For irrigation to be sustainable, irrigation and drainage must be conducted in a way that does not degrade the quality of land, water and other natural resources that contribute to both agricultural production and environmental quality (Oster & Wichelns, 2003).

Hubbell Trading Post Demonstration

- **In 2003, the director of the Hubbell Trading post in Ganado, AZ approached the Bureau of Reclamation re-establishing agriculture on the historical site**

- **Part of this effort was to install demonstration plots that promoted efficient irrigation**

Facts About Hubbell

- **The trading post was purchased by Lorenzo Hubble in 1878.**
- **One of the oldest (if not the oldest) continuously operating trading post in the country.**
- **In the last 10 years, they have made real efforts to restore agricultural production on the site.**

Water Use in the Navajo Nation

- **Over 60 percent of the Navajo population hauls water to their homes.**

- **Many Navajo's haul this water for the purpose of growing a small kitchen garden for fresh vegetables and corn pollen for ceremonies.**

Water Use in the Navajo Nation

To help promote efficient irrigation in the Navajo Nation, a demonstration project was initiated to show the benefits of a low-cost, gravity-fed, drip irrigation system.

Water Use in the Navajo Nation

- All drip systems require pressure to get the water to flow out of the tubing or tape. Many systems require 10 or 15 psi. Usually, homeowners have to install a pressure reducer to make sure they don't blow their emitter off.

- However, efforts have been made to look at low pressure drip systems, really low pressure

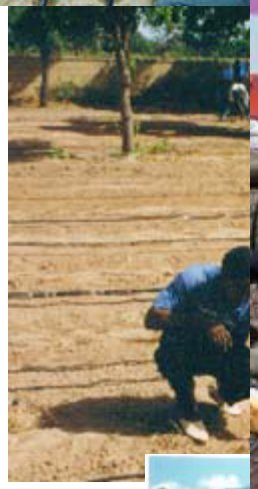
Water Use in the Navajo Nation

- **Gravity drip systems do not require any electricity for pumps. Instead, these systems use the force of gravity to push water through the drip line.**
- **Remember that every 2.31 feet equals 1 psi. So, if you need 10 psi, then you will have to raise your water source about 23.1 feet in the air.**
- **In general, these systems require about 5-6 feet of head (2.2 – 2.6 psi) .**

Bucket Drip at Hubbell

- **A small bucket drip system was installed at the Hubbell Trading Post garden in 2004.**
- **The small buckets were hung about 6 feet in the air and filled with a hose daily.**
- **Cheese cloth covered the buckets to act as a filter and prevent debris from falling into the bucket.**




Bucket Drip - 2004

The 2004 year was a learning year and although the corn did well, we did have our problems of getting enough water to the plants.

What did we learn

- The system wasn't designed for high water use crops like corn, so we need to shorten the tape length or increase the number of time we will the bucket

- Filling the bucket is boring

So we went to the Big Bucket

- This system is design to do a much larger area

- We had five systems working
  - At the University of Arizona campus in Tucson
  - At the U of A Maricopa Agricultural Center in Maricopa
  - And three at the Hubbell Trading Post

Maricopa Farm

- The system at the Maricopa farm worked well but we had some trouble with emitters plugging and salts in the water.

The water at Maricopa had very high salts and although the corn still grew, the tape was getting clogged.

How did we do?

- The systems in Tucson and Maricopa worked well but we did have some problems keeping up with water demand

- Like other drip systems, there still are problems with water quality.

Water Testing

- We tested the Electrical Conductivity (EC) of the water at Maricopa. EC relates to the total salts.

- The recommended EC for water used to irrigate corn is 1.7…… our water was 3.4. Needless to say, our yield at Maricopa was low.

What About Hubbell?

- At the Hubbell site, we installed three Big Bucket Systems and also used the same system for the garden area.

- We also put in a surface irrigated plot at Hubbell to compare with


13 6 2005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How did it go – at the start?

Early season, all went well. There was one “flooding” event of the drip plots from the surface irrigation water, but other than that, we did well.


21 7 2005


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American Alligator
Anahuac NWR, 21 Apr 2004
©Henry Detwiler, Southwest Birders

How did it go – mid-season?

Mid season, we continued to see our corn grow but we started to get some differences in the amount of water applied. This could have been due to clogging problems due to debris and algae in the system?


4 8 2005


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4 8 2005

In the End…

The corn grew tall and we had to get out there and harvest


1 10 2005


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Although we did well, we still had problems with clogging.


1 10 2005


1 10 2005

2006?

The year went fairly well and we were able to keep enough water on the plants. Aside from a corn borer problem, we had another good year.

Since the Hubbell study, we have installed systems in several place on the Navajo Nation.

Such as . . .

Dine' College

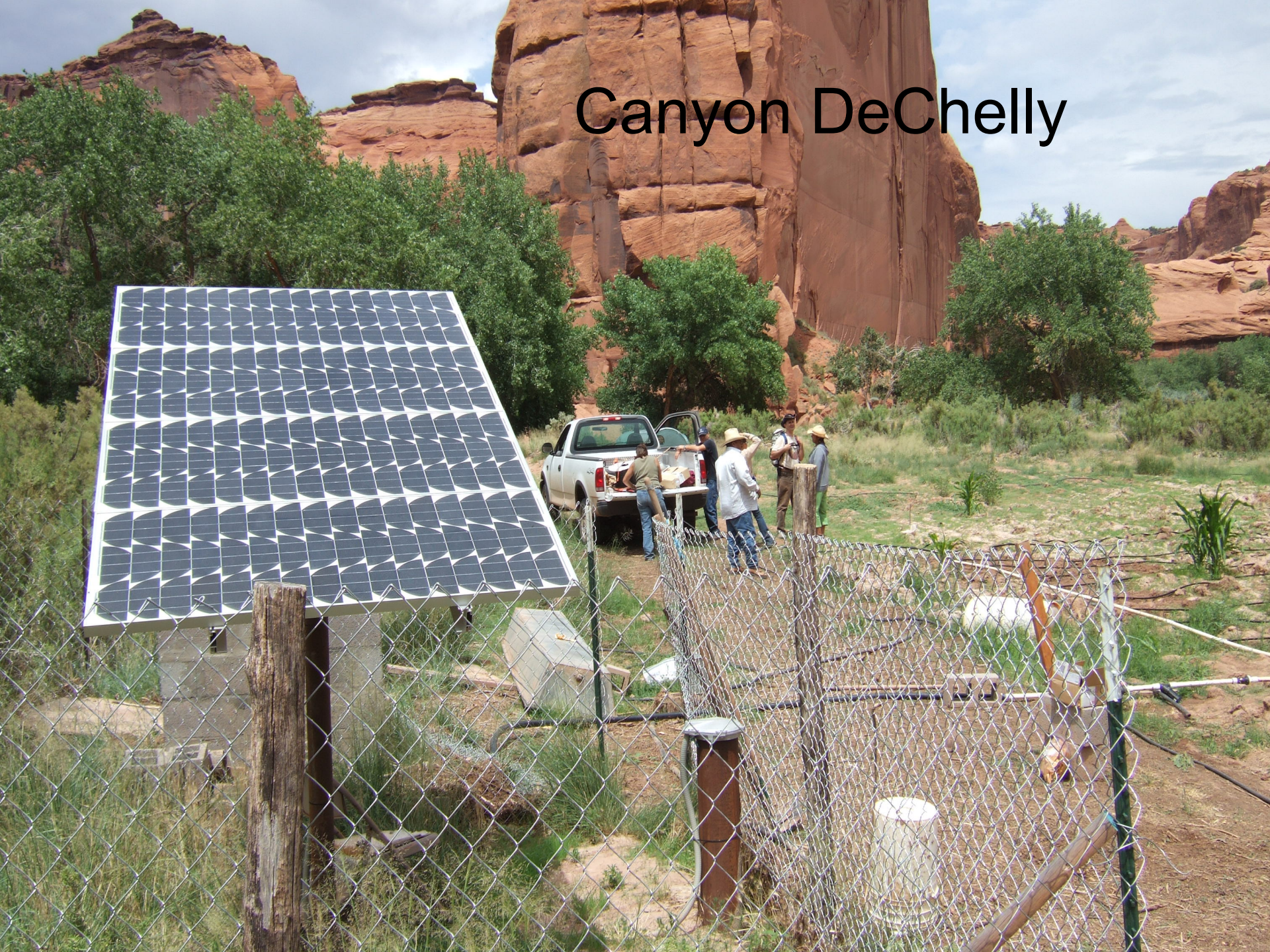
Dine’ College


Canyon del Muerto

Canyon del Muerto

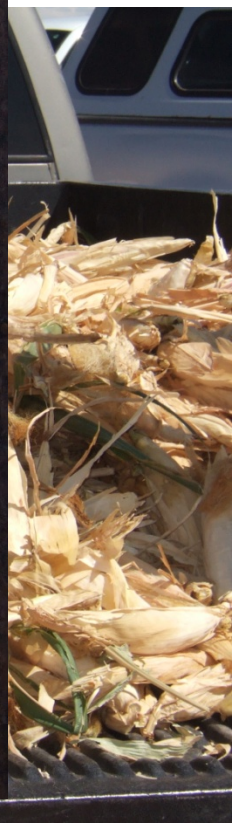

Canyon del Muerto


Canyon DeChelly


Canyon DeChelly

North Leupp Family Farms

North Leupp Family Farms



THANKS

Bureau of Reclamation
NPS - Hubbell Trading Post
New Mexico State University
Navajo Department of Agriculture

THANKS

To people who gave their time and their expertise to help establish drip irrigation on the Navajo Nation

Thank You