Advances in Lo- and Hi-Tec Irrigation Systems

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Objective

Webinar provides a national view of water use and irrigation along with an overview of the main irrigation systems and their recent advances and utility.

Webinar is expected to be of value to most field staff, especially since most systems discussed in this webinar are supported by NRCS and others as means of addressing inefficient use and management of water resources, water quality degradation, energy conservation, and sustainability.

Outline

- Brief on Water Withdrawals and Irrigation…….. Sampson
- Irrigation Methods & Advances in Micro Irrigation…. Farahani
- Advances in Surface and Sprinkler Systems …….. Prestwich
- What's New in Irrigation Pumping?…… Nelson

Advances are covered in general terms.

Areas not covered are irrigation improvements and advances due to agronomic and other practices. For instance:

Furrow diking, Reduced and no-till, Wastewater, Frost/temp protection and dust suppression, and turf applications…

Water Withdrawals by Category (USGS, 2010)

Category	Withdrawal	
Thermoelectric	48%	94%
Irrigation	34%	
Public Supply	11%	
Industry	5%	
Others	1%	

Consumptive Use of Water

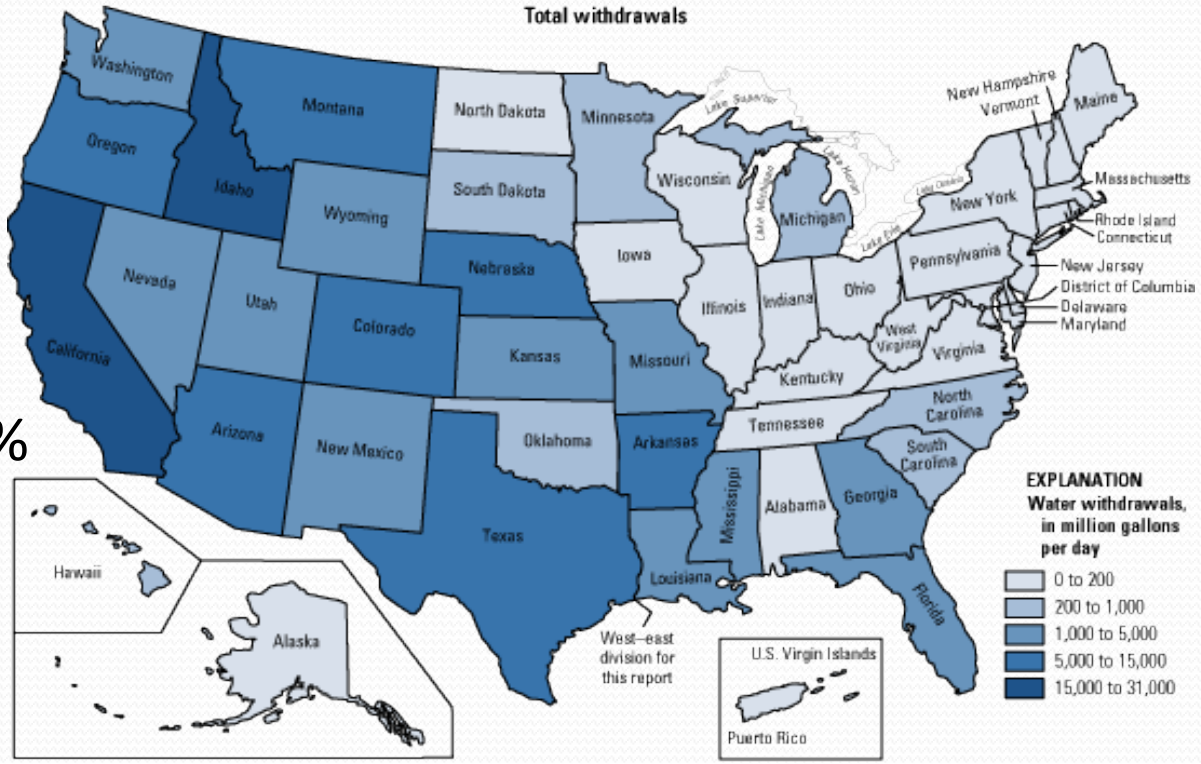
Thermoelectric	< 2.5%
Irrigation	> 70%

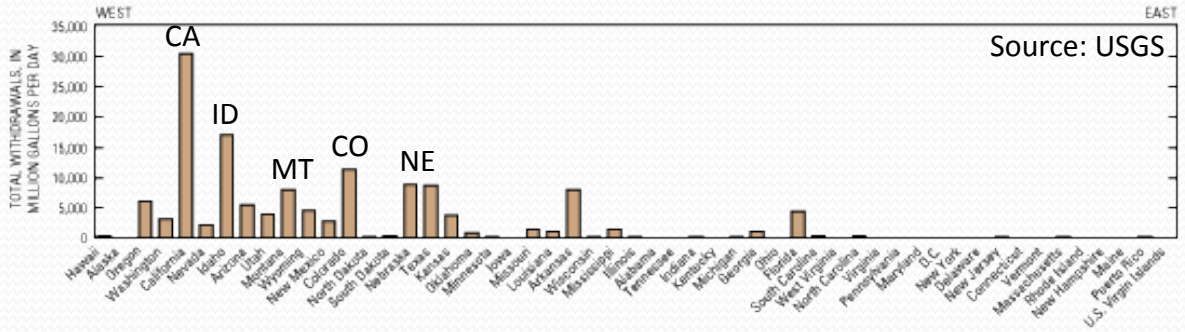
Irrigation Withdrawals

- Withdrawals for irrigation in 2010 were nine percent less than 2005.
- Withdrawals for irrigation in 2010 were the lowest since before 1965.

Irrigation - Major ground and surface water users in the US

Surface water withdrawals = 78%





Source: USGS

2013 Farm & Ranch Irrigation Survey

Irrigated Acres in the United States:

2008: 55,540,978 acres [91,956,721 acre-feet applied = 1.66 ft. (19.9 inch)]
2013: 55,319,417 acres [88,510,811 acre-feet applied = 1.60 ft. (19.2 inch)]

20 inch per season = 2 inch per week for 10 weeks = 0.28 inch/day

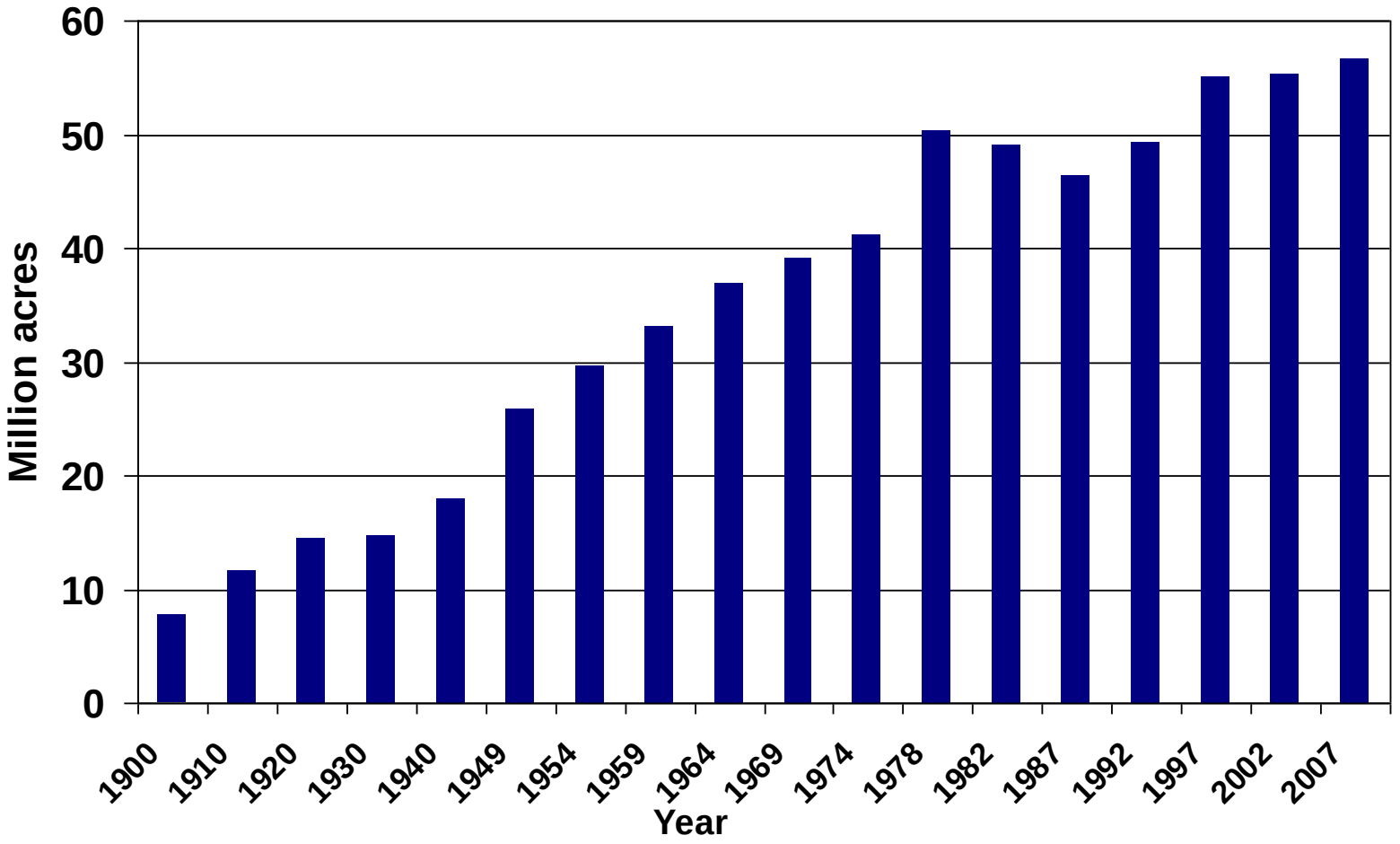
Top Five Irrigated States:

Nebraska:	8,297,560 acres	(8,069,122 acre-feet applied = 1.0 ft.)
California:	7,549,161 acres	(23,499,744 acre-feet applied = 3.1 ft.)
Arkansas:	4,950,053 acres	(6,454,502 acre-feet applied = 1.3 ft.)
Texas:	4,491,987 acres	(5,802,895 acre-feet applied = 1.3 ft.)
Idaho:	3,511,839 acres	(6,424,185 acre-feet applied = 1.8 ft.)

Importance of Irrigation:

Irrigated agriculture covers only 16% of all harvested cropland, yet produces nearly half the value of all crops

U.S. Irrigated acres 1900-2007



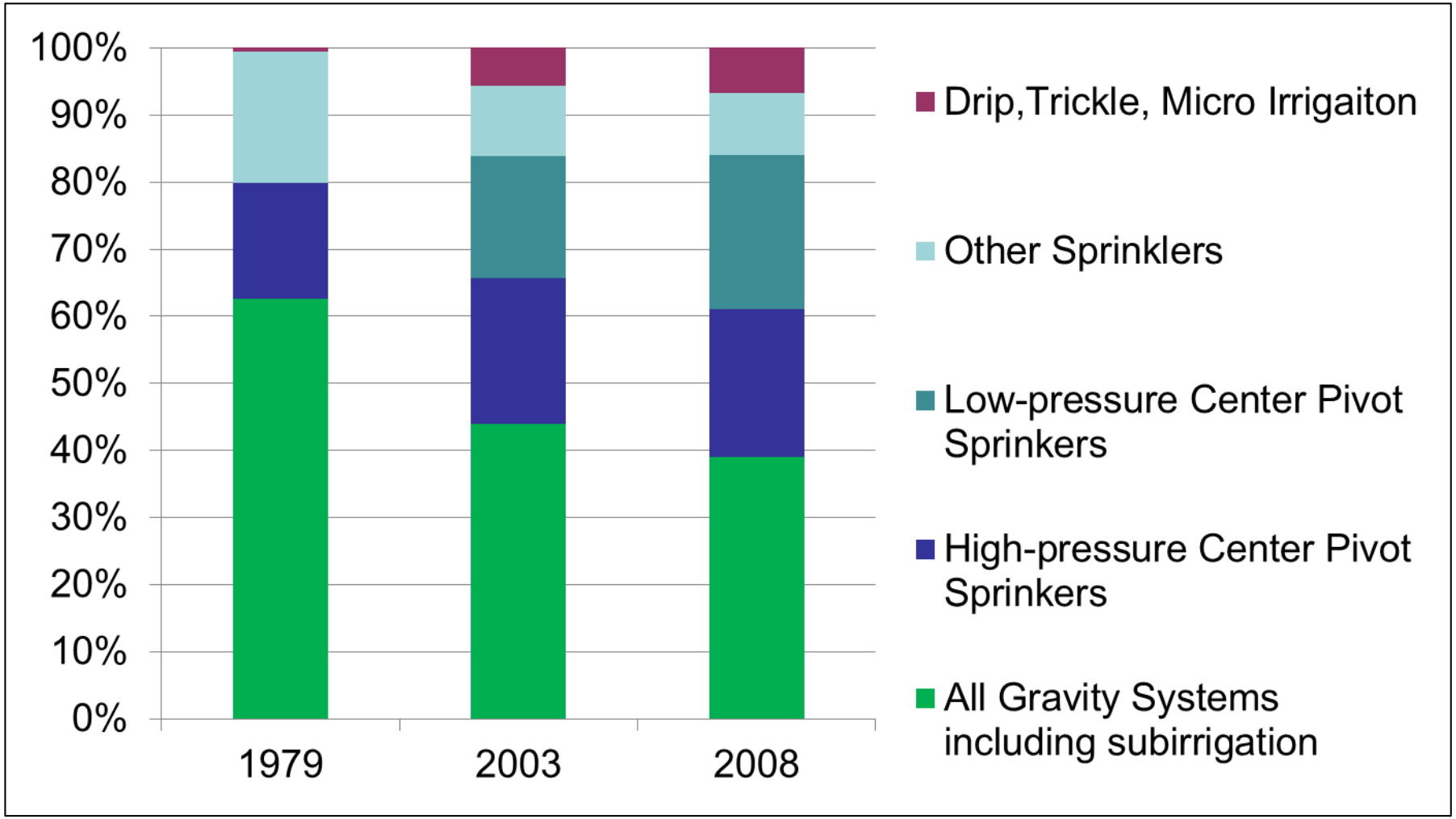
Source: USDA, NRCS, based Census of Agriculture Data

Changing Irrigation Methods Over Time

Irrigation Methods

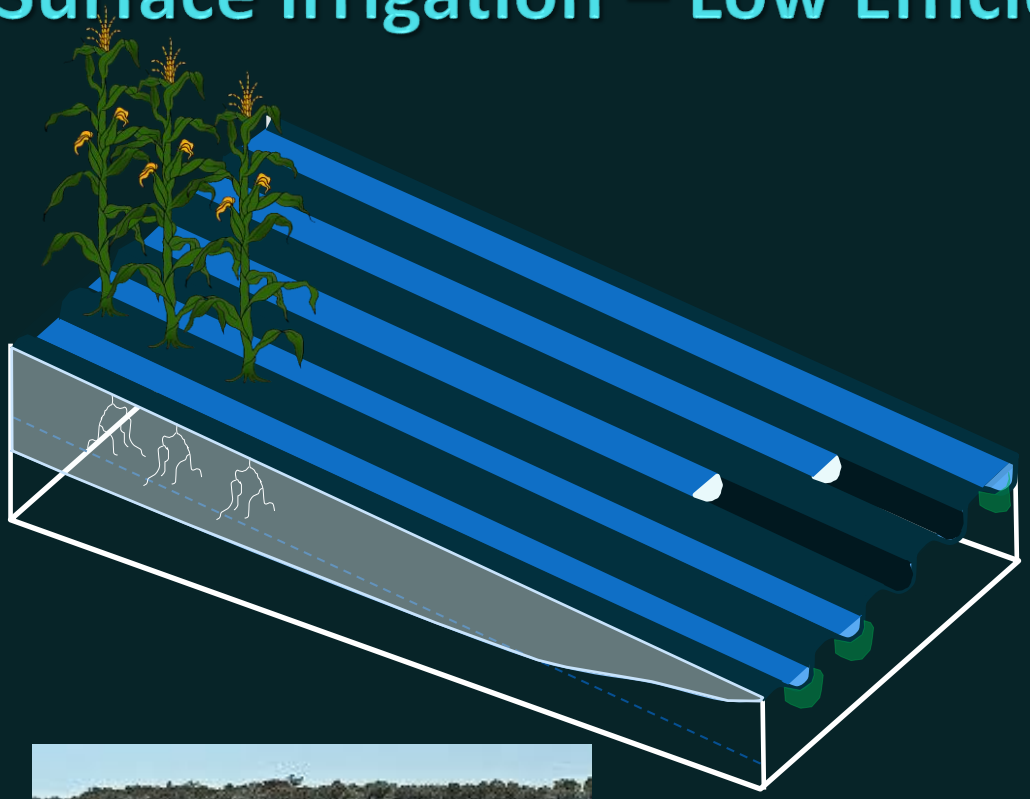
60% Pressurized (>80% sprinkler)

40% Gravity (surface & subsurface)



IRRIGATION SYSTEMS

Surface Irrigation – Low Efficiency and Uniformity



Farm Production:
Applying water to crops with a profit motive

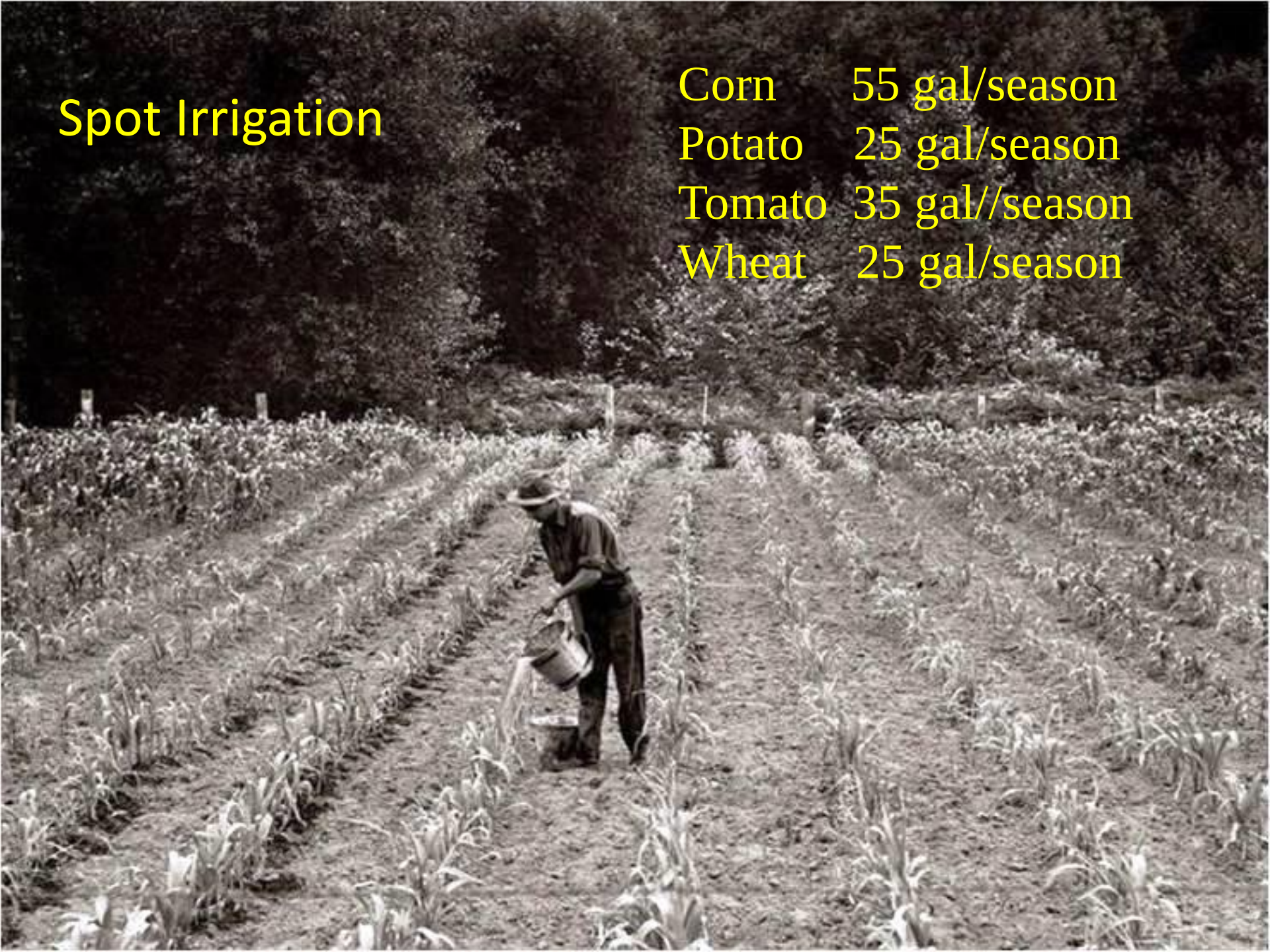
Advances in Micro-Irrigation System

A drip irrigation in action.

Bubbler

Micro spray

Drip


Spot Irrigation
Corn 55 gal/season
Potato 25 gal/season
Tomato 35 gal//season
Wheat 25 gal/season

Modern Spot Irrigation

Advances in Micro Irrigation Systems

- Drip tape and its recent PC versions
  - Thin-walled collapsible emitting hoses (mostly used in annual crops)
- Emitter hydraulics, PC, non-clogging, and manufacturing quality (CV < 3%)
- Automation/control and valve systems (flow, air/vacuum, pressure)
  - Microcontroller-based automation with real time feedback (soil moisture sensors)
- Filtration and chemical injection systems
  - Wide range of sand, disk & screen filters, Automatic flushing & cleaning
- Subsurface Drip Irrigation (SDI)
  - A more defined and practical root zone water and nutrient management
- Precision lateral placement in SDI (RTK technology)
- Use of Plastic Mulch and Recyclable Material (i.e., drip tape)
- Availability, affordability, flexibility, range of applicability, design and installation service
  - Vegetables, row crops, orchards, nursery, greenhouse, and landscape

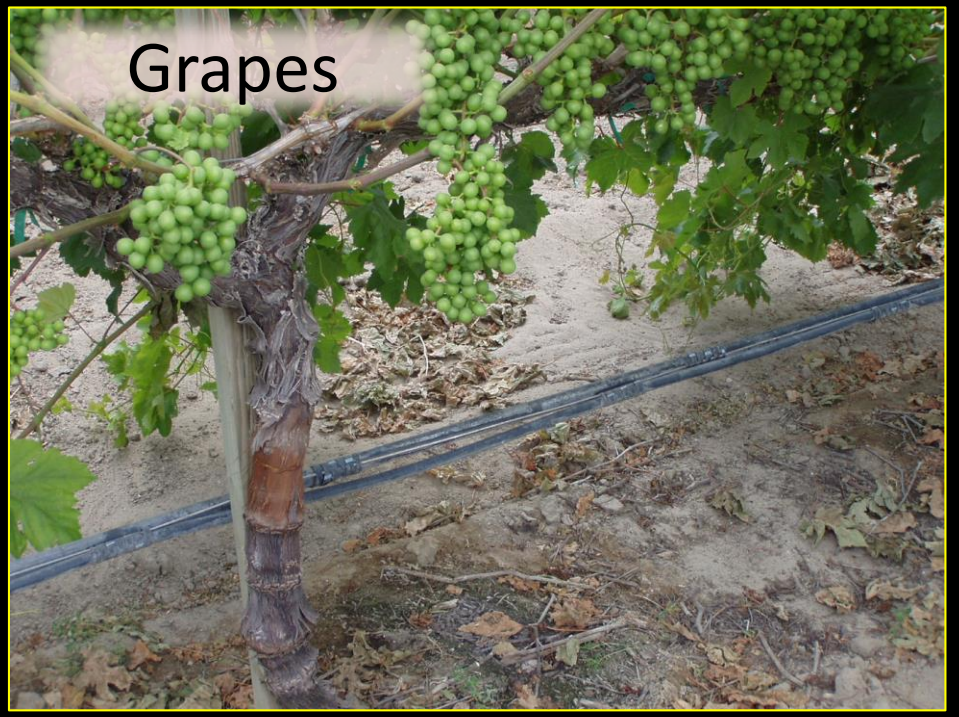

Blueberries


Strawberries


Tomatoes


Onions


Cotton


Grapes

Drip Irrigation under High Tunnels

Subsurface Drip Irrigation (SDI)

Lateral Material/Types

- Drip tape

- Thin wall drip line

- Heavy wall drip line

- Polypipe with punch emitters

- Polypipe with sprays

Point source emitters

Sprayers & Mini Sprinklers

Lay flat submain and manifold

Head control

Filters









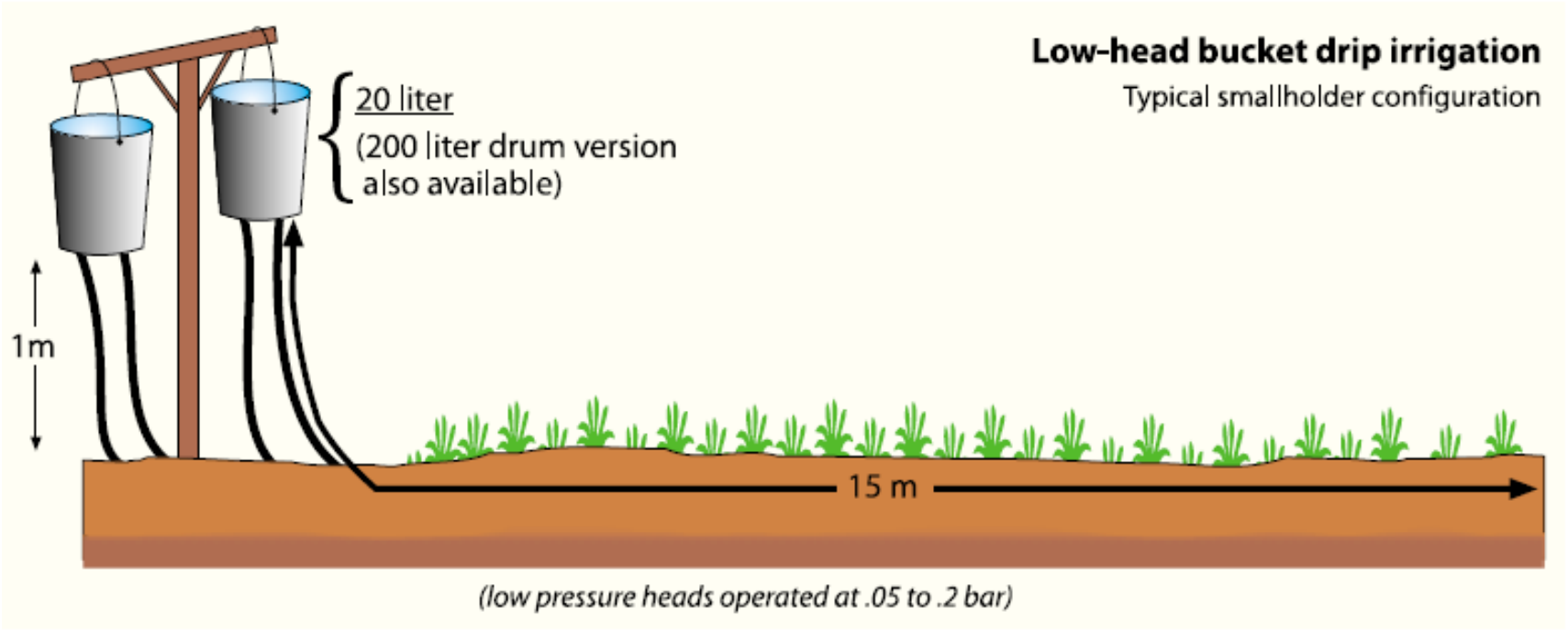
Automatic Self-cleaning Filters

Automatic controls

Air Valves

- Required on all drip systems especially on SDI
  - To release large volume of air on startup
  - Continuous release of air after system is pressurized
  - Prevention of vacuums

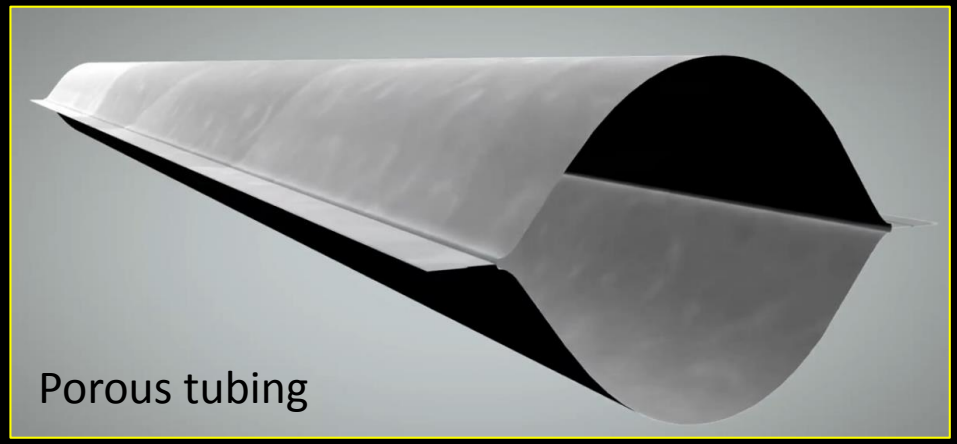
Gravity Drip Irrigation (GDI)



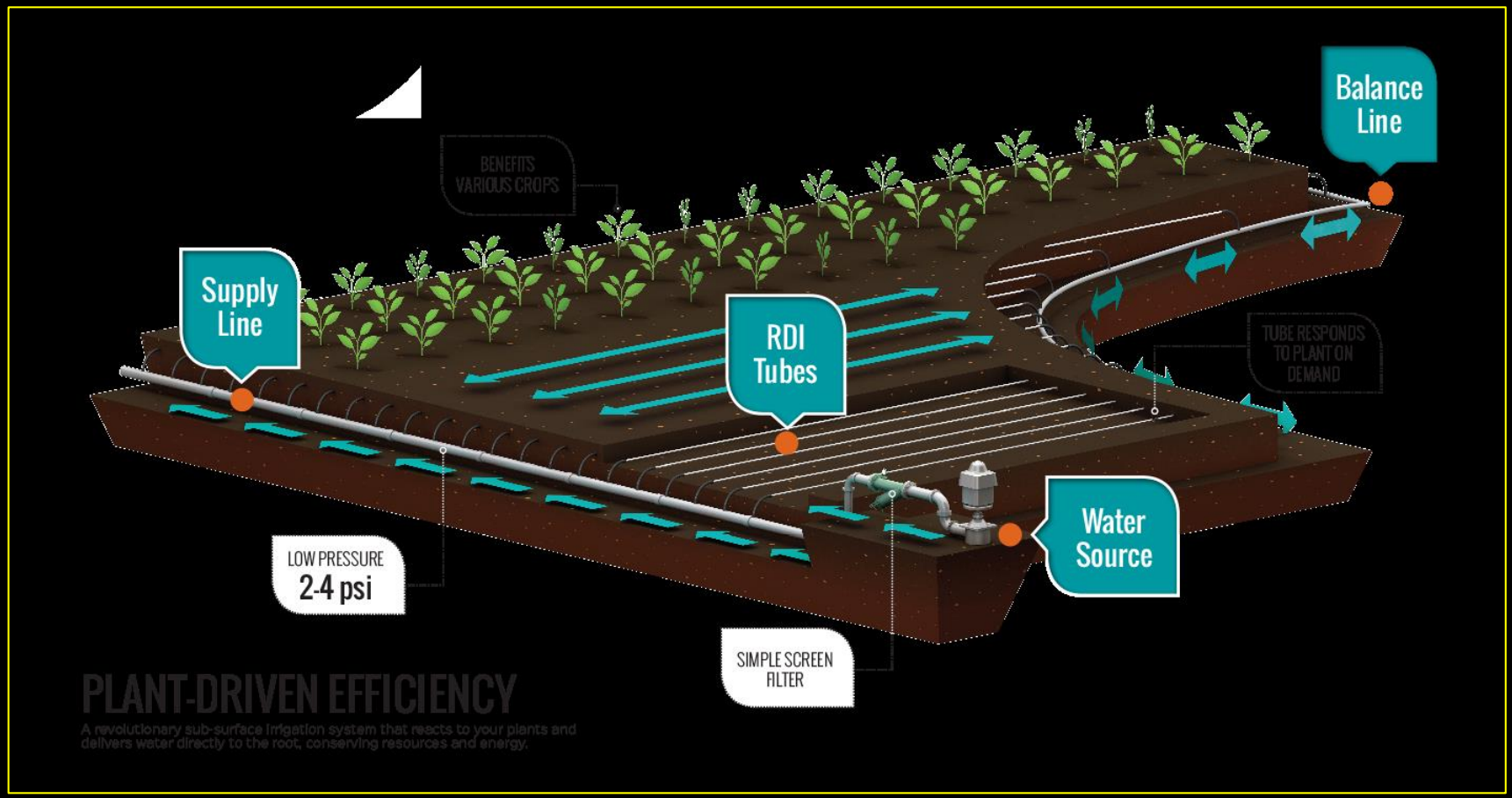
Pre-packaged low pressure systems to irrigate 1/3 ac were used in Afghanistan.

Low Pressure Gravity Drip Irrigation

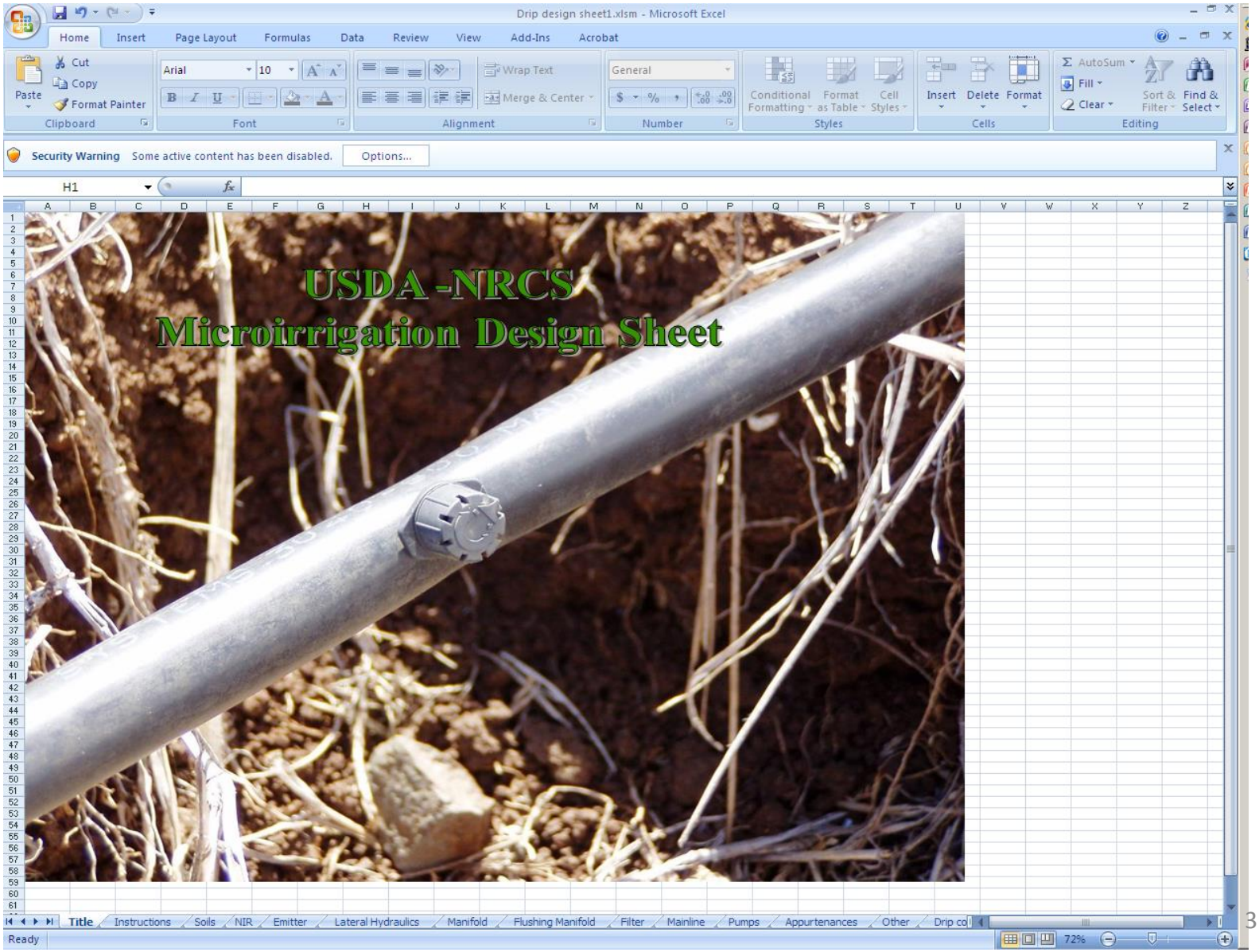
ROOT DEMAND
IRRIGATION



Porous tubing



USDA-NRCS Micro Irrigation Design Tool



Sensor-based Agriculture

Wireless Capable & Internet Deployable


Thank you