Pilot Test of LEPA / LESA Retrofits

- Pilot test approach
- Goal - Define how much water savings can be achieved
- Provide on-the-ground data to help support potential funding for implementation on a valley-wide scale.
- Key points:
  - Volunteer Basis
  - Requirement: Two pivots on a ranch with similar soils and similar alfalfa production and expected production from the each field
  - Equip one pivot with LEPA or LESA and reduce pumping to 20% for first cutting, 15% second cutting, and 10% last cutting (hypothetical %)
  - Measure yield (bales) and general notes on crop health for each pivot
  - Equip another set of pivots with LESA to run concurrently
  - SVGWD grant funding for acquisition of LEPA/LESA equipment
  - Ranch owner to donate all manpower to install, and assist with documenting flows to each pivot and crop conditions
  - Reallocate some Cat. D budget for pilot equipment - use existing grant funding

LESA – Low Elevation Spray Application
LEPA – Low Energy Precision Application

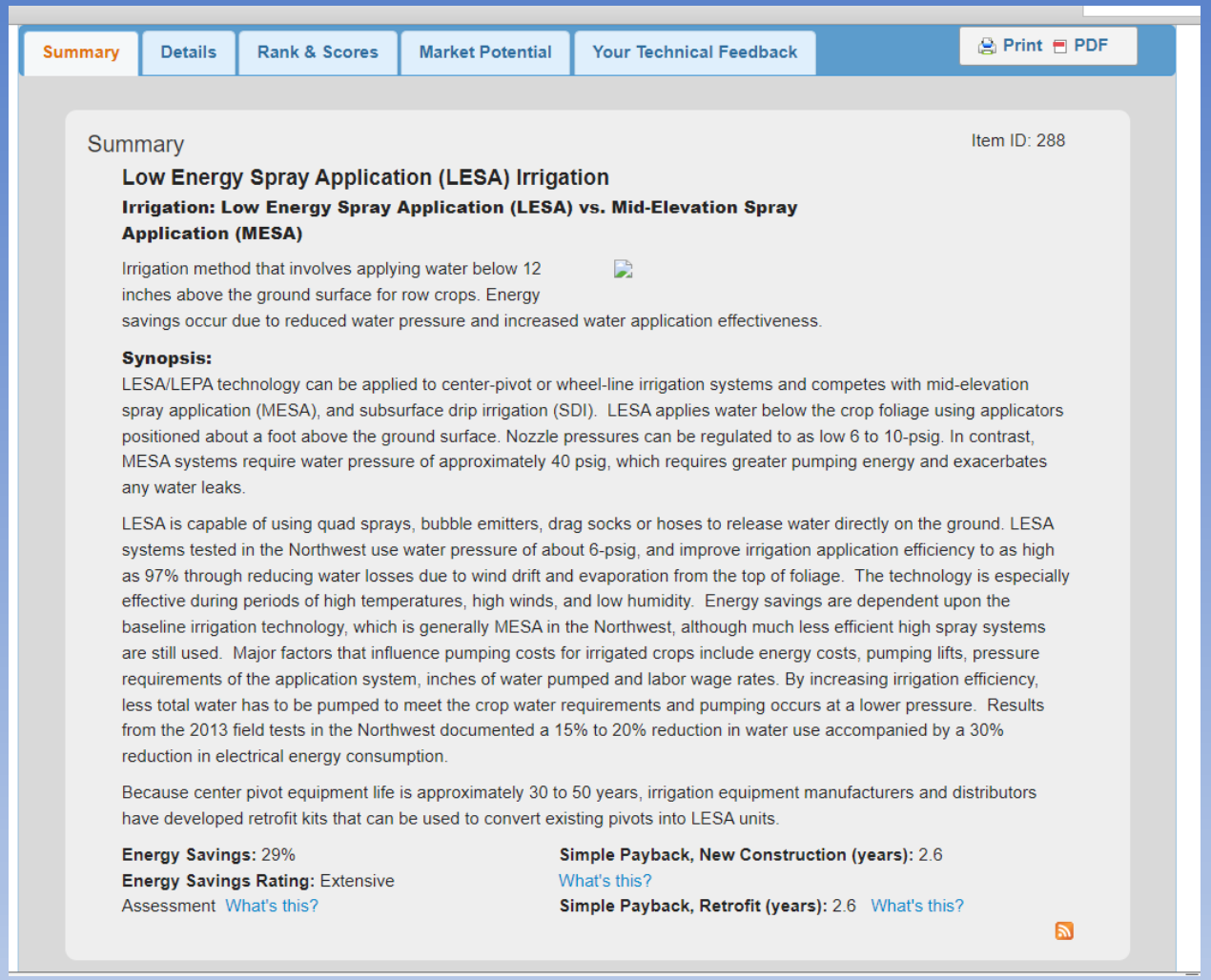
LESA

- Goal: maximize the efficiency of irrigation systems by limiting water losses to evaporation and wind drift while also reducing energy needed for pumping.
- Water is applied very close (~1 ft) to the soil surface through suspended sprinklers/spray heads
  - potential for slight water losses from wind drift and evaporation
- Low operating pressure significantly reduces energy needed for pumping

LEPA

Goal: maximize the efficiency of irrigation system by limiting water losses to evaporation and wind drift while also reducing energy needed for pumping.

- Water is applied directly onto the soil surface at very low pressure by sprinklers or bubblers that operate at or just above ground level.
- Low operating pressure (~6-10 psi) significantly reduces energy needed for pumping.


Summary
Details
Rank & Scores
Market Potential
Your Technical Feedback
Print
PDF
Summary
Item ID: 288
Low Energy Spray Application (LESA) Irrigation
Irrigation: Low Energy Spray Application (LESA) vs. Mid-Elevation Spray Application (MESA)
Irrigation method that involves applying water below 12 inches above the ground surface for row crops. Energy savings occur due to reduced water pressure and increased water application effectiveness.
Synopsis:
LESA/LEPA technology can be applied to center-pivot or wheel-line irrigation systems and competes with mid-elevation spray application (MESA), and subsurface drip irrigation (SDI). LESA applies water below the crop foliage using applicators positioned about a foot above the ground surface. Nozzle pressures can be regulated to as low 6 to 10-psig. In contrast, MESA systems require water pressure of approximately 40 psig, which requires greater pumping energy and exacerbates any water leaks.
LESA is capable of using quad sprays, bubble emitters, drag socks or hoses to release water directly on the ground. LESA systems tested in the Northwest use water pressure of about 6-psig, and improve irrigation application efficiency to as high as 97% through reducing water losses due to wind drift and evaporation from the top of foliage. The technology is especially effective during periods of high temperatures, high winds, and low humidity. Energy savings are dependent upon the baseline irrigation technology, which is generally MESA in the Northwest, although much less efficient high spray systems are still used. Major factors that influence pumping costs for irrigated crops include energy costs, pumping lifts, pressure requirements of the application system, inches of water pumped and labor wage rates. By increasing irrigation efficiency, less total water has to be pumped to meet the crop water requirements and pumping occurs at a lower pressure. Results from the 2013 field tests in the Northwest documented a 15% to 20% reduction in water use accompanied by a 30% reduction in electrical energy consumption.
Because center pivot equipment life is approximately 30 to 50 years, irrigation equipment manufacturers and distributors have developed retrofit kits that can be used to convert existing pivots into LESA units.
Energy Savings: 29%
Energy Savings Rating: Extensive
Assessment What's this?
Simple Payback, New Construction (years): 2.6
What's this?
Simple Payback, Retrofit (years): 2.6 What's this?

LESA – Low Elevation Spray Application

LESA is a modification to traditional sprinkler configuration of center pivot or linear moving irrigation systems

- Goal: maximize the efficiency of irrigation systems by limiting water losses to evaporation and wind drift while also reducing energy needed for pumping.
- Water is applied very close (~1 ft) to the soil surface through suspended sprinklers/spray heads
  - potential for slight water losses from wind drift and evaporation
- Low operating pressure significantly reduces energy needed for pumping

The LESA technique applies water more uniformly across the soil surface than LEPA

- Water is spread out in a limited way by suspended sprinkler heads
- Gives water more time to infiltrate into the soil
- Fewer issues with unconformity, crop germination, or ponding and runoff than LEPA on field without furrow dikes
  - Can be more flexible with a variety of crops, row orientations, and tillage systems.

LEPA – Low Energy Precision Application

LEPA is a modification to traditional sprinkler configuration of center pivot or linear moving irrigation systems

- Goal: maximize the efficiency of irrigation system by limiting water losses to evaporation and wind drift while also reducing energy needed for pumping.
- Water is applied directly onto the soil surface at very low pressure by sprinklers or bubblers that operate at or just above ground level.
- Low operating pressure (~6-10 psi) significantly reduces energy needed for pumping.

Drawback:

- Since application time is reduced, there is an increased possibility of ponding and/or runoff.

Ponding and Runoff Mitigation:

- Furrow diking to hold water until it can infiltrate the soil
- Drag socks to reduce erosion from sprinkler dragging on soil surface
- Using a dammer diker to loosen soil in order to increase water storage and promote quicker infiltration

Management Actions – Initial Scope

- Review irrigation efficiency improvements
- Feasibility Review for Surface Water Management Actions
  - Reduce groundwater pumping on ranches with combine water sources by more effectively using surface water sources
    - On-farm storage, timing of releases from Frenchman Reservoir, winter releases and spreading
    - Lake Davis source
  - Increase Recharge
    - Target deep aquifer (source of irrigation wells and water level decline) – ID preliminary suitable locations along boundaries of basin
    - Target eastern side
    - Diversion and spreading in areas suitable for deep recharge