



IRRIGATION  
TRAINING &  
RESEARCH  
CENTER

**Flathead Indian Irrigation Project**  
*On-Farm Irrigation*

**U.S. Bureau of Indian Affairs**  
**Branch of Irrigation & Power**

April 2016

## **TABLE OF CONTENTS**

<b>On-Farm Irrigation .....</b>	<b>1</b>
Side Roll Sprinkler Systems .....	1
Center Pivot Systems .....	3
The Solution .....	4

## LIST OF FIGURES

Figure 1. The district circular patterns of uneven crop growth are caused by a poor side roll sprinkler system DU .....	2
Figure 2. Another example in FIIP of the results of poor side roll sprinkler DU .....	2
Figure 3. Uneven growth in FIIP under side roll sprinklers. The wetted pattern right of center shows non- uniformity. Alternate sets would solve much of this problem. ....	3
Figure 4. Example of some plugged center pivot sprinklers in FIIP. The plugging results in distinct dry circular bands.....	3

## ON-FARM IRRIGATION

The request for a Modernization Plan dealt only with diversion, conveyance, and distribution equipment and strategies. However, the definition of *modernization* recognizes the link between good water delivery service to turnouts and on-farm irrigation management potential. One objective of irrigation modernization in the Flathead IIP is to improve production per unit of water, or to reduce the amount of water needed to irrigate adequately.

It would be remiss to not mention the importance of improving on-farm irrigation efficiency – downstream of the handoff point between the project and the farmer. Certainly, improved flow rate and volumetric measuring and accounting will help increase farmer awareness of the water that is used, and when. Many of the proposed improvements will improve the farmer's ability to properly manage the flows, but it appears that there are also substantial potential on-farm improvements – especially with sprinkler irrigation.

There are two predominate methods of sprinkler irrigation in FIIP:

1. Side roll (wheel line) sprinklers
2. Center pivots

Each of these methods has different types of adjustments that can be made to improve performance, but ultimately, there will be two relatively simple areas of improvement for both:

1. Improving the distribution uniformity (DU) of the irrigation systems
2. Improving the irrigation scheduling (when, and for what duration). This also involves proper nozzle selection for side roll sprinkler systems.

### *Side Roll Sprinkler Systems*

The distribution uniformity (DU) of FIIP's side roll sprinkler systems can likely best be improved by modifying the irrigation systems as follows:

1. Basic ideas that everyone will likely understand:
  - a. Add sprinkler levelers, if not already used. It appears that most of the systems already use levelers.
  - b. Improve the filtration of the water that goes into the sprinklers. This will minimize nozzle plugging.
  - c. Replace nozzles with new nozzles – ensuring that they are all the same size.
2. Practices that are of major importance, but do not appear to be currently used on many fields:
  - a. Use alternate sets correctly.
  - b. After the side roll makes a pass over its area of the field, it should definitely be moved back (dry) to the start point.
  - c. Use the proper pressure. It appears that most of the sprinklers are operating at a pressure that guarantees large droplet sizes and poor overlap patterns. The common nozzles with about 8 GPM each need a pressure at the nozzle of about 65 psi – which means a pump discharge pressure of 75 psi or so.



**Figure 1. The distinct circular patterns of uneven crop growth are caused by a poor side roll sprinkler system  
DU**



**Figure 2. Another example in FIIP of the results of poor side roll sprinkler DU**



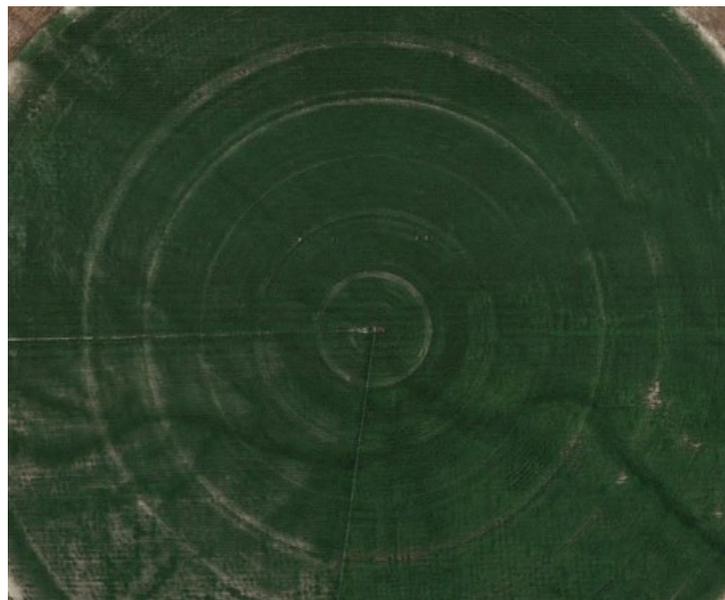
**Figure 3. Uneven growth in FIIP under side roll sprinklers. The wetted pattern right of center shows non-uniformity. Alternate sets would solve much of this problem.**

### ***Center Pivot Systems***

Center pivot sprinkler systems, if designed and operated properly, can obtain about 10% better DU values than side roll sprinklers. Common problems with pivots include:

1. Inadequate filtration, resulting in plugged or worn nozzles
2. Improper nozzle configurations
3. Pressures that are too low or too high
4. Incorrect pressure regulation of individual sprinklers

The Google image seen below shows obvious plugged sprinkler problems.



**Figure 4. Example of some plugged center pivot sprinklers in FIIP. The plugging results in distinct dry circular bands.**

## ***The Solution***

The solution to improvement generally involves several steps:

1. Document performance. Cal Poly ITRC has standardized Microsoft Excel programs that are used by teams of students every summer to evaluate on-farm irrigation systems. The project, tribes, or groups of farmers could hire a team of two students for a summer to evaluate side roll sprinkler systems, for example. The students would attend a one-week short course in June at San Luis Obispo, and then evaluate perhaps 30 fields. This one summer effort would help individual farmers, but would also increase awareness of typical performance levels and problems.
2. Increase awareness. The results should be shared with farmers, the local NRCS, and irrigation dealers.
3. Improve systems. Ideally, there would be some type of cost-sharing program that would include an evaluation and the interventions needed to improve performance.