

PINPOINTING IRRIGATION PROBLEMS

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Introduction

Research continues to provide data which allows farmers to increase their crop yields and progressive farmers are alert to take advantage of this and other successful farmers ideas. Potato farmers have been quick to accept fertilizer, variety, insect control, and weed control recommendations. Much of this rapid acceptance is due to an army of salesmen who have products to sell.

With quality seed and properly applied chemicals 30 to 35-ton yields are possible but too many growers are limiting this potential by inattention to proper irrigation practices. Although research data show and recommendations for light frequent irrigations are being made, about the only product to sell is sprinkler irrigation. Most new developments are utilizing automated sprinkler systems but changes are slow toward sprinkler installations on older developed land.

Within the last few years many cases of poor irrigation practices have come to my attention. Many of these irrigation problems have been presented by alert growers who are recognizing either equipment problems, scheduling problems, or combinations of both as they strive for precision soil moisture management. Regardless of the specific problem the solution usually involves a systematic analysis of all aspects of irrigation. These can usually be labeled under (1) potato water requirements or (2) optimum soil moisture levels, and (3) how to fit the irrigation system and labor availability to meet these demands.

Recommended Irrigation Practices

To the best of our knowledge the most optimum moisture conditions for quality Russets is to allow no more than about 15% of the available moisture to be used in the upper two feet of soil. This requires daily irrigation on light textured soils during much of the growing season and no more than three days on our heaviest textured soils. Due to intake problems on many of our heavier textured soils, one or two day intervals may be required for these soils also where surface methods are used.

Recognizing Problems

Often farmers may not realize an irrigation problem exists or may recognize it only after damage has been done. It is difficult to diagnose the cause after the season is over since most growers do not keep suffi-

cient records of their irrigation practices.

Know What You Are Doing

It is impractical to list here in detail all the steps necessary to obtain the data to diagnose a potential irrigation problem. The following procedures may serve as a guide to provide an understanding of soil and irrigation systems and whether a farmer is just spreading water or whether he is providing optimum moisture conditions for peak production.

Analyzing the Amount of Water Applied at Each Irrigation

Surface Irrigation

Inches applied minus inches of runoff equals amount of moisture in the soil.

$$\text{Inches} = \frac{\text{Cfs} \times \text{hrs}}{\text{acres}} \quad \text{Example: } 1" = \frac{1 \text{ cfs} \times 1 \text{ hr}}{1 \text{ acre}}$$

Runoff can be estimated by measuring several furrows with a known volume pail (dig a hole in the furrow for the pail) or can be measured more accurately by using measuring weirs and water stage recorders. Remember--intake rates usually decrease as the season progresses.

Sprinkler Irrigation

$$\frac{\text{Gallons per minute (sprinkler discharge)} \times 96.3 \times \text{hours}}{\text{spacing} \times \text{expected efficiency}} = \text{inches}$$

$$\text{Example: } \frac{6 \text{ gals/min} \times 96.3 \times 6 \text{ hrs}}{40' \times 50' \times .80} = 1.35"$$

Efficiency is primarily a measure of uniformity of water distribution. The better the design and lower the wind speed, the higher will be the uniformity.

Analyzing the Amount of Water Needed

One of the best tools available to measure plant needs is the evaporation pan data which is published daily except for weekends in most of the potato growing areas of the state. When one inch of water has evaporated, the potato crop with full ground cover will use one inch of soil moisture. When applications of water become less than is being used by the crop (or evaporated) the soil will become drier than the 15% allowable removal. When this happens misshapen potatoes can form. When more water is applied than is used, chances are that over-irrigation will leach

plant food below the active rooting area. Early in the season is a particularly critical time to closely match applications to use.

Soil Moisture Evaluation

Regardless of the efforts made to match water applications and needs as described above, nothing can take the place of knowing what is happening in the soil where the roots are located. Some successful growers do much digging, observing, and adjusting their practices. Others dig, observe, and still, really do not know what is happening. There are very few growers or soils experts who can estimate the 15% removal level or 30 to 50% moisture either, especially on coarse textured soils.

There is a place in many growers operations for the use of tensiometers and soil sampling programs even with a scheduling procedure based on evaporation pan method. Tensiometers need not be expensive as they can be made from small pvc tubing.

Management

Irrigation problems may arise after well designed systems are installed, a scheduling technique is followed, and a soil moisture evaluation system is being used. These problems can be quickly identified in most cases since knowledge and records are available which can be used to pinpoint the cause. Examples of these problems include uneven distribution of water, differences in soil types within the field, plugged siphons and sprinkler heads, etc.

Conclusion

Soil Moisture management requires thorough knowledge of water measurement, plant water requirements, application uniformity methods, scheduling. Proper management of these interrelated subjects should produce maximum yields of high quality potatoes.