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FIRST IRRIGATION OF POTATOES

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Figure 1. Check the wetting pattern at first irrigation. Be sure moisture reaches just beyond the seedpiece (A). You have over-irrigated if the crest of the potato hill is blackened by moisture over B. The soil below the dry row (C) has moisture because the roots have not yet reached this far.

*By D. C. Larsen and G. M. McMaster**

The first irrigation after planting is the most important to the production of smooth, uniform, U. S. No. 1 potatoes. First moisture needs must be met with a light irrigation which doesn't destroy the loose, mellow soil structure of the well-prepared seedbed. This sheet tells how to apply the first irrigation after planting for highest yields of No. 1 tubers.

FIRST IRRIGATION, QUALITY AND YIELD

Among the factors which influence the percentage and degree of malformation in your potato fields are soil moisture and soil temperature. Just as the tubers are beginning to set on the potato plant is a critical time to guard against malformation. *Lack of soil moisture in combination with warm weather for only a few days in June or early July can greatly increase malformation.*

At the Aberdeen Branch Station, irrigation within 40 days after planting held malformation below 5%. Malformation increased sharply when irrigation was delayed longer. This is illustrated in Figure 2.

In addition to increasing the number of poorly shaped tubers, *delayed irrigation holds down tuber set of the potato vine.* Irrigation at 5 days after planting gave yields of 579 tubers per plot at Aberdeen. Delaying irrigation until 33 days reduced yields to 537 tubers. Irrigation at 41 days gave yields of 531 tubers. Tuber yield dropped to 453 when fields were irrigated 57 days after planting and 448 with irrigation 71 days after planting.

A 1961 survey of potato growers indicated that many farmers were irrigating before moisture levels dropped below the critical point. But a large share, *43%, failed to take advantage of the added yield potential that early irrigation can mean.*

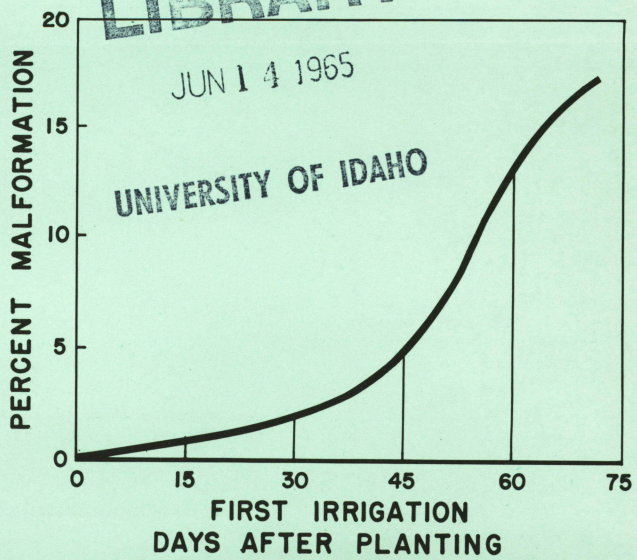

Figure 2. The effect of time of first irrigation on potato malformation at the Aberdeen Branch Station, 1948.

*University of Idaho Extension Irrigationist and Assistant Irrigationist, respectively.

IRRIGATE WHEN . . .

Soil moisture in each field varies from year to year. Mother Nature is changeable. Experience has proved that highest profits are seldom realized by irrigations timed by the calendar alone.

Experimental first irrigations were made at the Aberdeen Branch Station after potato plants had reduced soil moisture to 60, 40 and 20% available. The test results are shown below. Highest yield and quality were obtained when water was applied while soil moisture was near 60% available moisture.

Table 1—Effect of soil moisture levels at first irrigation upon potato yield and quality. Aberdeen, 1963

Per cent available soil moisture when irrigated	Total yield cwt/acre	U.S. No. 1's cwt/acre	Per cent U.S. No. 1's
60	256.0	173.5	67.8
40	259.8	164.2	63.2
20	216.0	125.8	57.8

First irrigation should be started when available soil moisture in the potato row falls to 60%. To check soil moisture content, pick out a row where there is a normal plant population, dig down 4 to 6 inches until you reach the seedpiece level. Use the "feel" method to determine available moisture*. If moisture is below the 60% level, apply water as outlined later in this report.

If June and early July are hot, an irrigator should watch the soil moisture level very carefully. Irrigation cools the soil at this period as shown in Figure 3. Bare soil and good evaporative conditions combine to make the temperature dip, reducing malformation.

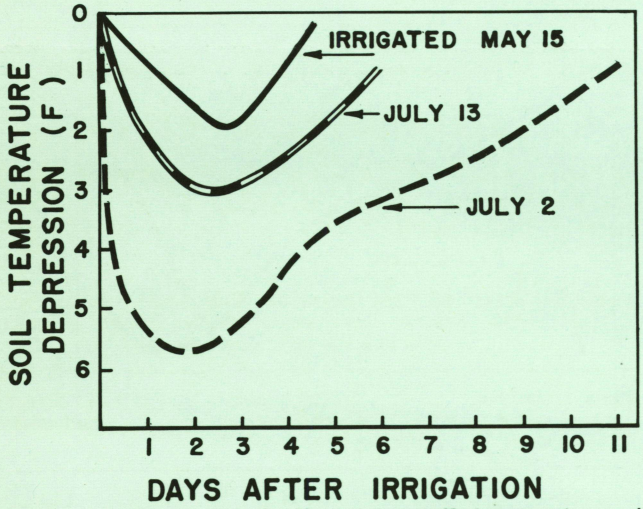

Figure 3. Effect of irrigation upon soil temperature at the 4-inch depth. Aberdeen, 1962.

*Your County Agent can show you how to estimate soil moisture by feel.

FIRST IRRIGATION HAZARDS

OVER-IRRIGATION—

1. When the soil is loose and the intake rate high, it is difficult to put on a light application of water.
2. Sprinkler application rates may be too high, causing water to stand, puddling soil and resulting in compaction.
3. There is danger of leaching out nitrogen.
4. Soils stay wet longer, delaying plant growth.
5. Disease dangers increase. For example, rhizoctonia has been observed to be more severe in fields obviously over-irrigated.

UNDER-IRRIGATION—

1. Serious malformation can result — pointed end, bottleneck or dumbbell shaped tubers.
2. Jelly-end rot may occur in storage because the stem ends of malformed tubers are usually lower in specific gravity and starches than the rest of the tuber.

FURROW IRRIGATION

How Much Water to Apply—The soil in the root zone should be at field capacity before planting. The plant takes its moisture from a spherical volume of soil surrounding the seedpiece where the young growing roots penetrate. This is the moisture that should be replaced.

First irrigation should be light but adequate. A test may be made by digging across the hill to the seed piece. Has the wetting front reached just past the seed piece as shown in Figure 1? Make sure fresh moisture reaches the seed piece. If it hasn't, an "early" second irrigation will be required. The second irrigation should penetrate to the submoisture. *Do not allow the wetted front to reach the surface between the furrows and make the "middles" black.* This means over-irrigation with compaction, disease and all the other over-irrigation ills.

APPLYING A LIGHT FURROW IRRIGATION—

1. Use large non-erosive furrow stream. Push water through as fast as possible. On high-intake-rate soils, a large stream is required. Make furrow big enough to handle head on flat land.
2. Use every other row. Loose soil has a high intake rate. Widening the spacing will help. Here again, avoid leaving water on until the middles are black. Evaluate by digging into the top foot of soil. Wetting patterns should wet just past the seed piece. This is enough to do the job, but make sure soil around seed piece is wet.

Figure 4. Furrow slickers smooth up the bottom and sides of the furrow decreasing the water intake rate. This moves water across the field faster, allows longer runs, gives more even distribution.

3. Use a smooth U-shaped furrow. A smooth pipe carries water faster than a rough one. A wider bottom will allow the furrow to carry a larger head without erosion.
4. On high-intake soils use a slicked furrow as shown in figure 4. A furrow slicker compresses the surface soil and decreases intake.
5. Irrigate in tractor-wheel row. Check shoulder of the hill in tractor row after irrigation. If it is hard and compact, it may be wise to break up at the next cultivation. Compaction decreases water intake.

SPRINKLER IRRIGATION

How Much to Apply — *The major moisture loss will occur in the top 12 inches of soil.* This should be replaced by sprinkling. In a medium-textured soil, about *1 to 1.5 inches of water at the sprinkler nozzle should replace the moisture used by the young potato plant.*

Apply enough to connect the wetting pattern with the subsoil. The water required will depend upon conditions at planting, pre-irrigation and so on.

Dig a hole to check moisture penetration. *The effective root zone of potatoes will be about 2 feet* after the first irrigation period. *No more water should be applied at first irrigation than is required to wet down the top 2 feet of soil.*

In some cases an adequate first irrigation can be applied in less time than the regular 12-hour set. A time clock can be used to turn off the system when the desired amount of water is applied. Then the lines can be moved at the regular intervals when labor is available.

APPLICATION RATE—

1. The sprinkler application rate should not exceed the maximum intake rate of the soil. When it does, the soil will puddle and water will run off. On low-organic soils puddling may even reduce the intake rate. If the bottom of the furrow has a glazed appearance upon drying, the soil is compacted. Yields may be reduced.

2. A desirable application rate is one which leaves no water standing in the bottom of the furrow at the end of the irrigation set. Experience has shown the intake rate on most of southern Idaho's medium textured desert soils to be very low, equivalent to .18 to .20 inches per hour.

3. If the application rate is too fast it can be reduced by either decreasing nozzle size or operating pressure. Since few large systems have exact pressure control, the most popular method is to reduce nozzle size.

Figure 5. Sprinkler application rates should be no higher than soil moisture intake rates. There should be no water standing in the furrow at the end of the irrigation set.

EARLY IRRIGATION PAYS

The potato cultural practice survey shows early irrigation pays. On 13,221 acres in southeastern Idaho early first irrigation produced more U.S. No. 1 potatoes.

Table 3—Effect of first irrigation date upon potato yield and quality in eastern Idaho. Idaho cultural practice survey, average 1962-3-4

First irrigation Days after planting	Total yield cwt/acre	U.S. No. 1's cwt/acre
10-19	194.9	120.8
20-29	195.0	117.7
30-39	181.6	109.0
40-49	180.1	103.8
50-59	150.1	79.3

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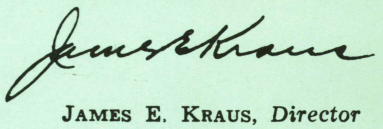

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