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USDA-ARS
Prosser, WA

Potato Cropping Systems – Accomplishments / Progress

Nutrient Management

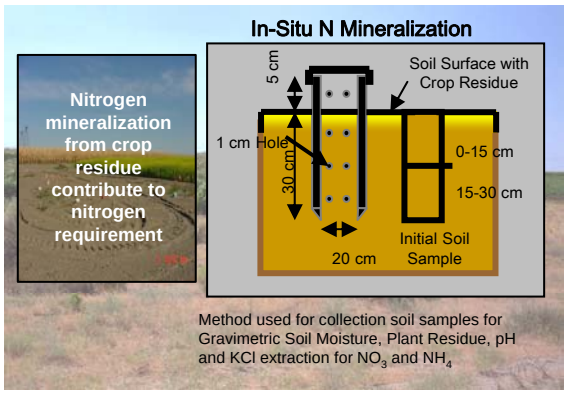
This research was supported by the USDA-ARS base funds to serve the research needs of the Pacific Northwest potato growers. Although WSPC did not directly fund this research, we hope that the long-term research accomplishments will benefit the potato growers in better management of nutrient and water in Potato Cropping Systems. We look forward to comments and input from the growers and industry specialists.

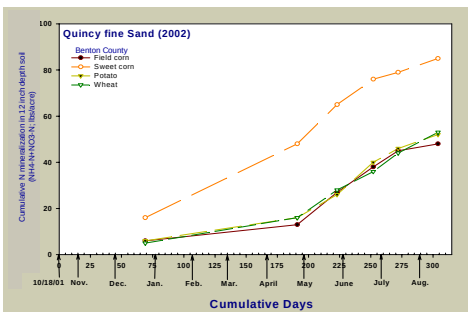
1. N Mineralization from crop residues:

Three-year field experiment was conducted in a sandy soil with potato rotation to evaluate the total biomass of crop residue returned to the soil following potato, wheat, sweet corn, field corn and different cover crops.

(i) On an annual basis, N mineralization from residue of potato, wheat, and field corn was about 40 to 50 lbs/ac. while that from sweet corn residue was about two fold.

(ii) Peak N mineralization occurred during May through July period across all crop residues.





Preliminary estimates of Crop residues and total N input to the soil in the PNW		
Main Crops	**Crop Residue (Ton/acre) dry wt. basis**	**N in Crop residue (lbs/acre)**
Potato	1.25	35 (1.4% N)
Sp. Wheat	5.31	69 (0.65% N)
Field corn	5.17	132 (1.28% N)
Sweet corn	4.33	75 (0.87% N)
Cover Crops		
Mustard	2.27	114 (2.5% N)
Sudan grass	1.2	41 (1.7% N)
Wheat	0.76	26 (1.7% N)
Oat / Vetch	0.23+0.17	6 + 13 (1.3% , 3.9% N)

2. Tillage and N management effects on potato yield and quality:

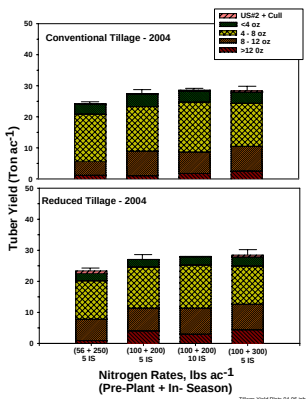
Three-year field study was conducted using 'Ranger Russet' cultivar to evaluate the tuber yield and quality as influenced by different N management practices under conventional and reduced tillage.

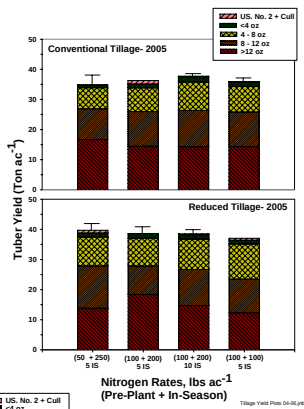
(i) In general, total tuber yield and different size grade tuber yields were not significantly influenced by the conventional verses reduced tillage methods.

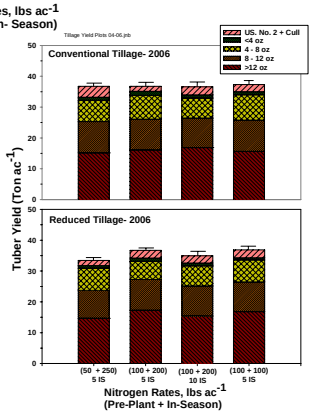
(ii) However, reduced tillage practice contributed to saving of production cost and also could provide enhanced soil quality and minimize wind erosion.

(iii) At 100 lbs/ac pre-plant N application, additional application of in-season N at either 100, 200, or 300 lbs/ac resulted in similar total tuber yield as well as distribution of tubers across different size grades.

(iv) Frequency of in-season N application (at 5 vs. 10) had no significant affects on tuber yield.







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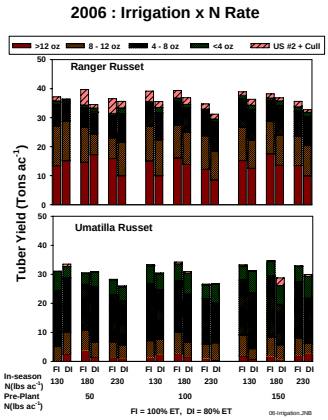
3. Irrigation x N rate studies:

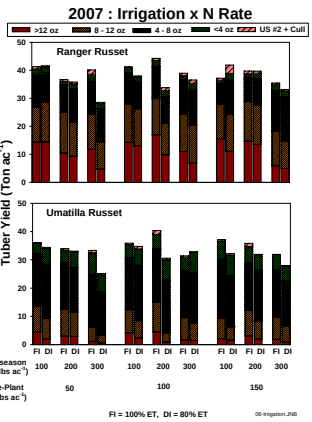
Two-year study was conducted using 'Ranger Russet' and 'Umatilla Russet' cultivars subject to two irrigation regimes (FI= Irrigation to replenish 100% of ET, and DI= Irrigation to replenish 80% ET) and different pre-plant and in-season N rates.

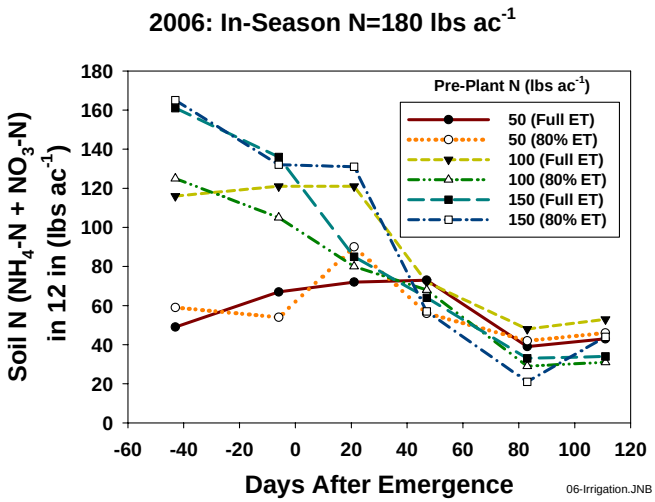
(i) Deficit irrigation management decreased total tuber yields in both cultivars.

(ii) The effects of N rates on tuber yields (180 to 380 lbs/ac in 2006; 150 to 450 lbs/ac in 2007) were in general marginal.

(iii) Yields were generally greater for 'Ranger Russet' cultivar as compared to that for 'Umatilla Russet' cultivar. The former cultivar had much greater percentage of total yield in the tuber size of > 8oz as compared to that of the latter cultivar.



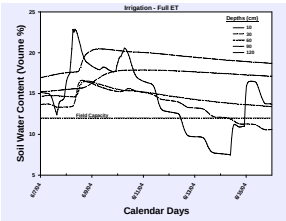
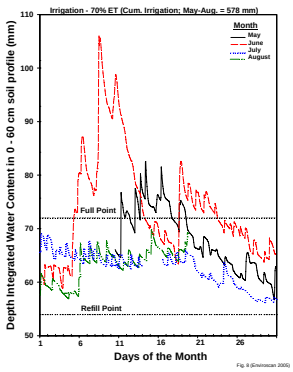
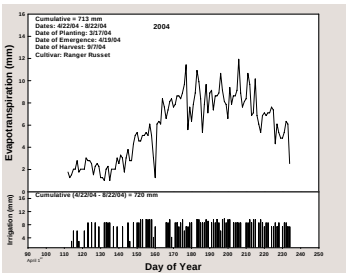
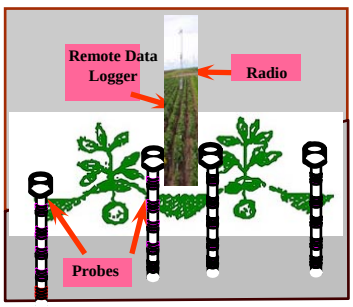
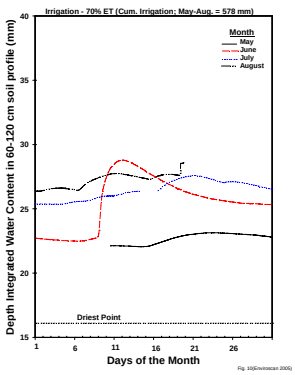




4. Automated, real-time, continuous monitoring of soil water content at and below the potato rootzone:

Capacitance probes (Enviroscan) were used to measure soil water content at various depths in the soil profile.

(i) The real-time measurement of soil water content in the rootzone shows a clear indication of pattern of soil water extraction and a reduction in soil water extraction as the soil water depleted.

(ii) The soil water content calculated for the rootzone provides a basis to develop set points for scheduling the irrigation.

(iii) The soil water content below the rootzone provides an estimate of water leached from the rootzone into the soil below the rootzone.