

PULSE CROPS AND NITROGEN CREDITS

MT Pulse Growers, November 29, 2016



N credit from pulse/legumes

- N Credit = Fertilizer N (lb/ac) to back off from a standard recommendation (e.g., lb N/bu of yield goal) when previous crop is a legume (ideally based on late fall to early spring nitrate)
- N benefit = Soil nitrate after pulse
 - soil nitrate after non-pulse
 - + N released from pulse residue
- N benefit > N credit. This is important.

What affects amount of N contributed to soil?

- Total yield, i.e., species and year productivity
- High N removed by harvest leaves less in soil, e.g. chickpea harvest removes more N than lentil. Can't use pulse grain yield to estimate N credit
- Low biomass plants (semi-leafless varieties) contribute less N
- Species differences. In dryland environment, N contributed by field pea > lentil > chickpea
- N contribution is cumulative - increases with increased # of rotations

(Walley et al., 2007)

How should pulses be managed to encourage N-fixation?

- Use granular inoculant
- Adequate P, K, S (and sometimes micros)
- Starter N only if crop shows poor nodulation
- No-till

(van Kessel and Hartley, 2000)

What affects rate that residue N becomes available?

- Slower in no-till than till, e.g., pea residue 43% (NT) vs. 55% (till)
- Faster with higher N and phosphorus (P) concentrations
- Pulse cover crop decomposes faster than pulse residue (Lupwayi et al. 2004, north-central Alberta)

BUT: rapid nutrient release is not necessarily desirable because potential loss from system before uptake by next crop

Recommended N credits in Montana

Crop	N Credit (lb N/acre)
Pulse grain crop grown 1-2x	~10
Pulse grain crop grown 3+ times	~20
Pulse cover crop grown 1-2x	20-30
Pulse cover crop grown 3+ times	30-50

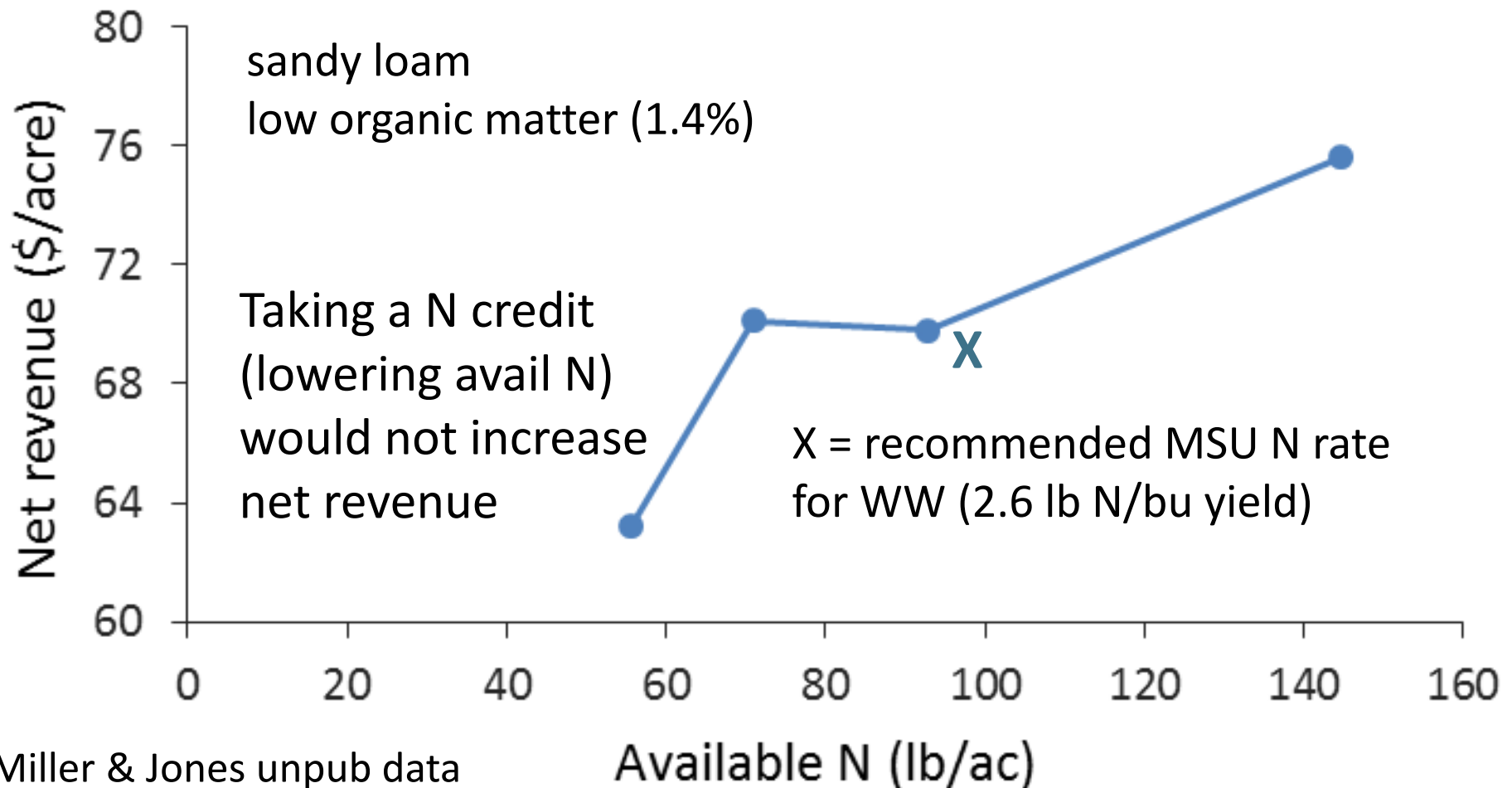
Example N rate calculation

(Big Sandy study, Miller and Jones, unpub. data)

	Fallow	Grain pulse grown 1x	Legume cover crop grown 1x
WW yield goal (bu/ac)	45	35	40
Spring soil N (lb/ac)	80	55	65
Total soil N recommended (bu/ac x 2.6 lb/bu)	$45 \times 2.6 = 117$	$35 \times 2.6 = 91$	$40 \times 2.6 = 104$
N credit (lb/ac)	0	10	25
Fertilizer N (lb/ac)	$117 - 80 - 0 =$ 37	$91 - 55 - 10 =$ 26	$104 - 65 - 25 =$ 14

Are there situations when should not use a N credit?

2015 net revenue with low protein premiums at Big Sandy



How decide whether to take an N credit, and if so, how much given every soil and farm different?

- Pulse grown 1-2x:
Use general recommendation of ~10 lb N/ac for pulse grain and 20 -30 lb N/ac for cover crop
- Track wheat grain protein after pulse:
If consistently > 13.2% (spring wheat) or > 12.5% (winter wheat), then should keep taking N credit. Otherwise, likely should not b/c yield is compromised from insufficient N.

See Fertilizer Facts 21 and 34 for more info

Summary

- Manage pulses to encourage N-fixation
- Keep records of late fall to early spring soil tests and subsequent wheat grain protein to develop farm-field specific knowledge of N credits
- Pulse crop benefits don't happen overnight

Questions?



For additional information on pulses, cover crops and soil fertility <http://landresources.montana.edu/soilfertility>