

# Intercropping Oats and Field Pea in an Organic Production System

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Intercropping is the practice of growing two or more crops together at the same time in the same field. The idea is to find combinations of plants that complement each other or perform better than when planted alone. Intercropping can lead to increased yield and quality compared to monocropping. Agronomic benefits from this mix also include the oats providing support for the pea with the pea providing nitrogen to the production system. Important considerations for intercropping include: proper seeding rate/plant density for each component of the mix, and variety selection to match maturity dates.

A field trial to examine organic intercropping of oats and peas for grain production was conducted this past growing season at the CREC. The trials main intent was to examine pea types and several seeding rate combinations of oat pea intercrops for grain yield. The sole rates and the 100% intercrop rates were set at 1,250,000 PLS/ac for the oats and 350,000 PLS for the peas. The seeding rate for peas remained constant across all intercrops. Rates for oats ranged from 25% to 100% seeding rate across the oat pea intercrops. Table 1 lists the rates used for all treatments in PLS per acre along with the plants per square foot for each treatment. The trial evaluated two pea types, Nette a semi-leafless pea and Protecta a leaf type field pea, which was developed for bio-farming or organic agriculture. Rockford was the oat variety used in this trial.

**Table 1. Seeding rates for sole and intercropped treatments.**

Treatments	Seeding Rate
Oat 100 %/pea intercrop	1,250,000 PLS/ac or 28.7 PLS sq. ft.
Pea 100% and all intercrops	350,000 PLS/ac or 8.0 PLS/ac sq. ft.
Oat 75% intercrop	937,500 PLS/ac or 21.5 PLS sq. ft.
Oat 50% intercrop	625,000 PLS/ac or 14.3 PLS sq. ft.
Oat 25% intercrop	312,000 PLS/ac or 7.2 PLS sq. ft.

The field trial was planted on May 6 on ground that was previously a cover crop of sorghum sudangrass, sudangrass, cowpea, soybean, crimson clover and turnip. Peas and oats were sown in the same row together with a row spacing of 7". Peas were inoculated with an OMRI-listed, peat-based rhizobia inoculant prior to planting. Stand counts were taken on May 29 to determine plant densities of the seeding rates used. The trial was harvested on August 7.

Performance of each crop component are presented in tables 2 and 3. Data gathered for the two pea varieties, table 2, illustrate the differences these two pea types possess. Protecta, a leaf-type pea, had more plant lodging as compared to Nette a semi-leafless type. Lodging scores ranged from 8.5 for the sole treatment to 1.0 for the 100% oat treatment demonstrating the benefits of the oat intercrop providing support for the pea. No plant lodging occurred with any of the Nette treatments. Seed protein percent was significantly different between the pea varieties with Protecta having a higher protein content. Seed yields were also higher with Protecta as compared to Nette. Seed yields for Protecta ranged from 43.9 (sole) to 30.1 (100% oat) bu/ac. Seed yields for Nette ranged from 37.9 (sole) to 13.0 (100 % oat) bu/ac. Data gathered illustrate that as more oats is added to the mix Nette is not as competitive as Protecta. Results also demonstrate that as more oats are added to the intercrop pea yields are lowered.

**Table 2. Pea performance in the oat pea intercrop.**

Oat Rate	Pea Variety	Plant Stand sqft	Days to Bloom	Plant Lodge 0 to 9	Plant Height inch	Seed Protein %	Test Weight lbs/bu	Seed Yield bu/ac	Yield % of check LER
NA	Protecta	8.8	53.3	8.5	14.2	26.2	62.6	43.9	1.00
25%	Protecta	7.8	53.5	6.5	17.8	26.2	62.9	42.4	0.97
50%	Protecta	8.9	53.0	2.5	24.4	26.0	63.8	36.6	0.84
75%	Protecta	8.1	53.3	1.8	23.8	26.2	63.7	31.6	0.73
100%	Protecta	7.7	53.3	1.0	24.1	25.4	64.0	30.1	0.69
NA	Nette	7.9	52.5	0.0	26.4	22.6	64.2	37.9	1.00
25%	Nette	6.4	51.8	0.0	21.2	22.3	63.8	26.7	0.70
50%	Nette	6.6	52.0	0.3	22.7	21.7	63.9	18.6	0.49
75%	Nette	6.7	52.0	0.0	19.1	21.9	63.9	14.6	0.38
100%	Nette	6.2	51.8	0.0	16.4	21.7	63.9	13.0	0.34
Mean		7.5	52.6	1.9	21.0	24.0	63.7	29.5	0.71
C.V. (%)		10.9	1.8	58.2	17.9	2.3	0.7	11.0	13.0
LSD 0.05		1.2	1.4	1.6	5.5	0.8	0.6	4.7	0.13

**Table 3. Oat performance in the oat pea intercrop.**

Oat Rate	Pea Variety	Plant Stand sqft	Days to Head	Plant Lodge 0 to 9	Plant Height inch	Grain Protein %	Test Weight lb/bu	Grain Yield bu/ac	Yield % of check LER
25%	Protecta	6.1	60.5	6.5	37.4	11.5	34.1	28.4	0.38
50%	Protecta	12.2	60.5	2.5	39.0	11.3	36.6	49.2	0.66
75%	Protecta	16.2	60.3	1.8	38.0	10.7	37.8	58.6	0.78
100%	Protecta	23.6	59.8	1.0	38.6	11.0	38.1	62.2	0.83
25%	Nette	4.7	60.5	0.0	39.7	10.4	34.5	47.7	0.64
50%	Nette	11.0	60.3	0.3	39.0	10.2	36.2	67.4	0.91
75%	Nette	15.8	59.5	0.0	38.2	10.2	37.4	75.6	1.01
100%	Nette	21.6	58.8	0.0	38.4	10.5	37.4	79.8	1.06
100%	NA	26.3	58.8	0.0	36.3	9.7	37.7	75.5	1.00
Mean		15.3	59.9	1.9	38.3	10.6	36.6	60.5	0.81
C.V. (%)		12.2	1.6	58.2	3.6	2.5	2.2	10.7	10.1
LSD 0.05		2.7	1.4	1.6	2.0	0.4	1.2	9.4	0.12

Oat performance, table 3, was also significantly influenced by pea variety in this trial. Oat yields were lower for the Protecta intercrops as compared to the Nette intercrop treatments. Yields for oats ranged from 28.4 to 62.2 bu/ac for the Protecta intercrop treatments and 47.7 to 79.8 bu/ac with the Nette intercrops. Oats over yielded in the Nette intercrop with a LER of 1.01 and 1.06 for the 75% and 100% oat intercrop treatments. Test weight of the oats was affected by the intercrop treatments. Lower plant densities of oats in the intercrop resulted in lower test weights of the oats in all pea intercrop treatments. Test weights ranged from 34.1 to 38.1 lbs/bu with Protecta as oat rates increased from 25% to 100%. The same trend was observed with Nette pea intercrop treatments with test weights increasing from 34.5 to 37.7 lbs/bu in the 25% to 100% treatments respectively. Grain protein of the

oats was also significantly influenced by the addition of peas to the mix. All pea intercrop treatments increased the protein content of the oats. An increase up to 1.8% in oat protein was detected when peas were added to the mix compared to the sole oat treatments.

Crop component yields, total yields and Land Equivalent Ratio are presented in table 4. Results gathered show significant differences in total yield amongst the treatments. Intercropping peas and oats increased total yield compared to sole treatments of either peas or oats. Total yields were higher as more plants were added to the mix. Land Equivalent Ratio (LER) is a measure of the amount of land it would take to achieve equal yields of the intercrop as compared to growing the crops individually. If the LER is greater than 1.0, overyielding occurred and the intercrop is more productive than growing either of the crops alone. LER for all intercrop treatments ranged from 1.34 to 1.52, meaning it would take 34 to 52% more land to equal the intercrop yield if each crop was grown alone.

**Table 4. Crop component yields, total yield and Land Equivalent Ratio of the oat pea intercrop.**

Oat Rate	Pea Variety	Pea Yield bu/ac	Oat Yield bu/ac	Pea Yield lb/ac	Oat Yield lb/ac	Total Yield lb/ac	LER %
NA	Protecta	43.9	.	2631	.	2631	1.00
25%	Protecta	42.4	28.4	2542	909	3451	1.35
50%	Protecta	36.6	49.2	2196	1575	3771	1.50
75%	Protecta	31.6	58.6	1893	1876	3769	1.50
100%	Protecta	30.1	62.2	1805	1990	3795	1.52
NA	Nette	37.9	.	2275	.	2275	1.00
25%	Nette	26.7	47.7	1600	1527	3128	1.34
50%	Nette	18.6	67.4	1117	2156	3274	1.39
75%	Nette	14.6	75.6	877	2419	3296	1.39
100%	Nette	13.0	79.8	783	2552	3335	1.40
100%	NA	.	75.5	.	2416	2416	1.00
Mean		29.5	60.5	1772	1936	3195	1.31
C.V. (%)		11.0	10.7	11.0	10.7	8.0	8.5
LSD 0.05		4.7	9.4	284	302	369	0.16