


[Home](#) > [Journal](#) > [Earth & Environmental Sciences](#) > AS

[Indexing](#) | [View Papers](#) | [Aims & Scope](#) | [Editorial Board](#) | [Guideline](#) | [Article Processing Charges](#)

AS > Vol.3 No.7, November 2012



Intercropping barley with pea for agronomic and economic considerations in northern Ontario

PDF (Size: 167KB) PP. 889-895 DOI: 10.4236/as.2012.37107

Author(s)

T. S. Sahota, Sukhdev S. Malhi

ABSTRACT

Intercropping, a mix of non-legume and legume crops, can improve crop yield and/or economic returns and reduce input costs. Field experiments (barley-pea intercrop) were conducted in 2008, 2010 and 2011 on an Oskondoga silt loam soil at Thunder Bay, Ontario, Canada, to determine the effect of intercropping barley (non-legume) and pea (legume) on grain yield, land equivalency ratio (LER), grain quality (protein concentration-PC), N uptake and economic returns. Barley and pea were grown as mono crops and in combinations as intercrops (both in the same row/and alternate rows). Nitrogen fertilizer was applied at 0, 40 and 80 kg N ha⁻¹ to mono crop barley and at 0, 20 and 40 kg N ha⁻¹ to barley-pea intercrop combinations. On an average of three years, application of 80 kg N ha⁻¹ increased grain yield of barley by 846 kg ha⁻¹ as a sole crop and by 420 - 488 kg ha⁻¹ in the two intercropping combinations. Compared to barley and pea as sole crops, grain yield with barley-pea intercropping was greater by 266 kg ha⁻¹ with alternate row combination and by 223 kg ha⁻¹ when both crops were grown in the same row. The LER values suggested 7% - 17% less land requirement for barley-pea intercropping than sole crops. Net returns from barley-pea intercropping without applied N greatly improved (\$854 - \$939 ha⁻¹) compared to barley sole crop with 80 kg N ha⁻¹ (\$628 ha⁻¹), although the net returns were highest for pea grown as a sole crop without applied N (\$1141 ha⁻¹). For barley as a sole crop, PC in grain increased with applied N. Compared to barley as sole crop with zero-N, PC in barley grain increased when barley was intercropped with pea. In barley-pea intercrop treatments, application of N fertilizer had no significant effect on PC in barley grain, although PC in pea grain was much higher than PC in barley grain. The response trends of total N uptake in grain were similar to grain yield. The findings suggest that pea or barley-pea intercropping could be an option for organic farming systems.

KEYWORDS

Barley; Economic Returns; Intercrop; N Fertilizer; N Uptake; Pea; Protein; Grain Yield

Cite this paper

 Sahota, T. and Malhi, S. (2012) Intercropping barley with pea for agronomic and economic considerations in northern Ontario. *Agricultural Sciences*, 3, 889-895. doi: 10.4236/as.2012.37107.

References

- [1] Jensen, E.S. (1996) Grain yield, symbiotic N₂ fixation and interspecific competition for inorganic N in pea-barley intercrops. *Plant and Soil*, 182, 25-38. doi:10.1007/BF00010992
- [2] Hauggaard-Nielsen, H., Ambus, P. and Jensen, E.S. (2001) Temporal and spatial distribution of roots and competition for nitrogen in pea-barley intercrops—A field study employing 32P technique. *Plant and Soil*, 236, 63-74. doi:10.1023/A:1011909414400
- [3] Hauggaard-Nielsen, H. and Jensen, E.S. (2001) Evaluating pea and barley cultivars for complementarity in intercropping at different levels of soil N availability. *Field Crops Research*, 72, 185-196. doi:10.1016/S0378-4290(01)00176-9
- [4] Szczukowski, S. (1989) Yield and seed quality of field peas grown in mixtures with cereals and in pure stands. *Acta Academiae Agriculturae ac Technicae Olstenensis, Agricultura*, 47, 40 p.
- [5] Danso, S.K.A. and Papastylianou, I. (1992) Evaluation of the nitrogen contribution of legumes to

[Open Special Issues](#)
[Published Special Issues](#)
[Special Issues Guideline](#)
[AS Subscription](#)
[Most popular papers in AS](#)
[About AS News](#)
[Frequently Asked Questions](#)
[Recommend to Peers](#)
[Recommend to Library](#)
[Contact Us](#)

Downloads:	137,789
Visits:	297,278

Sponsors, Associates, and Links >>

[2013 Spring International Conference on Agriculture and Food Engineering\(AFE-S\)](#)

- [6] Paolini, R., Caporali, F. and Campiglia, E. (1993) Yield response, complementarity and competitive ability of bread wheat (*Triticum aestivum* L.) and pea (*Pisum sativum* L.) in mixtures. *Agricoltura Mediterranea*, 123, 114-121.
- [7] Rauber, R., Schmidtke, K. and Kimpel-Freund, H. (2000) Competition and yield advantage in mixtures of pea (*Pisum sativum* L.) and oats (*Avena sativa* L.). *Konkurrenz und ertragsvorteile in gemengen aus erbsen (Pisum sativum L.) und hafer (Avena sativa L.)*, 185, 33-47.
- [8] Zielinska, A. and Rutkowski, M. (1988) Comparison of productivity of oats, barley and four cultivars of field peas in pure and mixed sowing. *Acta Academiae Agriculturae ac Technicae Olstenensis, Agricultura*, 46, 113-124.
- [9] Hiebesch, C.K. and McCollum, R.E. (1987) Area \times time equivalency ratio: A method for evaluating the productivity of intercrops. *Agronomy Journal*, 79, 15-22. doi:10.2134/agronj1987.00021962007900010004x
- [10] De Wit, C.T. and van den Bergh (1965) Competition between herbage plants. *Netherlands Journal of Agricultural Science*, 13, 212-221.
- [11] Szumigalski, A.R. and Van Acker, R.C. (2008) Land equivalent ratios, light interception, and water use in intercrops in the presence or absence of in-crop herbicides. *Agronomy Journal*, 100, 1145-1154. doi:10.2134/agronj2006.0343
- [12] Helenius, J. (1991) Insect numbers and pest damage in intercrops vs. monocrops: Concepts and evidence from a system of faba bean, oats and *Rhopalosiphum padi* (Homoptera, Aphididae). *Journal of Sustainable Agriculture*, 1, 57-80. doi:10.1300/J064v01n03_06
- [13] Poggio, S.L. (2005) Structure of weed communities occurring in monoculture and intercropping of field pea and barley. *Agriculture, Ecosystems & Environment*, 109, 48- 58. doi:10.1016/j.agee.2005.02.019
- [14] Xiao, J., Zheng, Y., Tang, L., Li, L., Zhu, Y. and Yang, J. (2005) Effects of potassium and nitrogen supply on the occurrence of wheat rust in a wheat and faba bean intercropping system. *Journal of Yunnan Agricultural University*, 20, 640-645.
- [15] Chen, Y., Zhang, F., Tang, L., Zheng, Y., Li, Y., Christie, P. and Li, L. (2007) Wheat powdery mildew and foliar N concentrations as influenced by N fertilization and below- ground interactions with intercropped faba bean. *Plant and Soil*, 291, 1-13. doi:10.1007/s11104-006-9161-9
- [16] Izaurralde, R.C., McGill, W.B. and Juma, N.J. (1992) Nitrogen fixation efficiency, interspecies N transfer, and root growth in barley-field pea intercrop on a Black Chernozemic soil. *Biology and Fertility of Soils*, 13, 11-16. doi:10.1007/BF00337231
- [17] Tofinga, M.P., Paolini, R. and Snaydon, R.W. (1993) A study of root and shoot interactions between cereals and peas in mixtures. *Journal of Agricultural Science*, 120, 13-24. doi:10.1017/S0021859600073548
- [18] Noel, R.J. and Hambleton, L.G. (1976) Collaborative study of a semi-automated method for the determination of crude protein in animal feeds. *Journal of Association of Official Analytical Chemists*, 59, 134-140.
- [19] SAS Institute, Inc. (2004) Online documentation for SAS, version 8. SAS Institute, Cary. <http://support.sas.com/documentation/onlinedoc/index.html>
- [20] Anderson, M.K., Hauggaard-Nielsen, H., Ambus, P. and Jensen, E.S. (2004) Biomass production, symbiotic nitrogen fixation and inorganic N use in dual and tri-component annual intercrops. *Plant and Soil*, 266, 273-287. doi:10.1007/s11104-005-0997-1
- [21] Cowell, L.E., Bremer, E. and van Kessel, C. (1989) Yield and N₂ fixation of pea and lentil as affected by intercropping and N application. *Canadian Journal of Soil Science*, 69, 243-251. doi:10.4141/cjss89-025
- [22] Chen, C., Westcott, M., Neil, K., Wichmann, D. and Knox, M. (2004) Row configuration and nitrogen application for barley-pea intercropping in Montana. *Agronomy Journal*, 96, 1730-1738. doi:10.2134/agronj2004.1730
- [23] Knudson, M.T., Hauggaard-Nielsen, H., Jornsgaard, B. and Jensen, E.S. (2004) Comparison of interspecific competition and N use in pea-barley, faba bean-barley and lupin-barley intercrops

