



Michigan Technical Note
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TOPIC: AGRONOMY #47

**Subject: Squeezing More Value from Manure with
Cover Crops**

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GENERAL INFORMATION

Following for your use and distribution is a technical note, Squeezing More Value from Manure with Cover Crops, by Brian Hall, Edible Bean & Canola Specialist, Ontario Ministry of Agriculture and, Food and Rural Affairs, Canada. Reprint from Crops and Soils; Nov-Dec. 2009 pgs. 20-21, and provided by Bill Kuenstler, Conservation Agronomist for NRCS Central National Technology Support Center.

Canada East

Squeezing more value from manure with cover crops

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Establishment of cover crops following manure applied in late summer has been promoted as a means of reducing manure nitrogen (N) losses to the environment through leaching and increasing manure N availability to the following corn crop. Except for red clover, changes in corn N requirements associated with cover cropping have not been extensively evaluated in Ontario. Seventeen on-farm trials were conducted in southern Ontario from 2003–2008 to evaluate the potential of three commonly available cover crops (oats, oilseed radish, and field peas) for (i) their ability to sequester manure N when seeded immediately following manure applied in August on wheat stubble fields and (ii) their impact on corn N requirements the next year.

Shortly after cereal harvest (usually in August), manure was applied and oat, oilseed radish, and field pea cover crops were seeded. Strips where manure was not applied were included in each trial to evaluate the impact of manure on cover crop growth, N uptake, and N transfer to next year's corn. The rate of manure applied was typical for each farm with an overall average manure ammonium N application of 80 lb of N/acre. The cover crops were allowed to grow until the end of the growing season (November) at which time fall tillage was conducted according to the cooperators' discretion. The following spring, plots were split with half of the plots receiving an additional 150 lb of N/acre of fertilizer N side-dressed as urea ammonium nitrate in early to mid-June.

Cover crop growth and N uptake

Both oat and oilseed radish growth and N uptake were clearly higher where manure was applied. Table 1 shows the cover crop and N uptake values averaged across all sites. Applying manure increased oat and oilseed radish growth by about 1,000 lb/acre and N uptake by about 35 lb of N/acre.

Both oat and oilseed radish cover crops resulted in late-fall soil N levels following manure that were similar to those observed when manure was not applied (Table 1). This suggests that establishing either oat or oilseed radish cover crops can reduce the potential for fall N leaching following summer-applied manure to levels that are similar to when manure is not applied.

Field peas often were more difficult to establish and generally did not produce more above-ground growth than oats (Table 1). As a legume, field pea can fix N, resulting in above-ground N content that was about twice that of either oats or oilseed radish when manure was not applied. Following manure, field peas had N contents similar to either oats or oilseed radish. Higher late-fall soil N levels following field peas suggest that oat or oilseed radish

are a better choice for reducing fall soil N levels following late-summer manure application.

Corn response

Corn yield response to manure, cover crops, and fertilizer N application averaged across all 17 sites is shown in Table 2. When nitrogen was not applied, corn yields were not significantly increased by either oat or oilseed radish cover crops compared with when a cover crop was not planted. Also, the yield response to applying 150 lb of N/acre following oats or oilseed radish was not less than when a cover crop was not planted. These corn yield responses to oat or oilseed radish cover crops suggest that fertilizer N requirements were not reduced compared with when a cover crop was not planted. The maximum economic rate of nitrogen (MERN) estimates included in Table 2 clearly indicate that oat and oilseed radish cover crops, on average, did not reduce corn fertilizer N requirements when manure was or was not applied the previous summer.

Field peas did slightly increase yields when fertilizer was not applied and did have a slightly smaller yield response to adding fertilizer N when

► Table 1. Effect of late-summer manure application on cover crop yield, nitrogen content, and associated soil N levels in surface 12 inches measured in November.

Manure cover crop	Cover crop yield	Cover crop N	Soil N
	lb dry matter/acre	lb N/acre	
No manure			
Oats	1,800	28	29
Oilseed radish	1,360	25	31
Field peas	1,590	53	37
No cover planted†	470	5	40
Manure applied			
Oats	2,620	61	40
Oilseed radish	2,530	65	35
Field peas	1,850	63	50
No cover planted†	650	9	56

† Yield and N content of weeds and volunteer cereal growth.

North Central

Illinois CCA Convention

The Illinois CCA Convention will be held on Dec. 17, 2009 at the Crowne Plaza in Springfield. There'll be great speakers on hot topics, CEU credits, good food, and networking. Registration materials will be available in November. Go to www.illinoiscca.org or contact Lisa Martin at lisam.martin@verizon.net or 815-844-6677 for more information.

Ohio CCAs promote their professionalism

Ohio State University Extension's 47th annual Farm Science Review was held September 22–24 at the Molly Caren Agricultural Center in London, OH. With more than 600 commercial exhibitors and 138,014 attendees over the three-day event, the Ohio CCA board saw this as perfect opportunity to showcase the professionalism of the CCA program. Members of the board distributed CCA signs to all exhibitors employing CCAs. Exhibiting companies were asked to place the sign, listing their CCAs, in a conspicuous location within their exhibit.

South Dakota Agronomy Conference

The South Dakota Agri-Business Association's (SDABA) 2009 Agronomy Conference will take place December 15 and 16 in Sioux Falls. This is the eighth year for this two-day conference, which has gained recognition from CCAs for its comprehensive program that keeps them abreast of current agronomic topics. It's also a great way to catch up on CEUs (CCAs can earn up to 20 at this conference—five in each category) before the end of the year. The conference will feature experts from several state universities and national companies covering many different topics. Complete information on the program and how to register can be found online at www.sdaba.org; or you can call 605-224-2445 for more information. ■

manure was not applied (Table 2). The field pea credit averaged about 23 lb of N/acre when manure was not applied. When manure was applied, use of field peas did not significantly increase N availability to corn.

Corn yields following any of the cover crops were similar to when a cover crop was not planted (Table 2), suggesting that these cover crops are not consistently associated with a rotation benefit that increases corn yield potential.

Summary

Oat or oilseed radish cover crops usually did successfully establish and grow when seeded into cereal stubble fields in August, especially when manure was applied. Sufficient growth of oats or oilseed radish usually occurred, reducing the risk of soil erosion and soil N leaching losses following manure incorporated in summer. However, fertilizer N requirements of corn planted the next year were not reduced by either oat or oilseed radish cover crops.

Field peas were more difficult to establish and did not significantly reduce

the risk of soil N loss following manure application. Field pea credit when manure is not applied averaged about 23 lb of N/acre, a reduction in fertilizer N cost that, even at current N prices, would not cover the seeding cost of a pea cover crop.

Reducing the risk of soil erosion and fall soil N leaching losses on susceptible fields is a sufficient reason to justify establishment of either oat or oilseed radish cover crops following manure incorporated in summer. Field pea cover crops, owing to their ability to fix N, are best suited as a cover crop for fields with low N availability where either oat or oilseed radish cover crop growth would be limited by N availability.

These short-term trials were not designed to evaluate the potential long-term benefits that cover crops may potentially have on corn yield and/or N availability. Unfortunately, it does not appear that August seeding of oat, oilseed radish, or field pea cover crops into cereal stubble fields will reduce corn fertilizer N requirements and/or increase yield sufficiently to cover the cost of seeding the cover crop. ■

► Table 2. Corn yield response to manure application, cover crops, and fertilizer N.

Manure cover crop	Corn yield			MERN ^{††} lb N/acre
	0 lb N/acre	150 lb N/acre	Response [†]	
	bu/acre			
No manure				
Oats	123	167	44	83
Oilseed radish	131	170	39	77
Field peas	144	174	30	53
No cover planted	136	175	38	76
Manure applied				
Oats	157	177	20	40
Oilseed radish	161	179	18	37
Field peas	162	176	15	29
No cover planted	162	177	18	37

[†] Yield increase associated with applying 150 lb of N/acre of fertilizer N.

^{††} Estimate of maximum economic rate of nitrogen predicted by the size of yield response to fertilizer N assuming a corn price of \$5.00/bu and a fertilizer N price of \$1.00/lb of N.