Fertility Paradigms

Dave Ruden (right) manages the New Melleray Abbey farm, a cooperator with the fertility paradigms project.

In the last several years, you may have heard something about PFI's work with *fertility paradigms*. If so, you probably heard the explanation that a paradigm is a way of looking at the world, a way of making sense of things. People have different ways of looking at soil fertility, for instance. One person asks, "Do I have *enough* soil fertility?" Another's question is, "Do I have soil fertility in the right *balance*, or proportion?"

Soil scientists at land grant universities use the "do I have enough," or "sufficiency" criterion, and they have calibrated crop responses with soil tests on this basis. The "balance" school of thought is represented by producers and consultants who view fertility in terms of the proportions of nutrients on the soil's cation exchange; this could be termed the "ratio" approach. Little communication takes place between proponents of the sufficiency and ratio paradigms, and farmers are generally left on their own to decide where to put their money.

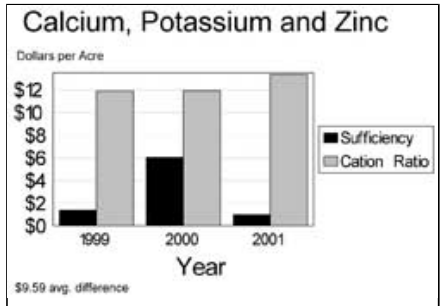

Fig. 5. Input expenses excluding lime over the fertility paradigms study.

The PFI soil paradigms project was designed to spark discussion on this question and to discover what are the immediate outcomes producers could expect from adopting one approach or the other. This SARE-funded project was in its third and final year in 2001. Collaborators are Kathleen Delate, the ISU Organic Agriculture Specialist, Doug Karlen, a soil scientist at the National Soil Tilth Laboratory, and crop consultant Keith Cuvelier, of Supergrow of Iowa, Inc.

Results from 2001 come from six private farms and two ISU experiment farms and appear in Table 5. The cooperators were: **Dennis and Eve Abbas**, Hampton; **John Bokelman**, Ventura; **John Hestad**, Garner; **Dave and Lisa Lubben**, Monticello; **Paul and Karen Mugge**, Sutherland, and the **New Melleray Abbey**, near Dubuque. Cooperating ISU farms were the Armstrong Research Farm, near Atlantic, and the Bruner Research Farm, just west of Ames.

Table 5, click to view shows that there were no significant differences in yield between the two treatments in 2001. This has been the norm during the study. Of 16 site-years reporting yields, there have been only two significant yield differences - one either way.

Table 5 and Fig. 5 also provide average fertilizer expenses related to the trial. There has been a consistent trend for those costs to be greater with the fertilizer recommendations stemming from the cation ratio approach to fertility.

Limestone costs are not included in these statistics. Western Iowa has calcitic lime, while the eastern half of the state has limestone in which magnesium is present along with the calcium. The choice of limestone does affect the ratio of calcium and magnesium on the soil cation exchange. However, because few farmers (or scientists!) would spend the money to haul limestone from one part of the state to another just to conform with a particular philosophy, it is not realistic to charge this aspect of the study to the costs of the systems.

Final conclusions cannot be drawn until analysis of soil, crop, plant tissue and weed biomass has been completed. The project is looking for changes in soil quality, crop quality, and the overall agroecosystem. However, evidence from cooperator farms suggests two things. First, it is possible to raise good crops by either approach, at least for the fairly short term that this study encompassed. Second, there appears to be a cost difference between the two approaches to fertility. The ratio treatment was not implemented using expensive proprietary or highly processed products; nevertheless, the cation ratio approach to fertility averaged more expensive by $9.59 per acre, and the difference did not decline over the period of the study. Taking into account all the yields in all the crops grown, the value of the harvest did average about $3.35 greater in the plots fertilized by the ratio approach than in the sufficiency treatments. However, that is still more than $6 per acre less than the difference in expenses. As always with crop production decisions, consider the value delivered for the cost paid.

Table 5. Fertility Paradigm Trials

Fertility Paradigm Trials

COOPERATOR	CROP	TRT."A", RATIO FERTILITY			SUFFICIENCY TRT.	SUFFICIENCY		DIFFERENCE				COMMENT
		DESCRIPTION	YIELD (bu.)	TREATMENT COST	DESCRIPTION	YIELD (bu.)	TREATMENT COST	YIELD DIFF.	YLD LSD (bu.)	YLD SIG.	$ BENEFIT OF TRT "A"	
ABBAS	BARLEY	POTTASIUM SULFATE, ZINC	53.8	$27.50	NO ADDITIONAL INPUTS	50.5	$0.00	3.3	9.3	N.S.	-$27.50	
ARMSTRONG	CORN	ZINC	132.4	$9.00	NO ADDITIONAL INPUTS	139.7	$0.00	-7.3	15.4	N.S.	-$9.00	SUPERPHOSPHATE (0-46-0) APPLIED TO BOTH TREATMENTS
BOKELMAN	CORN	0-0-60, ZINC	143.1	$11.19	NO ADDITIONAL INPUTS	142.3	$0.00	0.8	5.4	N.S.	-$11.19	18-46-0 DAP APPLIED TO BOTH TREATMENTS
BRUNER	CORN	ZINC, 0-0-60	143.6	$14.89	NO ADDITIONAL INPUTS	143.9	$0.00	-0.3	16.2	N.S.	-$14.89	
HESTAD	CORN	0-0-60	170.8	$8.25	NO ADDITIONAL INPUTS	155.6	$0.00	15.2	25.2	N.S.	-$8.25	11-52-0 (MAP) APPLIED TO BOTH TREATMENTS
LUBBEN	SOYBEAN	100 LBS/ACRE 0-0-60	53.1	$7.98	100 LBS/ACRE 0-0-60	52.4	$7.98	0.7	1.1	N.S.	$0.00	
MUGGE	CORN	Zn SULFATE	109.2	$0.88	NO ADDITIONAL INPUTS	104.7	$0.00	4.4	9.5	N.S.	-$0.88	ROCK PHOSPHATE APPLIED TO BOTH TREATMENTS
NEW MELLERAY	OATS	POTASSIUM SULFATE, ZINC	81.8	$27.00	NO ADDITIONAL INPUTS	81.6	$0.00	0.2	7.2	N.S.	-$27.00	
			AVG:	$13.34		AVG:	$1.00					
		AVERAGE CORN:	139.8			137.2						
		AVERAGE SMALL GRAIN:	67.8			66.0						
		SOYBEANS:	53.1			52.4						