



Additionality in U.S. Agri-Environmental Programs for Working Land

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Literature on additionality in conservation payment programs

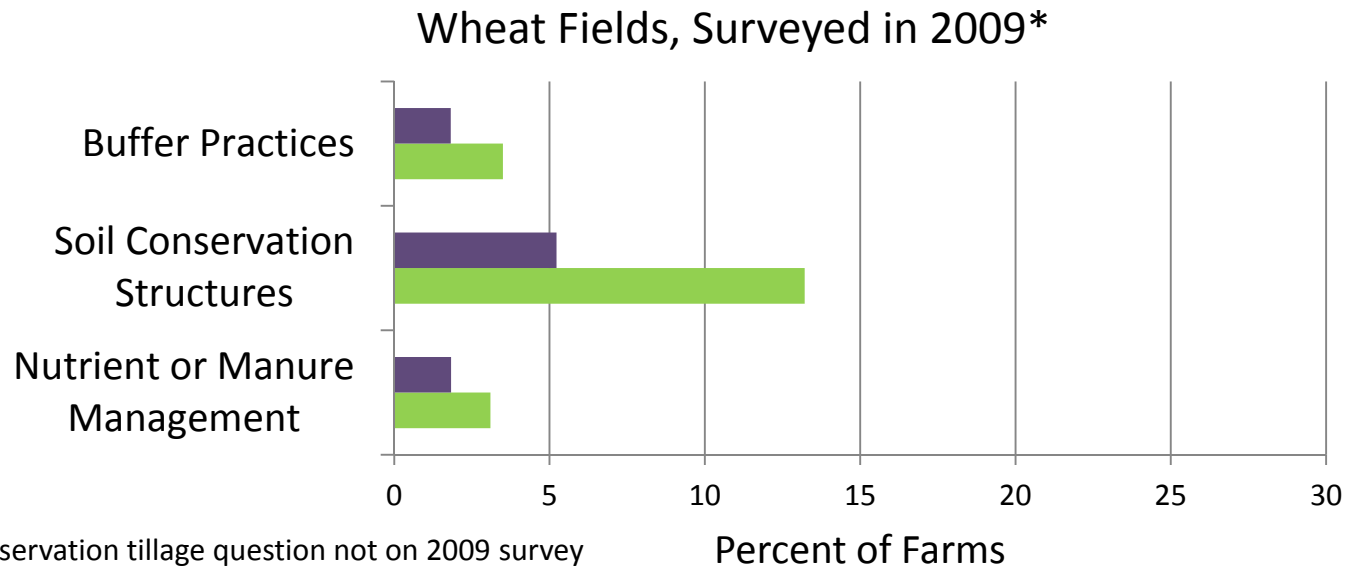
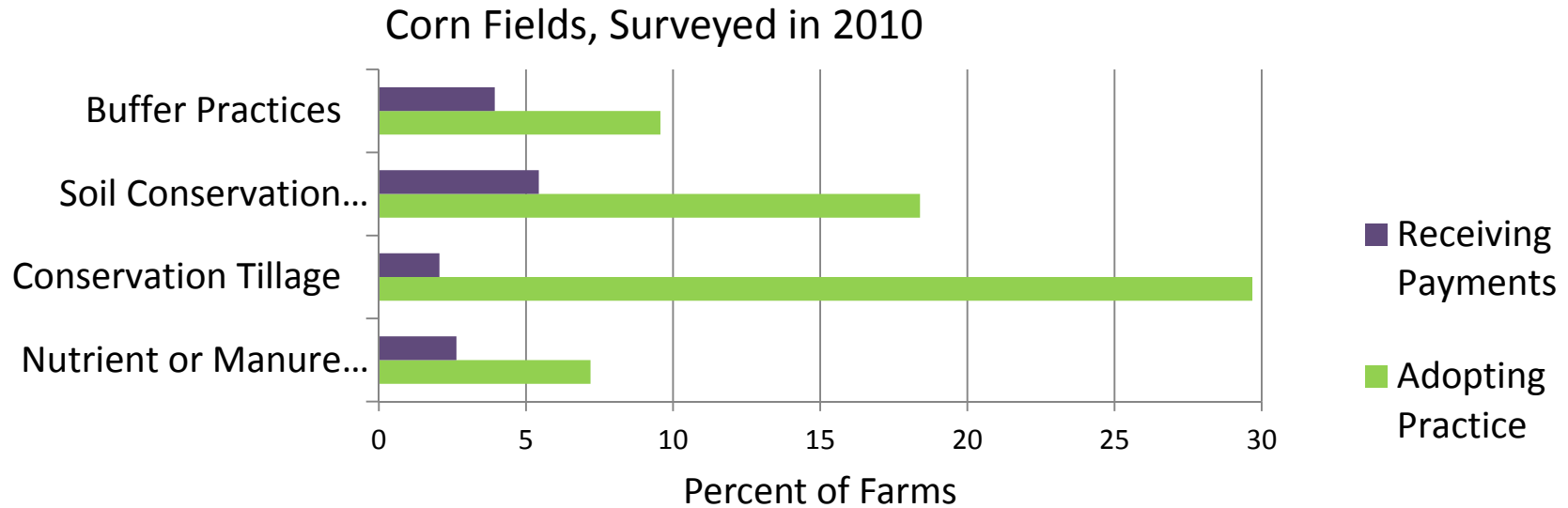
- Chabe-Ferret, S. and J. Subervie, 2011, "Estimating the Causal Effects of French Agro-Environmental Schemes on Farmers' Practices"
- Mezzatesta, M., D. Newburn, and R. Woodward, 2011, "Additionality and the Adoption of Farm Conservation Practices"
- Pufahl, A. and C. R. Weiss, 2009, "Evaluating the effects of farm programmes: results from propensity score matching," *European Review of Agricultural Economics*, 36(1): 79-101.

Practice-specific data from field-level ARMS survey Wheat (2009) and Corn (2010)

	Practice Group	Practices
For each practice, we ask:	Buffer practices	Field-edge filter strips Field borders Riparian buffers
•In use on field?		
•When installed or first used?	Soil Conservation	Terraces Grassed waterways Grade stabilization structures Water and sediment basins
•Payment received?		
•Which program?	Conservation tillage	No-till Mulch-till Ridge-till
	Nutrient management	Comprehensive NM Manure management

Source: Economic Research Service

Conservation Practice Adoption and Payments, by Practice



*Conservation tillage question not on 2009 survey

Source: Economic Research Service

Measuring Additionality: Average effect of Treatment on the Treated (ATT)

$$ATT = E[Y_f(1) - Y_f(0)]$$

$Y_f(1)$ = outcome on farm f with payment

$Y_f(0)$ = outcome on farm f without payment

- If practice adoption is our indicator
 - $Y_f(1) = 1$ payment farms adopt required practice
 - $Y_f(0) = 0$ if practice would not have been adopted without payment
 - $Y_f(0) = 1$ if practice would have been adopted without payment
- Farm contributes $Y_f(1) - Y_f(0) = 0$ or 1 to the ATT
- ATT is the proportion of funded practices that are additional.



Estimating ATT: Propensity Score Matching (PSM)

- **Critical problem:** $Y_f(0)$ is not observed on payment farms
- **Key assumption:** Farms that are “observationally equivalent” make the same decisions.
 - Obtain estimate of $Y_f(0)$ by matching payment farms to “observationally equivalent” non-payment farms
- Matching is based on **propensity scores—the estimated probability of receiving a payment**
 - Practice adoption
 - Conservation program application
 - Selection for programs enrollment



Payment models: Data on fields and farmers

- Probit Estimation of $\Pr(\text{Payment})$:
- Explanatory variables (characteristics of field, farm, and farmer):
 - **Field**: soil productivity, irrigation, soil erodibility, wetland, precipitation, temperature
 - **Famer**: tenure, age, education, full-time farmer, farm income
 - **State indicators**
 - pick up state variation in policy (Federal and non-Federal programs)
 - factors not otherwise captured
- ARMS is a good dataset for this purpose
 - Information on payment and non-payment farms
 - Extensive information on the field, farm, and farmer



Payment Model Estimation Results--Corn

COEFFICIENTS	Nutrient	Tillage	Soil	Buffer
	Management		Conservation	Practices
Soil Productivity (NCCPI)	0.23	-0.37	1.19***	1.07***
15-yr avg. precip. (mm)	-0.01	-0.12	0.13*	0.03
15-yr avg. max. temp. (C)	-10.30	4.25	9.08	-1.51
Total years operating field	0.00	0.00	0.12**	0.01
Owns field (=1)	0.45***	0.08	0.17	0.32**
Field is irrigated (=1)	-0.24	0.19	-0.17	0.47
Highly erodible (=1)	0.49**	0.27	0.61***	-0.11
Wetland	0.44	0.31	-0.10	--
Operator age	-0.02**	0.01	0.01	0.00
College Degree (=1)	0.38**	0.43**	0.49***	0.38**
Occupation is farmer (=1)	0.02	0.72*	-0.02	-0.26
On-farm income (\$10,000)	-0.01	-0.00	0.01	0.00
Observations	1,333	1,294	1,334	1,298
Pseudo-R2	0.12	0.11	0.16	0.10

*significant at 10 percent; **5 percent, ***10 percent

Kernel-based matching estimator

- Many types of matching could be used:
 - Nearest neighbor
 - Caliper
- Kernel-based matching uses all farms, but gives higher weight to farms with more similar propensity scores



Preliminary estimates show high additionality

Practice	Estimated Additionality
Corn	
Buffer Practices	0.90
Nutrient Management	0.96
Soil Conservation Structures	0.89
Tillage	0.75
Wheat	
Buffer Practices	1.00
Nutrient Management	0.96
Soil Conservation Structures	0.93
Corn and Wheat	
Buffer Practices	0.97
Nutrient Management	0.98
Soil Conservation Structures	0.89

Source: Economic Research Service

Next Steps

- More data are coming in soon
 - Sorghum and Barley fields surveyed (data available in May 2012)
 - Soybeans fields in 2012 (data available in May 2013)
- Improve treatments models
 - Better data on state policies
 - Better information on NRCS state and local priorities
- Outcomes rather than adoption
 - Do producers with nutrient management plan actually manage nutrients differently?

