Journal of Environmental Management 127 (2013) 221–227

Contents lists available at SciVerse ScienceDirect

Journal of Environmental Management

journal homepage: www.elsevier.com/locate/jenvman

Awareness and pro-active adoption of surface water BMPs

Joleen C. Hadrich [a,*], Andrea Van Winkle [b,1]

[a] Dept. Agricultural and Resource Economics, Colorado State University, B-303 Clark Building, Fort Collins, CO 80523-1172, USA
[b] Offutt School of Business, Concordia College, 901 8th St. S., Moorhead, MN 56562, USA

ARTICLE INFO

Article history:
Received 12 November 2012
Received in revised form
23 April 2013
Accepted 29 April 2013
Available online 10 June 2013

Keywords:
Best management practices
Cost-share
Livestock

ABSTRACT

Beef cow operators were surveyed to determine the effect of cost-share awareness and farm management characteristics on the adoption of surface water best management practices (BMPs) in a state without defined BMPs. Results demonstrated that farm management characteristics determined nutrient management adoption, farm characteristics determined filter strip adoption, and human capital and farm characteristics played the largest role with streambank fencing adoption. Cost-share awareness was not found to increase the probability of adopting any BMPs and Extension education was found to positively and significantly increase the adoption of all three BMPs.

© 2013 Elsevier Ltd. All rights reserved.

1. Introduction

The Environmental Protection Agency (EPA) regulates environmental concerns under the authority granted by the Clean Water Act (CWA). In 1972, the CWA made it illegal to discharge pollutants into waterways unless a permit was obtained through the National Pollutant Discharge Elimination System (NPDES) (EPA, 2011). In 2003, livestock operations with more than 1000 animal units (AU) were considered a pollution point source and were required to obtain a no-discharge NPDES permit via the Concentrated Animal Feeding Operations (CAFO) rule (EPA, 2013). Recognizing the importance that all livestock operations should adhere to environmental stewardship, some states have defined a set of recommended Best Management Practices (BMPs) for livestock production that relates to the CWA and NPDES permits. BMPs vary across states and livestock species, but the overall objective is to ensure the quality of surface and ground water in agricultural areas. BMPs apply to CAFOs as well as Animal Feeding Operations (AFOs), which have less than 1000 AU. While AFOs are not required to have NPDES permits, BMPs regarding surface water address the increasing importance for AFOs that use a grazing system due to the direct contact livestock have with local waterways and surface water.

Increasing BMP adoption through an economic incentive is one method to influence compliance with the CWA. The Environmental Quality Incentives Program (EQIP) provides a subsidy, or cost-share, which target funds to livestock producers adopting BMPs in compliance with the CWA (USDA-NRCS, 2011). Individual states can offer additional cost-share programs to further encourage BMP adoption. While cost-share programs exist, many producers are simply not aware of BMPs or how cost-share programs can be used to adopt these practices. This introduces the question of how to address and link these issues to result in a joint output that includes improved environmental quality at decreased costs for livestock producers.

This paper evaluates the interaction between producer awareness and adoption of BMPs with federal and state level cost-share programs. First, a state must define recommended BMPs, disseminate this information, and provide incentives for BMP compliance when applicable. Second, producers must have access to funds through normal financial channels or cost-share programs to adopt BMPs. To-date, a study has not been completed in an area where BMPs are not defined for cow-calf AFOs, but where multiple cost-share programs exist for pro-active BMP adoption. This study specifically evaluates this topic area. The state of North Dakota (ND) has not identified cow-calf AFO BMPs, yet cost-share programs exist at a state and industry level to provide funding assistance for pro-active adoption of environmentally sound production practices. This makes ND an interesting and unique study area compared to previous studies where BMPs have been identified and recommended at the state level in which there were limited or no state level cost-share programs available.

The objective of this study is to determine the probability of adopting BMPs as a function of farm characteristics, management and human capital characteristics, as well as producer awareness of state and federal BMP cost-share programs. Three livestock specific

* Corresponding author. Tel.: +1 970 491 2836; fax: +1 970 491 2067.
E-mail addresses: joleen.hadrich@colostate.edu (J.C. Hadrich), avanwink@cord.edu (A. Van Winkle).
1 Tel.: +1 218 299 3483.

0301-4797/$ – see front matter © 2013 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.jenvman.2013.04.062

BMPs were identified for this analysis: nutrient management, filter strips, and streambank fencing. North Dakota regulatory agencies and industry professionals recommended these three BMPs as the most likely for cow-calf AFOs which could be enforced.

The remainder of the paper is organized as follows. The next section reviews BMPs across the U.S and the factors that affect adoption. The conceptual framework follows which describes the decision making process for livestock producers. The empirical model section outlines the probability of adopting BMPs, followed by a description of the data. Empirical results are reported to provide evidence of the relationship between factors affecting BMP adoption and cost-share program awareness in a state where BMPs are not required. The final section discusses the implications of results, as well as the potential for further research.

2. Literature review

BMP adoption varies spatially and by livestock species (Innes, 2000; Goetz and Zilberman, 2000). Past studies have evaluated factors which influence reasons for adopting BMPs, mitigation methods, and use of cost-share programs. Beale and Bolan (1995) identified awareness of new practices as the critical first stage in agricultural technology diffusion. This can be applied to this study where technology awareness is categorized in two groups: BMP awareness versus cost-share program awareness.

Understanding the relationship between BMP adoption and awareness can help identify factors which influence livestock producers' decision to adopt BMPs. Perrin and Winkelmann (1976) found that asset heterogeneity affects technology adoption across livestock enterprises. Daberkow and McBride (2003) tested this using a two stage logit model which found that operator education, computer literacy, and farm size increased the probability of awareness of precision (PA) technology. In the second stage of their model, awareness was not found to limit PA technology adoption. Rather, profitability was found to be the driving factor for PA adoption. Rahelizato and Gillespie (2004) found BMP adoption increased on dairy farms with increased awareness of the CWA and legislation to control non-point source pollution. They also found the greatest level of adoption was associated with more highly promoted BMPs. Conversely, the most common reasons cited for not adopting BMPs included unfamiliarity with BMPs, high costs of the practices, and non-applicability of the practice. The results of Gillespie et al. (2007) highlight the importance of the interaction between awareness and adoption, but also how cost can influence these decisions.

Economic incentives have been identified as a method to defray BMP adoption costs to limit possible negative effects on farm profitability (Shuck and Birchall, 2001; Daberkow and McBride, 2003; Gillespie et al., 2007; Ghazalian et al., 2009). Awareness of and application to EQIP for cow-calf producers was found to depend on the amount of previous BMP adoption costs paid at the producer's expense as well as the portion of off-farm income used (Obubuafo et al., 2008). Onianwa et al. (2004) identified a positive relationship between land ownership, cost-share program participation, and limited resource producers. Paudel et al. (2008) compared EQIP benchmark costs against BMP establishment costs to find cow-calf BMPs with the highest adoption rates also had the highest average cost of adoption. However, this cost was decreased by using EQIP funding. Monetary incentives are an important factor of BMP adoption, but awareness of cost-share programs are equally important. Gillespie et al. (2007) stated that economic benefits are likely to be effective only if education complements them. Working with NRCS (Paudel et al., 2008) and participating in agro-environment groups (Ghazalian et al., 2009) were found to increase application to cost-share programs and adoption of BMPs.

Previous work has shown that BMP adoption is affected by the interaction between BMP and cost-share program awareness. This paper extends previous work to capture these interactions for cow-calf producers in ND; specifically those operations with less than 1000 AU. These results can be extended to other cow-calf operations in the U.S., as well as provide a base scenario for states without recommended BMPs.

3. Conceptual model

Livestock producers adopt new technology with the assumption that it will provide future benefit to their farming operation (e.g. increased profit, mitigating environmental concerns, increased efficiency, etc.). In order to make the decision to adopt new technology, producers use information they have received and past experience regarding technologies. A livestock producer's decision to adopt a new technology can be represented by their utility function. Following Gillespie et al. (2007), assume that the ith producer has j technology choices and the utility of adopting j is defined by:

$$U = U(q, \pi, n, z), \tag{1}$$

where q is awareness regarding the new technology, π is profit generated on the farm, n is the producer's willingness to alter management strategies, and z denotes other attributes in the producer's utility function. Assuming that increased awareness provides more information regarding benefits of the new technology, we can assume that a higher value of q will result in an increased likelihood of the producer adopting the technology:

$$U(q^*, \pi, n, z) > U(q, \pi, n, z), \text{ where } q^* > q. \tag{2}$$

The producer must have the financial means to adopt the new technology. Profit for technology j can be defined as:

$$\pi = \pi(y, b, x, \delta), \tag{3}$$

where y is output (number of beef cows on the operation), b is the BMP or technology, x denotes other inputs for the operation, and δ is the discount rate for the technology adopted. The producer will adopt the BMP when

$$\pi(y, b = 1, x, \delta) > \pi(y, b = 0, x, \delta), \tag{4}$$

where $b = 1$ denotes technology adoption. In some cases economies of size will affect profit levels as a function of BMPs which can be a potential constraint for adoption.

Assuming the technology is available, a producer's willingness to alter their management practices to adopt technology depends on the size of the operation (y), type of technology (b), labor availability (l), and other input levels (x). Additionally, the availability of a cost-share program (s) may be the incentive needed for a producer to adopt new environmental technologies. Management practices can be represented by the following equation

$$n = n(y, b, l, x, s). \tag{5}$$

4. Empirical model

The decision to adopt BMPs is an individual producer decision. The probability that a producer will choose to adopt a BMP is given by the probability that the utility of adopting is greater than the utility that the producer would receive from any other given alternative as described earlier (Kennedy, 2003). The decision to adopt BMP_j is estimated using a probit model utilizing both binary

Download English Version:

https://daneshyari.com/en/article/1056024

Download Persian Version:

https://daneshyari.com/article/1056024

Daneshyari.com