Adoption of Phytase by Livestock Farmers

Michael Stahlman1, Laura M.J. McCann1, and Haluk Gedikoglu2
1University of Missouri, Columbia, Department of Agricultural Economics
2University of Wisconsin-La Crosse

For further information contact Dr. Laura McCann, e-mail: mccannl@missouri.edu

Abstract

Since a farmer can receive satisfaction from the economic and environmental benefits of phytase, this model is based on utility maximization. The variables relate to relative advantage and compatibility of phytase as well as the socio-economic characteristics of the farmer. A logit regression was conducted to determine how the farmer’s response was influenced by factors relating to the farm and the farmer.

Introduction

The grains and oil seeds in animal feed contain nutrients, like calcium and phosphorus, that are bound in a salt called phytate. Unfortunately, non-ruminants, like pigs and poultry, lack the ability to digest phytate. Instead of adding inorganic phosphorus, a farmer could add phytase, an enzyme that breaks up phytate, saving money on feed and reducing phosphorus pollution.

Phytase became commercially available in Europe in 1991 and regulations made phytase use widespread (Institute for Applied Environmental Economics). The EPA concluded in 2001 that phytase would only cost 1% more while reducing phosphorus output by 40% (EPA).

Phytase has overcome several technological barriers and production costs have decreased. Increasing dicalcium phosphate prices have also made phytase more profitable. However, to our knowledge, no other studies of the adoption of this new technology have been published.

Objectives

- To examine social and economic factors that impact the stated adoption of phytase.
- To determine the state of farmer knowledge about this new technology.

Methods

- A mail survey was conducted, following Dillman, among 3,014 randomly selected livestock producers in Missouri and Iowa in Spring 2006.
- The effective response rate was 37.4 percent.
- A logit regression was conducted to determine how the farmer’s response was influenced by factors relating to the farm and the farmer.
- 437 surveys were used after dropping blank or “Don’t Know” responses.

Results

- People are more likely to say they use phytase if they think it is profitable, not time intensive, and improves water quality.
- They are less likely to indicate they use it if they are concerned about water quality, have ruminants, or have off farm income.
- They are also more likely to say they use it if they give their manure away and are from Iowa.
- The stated adoption rate for the survey was 7.7%, among farmers with non-ruminants the adoption rate was 17.2%.
- 355 of 951 farmers surveyed did not know whether they used phytase.
- 78% of farmers stated they were concerned about water quality.
- 71 of 79 phytase users came from Iowa.
- There were no broiler farmers that indicated they used phytase.

Implications

- Since most premixes for non-ruminants include phytase (Shannon) the fact that no broiler farmers, only 5% of turkey farmers, and less than half of swine farmers reported using phytase suggests there is an information disconnect between farmers and feed-manufacturers/contractors.
- While the stated adoption rate for non-ruminants was only 17%, the actual rate is much higher so we are measuring knowledge rather than adoption.
- Centralized decision-making by feed-manufacturers/contractors to reduce dicalcium costs has probably had environmental benefits.
- This is a success story based in part on induced innovation. Further research needs to be conducted to develop other win/win technologies.

References:

- Shannon, M, C. Personal Communication. (07-08-08).

Logit Regression Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Coef.</th>
<th>Marginal Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phytase Not Profitable (1-2)</td>
<td>Indicator Variables, Based on Likert Scale (1-5), Base “3”</td>
<td>-0.437</td>
<td>0.010</td>
</tr>
<tr>
<td>Phytase Profitable (4-5)</td>
<td>Indicator Variables, Based on Likert Scale (1-5), Base “3”</td>
<td>1.897***</td>
<td>0.101</td>
</tr>
<tr>
<td>Not Time Intensive (1-2)</td>
<td>Indicator Variables, Based on Likert Scale (1-5), Base “3”</td>
<td>1.115***</td>
<td>0.036</td>
</tr>
<tr>
<td>Time Intensive (4-5)</td>
<td>Indicator Variables, Based on Likert Scale (1-5), Base “3”</td>
<td>-0.021</td>
<td>-0.015</td>
</tr>
<tr>
<td>Doesn’t Improve Water (1-2)</td>
<td>Indicator Variables, Based on Likert Scale (1-5), Base “3”</td>
<td>-0.294</td>
<td>-0.007</td>
</tr>
<tr>
<td>Improves Water (4-5)</td>
<td>Indicator Variables, Based on Likert Scale (1-5), Base “3”</td>
<td>1.424***</td>
<td>0.059</td>
</tr>
<tr>
<td>Not Concerned about Quality</td>
<td>Indicator Variables, Based on Likert Scale (1-5), Base “3”</td>
<td>-0.562</td>
<td>-0.012</td>
</tr>
</tbody>
</table>

Pseudo R-Square= 0.5273    Overall Correct= 90.8%    LR Chi-Squared (32 d.f.)= 206.35