

Application of ADOPT (Adoption & Diffusion Outcome Prediction Tool) to Identify Factors Influencing Adoption of Rotational Grazing

Report for Pennsylvania



Introduction

As part of a USDA Natural Resource Conservation Service (NRCS) Conservation Innovation Grant to promote rotational grazing in the Chesapeake Bay watershed, the Chesapeake Bay Foundation (CBF) used ADOPT (Adoption and Diffusion Outcome Prediction Tool), a tool developed by social scientists in Australia, to predict an agricultural practice's likely rate, and peak level, of adoption.¹ The tool is designed to be "quick and dirty," but also to provide insights on the importance of various factors influencing the adoption of a particular practice, in our case, rotational grazing. The first step in using ADOPT is to clearly define the population of farmers whose adoption behavior we are interested in influencing. This is a crucial step as responses are likely to be different for the same practice among different groups of farmers.

The actual tool is an Excel spreadsheet and users are asked to respond to 22 questions related to: a) characteristics of the practice that influence its relative advantage, b) characteristics of the population influencing their perceptions of the relative advantage of the practice, c) characteristics of the practice influencing the ease and speed of learning about it, and d) characteristics of the potential adopters that influence their ability to learn about the practice. Most questions have five possible responses with a gradation of options (i.e., highly likely, likely, no effect, unlikely, very unlikely). The outputs from the tool are predictions about the percentage of the population that is likely to adopt the practices and the amount of time to peak adoption. We have found that the real benefits of running the tool are the insights that are revealed during the workshop discussions.

According to the developers of the tool, answers to the questions are best acquired in a workshop setting. To that end, CBF hosted three workshops, one each in Maryland, Pennsylvania, and Virginia, to run ADOPT. Workshop participants are local experts, staff from local soil conservation districts, extension, and/or NRCS who work with producers on grazing and other practices as well. We want participants who can give relatively objective answers to the questions based on their experience working with producers.

This report presents the results of our third workshop held at the Red Lion Hotel in Harrisburg, Pennsylvania on Thursday, July 19, 2018. Beth McGee (CBF) facilitated the workshop that was attended by six participants (we had three people drop out at the last minute). The workshop participants and their affiliations are listed below.

Workshop Participants: Susan Parry (NRCS), Titus Martin (retired NRCS), Peter Hughes (Red Barn Consulting), Ann Baseshore (producer-goat grazer), Franklin Egan (Pennsylvania Sustainable Agriculture Association), and Matthew Haan (Penn State Extension).

Description of the Population: As noted above, identifying the target population is important as it will dictate the answers to the questions. The group discussed the dire financial situation for dairy farmers in the region and differences among conventional and organic farms, large versus small farms, and new versus long-time farmers. Ultimately, the group decided to focus on small conventional dairies that would likely need to diversify to remain financially viable. This diversification could include not just a shift to rotational grazing, but other operational changes (e.g., growing more diverse crops, or adding other poultry or livestock) not being considered here.

Information Entered into ADOPT

Below is a summary of the responses to the 22 questions. "Initial vote" reflects participants' votes after hearing the question, but prior to any discussion. After the initial vote, we discussed responses and participants were asked to vote again and whatever response got the majority of votes was then entered into the tool. The predictions about time to peak adoption and the percentage of the target population likely to adopt are based on the following information entered into the Adoptability and Diffusion Outcome Prediction Tool. **Highlighted questions** were found, in the resulting sensitivity analysis, to be in the top four, in terms of the effect on the level of adoption. Sensitivity analysis on the prediction about the level of adoption indicates a step up or down in the changes to the responses will have little effect on the prediction (see section on Sensitivity Analysis).

Relative Advantage for the Population

Question 1: Profit Orientation

Potential answers range from 1—almost none have maximizing profit as a strong motivation, to 5—almost all have profit as a strong motivation.

Response:

4—A majority have maximizing profit as a strong motivation.

In the initial voting, one vote for 3, two votes for 4, and two votes for 5. End vote: five votes for 4. (One participant was late to the meeting, so there are only five votes/participants for the first two questions.)

¹ Kuehne, G, Llewellyn, R, Pannell, DJ, Wilkinson, R, Dolling, P, Ouzmana, J, Ewing, M. 2017. Predicting farmer uptake of new agricultural practices: A tool for research, extension and policy. *Agricultural Systems* 156: 115-125. Attached as an Appendix.

Reasoning:

The participant initially voting 3 noted that besides profit, “lifestyle” choices are also important. For example, farmers may be seeking less stress and a less labor-intensive farming approach. The group generally agreed, however, that the initial impetus to change would likely be profit-driven, but other benefits, such as benefits to lifestyle would follow. Also, a farmer interested in diversifying his/her farm would likely be doing so to increase profit.

Question 2: Environmental Orientation

Potential answers range from 1—almost none have protection of the environment as a strong motivation, to 5—almost all have protection of the environment as a strong motivation.

Response:

3—About half have protection of the environment as a strong motivation. (One participant was late to the meeting, so there are only five votes/participants for the first two questions.)

In the initial vote, two voted for 2, two voted for 3, and one voted for 4. End vote: four votes for 3 and one vote for 4.

Reasoning:

It was noted that some of the differences in opinion could be related to differences in who participants typically work with. For example, extension agents may deal more with young, typically more progressive, farmers, whereas NRCS staff deal with a broader variety of producers—one participant noting that “people go to NRCS for money.” The distinction was made that many farmers see themselves as “stewards of the land” and recognize that milk quality is impacted by the quality of the land, but don’t necessarily see themselves as “environmentalists.”

Question 3: Risk Orientation

Potential answers range from 1—almost none have risk minimization as a strong motivation, to 5—almost all have risk minimization as a strong motivation.

Response:

2—A minority have risk minimization as a strong motivation.

In the initial voting, four votes for 2 and two votes for 3. End vote was five votes for 2 and one vote for 3.

Reasoning:

It was noted that producers in the dairy business are already risk takers. Though organic dairies may be more “stable,” the process of shifting to organic/grazing is risky.

Question 4: Enterprise Scale

Potential answers range from 1—almost none of the target farms have a major enterprise that could benefit, to 5—almost all the target farms have a major enterprise that could benefit.

Response:

4—A majority of the target farms have a major enterprise that could benefit.

In the initial voting, there was one vote for 2, four votes for 4, and one vote for 5.

Reasoning:

This is an outcome of defining the target population the way we did.

Question 5: Management Horizon

Potential answers range from 1—almost none have a long-term (greater than 10 years) management horizon, to 5—almost all have a long-term management horizon.

Response:

3—About half have a long-term management horizon.

In the initial vote, one vote for 1, three votes for 3, one vote for 4, and one vote for 5. The end vote was four votes for 3, one vote for 4, and one vote for 5.

Reasoning:

The participant that voted 1 noted that a ten-year plan is long for any business and the participant that voted 5 noted that many producers

have a strong commitment to family, property, and livelihood. Many farmers are older and that could affect long-term planning, but it was also noted that many farmers do think about the next generation. Participants thought there may be geographic differences in the responses to this question; most of our participants were from south central Pennsylvania.

Question 6: Short-term Constraints

Potential answers range from 1—almost all currently have a severe short-term financial constraint, to 5—almost none have a severe short-term financial constraint.

Response:

1—Almost all have a severe short-term financial constraint.

In the initial voting, five votes for 1 and one vote for 2.

Reasoning:

The milk market is down and this is exacerbated by weather conditions (e.g., wet spring/dry summer). Even some organic dairy farmers are struggling either because they are unable to get contracts or their contracts aren't being renewed.

Learnability Characteristics of the Innovation

Question 7: Trial Ease

Potential answers range from 1—not easy to trial, to 5—very easy to trial.

Response:

3—Moderately easy to trial.

In the initial voting, five votes for 3 and one vote for 4. End vote: four votes for 3 and two votes for 4.

Reasoning:

One participant noted he got into grazing (dairy) by trying it out on 20 acres for 6 months and that was enough to convince him to convert. Minimal costs are associated with flexible fencing, which is sufficient to demonstrate the concept and is do-able. It was noted that farmers need advice and guidance during this trial period.

Question 8: Innovation Complexity

Potential answers range from 1—very difficult to evaluate effects of use due to complexity, to 5—not at all difficult to evaluate effects of use due to complexity.

Response:

5—Not at all difficult to evaluate effects due to complexity.

Initial vote: three voted for 4 and three voted for 5. End vote: six votes for 5.

Reasoning:

Easy to observe cows grazing and dairy farmers can evaluate milk production and feed costs; also fairly easy to observe the health of pasture and health of animal.

Question 9: Observability

Potential answers range from 1—not observable at all, to 5—very easily observable.

Response:

5—Very easily observable.

In the initial vote, six voted for 5.

Reasoning:

As noted above, it is easy to see animals in pasture, with fencing. This is one reason that pasture walks are so effective.

Learnability of Population

Question 10: Advisory Support

Potential answers range from 1—almost none use a relevant advisor, to 5—almost all use a relevant advisor.

Response:

3—About half use a relevant advisor.

Initial vote: five votes for 3 and one vote for 4.

Reasoning:

There was general agreement that farmers tend to get information from other farmers, but still some seek out assistance from professionals. One participant noted it would be useful to have quantitative information on the answer to this question. As in Maryland, it seems like the votes may have broken somewhat along employer lines, with extension staff thinking a higher proportion use advisors because they have producers seeking their services, versus NRCS staff who are thinking about the entire population of producers and how many seek out technical assistance.

Question 11: Group Involvement

Potential answers range from 1—almost none are involved with a group that discusses farming, to 5—almost all are involved in a group that discusses farming.

Response:

3—About half are involved with a group that discusses farming.

In the initial vote, six voted for 3.

Reasoning:

Unlike in Maryland and Virginia where this question was interpreted to include farmer-to-farmer interactions, this group wanted to focus on farmer groups such as grazing groups, co-ops, etc. Dairies often sell to co-ops, so they are used to group interactions. It was noted that for groups to be successful, they need a champion, one with credibility. In south central Pennsylvania (Franklin County), there is a very old and vibrant group of graziers. It was also noted that there is different mindset of conventional dairy versus graziers in terms of information sharing, e.g., conventional can be competitive—gender differences in co-ops were also noted. One participant opined that the Dairy Profit teams can be focused more on production rather than farmer profit. Pennsylvania Association for Sustainable Agriculture (PASA) has a dairy grazing apprenticeship program designed to encourage new producers. One participant suggested it might be valuable to connect grazing groups with product-based groups, like cheese makers. Participants noted that if they had been thinking of one-on-one farmer interactions, the answer would have been higher.

Question 12: Relevant Existing Skills and Knowledge

Potential answers range from 1—almost all need new skills and knowledge, to 5—almost none need new skills and knowledge.

Response:

2—A majority will need new skills and knowledge.

In the initial vote, one vote for 1 and five votes for 2. The end vote had six votes for 2.

Reasoning:

Those who voted 2 noted that there are a lot of farmers involved in good grazing management e.g., how grazing affects plant and soil; the need to constantly adapt to weather; that it can be more of an “art than a science,” etc.

Question 13: Innovation Awareness

Potential answers range from 1—it has never been used or demonstrated in their district, to 5—almost all are aware it has been used or demonstrated in their district.

Response:

5—Almost all are aware that it has been used or demonstrated in their district.

In the initial vote, two voted for 3, one voted for 4, and two voted for 5. End vote saw one vote for 4 and five votes for 5.

Reasoning:

Most agreed that there is a high level of awareness of the practice, but not all producers know much about how it really works.

Relative Advantage of the Innovation

Question 14: Relative Upfront Cost of Innovation

Potential answers range from 1—very large initial investment, to 5—no initial investment required.

Response:

3—Moderate initial investment needed.

Initial vote: four votes for 3 and two votes for 4. End vote: five votes for 3 and one vote for 4.

Reasoning:

Those that voted 4 noted that it is fairly cheap to implement a temporary system, with flexible fence and above-ground water. Some producers will actually do it on their own; others will seek out money and assistance from NRCS. Some noted that meeting NRCS specifications could be a barrier both to grazing but also to achieving water quality benefits, e.g., we might get most of the water quality benefits with only a handful of the practices. It was also noted that any state dollars must follow “prevailing wage,” which can be very expensive.

Question 15: Reversability of Innovation

Potential answers range from 1—not reversible at all, to 5—very easily reversed.

Response:

4—Easily reversed.

Initial vote: two votes for 3, two votes for 4, and two votes for 5. End vote: five votes for 4 and one vote for 3.

Reasoning:

Those that voted 5 suggested it was relatively easy to install and uninstall fences. A buried water line might be harder to remove. Also, if there is a contract or agreement in place, that could also make it more difficult to reverse the practice.

Question 16: Profit Benefit in Years that It is Used

Potential answers range from 1—large profit disadvantage in the years it is used, to 8—very large profit advantage in years it is used.

Response:

6—Moderate profit advantage in years that it is used.

In the initial vote, two voted for 5, two voted for 6, and two voted for 7. The end vote was not recorded.

Reasoning:

Profit advantage comes in the form of reduced feed costs, lower labor costs, etc. but over the long-term, these benefits can be lost if animals are overstocked. One participant noted that banks will sometimes encourage producers to get more animals seeking to maximize production, but this can lead to overstocking and could reduce profits for the farmer or even result in a “crash.”

Question 17: Future Profit Benefit

Potential answers range from 1—large profit disadvantage in the future, to 8—very large profit advantage in the future.

Response:

7—Large profit advantage in the future.

In the initial vote, one vote for 6 and five votes for 7.

Reasoning:

The context for this answer is that in today’s world you are not making much money if you are a conventional dairy. Your hope would be to cut costs by converting to grazing, hoping to capitalize on the organic premium and/or a niche market. However, there is at least a three-year lag time before organic premiums can be earned and no guarantee they will be available. If you are willing to take on this innovation, you might make other changes that could help make your operation more profitable. The future for small conventional dairies is not good.

Question 18: Time Until Any Future Profit Benefits are Likely to be Realized

Potential answers range from 1—more than ten years, to 5—almost immediately.

Response:

3—Three to five years to realize profit benefits.

Initial vote: six votes for 3.

Reasoning:

Pasture establishment takes a while and sometimes animals need to adapt; immediate benefit of not paying for feed or making feed—but then it will take longer for full profit benefits to kick-in.

Question 19: Environmental Costs and Benefits

Potential answers range from 1—large environmental disadvantage, to 8—very large environmental advantage.

Response:

7—Large environmental advantage.

Initial vote: three votes for 6, one vote for 7, two votes for 8. End vote: two votes for 6 and four votes for 7.

Reasoning:

It was noted that if grazing isn't implemented or managed properly, the environmental benefits may be compromised, e.g., if the producer isn't necessarily getting cows out of the stream. In addition, there can be animal concentration areas and degraded pastures. All agree that if done well, there should be a large benefit.

Question 20: Time to Environmental Benefit

Potential answers range from 1—more than ten years, to 5—almost immediate.

Response:

4—One to two years for environmental benefits.

In the initial vote, six voted for 4.

Reasoning:

Converting to grazing will help reduce runoff, improve water and soil quality, and reduce greenhouse gases. In addition, graziers have, perhaps, an increased awareness of the environment because they are out in the field every day closely observing the health of their pastures.

Question 21: Risk Exposure

Potential answers range from 1—large increase in risk, to 8—very large reduction in risk.

Response:

6—Moderate reduction in risk.

In the initial vote, one voted for 4, four voted for 6, and one voted for 7. End vote: one vote for 5 and five votes for 6.

Reasoning:

Participants noted there are different types of risk. For example, graziers can't buy crop insurance and could be hurt by droughts if they have to buy feed (and organic feed isn't available). On the flip side, grazing can reduce feed costs and, if stocking density is appropriate, can make pastures more drought resistant. It was noted that farming is inherently risky.

Question 22: Ease and Convenience

Potential answers range from 1—large decrease in ease and convenience, to 8—very large increase in ease and convenience.

Response:

6—Moderate increase in ease and convenience.

In the initial vote, one voted for 3, three voted for 6, one voted for 7, and one voted for 8. End vote: one voted for 5, four voted for 6, and one voted for 8.

Reasoning:

The participant that voted 3 noted that it takes work to graze animals, especially if you are used to riding a tractor, i.e., you are out in the field every day, changing fences, etc. The vote for 8 noted that conventional dairies spend lots of time mixing feed and on manure handling/cleaning out the barn. It was also noted that ensuring the proper layout for a grazing system is important and can simplify or complicate life. In terms of workload, conventional dairies may have more intense peaks in effort whereas grazing may be a more consistent, lower, level of effort. It was noted that grazing requires thinking everyday—it is a different mindset.

Predicted Adoption Levels

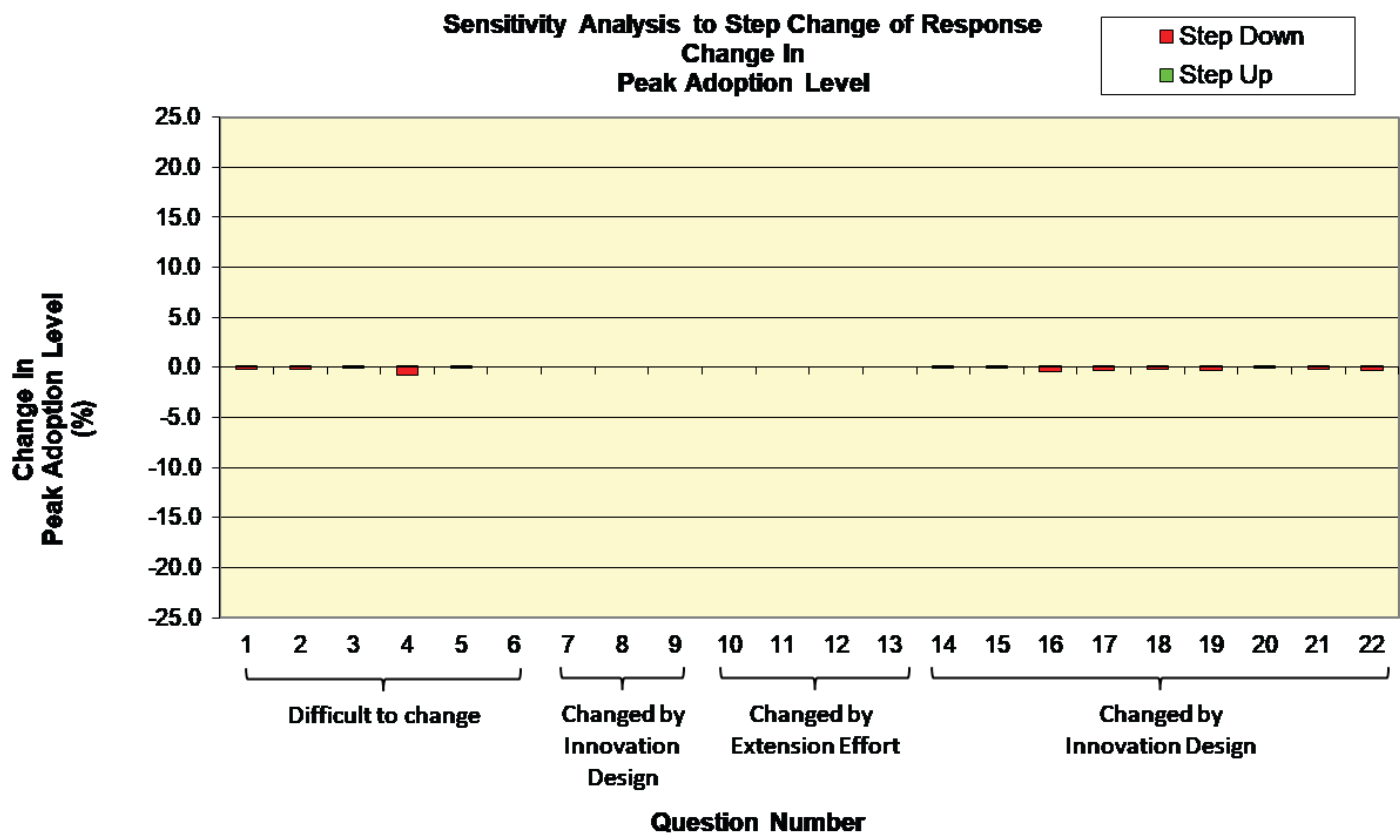
Predicted peak level of adoption ¹	98%
Predicted years to peak adoption ²	12
Predicted years to near-peak adoption ³	10
Year innovation first adopted or expected to be adopted	N/A
Year innovation adoption level measured	N/A
Adoption level in that year	N/A
Predicted adoption level in 5 years from start	64.1%
Predicted adoption level in 10 years from start	97.5%

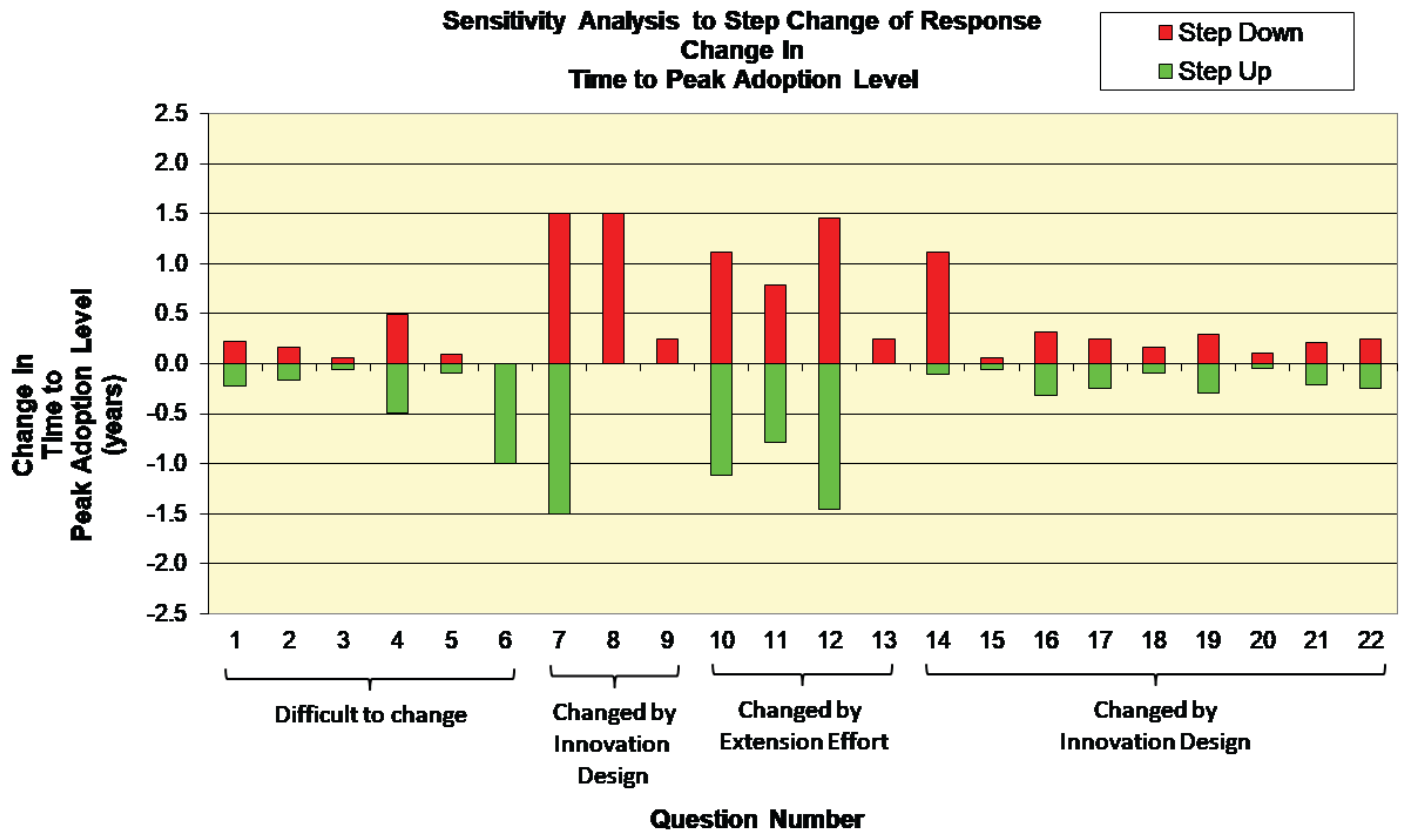
PLEASE NOTE:

1. The prediction of 'Peak Adoption Level' is a numeric output that is provided to assist with insight and understanding, and like any forecasts, should be used with caution.
2. The prediction of 'Time to Peak Adoption Level' is a numeric output that is provided to assist with insight and understanding, and like any forecasts, should be used with caution.
3. 'Time to Near Peak Adoption' represents the time to 95% of the maximum predicted adoption level.

Sensitivity Analysis

The following charts show the effects on 'Peak Adoption Level' and 'Time to Peak Adoption' of single step changes up and down for all questions. The bigger the bar, the bigger the change on that particular parameter.





Observations

ADOPT predicts that a high proportion of the target population (98%) should be willing to implement rotational grazing and the time to the peak adoption is 12 years. Results of the ADOPT workshops in Virginia and Maryland had similarly high rates of adoption. While encouraging, these estimates are probably optimistic. Our workshop participants, many of whom grew up on farms or are still farming, likely represent the perspective of the “early adopter” end of the spectrum of agricultural producers. The overall sense of the group is that rotational grazing does require additional skills and knowledge, but ultimately can increase farm profits, and reduce labor costs and stress. As noted below, however, the financial challenges of the dairy industry in Pennsylvania, even for those producing organic milk, will influence the likelihood of adoption. Nonetheless, the results do suggest there is potential for greater adoption with the right approaches and messages.

Participants believe that a majority of farmers had maximizing profit as a strong motivator (Question 1), but also noted that, for some, “lifestyle” benefits (i.e., lower stress, reduced costs) would also be important. Interestingly, during discussions of subsequent questions (11 and 16), one participant noted that the Dairy Profit Teams sponsored by Center for Dairy Excellence² and banks that loan money to farmers may be too focused on increasing total milk flow from the farm at the expense of farmer profits. That is, farmers may be encouraged to get more cows, seeking to maximize production, but this could lead to overstocking, reducing farmer profits, or even leading to an eventual crash in the herd.

Dairy farmers were viewed as inherent risk takers, given the nature of the dairy business (Question 3). And though conversion to pasture/rotational grazing was viewed, by the participants, as leading to a “moderate reduction in risk” (Question 21) and a “moderate increase in ease and convenience,” it was noted that conversion to grazing is perceived as being risky (Question 3) and does require a different “mindset” (Question 22). In addition, it will require new skills and knowledge.

Similarly, participants noted that converting to grazing should lead to a large future profit advantage (Question 17) due, in part to the precarious position of conventional dairies in today’s market. There will, however, be a delay in seeing those profit benefits (Question 18) and the future is complicated by the fact that even organic dairies are currently struggling.

One interesting difference between the three state workshops was the participant response to Question 5, about the portion of the population that have a long-term management horizon. In Virginia (Shenandoah Valley), it was believed that a minority of farmers have a long-term management horizon. Participants noted there is an aging population of farmers and that it was basically unaffordable for new farmers to enter into farming. Even those that would inherit their parents’ farms are reluctant because they are concerned they can’t afford it. Land values are competing with development pressures. In Maryland (“northern tier”), most participants chose the response, “about half,” with some indicating it

2. <http://centerfordairyexcellence.org/dairy-profit-team/>

was a “majority” of farmers. Maryland participants noted that farmland easements are common, especially in Carroll and Baltimore Counties, and also that local zoning can restrict development and protect farmland, so development pressure, in some areas, is low. In Pennsylvania (South-Central), the majority said “about half” with one participant indicating the “majority” and another “almost all.” Participants noted that many producers have a strong commitment to family, property, and livelihood. Though there is an aging population of farmers and this could affect long-term planning, it was also noted that many farmers do think about the next generation.

In terms of where farmers seek information, it was thought that about half use technical advisors (Question 10) and about half are involved in a group that discussed farming (e.g., dairy co-op, Dairy Profit Team). The Pennsylvania participants did not include farmer-to-farmer interactions when answering this question and believe the response would be much higher had they done so.

Recommendations

Taken together, these observations lead us to the following recommendations:

First, continue and expand farm field days, pasture walks, etc. where farmers talk to other farmers about rotational grazing and the benefits i.e., to their bottom line, quality of life, increased animal health, and to future generations. In addition, to help convey the idea that converting to grazing can be relatively easy, these events should include new graziers (as opposed to long-time graziers) as spokespersons to share their stories and experiences and help convey the “do-ability” of the practice. These recommendations logically draw from the observations about profit (Questions 1, 16, and 17), ease and convenience (Question 22), observability (Question 8), and management horizon (Question 5).

Second, seek opportunities to promote grazing by organizing more local grazing groups and by working with the Center for Dairy Excellence (CDE) to develop a Dairy Profit Team with expertise on evaluating benefits of rotational grazing/converting to organic. Expanding the number of local grazing groups will require identifying one or more “champions” who are willing to energize local efforts and keep them moving forward (Question 11). One participant believes that the Dairy Profit Team’s focus on milk production may in some instances come at the expense of farmer profits. Starting a dialogue with CDE to discuss this observation might lead to some changes to the program to focus on other aspects of farm profits/cost savings related to grazing/organic (Questions 11, 17, and 18).

Third, provide more opportunities to trial rotational grazing. As noted in discussion of Question 7, rotational grazing is relatively easy to trial on a small-scale basis, but as noted in responses to Question 14, there are substantial upfront capital costs for producers in completely transitioning to rotational grazing. So, more opportunities for producers to “try out” more intensive grazing systems, without investing significant resources, would be useful.

Fourth, leverage the idea that many farmers have a long-term management horizon and a desire to invest in the future of their farm (Question 5) by developing outreach materials that highlight the long-term benefits of grazing to soil health, increased resiliency to climatic extremes, and long-term farm productivity.

In conclusion, application of ADOPT provided the forum for an informed and engaged discussion about potential barriers to adoption of rotational grazing in south-central Pennsylvania. More importantly, the results led to some tangible recommendations that, if implemented, could lead to greater adoption.

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ADOPT: Adoption and Diffusion Outcome Prediction Tool.

