

# Adoption of BMPs for Animal Manure Management



Laura McCann<sup>1</sup>, Haluk Gedikoglu<sup>2</sup>, Bob Broz<sup>1</sup>,  
John Lory<sup>1</sup>, Ray Massey<sup>1</sup>

<sup>1</sup>University of Missouri

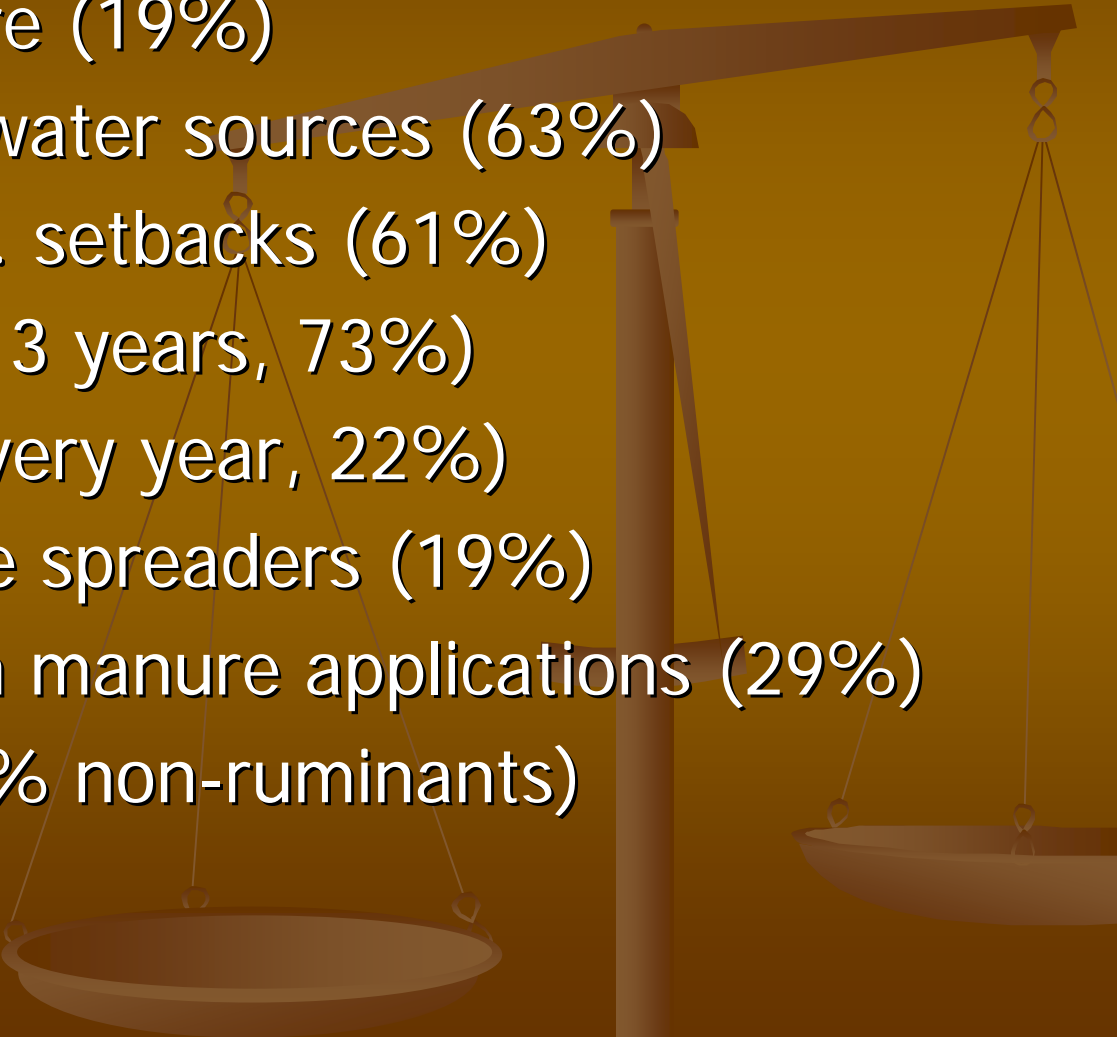
<sup>2</sup>UW LaCrosse

# Motivation for survey

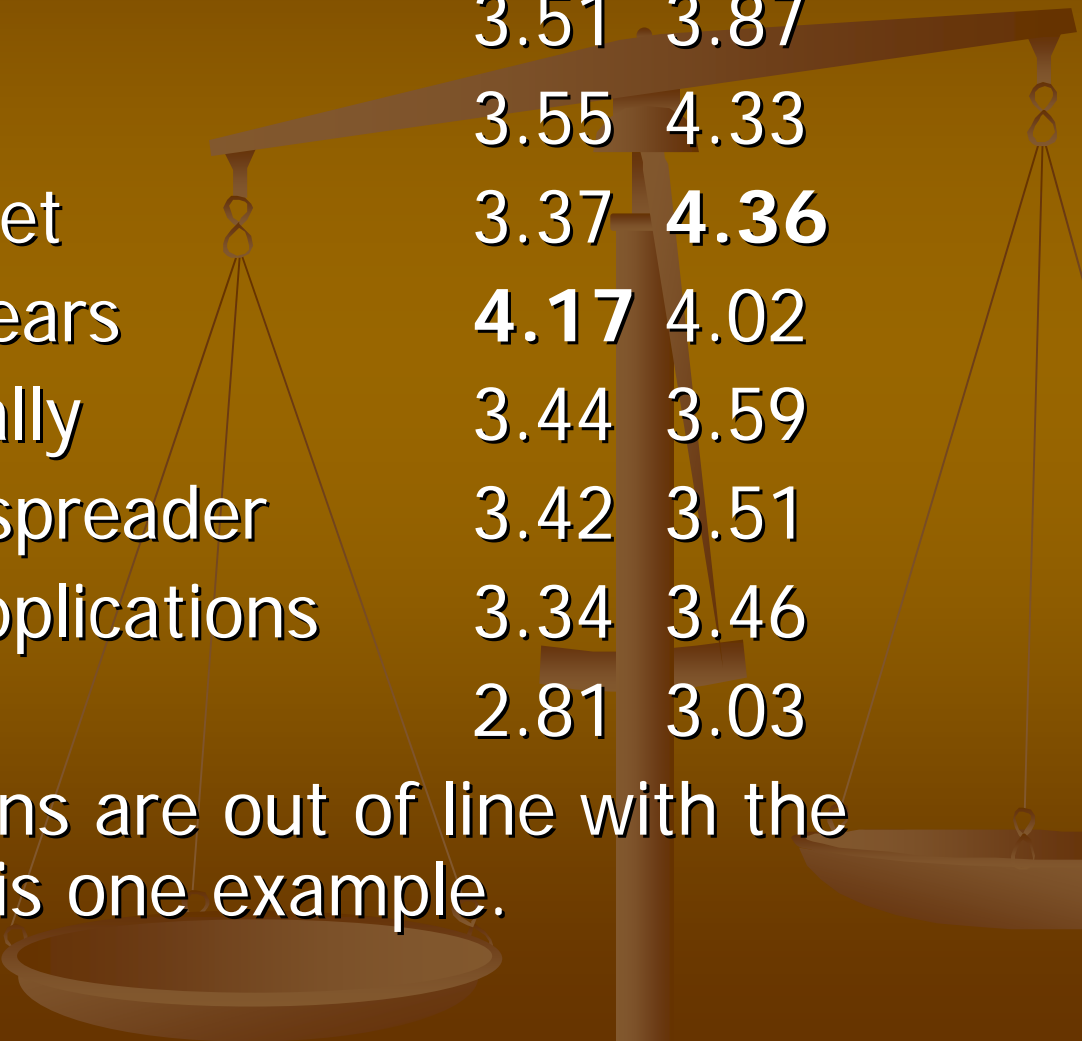
- Adoption of effective manure management practices can improve water quality
- Current programs for non-point source pollution emphasize voluntary adoption
- More information on factors affecting voluntary adoption of BMP's is thus needed to inform research, policy and educational efforts
- MO and IA livestock farmers surveyed in spring 2006

# Practices

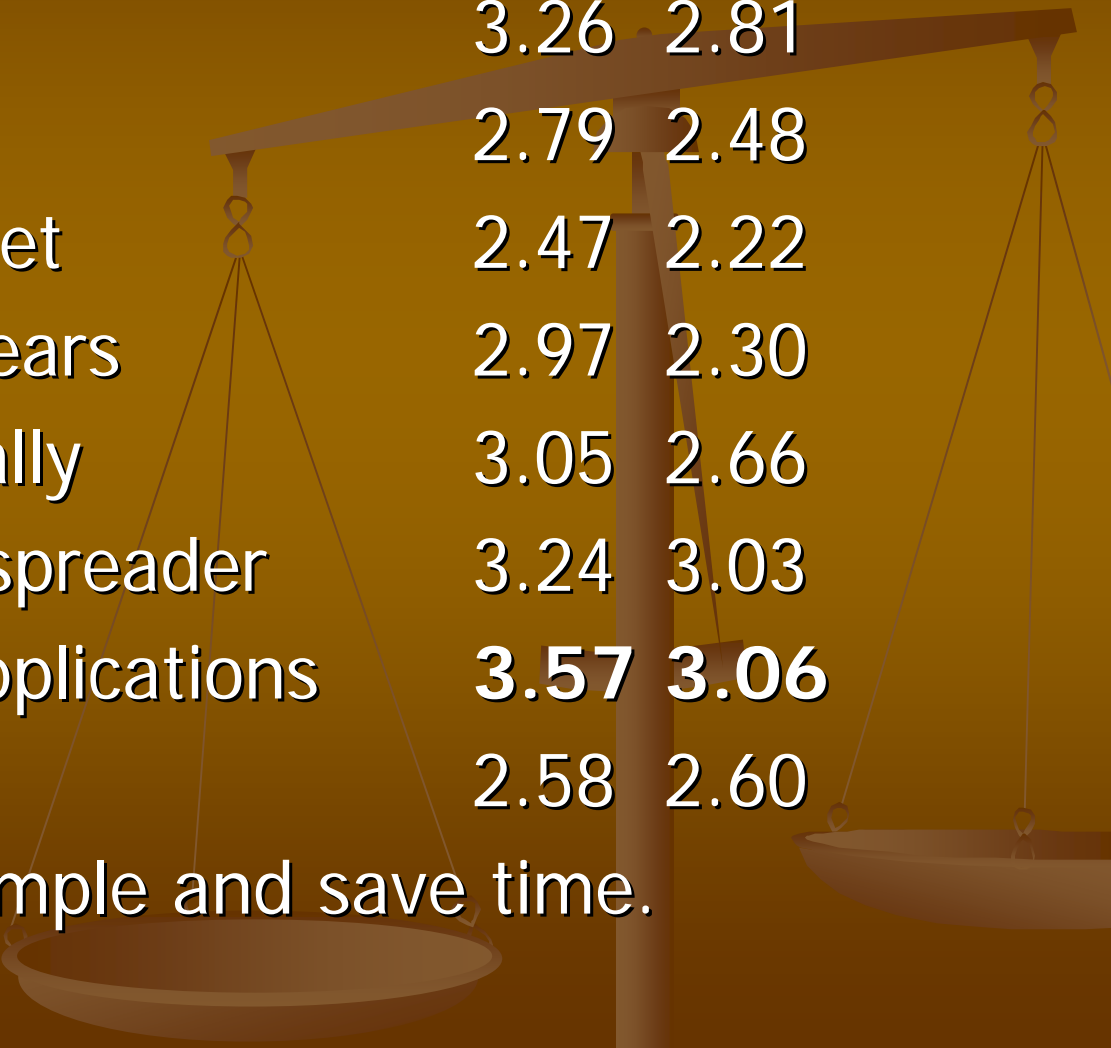
(% adoption for all farmers)

- Injection of manure (19%)
  - Grass filters near water sources (63%)
  - Maintaining 100 ft. setbacks (61%)
  - Soil testing (every 3 years, 73%)
  - Manure testing (every year, 22%)
  - Calibrating manure spreaders (19%)
  - Record keeping on manure applications (29%)
  - Phytase (7.7/17.2% non-ruminants)
- 

# Profitability/ Improves WQ Perceptions

- 
- |   |             |             |
|---|-------------|-------------|
| ■ Inject manure   | 3.51        | 3.87        |
| ■ Grass filters   | 3.55        | 4.33        |
| ■ Setbacks of 100 feet  | 3.37        | <b>4.36</b> |
| ■ Soil test every 3 years   | <b>4.17</b> | 4.02        |
| ■ Manure test annually  | 3.44        | 3.59        |
| ■ Calibrate manure spreader   | 3.42        | 3.51        |
| ■ Keep records of applications  | 3.34        | 3.46        |
| ■ Phytase   | 2.81        | 3.03        |
| ■ Q: What perceptions are out of line with the science? Phytase is one example. |             |             |

# Time Consuming/Complicated

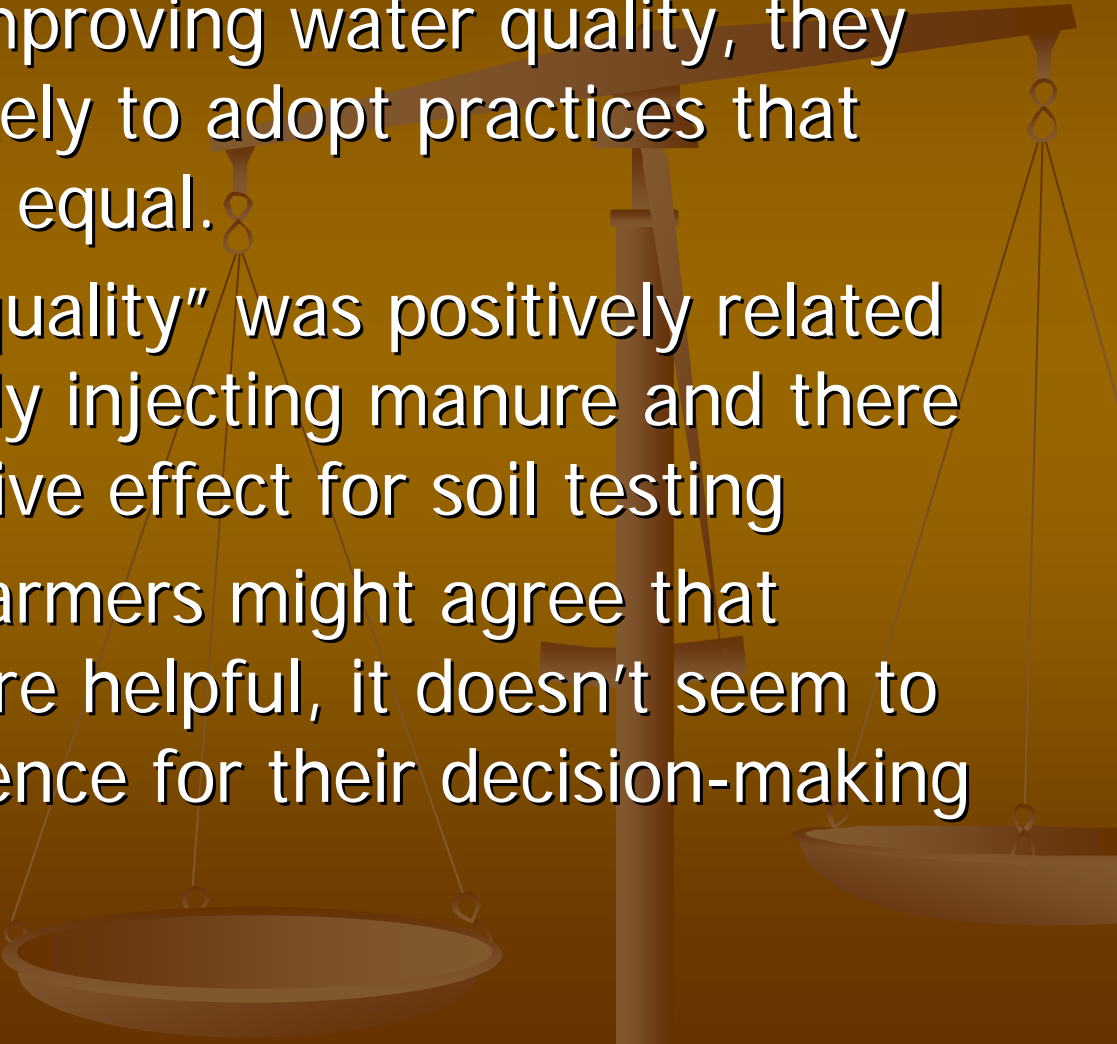
- 
- |  |             |             |
|--|-------------|-------------|
| ■ Inject manure                        | 3.26        | 2.81        |
| ■ Grass filters                        | 2.79        | 2.48        |
| ■ Setbacks of 100 feet                 | 2.47        | 2.22        |
| ■ Soil test every 3 years              | 2.97        | 2.30        |
| ■ Manure test annually                 | 3.05        | 2.66        |
| ■ Calibrate manure spreader            | 3.24        | 3.03        |
| ■ Keep records of applications         | <b>3.57</b> | <b>3.06</b> |
| ■ Phytase                              | 2.58        | 2.60        |
| ■ → Setbacks are simple and save time. |             |             |

# Profitability



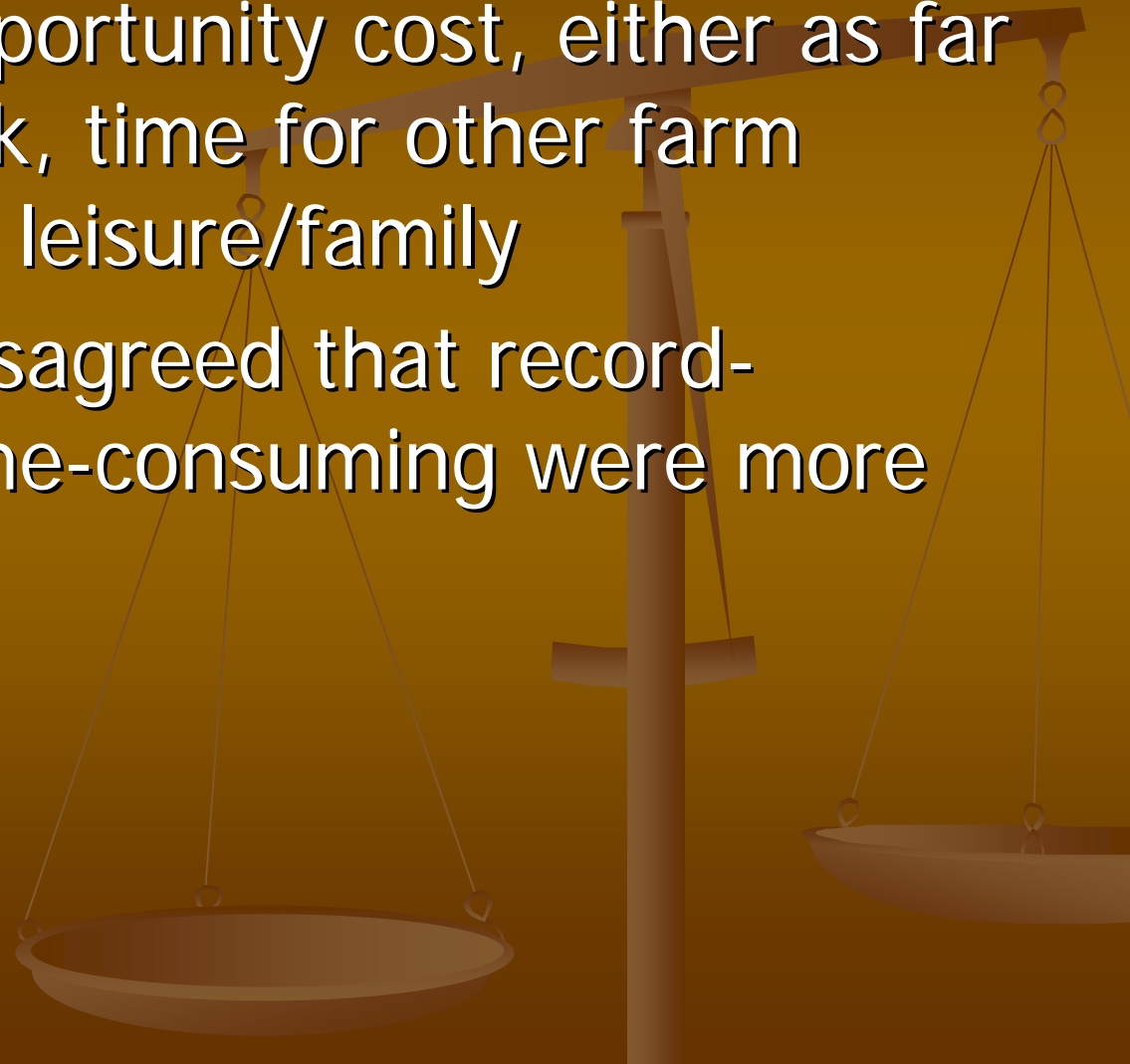
- Economic theory indicates that the most important factor is profitability of the practice but other factors such as risk, access to credit, age, education, etc. can be important.
- What practices are “profitable” will depend on farm and farmer characteristics, one size does not fit all.
- Perceived profitability of the practice was positively related to adoption of all practices (and the only factor that was)

# Water quality impact

- If farmers value improving water quality, they should be more likely to adopt practices that improve it, all else equal.
  - “Improves water quality” was positively related to adoption for only injecting manure and there was a slight negative effect for soil testing
  - Therefore, while farmers might agree that certain practices are helpful, it doesn't seem to make a real difference for their decision-making
- 

# Time consuming

- Time has an opportunity cost, either as far as off-farm work, time for other farm activities, or for leisure/family
- Farmers who disagreed that record-keeping was time-consuming were more likely to adopt



# Complicated

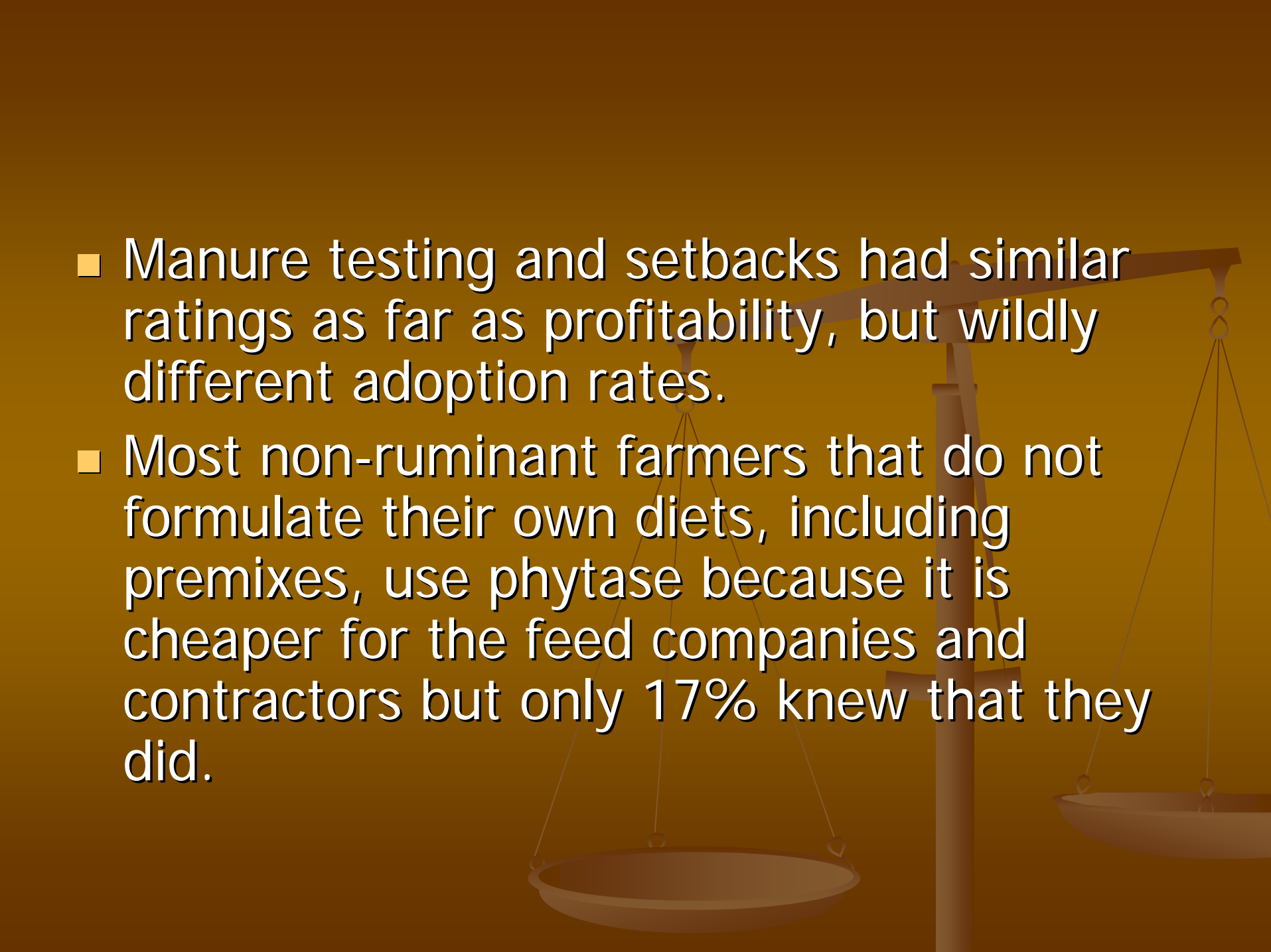


- Practices or technologies that are not complicated are more likely to be adopted.
- If farmers disagreed that the practice was complicated, they were more likely to adopt manure testing, calibration, injecting manure, grass filters, and soil testing than those who agreed it was complicated
- Seems to be a bigger issue than time

# Observability



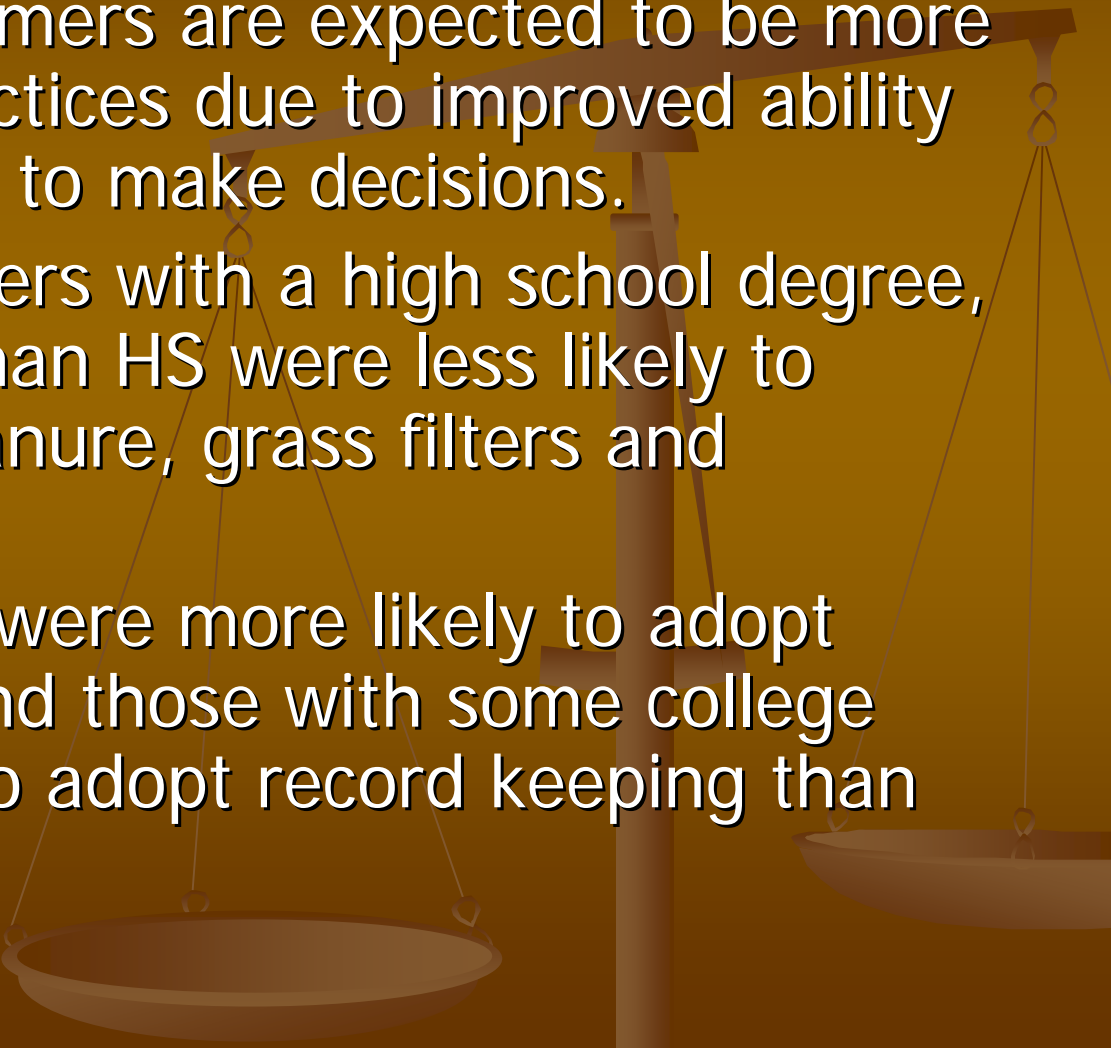
- Practices/technologies that are observable as far as their use (cellphones) or effects (higher yields) are more likely to be adopted.
- Many nutrient practices are like “credence goods” where the person just has to take it on faith that there will be an effect.
- When practices/results are directly observable, you obtain information at low cost

- 
- Manure testing and setbacks had similar ratings as far as profitability, but wildly different adoption rates.
  - Most non-ruminant farmers that do not formulate their own diets, including premixes, use phytase because it is cheaper for the feed companies and contractors but only 17% knew that they did.

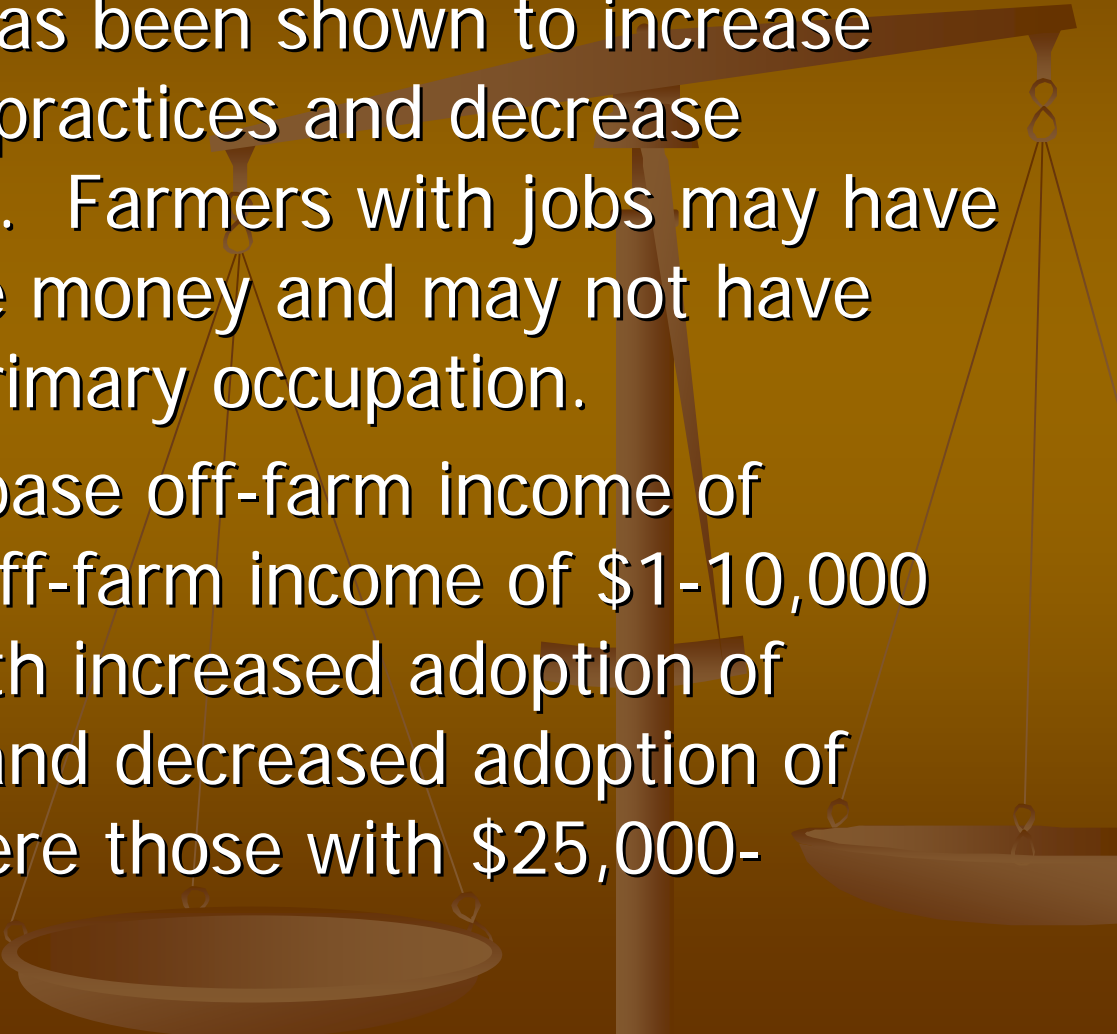
# Farmer Characteristics: Age

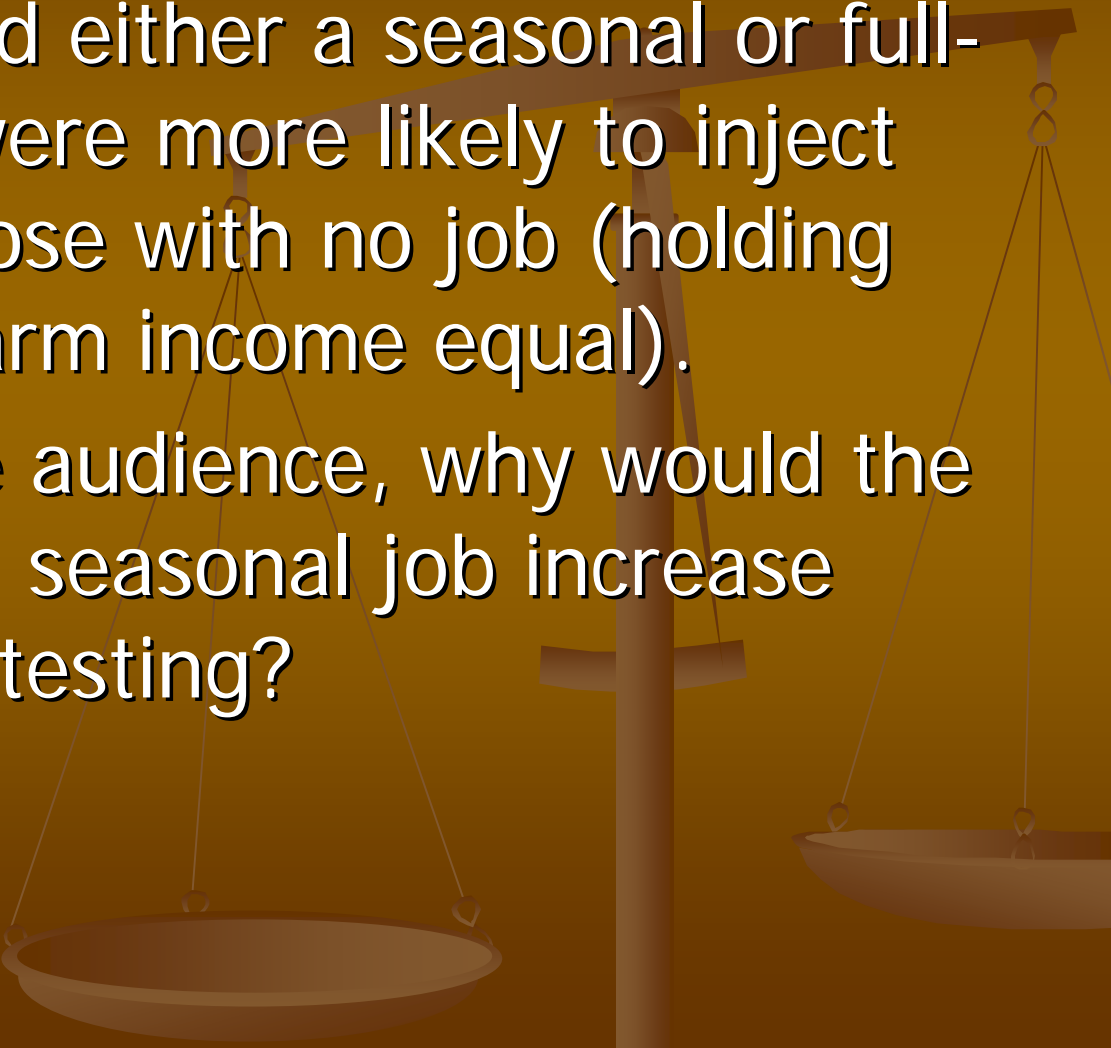
- Age is expected to impact adoption due to the fact that younger people may be more innovative and/or are able to benefit from the practice/technology over a longer period of time.
- Older farmers were less likely to adopt setbacks, grass filters, and soil testing

# Education

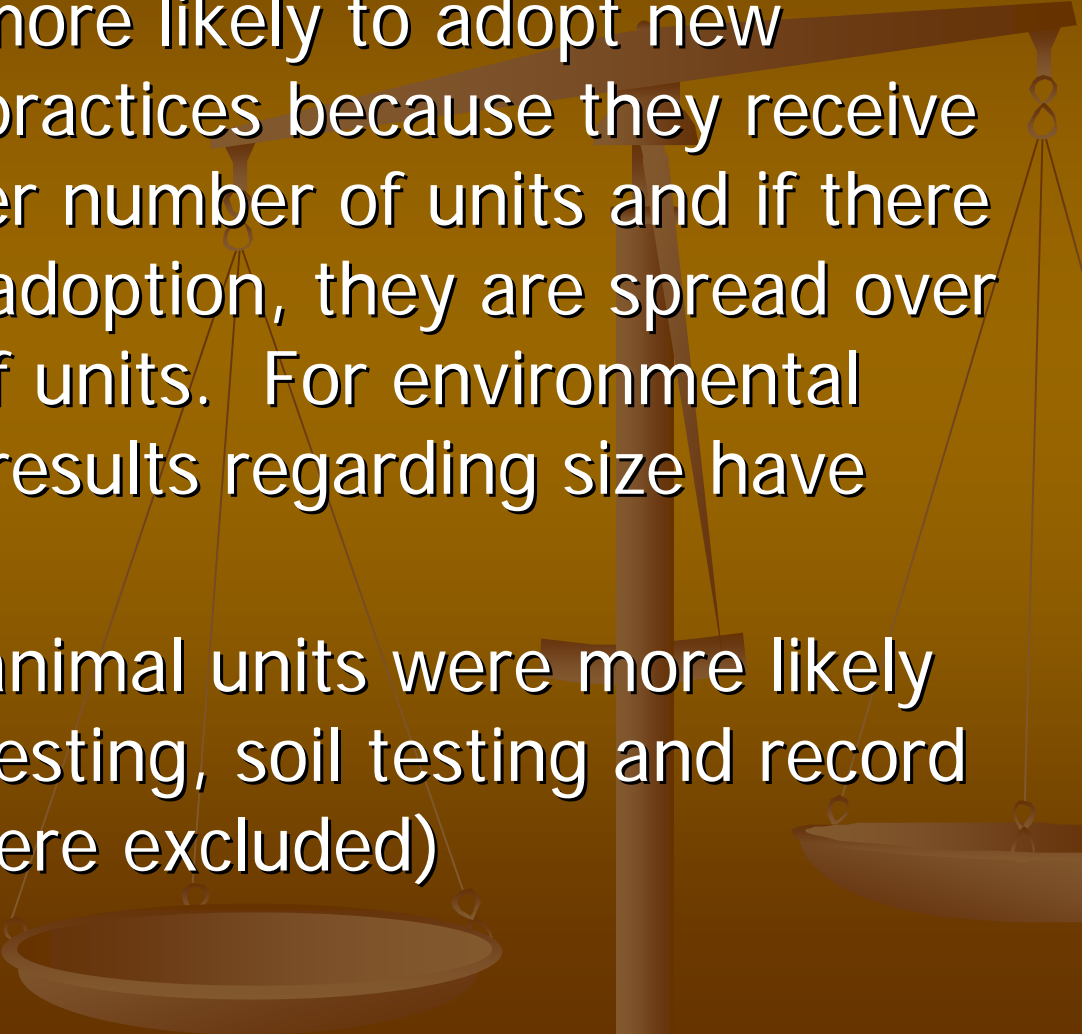
- More educated farmers are expected to be more likely to adopt practices due to improved ability to use information to make decisions.
  - Compared to farmers with a high school degree, farmers with less than HS were less likely to adopt injecting manure, grass filters and setbacks
  - Those with a B.S. were more likely to adopt manure testing, and those with some college were more likely to adopt record keeping than those with HS
- 

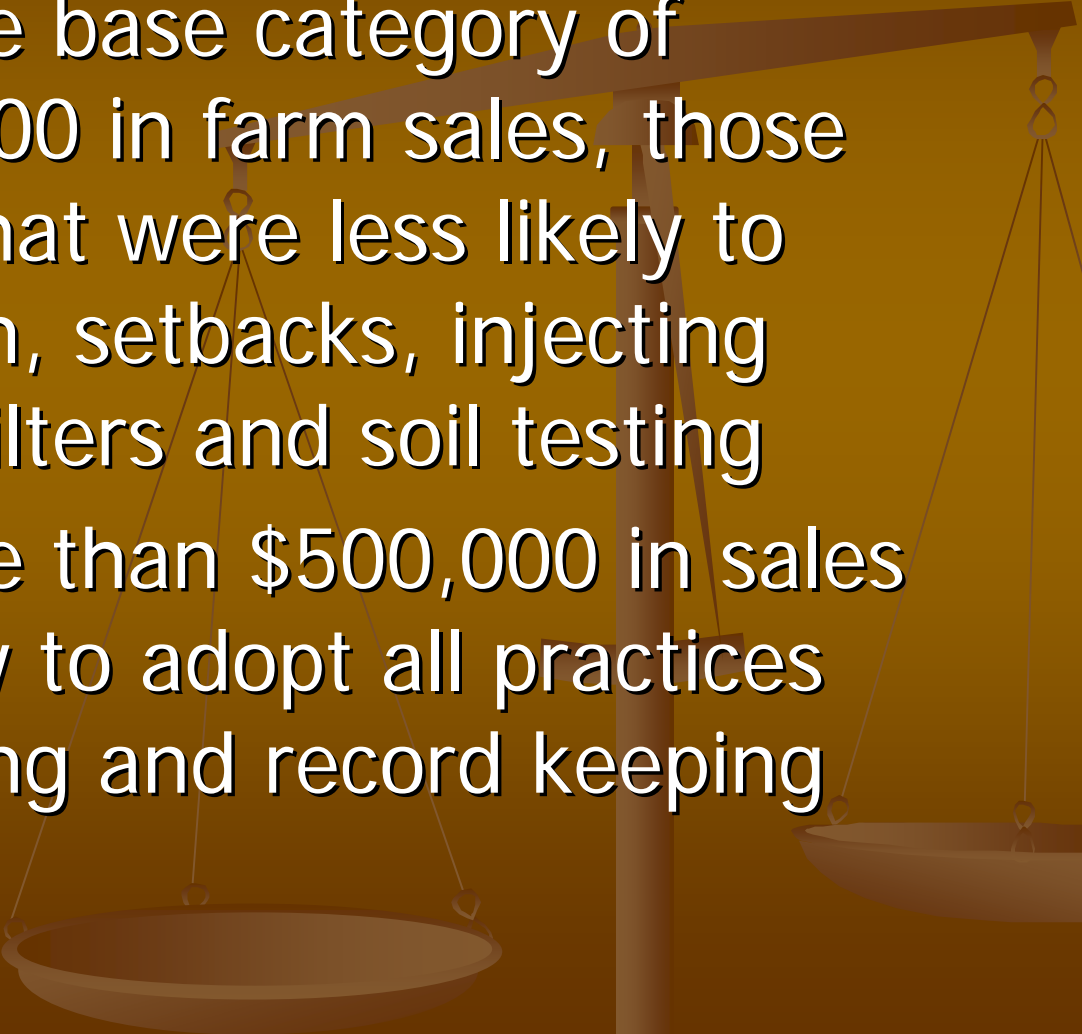
# Off-farm income

- Off-farm income has been shown to increase adoption of some practices and decrease adoption of others. Farmers with jobs may have less time but more money and may not have farming as their primary occupation.
  - Compared to the base off-farm income of \$10,000-25,000, off-farm income of \$1-10,000 was associated with increased adoption of injecting manure and decreased adoption of grass filters (as were those with \$25,000-50,000)
- 

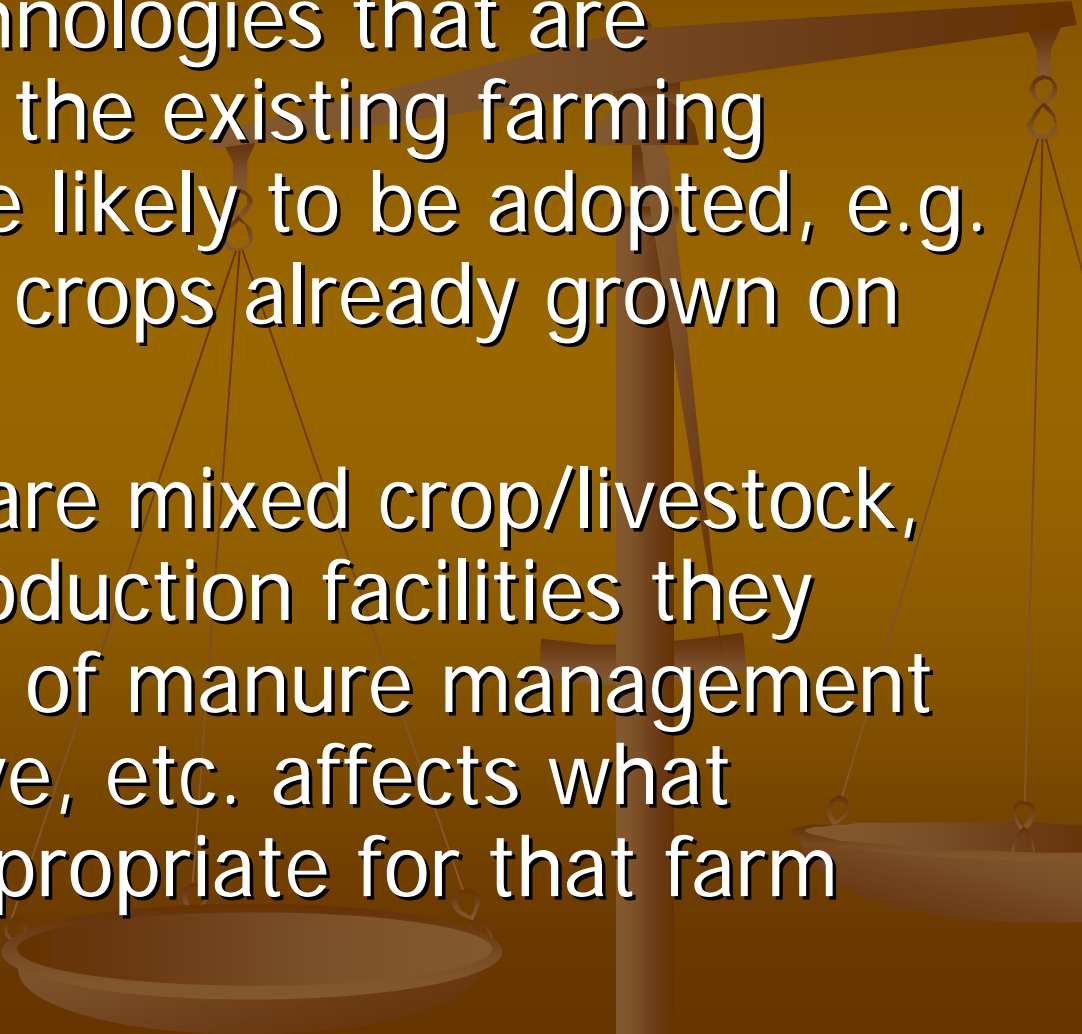
- 
- If the farmer had either a seasonal or full-time job, they were more likely to inject manure than those with no job (holding household off-farm income equal).
  - Question for the audience, why would the spouse having a seasonal job increase adoption of soil testing?

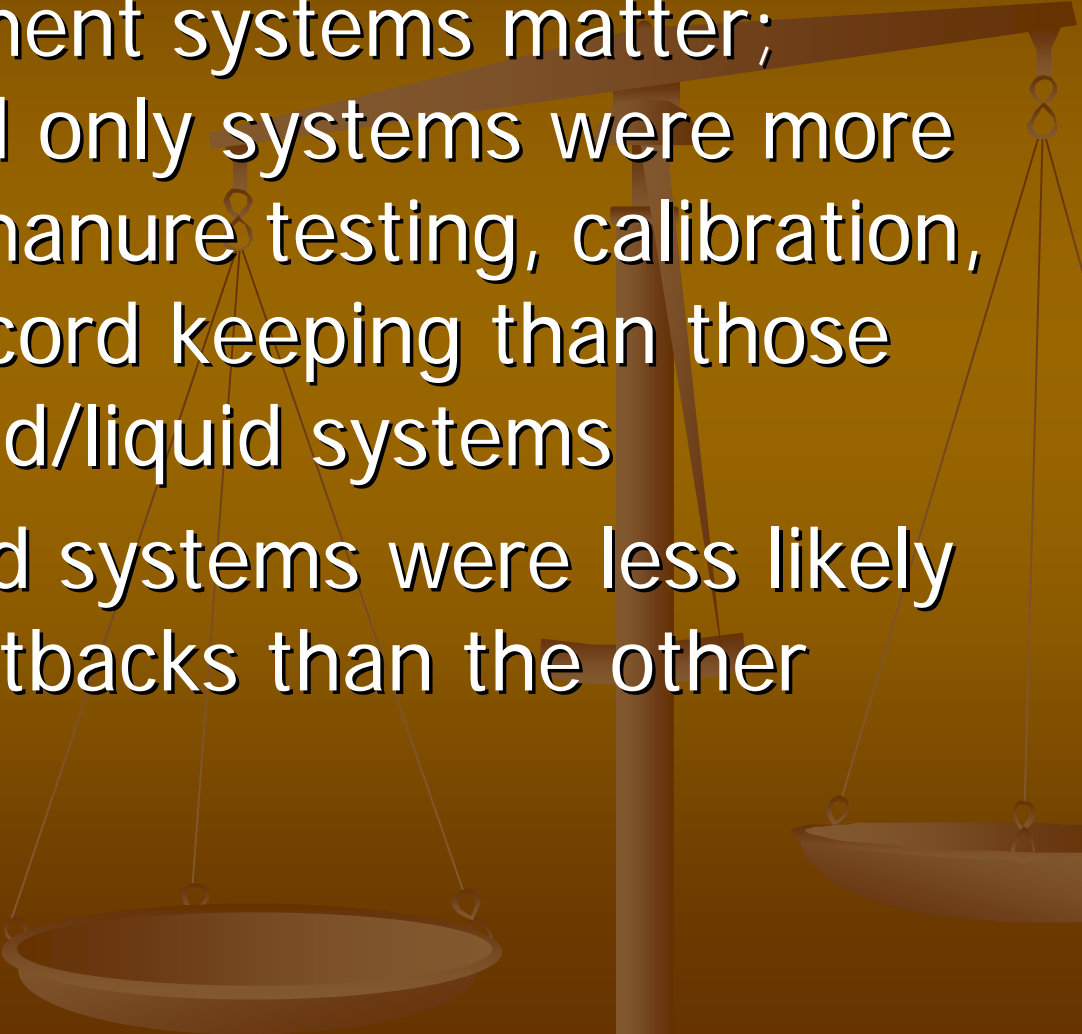
# Size of farm

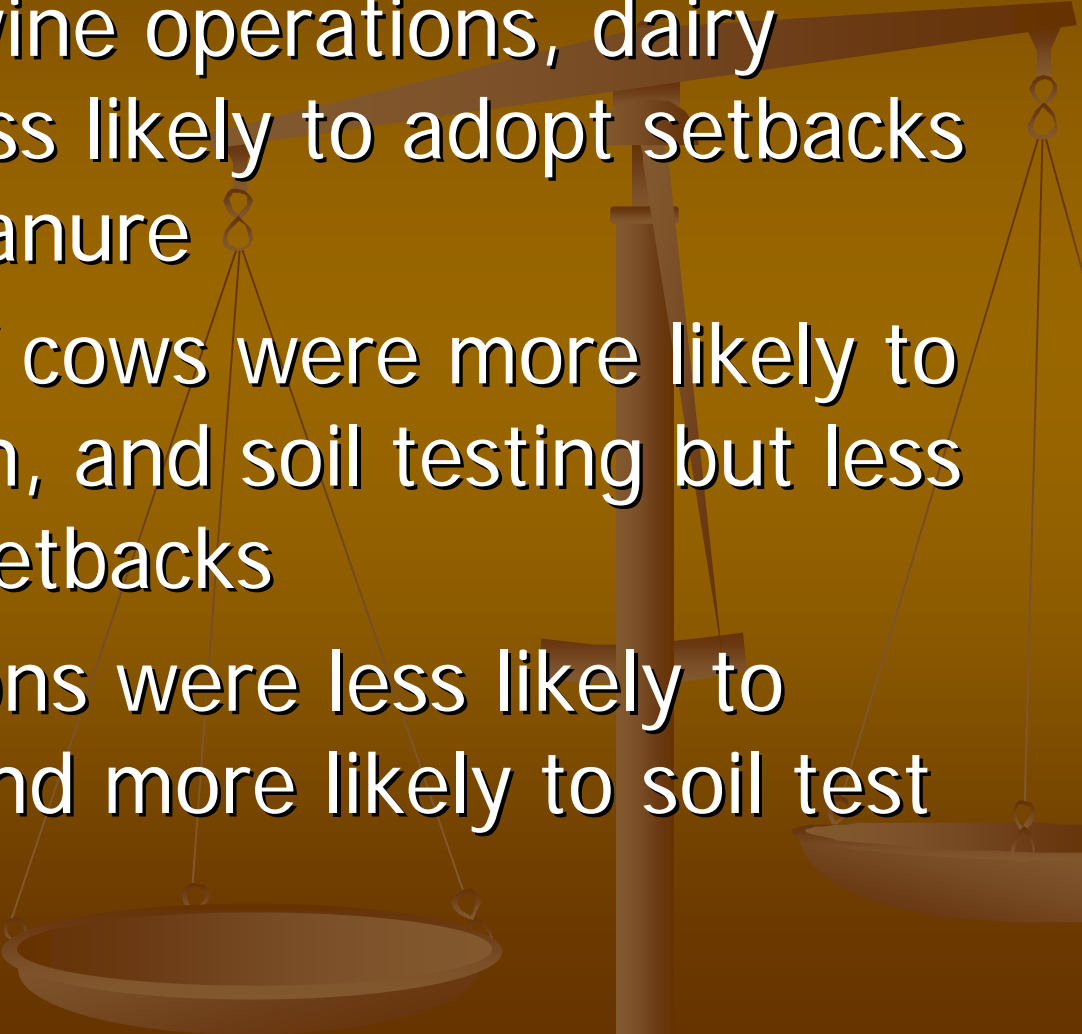
- Larger farms are more likely to adopt new technologies and practices because they receive a return on a larger number of units and if there are fixed costs of adoption, they are spread over a larger number of units. For environmental practices though, results regarding size have been mixed.
  - Those with more animal units were more likely to adopt manure testing, soil testing and record keeping (CAFOs were excluded)
- 

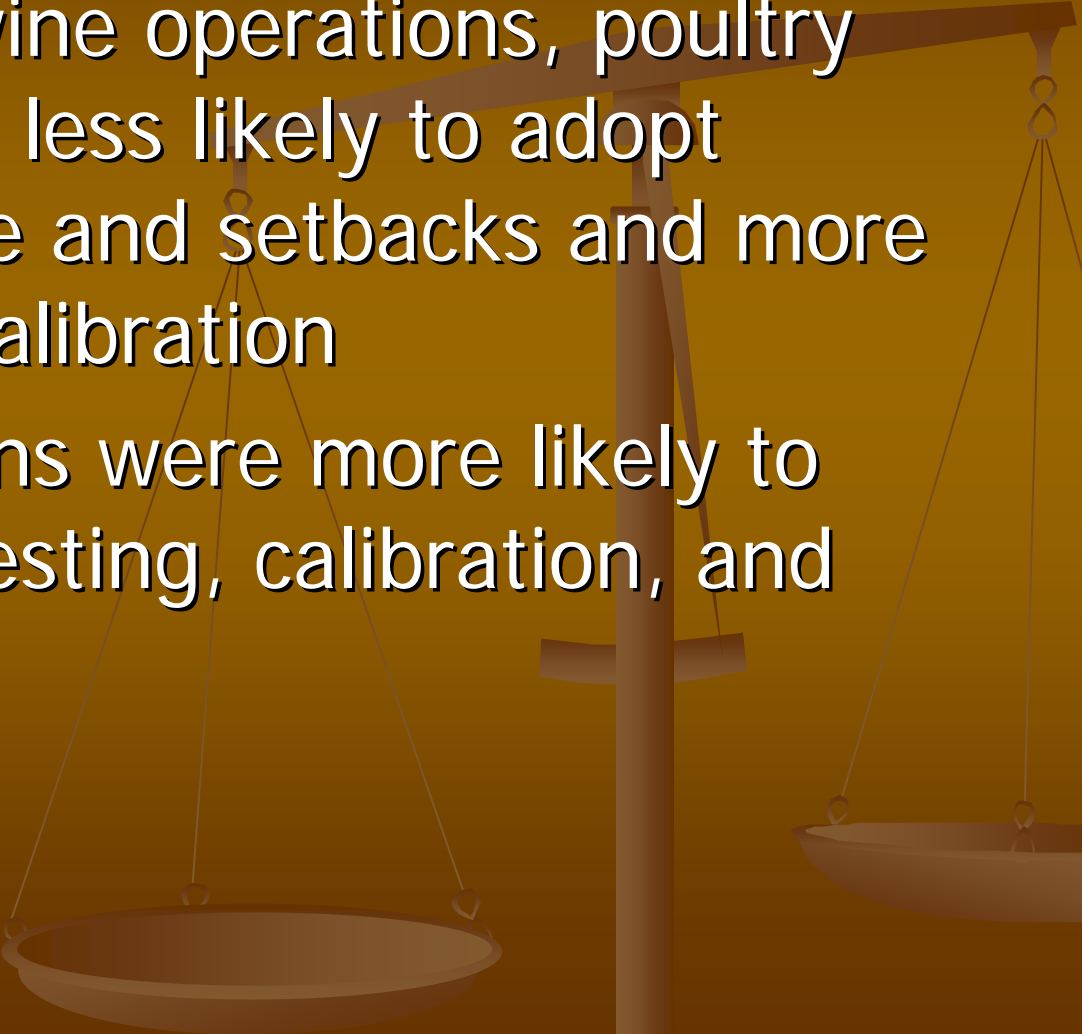
- 
- Compared to the base category of \$100,000-250,000 in farm sales, those with less than that were less likely to adopt calibration, setbacks, injecting manure, grass filters and soil testing
  - Those with more than \$500,000 in sales were more likely to adopt all practices except soil testing and record keeping

# Farming system

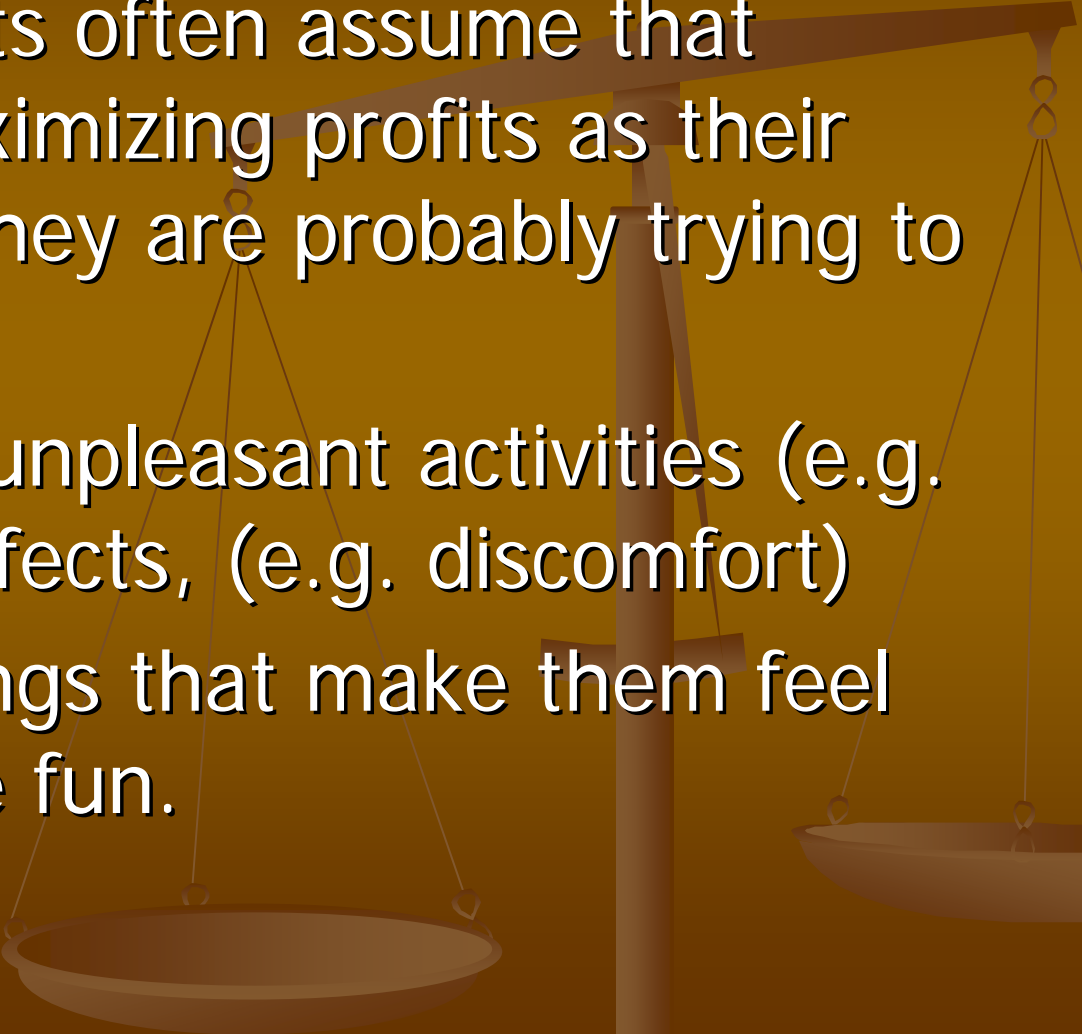
- Practices or technologies that are compatible with the existing farming system are more likely to be adopted, e.g. new varieties of crops already grown on the farm
  - Whether farms are mixed crop/livestock, what type of production facilities they have, what type of manure management system they have, etc. affects what practices are appropriate for that farm
- 

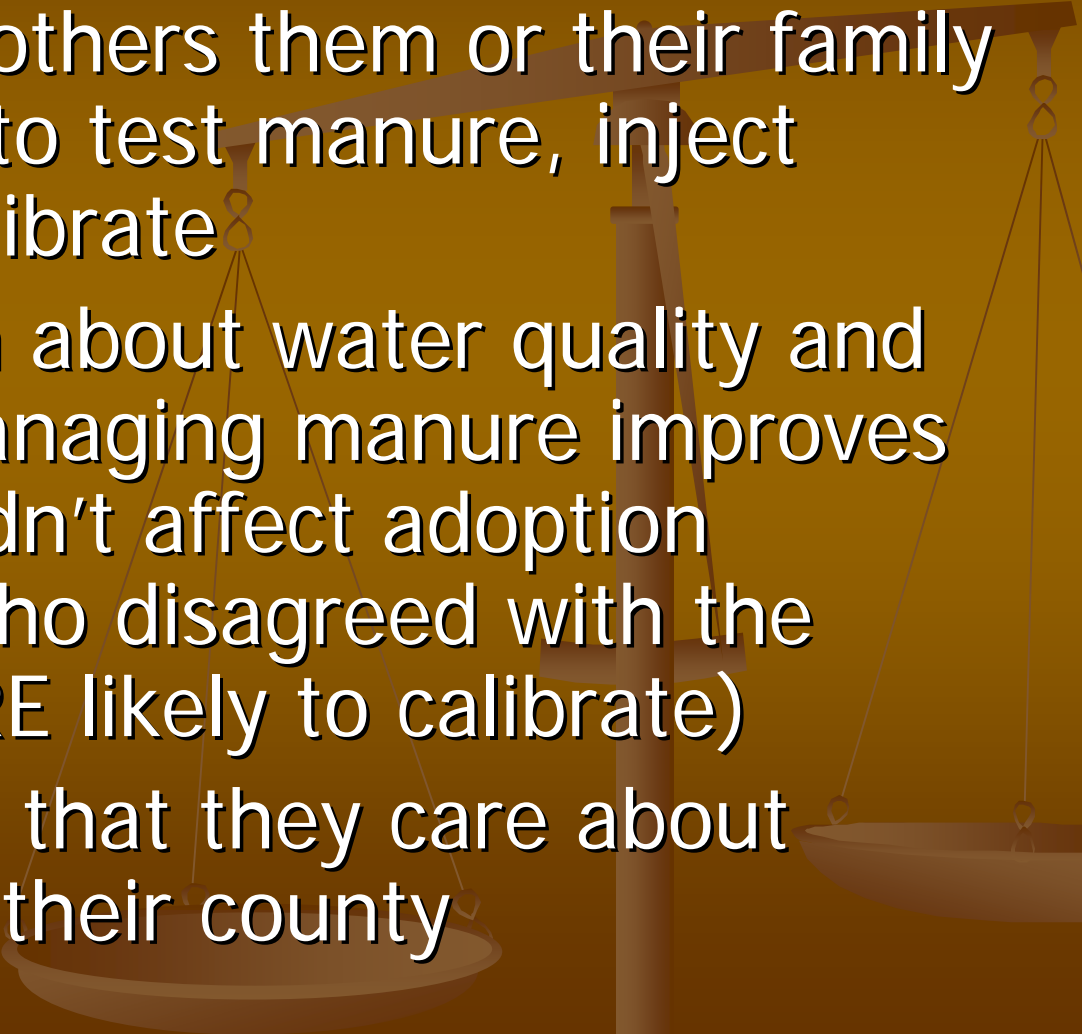
- 
- Waste management systems matter; those with liquid only systems were more likely to adopt manure testing, calibration, injection and record keeping than those with solid or solid/liquid systems
  - Those with liquid systems were less likely to implement setbacks than the other types

- 
- Compared to swine operations, dairy farmers were less likely to adopt setbacks and injecting manure
  - Those with beef cows were more likely to adopt calibration, and soil testing but less likely to adopt setbacks
  - Feedlot operations were less likely to inject manure and more likely to soil test

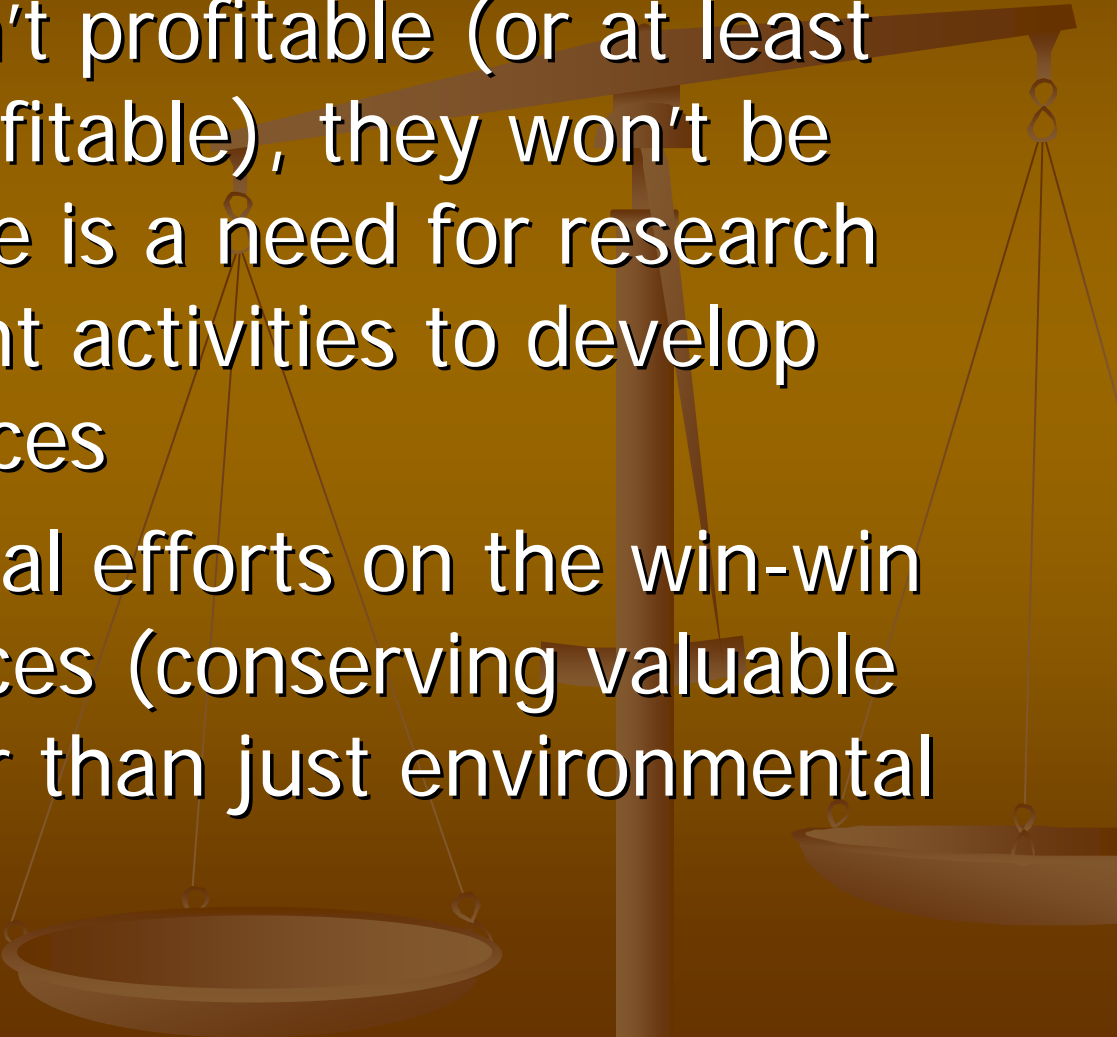
- 
- Compared to swine operations, poultry operations were less likely to adopt injecting manure and setbacks and more likely to adopt calibration
  - Turkey operations were more likely to adopt manure testing, calibration, and record keeping

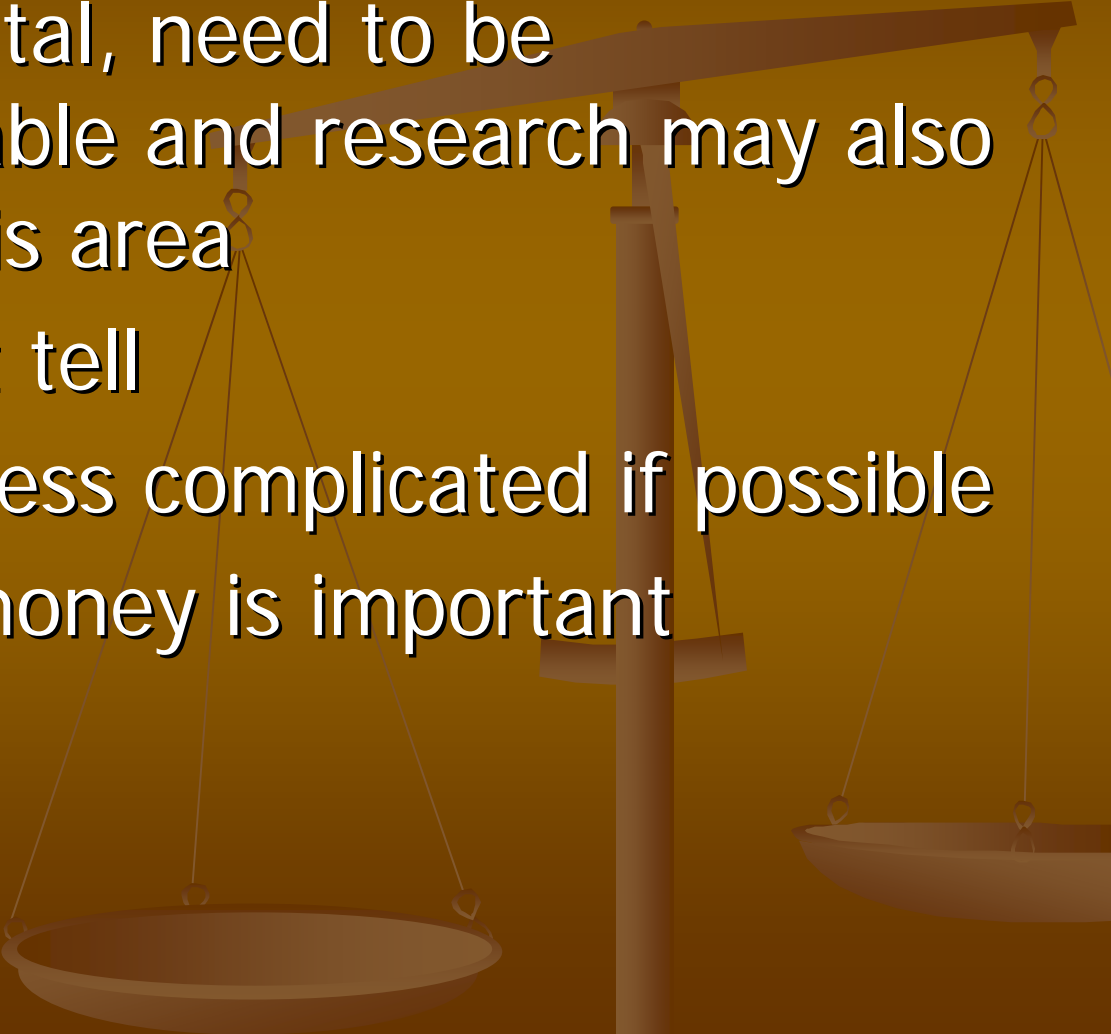
# Misc. factors

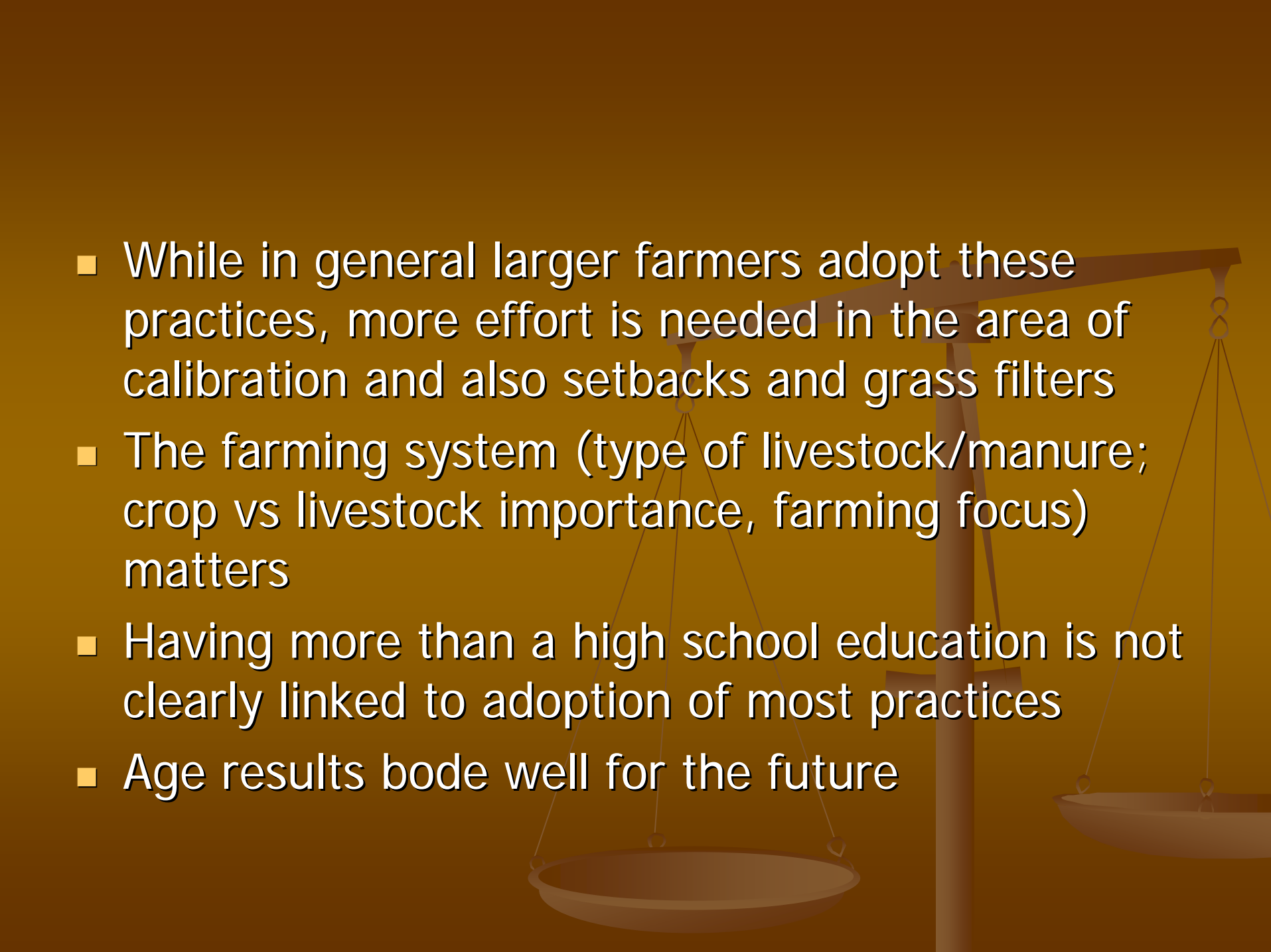
- While economists often assume that farmers are maximizing profits as their goal, in reality they are probably trying to maximize utility.
  - They will avoid unpleasant activities (e.g. bookwork) or effects, (e.g. discomfort)
  - They will do things that make them feel good or that are fun.
- 

- 
- Smell of manure matters for some livestock farmers; those who indicated that the smell bothers them or their family were less likely to test manure, inject manure, and calibrate
  - General concern about water quality and thinking that managing manure improves water quality didn't affect adoption (except those who disagreed with the latter were MORE likely to calibrate)
  - High agreement that they care about water quality in their county

# Implications

- If practices aren't profitable (or at least not wildly unprofitable), they won't be adopted so there is a need for research and development activities to develop profitable practices
  - Focus educational efforts on the win-win nature of practices (conserving valuable nutrients) rather than just environmental quality
- 

- 
- The benefits of practices, both financial and environmental, need to be obvious/observable and research may also be needed in this area
  - Show, don't just tell
  - Make practices less complicated if possible
  - Time, not just money is important

- 
- While in general larger farmers adopt these practices, more effort is needed in the area of calibration and also setbacks and grass filters
  - The farming system (type of livestock/manure; crop vs livestock importance, farming focus) matters
  - Having more than a high school education is not clearly linked to adoption of most practices
  - Age results bode well for the future

- 
- This project is partially funded by a USDA-CSREES Integrated Research, Extension and Education 406 Project
  - Contact info:
    - Dr. Laura McCann,
    - Dept. of Agricultural Economics
    - University of Missouri
    - [McCannL@missouri.edu](mailto:McCannL@missouri.edu)