Agricultural Modeling Team (AMT)
Meeting Minutes

October 13th, 2023
09:00 AM – 10:15 AM
Meeting Materials

Summary of Actions and Decisions

Decision: The AMT approved the September minutes.

Action: As per group feedback, data analysts from the Bay Program Office will continue assessing relationships between annually reported crop yields and five-year crop yields from the census of agriculture. Updates will be given at a future meeting.

Meeting Minutes

Statement of purpose:

To evaluate the crop yield and land uses in CAST and discuss potential alternatives for Phase 7.

Announcements

- Nutrient timing and eligibility in Phase 6 will be discussed at the October 19th AgWG meeting.
- Fertilizer Expert Group Phase 7 recommendations were tentatively adopted by the PSC on September 26th.

Introduction: 09:00-09:05 [5 min (Zach Easton, Virginia Tech)]

Zach reviewed the September minutes and introductory remarks. The AMT approved the minutes.

Scenario Discussions: Crop Yield trends approach 09:05- 10:05 [60 min (20 min presentation 40 min discussion) (Joseph Delesantro, ORISE; Tom Butler, EPA)]

The AMT continued their examination of crop yields with the help of a new data team member, Joseph Delesantro. Joseph's preliminary work outlined additional crop data that can be gained from NASS sources.

Discussion

Robert Sabo: When you say 56% of ag acres don't have reported crop yield, is that planted and harvested or just total ag land as reported in census or NASS?
Tom Butler: It's just crop acres, not total ag.
Olivia Devereux: Would it also be pasture and hay? I'm guessing that it is everything except feeding space.
Tom Butler: That's correct.
Olivia Devereux: Who are the voting members of the AMT?
Tom Butler: The list is here.
Olivia Devereux: What is the procedure for getting input from the group?

Tom Butler: We'd like everyone's input even if they aren't a voting member, but when it comes to formal decision making only the official membership will vote.
Robert Sabo: So this is saying that we don't have yield data for 56% of the classified agricultural land?
Tom Butler: No, not exactly. We have yield information for everything. Many crops just don't have that variable yield (e.g., bu/acre) data, so you would have something like acres per acre of tomatoes or asparagus. We already have yield information, we just want better info for variable yield.
Ken Staver: By variable, do you mean annual?
Tom Butler: It's not necessarily annual. I said variable because the units are not acre per acre, it's bushels per acre or ton per acre or something similar.
Ken Staver: So it's varying by crop type or year?
Tom Butler: What I mean is that the yield unit is different. It's a bushels per acre situation or tons per acre.
Mark Dubin: Some of the values for the minor crops that we don't get from NASS are taken from the literature, so those values don't change from year to year or census to census.
Ken Staver: And that is more than half of the acres?
Olivia Devereux: There are two issues getting conflated. One is the number of acres - Tom said that we have data for all crop/pasture/hay types every 5 years with the ag census. For the years in between, we have data for every year for about 7 crops or so. We interpolate for crop data that we don't have every year, like tomatoes. The second issue is units - Tom noted that some are measured in lbs per acre and some are in bushels.
Jess Rigelman: Yes, we have the acres and we have the yield data for 56% crops for a 5 year basis, but we only use it for 11 of those crops. For the acre per acre, we're trying to get at the application rate. So other than those 11 crops, we apply manure and fertilizer according to a lbs per acre basis, versus corn for example, which is lbs per yield unit basis (e.g., lbs per bushel). So acre per acre ends up being the yield unit for a lot of the vegetable crops. Acres is the yield unit, and the application rate is driven by the acres of that crop, not the traditional bushels or lbs.
Ken Staver: So are you saying on 56% of the acres we're applying nutrients not according to yield?
Tom Butler: 11 crops use 5-year census of ag data and 7 crops use annual survey data. 44% of crop acres covered use application per yield unit [Reference slides: august presentation on crop yields, slides 15 -17). The remaining crops receive an application on a per acre basis.
Ken Staver: A big part of that 56% is probably pasture and hay.
Tom Butler: Yeah the pasture is about 21% and leguminous hay is 8%, but the other hay makes up 18%. The row crops is about 51% of that land contribution for acres.
Olivia Devereux (in chat): In DE, it is more fruit/vegetable, not pasture/hay.
Robert D. Sabo (in chat): Hay yields are reported in the census as well.
Robert D. Sabo (in chat): We have a large subset of crop yield and acreage data from Census going back to ~1950. we will follow up with you, Tom.
Olivia Devereux (in chat): that is ORD has it? CBPO does not.
Dave Montali: So we are trying to predict what the farmer is going to do, but the farm is actually a county, and within that county we have nutrient management farmers and non-nutrient management farmers. Over time, for corn and some other crops, genetics is causing an increase in the amount of yield per acre. The farmer, whether he is using nutrient management or not, is not going to factor in a poor weather year when he decides what to do about next year because he's going to assume the best weather. So the yield should never go down - is that a correct assumption?

Gary Shenk: The first part is correct. We're looking at the expectation of the farmers when they're putting down the fertilizer plans - the expectation of the nutrient management rate and non-nutrient management rate (which, in Phase 6, is higher than the nutrient management rate). That is the red line in slide 9. Then we have a separate line that is the weather average line that is what we use when we predict loads coming out of CAST.
Dave Montali: So we are trying to predict what we expect the nutrient management farmers to do?
Gary Shenk: Yes. That's correct. In Phase 6, we said if you don't have a nutrient management plan then it's an additional percentage.
Dave Montali: So then we're trying to look at different states and say how does your nutrient management plan suggest how you pick your yield for next year?
Gary Shenk: Yes, I think so. We're trying to look over time. If we're counting total fertilizer sales and total number of animals to calculate the manure, we want to make sure that if yield is increasing, we're tracking that. Consistency is really important because we're predicting the long-term effects of certain management actions. We don't want a CAST scenario to be responsive to the weather that happened in that year. We want to base this on management and not have big jumps due to weather.
Dave Montali: I think we should do the red line on the right-hand side (regression, weighted residuals) but curious to hear what others think.
Robert D. Sabo (in chat): Door #3 looks good, especially if this is done county by county. Cool analyses!
Mark Dubin: To respond to the second part of Dave's comment, we're targeting the nutrient management application, then we're assigning a percentage increase application for non-nutrient management. So if we look at nutrient management and how it's defined in P6 - first we have core N and core P, and beyond that will be supplemental nutrient management for timing and placement. If you follow that logic about applications, applying the core nutrient management could be locking yourself in and you may not have the opportunity to change that application rate as easily.
Dave Montali: But that's a BMP, right?
Mark Dubin: Yes, but it affects the application rate. The supplemental N and P do not change the application rate.
Dave Montali: I was wondering if our estimate of yield would ever go down as time goes on? Or should it always be increasing?
Robert Sabo: There is improvement in crop technology but also market forces that may prompt farmers to plant on marginal cropland that will have inherently depressed yields relative to their prime crop land. But we don't see that very often in the Chesapeake Bay watershed.
Hunter Landis: Yes, yield estimate would most likely be going up every year. There may be situations where you reduce nutrient application though.
Ken Staver: That's the only way in CAST that we'll ever get a load reduction on that acre independent of other BMPs like buffers or cover crops. If we're only looking at the production, yield only matters because the relationship between application rate and yield drives loads, that's why it's so critical. If we use a sales number that is fixed but we don't get the yield right, then the loads will not be accurate.
Gary Shenk: Well said. And a hypothetical situation where there is only 2 states and one state is growing a crop that has a yield that is the same year after year, and another state growing a crop where yield increases, since we're using this fixed amount of fertilizer then we want to make sure we're capturing that increase in yield over time to correctly show where the fertilizer is going.

Mark Dubin: That example would be for non-variable yields.
Tom Butler: This seems like a good direction to keep heading.

Feedback: Planted v Harvested Acres (slide 13- 15)
Tim Larson (in chat): What is the source of the "planted acres" data?
Robert D. Sabo (in chat): NASS
Tim Larson (in chat): Farmer self-reported data?
Robert D. Sabo (in chat): They call farmers and bug them or send out surveys that they return.
Candiss Williams (in chat): NASS is producer reported.
Ken Staver: Quick comment - the two left boxes [on slide 14] are winter cereals and there has been confusion in reporting because we use those as cover crops, which really expanded in the last 10 years. I suspect those crazy low numbers might be a mix of cover and production acres. You don't see that in corn because it's not a cover crop.
Mark Dubin: For us, we get calls from NASS about what we planted for annual reports. They contact a small percentage of producers. They also rely heavily on FSA reported acreage as another source of data.
Tom Butler: Does anyone have feedback on how we estimate total fertilizer application and/or total crop removal [slide 15]?
Mark Dubin: For our operation, sometimes its crop failure at play.
Robert Sabo: I was wondering about the census-reported cover crop acreage and if we could use that if there was a deviation between the planted vs harvested acreage, and potentially have an automatic check to see if the crop was planted as a cover crop or a harvested crop.
Tamie Veith (in chat): Because of cover crops or failed crops, I would not assume that all planted acres were removed. I like Robert's idea.
Ken Staver: What Mark was talking about, I don't think that is what's happening in the middle graph on slide 14. The winter cereals are planted in the fall and then the decision next spring if it's not harvested then another crop will be planted there instead. So those unharvested acres will be a corn or soybean acre or something else in the harvest year. Need to tread carefully. For winter cereals, I would stick to harvested acres because cover crops are becoming more popular and it gets tricky.
Dave Montali: Doesn't our definition of cover crops say no nutrient application? There's traditional with Fall nutrients, right?
Ruth Cassilly: Yes, traditional with Fall nutrients gets an application, as does commodity cover crops. But commodity cover crops have a Spring application, not Fall.
Dave Montali: That makes it more complicated.
Ruth Cassilly: Now we have cover crops being grazed, but I don't think we're accounting for that currently.
Tom Butler: Sounds like we need more discussion on harvested vs planted, especially when it comes to cover crops.
Tamie Veith: I think we need to think about the issue in terms of what the overriding question is - if it's a matter of how much ground is covered to keep the erosion and sediment bound nutrients in place, then i think whether it's a cover crop or harvested crop might matter, but if it's total nutrients that we're concerned about then maybe it doesn't matter as much. Might want to keep in mind if we're concerned about land cover vs plant growth or nutrient cycling, etc.
Gary Shenk: To summarize today's discussion and resulting questions, we presented that blue arrow for how we're thinking about this - we've got inputs and uptake - but what do we do

when we cross the year line and something was planted and harvested in the next year? How do we deal with things that are put in as cover crops, etc.?
Robert D. Sabo (in chat): We can tackle the spring/summer crops today if you want to, Tom.
Ruth Cassilly: In response to Tamie and Gary, if you're considering a soil health perspective, regardless of what you're adding or removing, having cover crops there will increase the holding capacity of the soil and that will reduce runoff which impacts water quality. Something to think about.
Gary Shenk: Joseph will look at sensitivities to inputs and maybe we can incorporate soil health into those.

Closing –10:05-10:15 (10 minutes)

Adjourn – 10:15

Next Meeting: Friday, November 10th, 2023, from 09:00 - 11:00 am.

Participants

Jackie Pickford, CRC
Tom Butler, EPA-CBPO
Zach Easton, VT
Ashley Hullinger, PA DEP
Clint Gill, DDA
Curt Dell, USDA-ARS, University Park, PA
Candiss Williams
Chris Brosch, DDA
Dave Montali, Tetra Tech, WV, MWG
Emily Dekar, Upper Susquehanna Coalition
Emily Dekar, USC
Eric Hughes, EPA
Eric Rosenbaum - PA4R Nutrient Stewardship Alliance & Rosetree Consulting
Gary Shenk, USGS-CBPO
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Jessica Rigelman, J7 Consulting, contractor to the CBPO
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Tamie Veith, USDA-ARS
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Tyler Trostle, PA DEP
Victor Clark - Farm Freezers - DE

**Common Acronyms
AgWG- Agriculture Workgroup
AMT- Agricultural Modeling Team (Phase 7)
BMP- Best Management Practice
CAST- Chesapeake Assessment Scenario Tool (user interface for the CBP Watershed Model)
CBP- Chesapeake Bay Program
CBPO- Chesapeake Bay Program Office (houses EPA, federal partners, and various contractors and grantees working towards CBP goals)
CBW-Chesapeake Bay Watershed
CRC- Chesapeake Research Consortium
EPA- [United States] Environmental Protection Agency
PSC – Principals' Advisory Committee (CBP)
K - Potassium
N - Nitrogen
NASS - National Agricultural Statistics Service

ORISE - Oak Ride Institute for Science and Education (Fellowship Program)
P - Phosphorus
STAC- Scientific & Technical Advisory Committee
TMDL- Total Maximum Daily Load
WQGIT- Water Quality Goal Implementation Team