V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Soil, Air and Water (OARDC Led)

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources	0%		10%	
102	Soil, Plant, Water, Nutrient Relationships	0%		15%	
103	Management of Saline and Sodic Soils and Salinity	0%		5%	
111	Conservation and Efficient Use of Water	0%		10%	
112	Watershed Protection and Management	0%		15%	
131	Alternative Uses of Land	0%		10%	
132	Weather and Climate	0%		5%	
133	Pollution Prevention and Mitigation	0%		20%	
141	Air Resource Protection and Management	0%		10%	
	Total	0%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	6.5	0.0
Actual Paid Professional	0.0	0.0	3.9	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	543816	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	503765	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

On -going research activities include both basic and applied research. Both laboratory and multiple field sites/research stations are available throughout state to permit data gathering and to continue long - term experiments, such as no-till plots. On-farm research takes place, as do national and international studies, as is evidenced by programs such as OARDC's carbon sequestration program. All functional laboratories and sites will continue to be improved over time as program need and resources available warrant. OARDC faculty and staff engage in appropriate levels of outreach, engagement, and consultation, with both internal stakeholders such as fellow extension personnel and with external stakeholders.

2. Brief description of the target audience

Targeted audiences include, but not limited to: 1) Specific individuals or groups who have expressed a need for certain information that is to be derived through new research, extracted from on-going research, or is derived from scientific literature. Often those requests are communicated to OARDC by an intermediary such as a staffer at Ohio Dept. of Natural Resources or a county extension agent; 2) Fellow agencies or support organizations that will not only use the information but will also be brokers of that information, including embedding it into groups to encourage change; 3) Populations who have not requested the information but will likely benefit from that information, e.g. immigrant populations; 4) Other scientists and scientific groups; 5) Political entities; 6) Extension personnel; 7) Students from pre-school to post doctorate studies; 8) News organizations; and 9) Business groups such as chambers of commerce and community coalitions.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year:	2012
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	0	44	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of graduate students completed
  Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Continue to advance soil, water, nutrient, and plant research to, among other outcomes, ensure Ohio continues to be one of the top five states in corn and soybean production and has knowledge to support growing niche market agriculture, organic farming, and biobased products.
2	Provide the necessary research finding (scientific knowledge and techniques) to support stakeholder compliance with Ohio and federal EPA regulations, and future regulations, regarding odors and other air quality issues in ag production and processing.
3	Expand watershed and ecosystem level modeling to the extent that scientific data and watershed management protocols can bring all streams effected by agriculture and natural resource runoff into compliance with Ohio EPA standards.
4	Through the provisioning of watershed specific data, support the creation of and conservation action of community-based watershed networks in each major watershed in Ohio.
5	Advance the basic knowledge contribution so that Ohio continues to be viewed as a center of excellence in terms of soils and water sciences, and associated extension programming.
6	Provide the necessary soil, air, weather/climate, and water research, in conjunction with actions in other planned programs KA (e.g. IPM), to permit continued adoption of conservation tillage practices in the face of problems such as climatic changes, pest, etc.

Outcome #1

1. Outcome Measures

Continue to advance soil, water, nutrient, and plant research to, among other outcomes, ensure Ohio continues to be one of the top five states in corn and soybean production and has knowledge to support growing niche market agriculture, organic farming, and biobased products.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Provide the necessary research finding (scientific knowledge and techniques) to support stakeholder compliance with Ohio and federal EPA regulations, and future regulations, regarding odors and other air quality issues in ag production and processing.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Nitrogen runoff from agricultural fields is a major environmental problem.

What has been done
OARDC scientists compared the two - stage ditch, wetlands, and cover crops, in terms of cost per unit to remove nitrogen, under a range of interest rates and time horizons.

Results
Wetlands were found to be the most cost-effective practice for nitrogen removal, with an average cost of < $2/kg N removed. Two-stage ditches were the second-most cost-effective, over a 50-year time horizon; cover crops were the second-most cost-effective, over a 10-year time horizon. The study also revealed that two-stage ditches are more cost-effective under a CRP-style funding configuration (i.e., 50% cost-share on implementation, followed by annual rental payments), compared to EQIP funding (i.e., 75% cost-share on implementation, with no annual rental

payments).

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation
141	Air Resource Protection and Management

Outcome #3

1. Outcome Measures

Expand watershed and ecosystem level modeling to the extent that scientific data and watershed management protocols can bring all streams effected by agriculture and natural resource runoff into compliance with Ohio EPA standards.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Soluble phosphorus runoff has long been associated with water quality issues, such as algae blooms resulting in negative ecological, aesthetic, and economic impacts and water that are unsafe for drinking and watersports. The result is significant reductions in visitors who contribute to Ohio?s $11 billion-a-year Lake Erie tourism industry. A five percent decline in Lake Erie tourism could cost Ohio more than $500 million and approximately 6,000 jobs.

What has been done
OARDC and OSU Extension personnel, working as part of a national team, are identifying phosphorous sources and best management practices to mitigate water quality issues. One option is the potential role of fluidized gas desulfurization (FDG) gypsum (a synthetic form of gypsum) derived from flue gas desulfurization (FGD) systems at electric power plants. Sulfur dioxide emission control systems used by coal-fired power plants remove sulfur from combustion

gases using scrubbers. It has long been established that naturally occurring, mined gypsum is an effective soil amendment and fertilizer for farming.

Results
FDG, an abundant byproduct from coal-burning power plants, if spread on farmers? fields, could help control Lake Erie?s harmful algal blooms according to the study. Gypsum reduces soluble phosphorus, the form that can run off into rivers and lakes, by 40 to 70 percent. Synthetic gypsum costs farmers $25 to $45 a ton and can boost corn yields by five bushels an acre. At a rate of one ton per acre every two or three years and a conservative corn price of $5 a bushel, the gypsum can almost pay for itself the first year, Thus, a 1,000- acre farm using gypsum could net an extra $25,000 every other year. Additionally much of the environmental impact could be mitigated, protecting both the environment and associated industries such as tourism.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation

Outcome #4

1. Outcome Measures

Through the provisioning of watershed specific data, support the creation of and conservation action of community-based watershed networks in each major watershed in Ohio.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Advance the basic knowledge contribution so that Ohio continues to be viewed as a center of excellence in terms of soils and water sciences, and associated extension programming.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual

2012 0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Organic farming is a growing market in Ohio and the nation. With soil health recognized as the basis for organic production systems it is essential that new soil management strategies be developed to take full advantage of market opportunities.

What has been done
Maintaining soil health and productivity are on going concerns in no-till organic crop production systems. It is of primary concern to OSU Extension and OARDC specialist at OSU South Centers. With support from USDA the scientists sought to better understand how to assess and maximize organic ecosystem services. They focused on the use of Zeolite, oilseed radish, and winter pea as multi-functional cover crops in no-till organic systems.

Results
OSU research showed that by planting only 2 lbs. of oilseed radish and 25 lbs. of winter pea with 100 lbs. of Zeolite per acre after crops are harvested, radishes can grow more than 30 inches deep to break-up plow layer compaction, provide required nitrogen, and facilitate water infiltration. Oilseed radishes recycle more than 100, 30, and 30 lbs. of nitrogen, phosphorus, and potassium respectively, when applied with manure or biosolids. Zeolite was found to hold ammonium-N (NH4+) and other nutrients, and increases the nutrient-use efficiency by reducing nitrogen and phosphorus application needs. Furthermore, Zeolite was found to retain a higher volume of water and mitigate drought effects. At OSU South Centers their studies on the use of Zeolite, oilseed radish, and winter pea as multi-functional cover crops in no-till organic systems found a potential savings of up to $100,000 per year for organic farmers in Ohio.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
131	Alternative Uses of Land

Outcome #6

1. Outcome Measures

Provide the necessary soil, air, weather/climate, and water research, in conjunction with actions in other planned programs KA (e.g. IPM), to permit continued adoption of conservation tillage practices in the face of problems such as climatic changes, pest, etc.

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)
- Other (extramural funding)

Brief Explanation

Soil, air and water resources underpin all programs within the college. All items above continue to affect outcomes in production and processing. Extramural funding remains a problem in this area.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

No specific evalation data collected in this planned program.

Key Items of Evaluation

In OARDC 2012 Annual Report, two stakeholders offered the following:

"Water quality is a top concern in Ohio, and farmers want to be part of the solution. Ohio State's research to validate and update the Phosphorus Risk Index will help us determine what the next best management practices are when it comes to phosphorus use on the farm."
- Tom Fontana, Director, New Use Development, Ohio Soybean Council

"Good stewards of the public trust bring their expertise and resources to protect and restore natural resources, and work to find sustainable solutions to threats to our environment; this is what Warren Dick, his OARDC colleagues, and their many partners have been doing for years. Their research informs best agricultural practices with sound science."
- John A. Anderson Jr., president, Greenleaf Advisors, Chicago, and former director of The Nature Conservancy's Great Lakes Project