

Practice: 590 - Nutrient Management

Scenario: #2 - Basic NM

Scenario Description:

This scenario describes the implementation of a basic nutrient management system on cropland or hayland (non-organic and organic) where there is no manure application. The planned NM system will meet the current 590 standard. Implementation will result in the proper rate, source, method of placement, and timing of nutrients. Payment for implementation is to defray the costs of soil testing, analysis, consultant services that provide nutrient recommendations based on Land Grant University (LGU) recommendations or crop removal rates and an associated nutrient budget, and recordkeeping. Records demonstrating implementation of the 4 R's of the NM criteria will be required.

Before Situation:

A fertility program is either non-existent or does not meet the 590 nutrient management standard. Soil testing is not completed on a regular basis and applications of fertilizers are not based on land grant university recommendations or a nutrient budget. An environmental evaluation or risk assessment is not completed. Nutrients are transported to surface waters through runoff or soil erosion or to ground water from leaching in quantities that degrade water quality and limit use of intended purposes. Soil quality may be degraded by excess or inadequate nutrients.

After Situation:

Plan Development

- A nutrient management system will be developed to meet the NRCS 590 standard.
- The development and implementation of a nutrient management plan (NMP) will benefit plant productivity and reduce off-site degradation.
- A nutrient management budget will be developed for each field(s) based on soil test analysis and land grant university recommendations or crop removal rates.

Testing/Nutrient Data Collection

- On planning units typically 40 acres or larger, soil testing is completed according to LGU recommendations. The use of pre-plant soil tests will assist with the proper development of the annual nutrient budget.
- The use of post-harvest soil tests (results interpreted by crop consultant) will help establish the adequacy of the plan in meeting crop needs while minimizing P application rate and residual N, thus reducing the potential for off-site impacts.

Producer Activities/Equipment Needed

- Records are maintained annually documenting current soil test, analysis, amount of application, forms and rates of nutrients for each field, including post harvest analysis.
- Applications will be completed in a manner that minimizes nutrient runoff and leaching or build up of excess nutrient concentrations.

Scenario Feature Measure:

Scenario Unit: Acre

Scenario Typical Size: 40

Scenario Cost: \$647.21

Scenario Cost/Unit: \$16.18

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Equipment/Installation						
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$39.03	1	\$39.03
Labor						
Specialist Labor	235	Labor requiring a specialized skill set: Includes Agronomists, Foresters, Biologists, etc. to provide additional technical information during the planning and implementation of the practice. Does not include NRCS or TSP services.	Hour	\$90.67	6	\$544.02
General Labor	231	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$22.31	2	\$44.62
Materials						
Test, Soil Test, Standard	299	Includes materials, shipping, labor, and equipment costs.	Each	\$9.77	2	\$19.54

Practice: 590 - Nutrient Management

Scenario: #3 - Basic NM with Manure

Scenario Description:

This scenario describes the implementation of a basic nutrient management system on cropland or hayland (non-organic and organic) where there is manure or compost application in addition to commercial fertilizer applications. The planned NM system will meet the current 590 standard. Implementation will result in the proper rate, source, method of placement, and timing of nutrients while minimizing off-site degradation or the excessive built up of N and P. Payment for implementation is to defray the costs of soil testing, manure testing, analysis, proper implementation, consultant services that provide nutrient recommendations based on Land Grant University (LGU) recommendations or crop removal rates and an associated nutrient budget, and recordkeeping. Risk assessments including PI (phosphorus index) and NI (nitrogen index) will be completed with applications of manure completed based on risk results. Records demonstrating implementation of the 4 R's of the NM plan will be required along with copies of risk assessments.

Before Situation:

A fertility program is either non-existent or does not meet the 590 nutrient management standard. Soil testing and manure testing is not completed on a regular basis and applications of nutrients are not based on land grant university recommendations or a nutrient budget. Nutrients and manure solids are transported to surface waters through runoff or erosion or to groundwater through leaching in quantities that degrade water quality and limit use of intended purposes. Soil quality may be degraded by excess or inadequate nutrients. Fields have little or no erosion protection often times resulting in wind, sheet, rill, and ephemeral erosion.

After Situation:

Plan Development

- A nutrient management system that includes manure as a source will be developed to meet the NRCS 590 standard.
- The development and implementation of a nutrient management plan (NMP) will benefit plant productivity and reduce off-site degradation.
- A nutrient management plan will be developed for each field(s) based on soil tests and manure test analysis along with land grant university recommendations or crop removal rates.

Testing/Nutrient Data Collection

- Soil testing is completed according to LGU recommendations.
- The use of pre-plant soil tests will assist with the proper development of the annual nutrient budget. Applications of manure are based on risk assessments (PI - phosphorus index).
- The use of post-harvest soil tests (results interpreted by crop consultant) will help establish the adequacy of the plan in meeting crop needs while minimizing P application rate and residual N.
- The use of Pre side-dress soil nitrogen test (PSNT) or a Pre Top Dress Tissue test (PTDTT) prior to the rapid biomass growth of the plant will assist the producer in evaluating the mineralization of Nitrogen from manures / cover crops in providing adequate nitrogen to meet the crop requirements, thus reducing the potential for off-site impacts.

Producer Activities/Equipment Needed

- Records are maintained annually documenting current soil tests, manure tests, analyses, amount of application, forms and rates of nutrients for each field, including post harvest analysis.
- Applications will be completed in a manner that minimizes nutrient runoff and leaching or build up of excess nutrient concentrations.

Scenario Feature Measure:

Scenario Unit: Acre

Scenario Typical Size: 40

Scenario Cost: \$987.02

Scenario Cost/Unit: \$24.68

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Equipment/Installation						
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$39.03	1	\$39.03
Labor						
General Labor	231	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$22.31	3	\$66.93
Specialist Labor	235	Labor requiring a specialized skill set: Includes Agronomists, Foresters, Biologists, etc. to provide additional technical information during the planning and implementation of the practice. Does not include NRCS or TSP services.	Hour	\$90.67	9	\$816.03

Materials

Materials

Test, Manure Analysis	306	Moisture, Total N, P, K. Includes materials and shipping only.	Each	\$45.49	1	\$45.49
Test, Soil Test, Standard	299	Includes materials, shipping, labor, and equipment costs.	Each	\$9.77	2	\$19.54

Practice: 590 - Nutrient Management

Scenario: #4 - Enhanced NM

Scenario Description:

This scenario describes a conventional cropping system where either no nutrient management or only a basic level of nutrient management is being practiced. An enhanced nutrient management system includes activities such as split applications, multiple nutrient concentration tests (other than only soil tests) and methods that more concisely enable scheduling of appropriate fertilizer applications. Nutrients are transported to surface waters through runoff or wind erosion in quantities that degrade water quality and limit use of

Before Situation:

Conventional fertility programs involve very little or no soil testing. Application of fertilizers and amendments, are completed annually based upon tradition that does not specifically consider the detrimental affects of improper timing or rates of nutrients, or excess nutrient build-up in the soil. Fields are overwintered with little or no erosion protection often times resulting in sheet, rill, and ephemeral erosion by spring. Runoff flows into adjacent streams, water courses, tile drains, field surface drains, or other water courses causing degradation to receiving waters or leaching of nutrients to shallow ground water sources. There is typically no environmental evaluation of the potential for off-site movement. Soil quality may also be detrimentally affected.

After Situation:

Plan Development:

- The development and implementation of a Nutrient Management Plan (NMP) that meets and exceeds the NRCS 590 standard will benefit plant productivity and reduce off-site movement of nutrients.
- The NMP will stress the use of the four R's (Right Source of Nutrients, Right Time of Application, Right Rate, and Right Method of Application).
- These include practices such as use of split applications, slow release nutrients, proper timing of application, more appropriate formulations, banding, etc.
- A nutrient budget is developed for each field or section of field annually.
- Further minimization of risk is accomplished by identifying the variability across the field(s) by using soil survey maps or other simple techniques to establish zones, along with zonal soil testing.

Testing/Nutrient data collection:

- The use of pre-plant soil tests will assist with the development of the annual nutrient budget in accordance with Land Grant University fertilizer guides.
- Soil testing is completed according to Land Grant University (LGU) recommendations.
- Use of a post-harvest soil test (interpreted by a crop consultant) will help establish the adequacy of the plan in meeting crop needs while minimizing P application rate and residual N, thus reducing the potential for off-site impacts.
- Analysis are completed at least once every three years for N-P-K (soil tests).

Producer Activities/Equipment Needed:

- Applications of nutrients are completed using a GPS guided variable rate fertilizer applicator.
- Application of nutrients via fertilizers, and/or manures applied in a manner that minimizes nutrient runoff and leaching.
- Application rates of all sources of nutrients are based upon soil tests and either LGU recommendations, crop removal rates, or industry standard.
- Record keeping will document application of nutrients based on the 4 R's.
- Nutrients are applied at rates based on soil test zone analyses.

Scenario Feature Measure:

Scenario Unit: Acre

Scenario Typical Size: 40

Scenario Cost: \$1,572.03

Scenario Cost/Unit: \$39.30

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Equipment/Installation						
All terrain vehicles, ATV	965	Includes equipment, power unit and labor costs.	Hour	\$32.17	2	\$64.34
Fertilizer, precision application	952	Fertilizer application performed by light bar/GPS navigation system. Includes equipment, power unit and labor costs.	Acre	\$11.41	40	\$456.40
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$39.03	2	\$78.06
Labor						
General Labor	231	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$22.31	2	\$44.62

Labor

Specialist Labor	235	Labor requiring a specialized skill set: Includes Agronomists, Foresters, Biologists, etc. to provide additional technical information during the planning and implementation of the practice. Does not include NRCS or TSP services.	Hour	\$90.67	8	\$725.36
------------------	-----	---	------	---------	---	----------

Materials

Test, Soil Test, Precision, Grid or Zone	300	Includes materials, shipping, labor, and equipment costs.	Each	\$13.55	15	\$203.25
--	-----	---	------	---------	----	----------

Practice: 590 - Nutrient Management

Scenario: #6 - Enhanced NM with Tissue Testing

Scenario Description:

This scenario describes the implementation of an advanced precision nutrient management system on cropland. The planned NM system will meet the current 590 standard. Payment for implementation is to defray the costs of soil testing, analysis, consultant services, skilled labor and specialized nutrient application that provide nutrient proper recommendations based on Land Grant University (LGU) recommendations or crop removal rates and an associated nutrient budget, recordkeeping, and monitoring on a precision level that includes split applications, Normalized Differential Vegetation Index (NDVI) sensing, and aerial imaging. Records are kept demonstrating implementation of the 4 R's of the NM plan. This scenario goes beyond the enhanced system by using technologies that improve efficiency and effectiveness of nutrient management by utilizing specialized precision techniques and tools (variable rate applicators, NDVI, aerial photography, yield monitoring,, plant tissue testing). Precision nutrient mgmt techniques ensure that the right rate, proper timing, and proper placement of nutrients minimize non-point source pollution and provide proper amounts of nutrients to the crop where it is needed and not applying where it is not needed.

Before Situation:

A fertility program is already in place, however, application of nutrients across large acreages is based on a lack of representative soil samples or analyses. The current NM system may or may not meet 590 standards, however, could be improved by reducing energy inputs and utilizing precise mapping and diagnostic equipment. Because whole fields are often fertilized with the same rate, excess nutrients may be applied in some areas while inadequate amounts of nutrients are applied in other areas. Excess nutrients are transported to surface waters through runoff or erosion or to ground water from leaching in quantities that degrade water quality and limit use of intended purposes. Soil quality may be degraded by excess or inadequate nutrients. Fertilizer applications are made in their entirety more than 30 days prior to planting. Applications do not consider the detrimental affects of improper timing or improper rates. Whole fields with like crops and rotation are fertilized the same.

After Situation:

Plan Development

- An application rate (prescription) is developed for each zone based on representative soil analysis and a zone nutrient budget.
- A nutrient budget is developed for each field annually.
- Yield monitoring maps will be collected and utilized (where technology allows) to develop the following year nutrient applications.

Testing/Nutrient Data Collection

- Soil testing is completed in a fashion that provides a representative assessment of nutrient concentrations in each field or planning unit including zone directed sampling, real time Normalized Differential Vegetation Index (NDVI) sensing, Electrical Conductivity (EC) Index type sampling, or via high definition aerial photography that allows for the identification of numerous variations (zones) in a planning unit.
- Zone maps are created and a nutrient budget developed for each zone.
- Soil testing is completed annually for N and at least once every three years for P-K. Plant tissue samples collected and evaluated.

Producer Activities/Equipment Needed

- Application of nutrients is completed so that non-point source pollution is minimized.
- Nutrients are applied based on realistic yield expectations.
- The average field size is >=40acres.
- Applications of nutrients are completed using a GPS guided variable rate fertilizer applicator.
- Applications of nutrients will be completed in split applications where a majority of the N needs are applied based on the needs of the crop based on growing season requirements.
- Record keeping will include all soil tests, analysis, zone maps, nutrient prescriptions and budgets, and as-applied applications.

Scenario Feature Measure:

Scenario Unit: Acre

Scenario Typical Size: 40

Scenario Cost: \$2,792.47

Scenario Cost/Unit: \$69.81

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Equipment/Installation						
All terrain vehicles, ATV	965	Includes equipment, power unit and labor costs.	Hour	\$32.17	4	\$128.68
Chlorophyll Reader	1125	Applicator and chlorophyll sensor includes labor. No materials	Acre	\$12.85	40	\$514.00
Fertilizer, precision application	952	Fertilizer application performed by light bar/GPS navigation system. Includes equipment, power unit and labor costs.	Acre	\$11.41	40	\$456.40
Satellite imagery, aerial photography, infrared	966	Infrared imagery	Acre	\$0.16	40	\$6.40
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$39.03	4	\$156.12

Labor

Labor

Specialist Labor	235	Labor requiring a specialized skill set: Includes Agronomists, Foresters, Biologists, etc. to provide additional technical information during the planning and implementation of the practice. Does not include NRCS or TSP services.	Hour	\$90.67	12	\$1,088.04
General Labor	231	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$22.31	6	\$133.86
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$33.95	2	\$67.90

Materials

Test, Soil Test, Precision, Grid or Zone	300	Includes materials, shipping, labor, and equipment costs.	Each	\$13.55	15	\$203.25
Test, Soil Nitrogen Testing	311	Pre-Side Dress/Deep Soil Testing. Includes materials and shipping only.	Each	\$11.68	1	\$11.68
Test, Plant Tissue Test	301	Tissue analysis for crops. Includes materials and shipping only.	Each	\$26.14	1	\$26.14

Practice: 590 - Nutrient Management

Scenario: #7 - Adaptive NM

Scenario Description:

The practice scenario is for the implementation of nutrient management on a small plot where Nitrogen use efficiency is evaluated. Scenario includes implementing replicated strip trials on a field plot to evaluate, identify and implement various nutrient use efficiency improvement methods for timing, rate, method of application, or source of nutrients.

Before Situation:

The practice will be installed on cropland (small grain rotation or typical corn-soybean rotation) to address water quality degradation, air quality degradation and energy concerns. The scenario applies to non-organic and organic operations.

After Situation:

Installation of this scenario will result in adapting the four R's of nutrient management (right source, right rate, right timing and right placement) by following the procedures outlined in Agronomy Technical Note 7 - Adaptive Nutrient Management Process. Replicated plots will be established to evaluate one or more of the 4 R's. Plots with a minimum of 4 replications each of two treatments will be designed, laid out, managed and evaluated with the assistance of an individual certified in nutrient management planning and implementation. Yields and other appropriate data will be measured and statistically summarized following the procedures in Agronomy Technical Note 7 - Adaptive Nutrient Management Process. Results will be used to adapt the nutrient management plan for subsequent years to address nutrient use efficiency and water quality planning criteria with the reasoning clearly explained.

Scenario Feature Measure:

Scenario Unit: Each

Scenario Typical Size: 1

Scenario Cost: \$3,255.76

Scenario Cost/Unit: \$3,255.76

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Equipment/Installation						
Satellite imagery, aerial photography, infrared	966	Infrared imagery	Acre	\$0.16	2	\$0.32
Labor						
General Labor	231	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$22.31	16	\$356.96
Specialist Labor	235	Labor requiring a specialized skill set: Includes Agronomists, Foresters, Biologists, etc. to provide additional technical information during the planning and implementation of the practice. Does not include NRCS or TSP services.	Hour	\$90.67	30	\$2,720.10
Materials						
Test, Plant Tissue Test	301	Tissue analysis for crops. Includes materials and shipping only.	Each	\$26.14	4	\$104.56
Test, Soil Test, Precision, Grid or Zone	300	Includes materials, shipping, labor, and equipment costs.	Each	\$13.55	2	\$27.10
Test, Soil Nitrogen Testing	311	Pre-Side Dress/Deep Soil Testing. Includes materials and shipping only.	Each	\$11.68	4	\$46.72