Practice: 590 - Nutrient Management

Scenario #1 - Basic NM System

Scenario Description:

A plan will be developed to determine soil sample locations, number of samples and timing of sampling operations. Nutrients will be applied according to soil test recommendations, and will be based on realistic yield goals. All external sources of nutrients (residual legume credits, nitrates in irrigation water, etc.) will be accounted for in the nutrient budgeting process. All activities will be conducted in accordance with the Nutrient Management (590) practice standard. This practice will typically be applied to irrigated or dry cropland fields approximately 125 acres in size where there is no manure application. Successful implementation of this practice will result in the proper rate, source, method of placement and timing of nutrients to reduce the potential impact of excessive nutrients on water quality. This would be applicable to crop or hay production and not to grass establishment. These activities will be implemented for at least three consecutive years.

Before Situation:

A fertility program is either non-existent or does not meet the Nutrient Management (590) standard. Soil testing is not completed on a regular basis and application 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:

A plan is developed to determine soil sample locations, number of samples and timing of sampling operations, according to land grant university recommendations. A nutrient management budget is developed for each field(s) based on soil test analysis and land grant university recommendations, or crop removal rates. All external sources of nutrients (residual legume credits, nitrates in irrigation water, etc.) are accounted for in the budgeting process. Nutrients are applied according to soil test recommendations, and are based on realistic yield goals. Records are provided annually of the current soil test analysis, amount of application, forms and rates of nutrients for each field. Nutrient applications are completed in a manner that minimizes nutrient leaching or build-up of excess nutrient concentrations. These activities will be implemented for at least three consecutive years.

Feature Measure: Acre

Scenario Unit:: Acre

Scenario Typical Size: 125

Total Scenario Cost: $274.81

Scenario Cost/Unit: $2.20

Cost Details:

Component Name	ID	Description	Unit	Cost	QTY	Total
Equipment Installation						
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	$18.01	6	$108.06
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	$19.35	6	$116.10
Materials						
Test, Soil Test, Standard	299	Includes materials, shiping, labor, and equipment costs.	Each	$10.13	5	$50.65

Practice: 590 - Nutrient Management

Scenario #2 - Small Farm/Diversified

Scenario Description:

Small farm/diversified systems include Community Supported Agriculture (CSA), truck farms, market gardens, etc., where numerous variable crops are grown on small acreages. There is typically a higher cost/acre for nutrient management planning and implementation on smaller production areas (usually between .25-10 acres) with a large number of crops, often times with multiple harvests per year that require intense and diversified nutrient management. A plan will be developed to determine soil sample locations, number of samples and timing of sampling operations. Nutrients will be applied according to soil test recommendations, and will be based on realistic yield goals. All external sources of nutrients (residual legume credits, nitrates in irrigation water, etc.) will be accounted for in the budgeting process. All activities will be conducted in accordance with the Nutrient Management (590) practice standard. Successful implementation of this practice will result in the proper rate, source, method of placement and timing of nutrients to reduce the potential impact of excessive nutrients on water quality. This would be applicable to crop or hay production and not to grass establishment. These activities will be implemented for at least three consecutive years.

Before Situation:

A fertility program is either non-existent or does not meet the Nutrient Management (590) standard. Typical farm size is 0.25 acres to 10 acres. Soil testing is not completed on a regular basis and application of nutrients 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:

A nutrient management system is developed to meet the Nutrient Management (590) standard and the National Organic Program (NOP), if applicable. A plan is developed to determine soil sample locations, number of samples and timing of sampling operations, according to land grant university recommendations. A nutrient management budget is developed for each field(s) based on soil test analysis and land grant university recommendations, or crop removal rates. All external sources of nutrients (residual legume credits, nitrates in irrigation water, etc.) are accounted for in the budgeting process. Nutrients are applied according to soil test recommendations, and are based on realistic yield goals. Records are provided annually of the current soil test analysis, amount of application, forms and rates of nutrients for each field. Nutrient applications are completed in a manner that minimizes nutrient leaching or build-up of excess nutrient concentrations. These activities will be implemented for at least three consecutive years.

Feature Measure: Per Farm

Scenario Unit:: Each

Scenario Typical Size: 1

Total Scenario Cost: $194.56

Scenario Cost/Unit: $194.56

Cost Details:

Component Name	ID	Description	Unit	Cost	QTY	Total
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	$19.35	5	$96.75
Materials						
Test, Soil Test, Standard	299	Includes materials, shiping, labor, and equipment costs.	Each	$10.13	5	$50.65
Test, Manure Analysis	306	Moisture, Total N, P, K. Includes materials and shipping only.	Each	$47.16	1	$47.16

Practice: 590 - Nutrient Management

Scenario #3 - Basic NM system with manure

Scenario Description:

A plan will be developed to determine soil sample locations, number of samples and timing of sampling operations. Manure and commercial fertilizer will be applied according to soil test recommendations, and will be based on realistic yield goals. All external sources of nutrients (residual legume credits, nitrates in irrigation water, etc.) will be accounted for in the budgeting process. All activities will be conducted in accordance with the Nutrient Management (590) practice standard. This practice will typically be applied to irrigated or dry cropland fields approximately 40 acres in size, where there has been a history of manure application. Successful implementation of this practice will result in the proper rate, source, method of placement and timing of manure to reduce the potential impact of excessive nutrients on water quality. These activities will be implemented for at least three consecutive years.

Before Situation:

A fertility program for the application of manure is either non-existent or does not meet the Nutrient Management (590) standard. Soil and manure testing are not completed on a regular basis and application of nutrients are not based on land grant university recommendations or a nutrient budget. An environmental evaluation or risk assessment is not completed. Nutrients from manure and commercial fertilizer 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:

A nutrient management system is developed to meet the Nutrient Management (590) standard and the National Organic Program (NOP, if applicable. A plan is developed to determine soil sample locations, number of samples and timing of sampling operations, according to land grant university recommendations. Manure sampling is conducted according to land grant university recommendations. A nutrient management budget is developed for each field(s) based on soil test analysis and land grant university recommendations, or crop removal rates. All external sources of nutrients (residual legume credits, nitrates in irrigation water, etc.) are accounted for in the budgeting process. Manure and commercial fertilizer are applied according to soil test recommendations, and are based on realistic yield goals. Records are provided annually documenting the current soil test analysis, manure test analysis, amount of application, forms and rates of nutrients for each field. Manure and fertilizer applications are completed in a manner that minimizes nutrient leaching or build-up of excess nutrient concentrations. These activities will be implemented for at least three consecutive years.

Feature Measure: Acre

Scenario Unit:: Acre

Scenario Typical Size: 40

Total Scenario Cost: $124.13

Scenario Cost/Unit: $3.10

Cost Details:

Component Name	ID	Description	Unit	Cost	QTY	Total
Equipment Installation						
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	$18.01	1	$18.01
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	$19.35	2	$38.70
Materials						
Test, Soil Test, Standard	299	Includes materials, shiping, labor, and equipment costs.	Each	$10.13	2	$20.26
Test, Manure Analysis	306	Moisture, Total N, P, K. Includes materials and shipping only.	Each	$47.16	1	$47.16

Practice: 590 - Nutrient Management

Scenario #4 - Enhanced Nutrient Mgt

Scenario Description:

This scenario involves a fertility program where either no nutrient management or only a basic level of nutrient management is being practiced. An 'enhanced' nutrient management system includes methods that more concisely enable scheduling of appropriate nitrogen fertilizer application at the lowest (resolution level; by field or subfield. Nutrient recommendations and applications occur through such methods as in-season nitrogen incorporation/injection, slow release nutrients, nitrogen inhibitors, management zones, multiple nutrient concentration tests (other than only soil tests), non-variable rate sensor based technology such as N-rich strips, chlorophyll meters, spectral analysis, etc. This practice will typically be applied to irrigated or dry cropland fields approximately 125 acres in size. These activities will be implemented for at least three consecutive years.

Before Situation:

A fertility program involving very little or no soil, or manure, testing is being practiced. Application of fertilizers, including manure and ammendments, are completed annually based upon tradition that does not specifically consider the detrimental effects of improper timing or rates of nutrients, or excess nutrient build-up in the soil. Runoff flows into adjacent streams or water courses causing degradation to receiving waters or leaching of nutrients to shallow ground water. There is typically no environmental evaluation of the potential for off-site movement.

After Situation:

An 'enhanced' method of nutrient management is applied in an effort to benefit plant productivity and reduce off-site movement of nutrients. These methods include techniques such as the use of in-season incorporation/injection of nitrogen, slow release nutrients, nitrogen inhibitors, managment zones, plant tissue testing, non-variable rate sensor based technology such as N-rich strips, chlorophyll meters, spectral analysis, etc. A nutrient management budget is developed for each management zone annually, based on soil test analysis and land grant university recommendations. Nutrients are applied according to soil test recommendations, and are based on realistic yield goals. Applications are completed in a manner that minimizes nutrient leaching or build-up of excess nutrient concentrations.These activities will be implemented for at least three consecutive years.

Feature Measure: Acre

Scenario Unit:: Acre

Scenario Typical Size: 40

Total Scenario Cost: $591.94

Scenario Cost/Unit: $14.80

Cost Details:

Component Name	ID	Description	Unit	Cost	QTY	Total
Equipment Installation						
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	$18.01	1	$18.01
All terrain vehicles, ATV	965	Includes equipment, power unit and labor costs.	Hour	$27.01	2	$54.02
Satellite imagery, aerial photography, infrared	966	Infrared imagery	Acre	$0.17	40	$6.80
Chlorophyll Reader	1125	Applicator and chlorophyll sensor includes labor. No materials	Acre	$10.87	40	$434.80
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	$19.35	3	$58.05
Materials						
Test, Soil Test, Standard	299	Includes materials, shiping, labor, and equipment costs.	Each	$10.13	2	$20.26

Practice: 590 - Nutrient Management

Scenario #5 - Precision NM System EC Mapping and Grid Sampling

Scenario Description:

This scenario involves a fertility program where either no nutrient management or only a basic level of nutrient management is being practiced. A 'precision' nutrient management system includes methods that more concisely enable scheduling of appropriate fertilizer applications at a mid level resolution. This activity involves the creation of independent N, P and K maps within a management zone within a field through the process of 'grid sampling', where one soil sample is taken every 2.5 acres, or through the process of EC mapping. A nutrient budget will be developed from N, P and K maps made for each management zone within a field. Fertilizer will then be applied according to land grant university guidelines, at variable rates, through the use of an electronic map with a GPS a receiver. This practice will typically be applied to dryland or irrigated cropland fields approximately 125 acres in size. These activities will be implemented for at least three consecutive years.

Before Situation:

A fertility program involving very little or no soil, or manure, testing is being practiced. Application of fertilizers, including manure and amendments, are completed annually based upon tradition that does not specifically consider the detrimental effects of improper timing or rates of nutrients, or excess nutrient build-up in the soil. Runoff flows into adjacent streams or water courses causing degradation to receiving waters or leaching of nutrients to shallow ground water. There is typically no environmental evaluation of the potential for off-site movement.

After Situation:

A 'precision' method of nutrient management using grid sampling or EC mapping is applied in an effort to benefit plant productivity and reduce off-site movement of nutrients. A nutrient management budget is developed for each management zone within the fielld with independent N, P and K layers per developed zone based on soil test analysis and land grant university recommendations. Nutrients (N,P & K) are applied at variable rates within each developed zone, according to soil test recommendations, and are based on realistic yield goals. Applications are completed in a manner that minimizes nutrient leaching or build-up of excess nutrient concentrations. These activities will be implemented for at least three consecutive years.

Feature Measure: Acre

Scenario Unit:: Acre

Scenario Typical Size: 120

Total Scenario Cost: $2,064.99

Scenario Cost/Unit: $17.21

Cost Details:

Component Name	ID	Description	Unit	Cost	QTY	Total
Equipment Installation						
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	$18.01	3	$54.03
Fertilizer, precision application	952	Fertilizer application performed by light bar/GPS navigation system. Includes equipment, power unit and labor costs.	Acre	$9.48	120	$1,137.60
Labor						
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	$26.79	6	$160.74
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	$19.35	2	$38.70
Materials						
Test, Soil Test, Precision, Grid or Zone	300	Includes materials, shipping, labor, and equipment costs.	Each	$14.04	48	$673.92

Practice: 590 - Nutrient Management

Scenario #6 - Advanced Precision NM System

Scenario Description:

This scenario involves a fertility program where either no nutrient management or only a basic level of nutrient management is being practiced. An 'advanced' nutrient management system goes beyond the 'enhanced' or 'precision' systems were management zones include specialized precision techniques to apply nitrogen fertilizer at the highest resolution level; <1 acre. This involves fertilizer applications by sensor based variable rate application using techniques such as NDVI (Normal Difference Vegetation Index) sensing, aerial and satellite to improve the efficiency and effectiveness of nitrogen management. This practice will typically be applied to dryland or irrigated cropland fields approximately 125 acres in size. These activities will be implemented for at least three consecutive years.

Before Situation:

A fertility program involving very little or no soil, or manure, testing is being practiced. Application of fertilizers, including manure and amendments, are completed annually based upon tradition that does not specifically consider the detrimental effects of improper timing or rates of nutrients, or excess nutrient build-up in the soil. Runoff flows into adjacent streams or water courses causing degradation to receiving waters or leaching of nutrients to shallow ground water. There is typically no environmental evaluation of the potential for off-site movement.

After Situation:

An 'advanced' method of nutrient management using variable rate application is applied in an effort to benefit plant productivity and reduce off-site movement of nutrients. A nutrient management budget is developed for each management zone within a field(s) annually utilizing precision techniques to apply nitrogen fertilizer at much higher precision and applied based on soil test analysis and land grant university recommendations. Nutrients are applied according to soil test recommendations, and are based on realistic yield goals. Applications are completed in a manner that minimizes nutrient leaching or build-up of excess nutrient concentrations.These activities will be implemented for at least three consecutive years.

Feature Measure: Acre

Scenario Unit:: Acre

Scenario Typical Size: 40

Total Scenario Cost: $953.32

Scenario Cost/Unit: $23.83

Cost Details:

Component Name	ID	Description	Unit	Cost	QTY	Total
Equipment Installation						
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	$18.01	2	$36.02
Fertilizer, precision application	952	Fertilizer application performed by light bar/GPS navigation system. Includes equipment, power unit and labor costs.	Acre	$9.48	40	$379.20
All terrain vehicles, ATV	965	Includes equipment, power unit and labor costs.	Hour	$27.01	2	$54.02
Satellite imagery, aerial photography, infrared	966	Infrared imagery	Acre	$0.17	40	$6.80
Labor						
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	$26.79	3	$80.37
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	$19.35	2	$38.70
Materials						
Test, Soil Test, Precision, Grid or Zone	300	Includes materials, shipping, labor, and equipment costs.	Each	$14.04	15	$210.60
Test, Plant Tissue Test	301	Tissue analysis for crops. Includes materials and shipping only.	Each	$27.10	5	$135.50
Test, Soil Nitrogen Testing	311	Pre-Side Dress/Deep Soil Testing. Includes materials and shipping only.	Each	$12.11	1	$12.11

Practice: 590 - Nutrient Management

Scenario #7 - Phosphorus Banding

Scenario Description:

All Phosphorus (with the exception of "pop up") will be banded at a maximum of 50 -75% of the recommended broadcast rate, and at a depth of no less than 4- 8 inches below the crop seed planting depth. Banded applications reduce fertilizer fixation to the soil. All nutrients are concisely applied close to the seed row, according to a soil test taken at least annually, and will be based on realistic yield projections. All external sources of nutrients (residual legume credits, nitrates in irrigation water, etc.) will be accounted for in the budgeting process. All activities will be conducted in accordance with the Nutrient Management (590) practice standard. This practice will typically be applied to irrigated or dryland cropland, pastureland, or hayland fields approximately 125 acres in size. Successful implementation of this practice will reduce the potential impact of excessive nutrients on water quality and provide energy savings. These activities will be implemented for at least three consecutive years.

Before Situation:

A fertility program involving very little or no soil, or manure, testing is being practiced. Application of fertilizers, including manure and amendments, are completed annually based upon tradition that does not specifically consider the detrimental effects of improper placement, timing or rates of nutrients, or excess nutrient build-up in the soil. Runoff flows into adjacent streams or water courses causing degradation to receiving waters or leaching of nutrients to shallow ground water. There is typically no environmental evaluation of the potential for off-site movement.

After Situation:

All Phosphorus (with the exception of "pop up") will be banded at a maximum of 50 -75% of the recommended broadcast rate, and at a depth of no less than 4- 8 inches below the crop seed planting depth. This activity reduces potential impact of excessive nutrients on water quality and provides energy savings. All external sources of nutrients (residual legume credits, nitrates in irrigation water, etc.) are accounted for in the nutrient budgeting process. Successful implentation of this practice reduces the potential impact of excessive nutrients on water quality and provides energy savings. These activities will be implemented for at least three consecutive years.

Feature Measure: Acre

Scenario Unit:: Acre

Scenario Typical Size: 125

Total Scenario Cost: $1,596.60

Scenario Cost/Unit: $12.77

Cost Details:

Component Name	ID	Description	Unit	Cost	QTY	Total
Equipment Installation						
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	$18.01	5	$90.05
Fertilizer, precision application	952	Fertilizer application performed by light bar/GPS navigation system. Includes equipment, power unit and labor costs.	Acre	$9.48	125	$1,185.00
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	$19.35	14	$270.90
Materials						
Test, Soil Test, Standard	299	Includes materials, shiping, labor, and equipment costs.	Each	$10.13	5	$50.65

Practice: 590 - Nutrient Management

Scenario #8 - Deep Soil Testing for Nitrogen

Scenario Description:

A plan will be developed to utilize plant available nitrogen in the soil profile, below the normal soil testing depth. This will minimize the potential for deep percolations into ground water resources while at the same time potentially reducing the amount of commercial nitrogen and energy used for crop production. This practice applies to cropland only. A plan will be developed to determine soil sample locations, number of samples, timing of sampling operations and depth of soil samples according to land grant university recommendations. All activities will be conducted in accordance with the Nutrient Management (590) practice standard and will be implemented for at least three consecutive years.

Before Situation:

A fertility program involving very little or no soil, or manure, testing is being practiced. Application of fertilizers, including manure and amendments, are completed annually based upon tradition that does not specifically consider the detrimental effects of improper timing or rates of nutrients, or excess nutrient build-up in the soil. Runoff flows into adjacent streams or water courses causing degradation to receiving waters or leaching of nutrients to shallow ground water. There is typically no environmental evaluation of the potential for off-site movement.

After Situation:

This practice reduces potential impact of excessive nitrogen on water quality and provide energy savings. A plan is developed to determine soil sample locations, number and depth of samples and timing of sampling operations, according to land grant university recommendations. A nutrient management budget is developed for each field(s) based on soil test analysis and land grant university recommendations, and crop removal rates. Nutrients are applied according to soil test recommendations, and are based on realistic yield goals. Successful implementation of this practice is completed in a manner that minimizes nutrient leaching or build-up of excess nutrient concentrations. These activities will be implemented for at least three consecutive years.

Feature Measure: Acre

Scenario Unit:: Acre

Scenario Typical Size: 125

Total Scenario Cost: $384.85

Scenario Cost/Unit: $3.08

Cost Details:

Component Name	ID	Description	Unit	Cost	QTY	Total
Equipment Installation						
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	$18.01	5	$90.05
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	$19.35	10	$193.50
Materials						
Test, Soil Test, Standard	299	Includes materials, shiping, labor, and equipment costs.	Each	$10.13	10	$101.30