CONSERVATION ENHANCEMENT ACTIVITY

E447A

Advanced Tailwater Recovery

Conservation Practice 447: Irrigation System, Tailwater Recovery

APPLICABLE LAND USE: Crop (Annual & Mixed); Crop (Perennial); Pasture

RESOURCE CONCERN: Water

PRACTICE LIFE SPAN: 1 year

Enhancement Description

This enhancement is for a recovery system that capture 100% of excess irrigation and drainage runoff water from the contiguous land where the activity is implemented. Runoff water is conveyed through properly designed recovery ditches to a storage structure. Each recovery ditch and storage structure have adequate capacity to store excess irrigation water and reasonable runoff water. The system is designed to incorporate the collected water back into the delivery system so that excess water is reused. The system is fully automated to operate the recovery pumps, valves, and collection system. Key elements in the system are sensors that can evaluate data and operate devices through the system in opening/closing or on/off based on scientifically determined parameters.

Criteria

General

- All fields where the activity is implemented are contiguous and have a properly designed recovery system.
- Topography of the contiguous fields may require multiple independent recovery systems.
- Prevent field erosion by utilization of properly designed, installed, and maintained recovery collection structures.
- Install freeboard gauges in recovery storage structures.
- Design all structures with overflow protection to prevent flooding of crops or neighboring lands.
• Measure the volume of irrigation water applied to each field by using a permanently installed flowmeter. Include all irrigation sources for the field in the measurement.

• Tailwater recovery pits will have a permanent water level sensor with data recording to monitor the tailwater captured throughout the irrigation season.

Additional Criteria of recovery collection structures

• Recovery collection structures will be properly designed and installed according to NRCS CPS 410 Grade Stabilization Structure or CPS 587 Structure for Water Control.

Additional Criteria of overflow structures

• Structures will be designed according to NRCS Conservation Practice Standard 587 Structure for Water Control.

• Structures will be constructed of UV protected material or have a protective coating applied.
Documentation and Implementation Requirements

Participant will:

Prior to implementation
- An Irrigation Water Management plan will be written and submitted to NRCS for approval.
- A system map will be created that identifies each component of the tailwater recovery system.

During installation or implementation
- The Irrigation Water Management plan will be followed.
- Routinely check the system for any issues resulting from animal activities such as beavers clogging the structures.
- Evaluate the functionality of each component throughout the system to determine if any changes, corrections, or repairs need to be made.
- Record irrigation data such as location, dates, duration, and flow rate of water applied to the field and amount recycled.

After implementation
- Provide documentation of the following to NRCS for certification
  - Water use during the irrigation season.
  - Water recycled during the irrigation season.
  - Changes, corrections, or repairs made to the system to improve functionality.

NRCS will:

Prior to implementation
- Provide and explain NRCS Conservation Practice Standard Irrigation System, Tailwater Recovery (Code 447) and Irrigation Water Management (Code 449) as it relates to implementing this enhancement
- Provide additional assistance to the participant as requested
- Review and approve all recovery collection structures
After Implementation

☐ Verify installation of all irrigation water management equipment and collected records from the season

**NRCS Documentation Review:**

I have reviewed participant’s documentation and have determined that participant has implemented the enhancement and meets all criteria and requirements.

Participant Name __________________________   Contract Number ______________________

Total Amount Applied ________________________   Fiscal Year Completed __________________

______________________________________________________________________________

NRCS Technical Adequacy Signature   Date
CONSERVATION ENHANCEMENT ACTIVITY

E449A

Complete pumping plant evaluation for water savings

Conservation Practice 449: Irrigation Water Management

APPLICABLE LAND USE: Crop (Annual & Mixed); Crop (Perennial); Pasture; Associated Ag Land; Farmstead

RESOURCE CONCERN: Water, Energy

ENHANCEMENT LIFE SPAN: 1 year

Enhancement Description

Evaluation of all pumping plants to determine the potential to rehabilitate/replace/reconfigure pump performance to improve water delivery efficiency 10% or more. Evaluate to determine if a Variable Frequency Drive motor controller(s) is recommended and the simple payback in terms of energy savings is less than 10 years.

Criteria

- Pump test evaluation will include all irrigation pumps on fields where the activity is implemented. There could be multiple pumps that are used on single or multiple fields.
- Minimum data necessary to complete the pumping evaluation:
  - Flow rate, instantaneous and for the season.
  - Pressure at different flow rates based on partial or complete irrigation.
  - Power usage to compute efficiency of the drive unit.
  - Area and fields irrigated.
  - Estimate of friction loss in pipelines based on pressure drop in lines during test.
- The irrigation water management plan is followed and includes, as per NRCS Conservation Standard Practice, Irrigation Water Management (Code 449):
An irrigation system layout map showing the main pipeline(s), irrigated area, soil moisture locations and depths (if used), and soils. If water level sensors are used, show locations and number of sensors used.

Methods used to measure or determine the flow rate or volume of the irrigation applications.

Measurement records showing the amount of water used to irrigate as it comes onto the farm and goes to each field.

Documentation of the scientific method used for scheduling the timing and amount of irrigation applications.

The Irrigation water management plan explains:

- How irrigation system meets crop needs, while maximizing irrigation water efficiency.
- Seasonal or annual planned water application volumes by crop.
- Management allowable depletion (MAD) and depth of the managed crop root zone or water level for each crop and stage of growth.
- Evaluation of irrigation system distribution uniformity and necessary changes to insure uniform irrigation.
- Information on how to recognize irrigation induced erosion and how to mitigate it.
- Indicate how data from the sensor locations and depths will be considered to make field-wide irrigation decisions.
- Water application scheduling based on soil moisture or water level monitoring and or evapotranspiration monitoring from the weather station.

Recordkeeping documents for the irrigator to use during operation and management.
Documentation and Implementation Requirements

Participant will:

☐ Prior to implementation, provide NRCS with a map showing the location of all fields and pumps connected to the irrigation system.

☐ Prior to implementation, arrange for pump test evaluations of all irrigation pumps on fields where activity is implemented.

☐ Prior to implementation, acquire an irrigation water management plan meeting NRCS Conservation Practice Standard Irrigation Water Management (Code 449) requirements.

☐ During implementation, follow the irrigation water management plan and keep records as required by the plan.

☐ During implementation, have a pump test evaluation performed on all irrigation pumps on fields where activity is implemented.

☐ After implementation, make the following items available for review by NRCS to verify implementation of the enhancement:
  o Irrigation water management plan and records kept.
  o Pump test evaluation report(s).
  o Provide a list of any adjustments to improve system efficiency made as a result of the evaluation. Calculate the reduction of energy use based on before and after conditions. Energy savings can be reported as the average annual or seasonal energy reduction compared to previous operating conditions.

NRCS will:

☐ Prior to implementation, provide and explain NRCS Conservation Practice Standard Irrigation Water Management (Code 449) as it relates to implementing this enhancement

☐ As needed, provide additional technical assistance to the participant as requested.
After implementation, verify implementation of the irrigation water management plan, by reviewing records kept during enhancement implementation.

After implementation, verify pump test evaluation, by reviewing evaluation report.

After implementation, verify energy savings based on system efficiency before and after implementation of the enhancement.

NRCS Documentation Review:
I have reviewed all required participant documentation and have determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name ______________________________ Contract Number _______________
Total Amount Applied ______________________ Fiscal Year Completed _____________

NRCS Technical Adequacy Signature _______________ Date _______________

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**CONSERVATION ENHANCEMENT ACTIVITY**

**E449B**

**Alternated Wetting and Drying (AWD) of rice fields**

Conservation Practice 449: Irrigation Water Management

**APPLICABLE LAND USE: Crop (Annual & Mixed)**

**RESOURCE CONCERN: Water**

**PRACTICE LIFE SPAN: 1 year**

**Enhancement Description**

Rice fields are drained and allowed to “dry down” to a saturated soil condition prior to re-flooding the field. System is installed in year 1 with Scenario E449144Z8 and this scenario used in years 2-5.

**Criteria**

- Deliver water to individual rice paddies through a “multi-inlet” or “side-inlet” distribution system, or the field has been graded flat.
- Prepare and plant the fields using typical agricultural practices.
- If necessary to germinate seed, flood the field, then allow the field to dry down and plants to reach the fifth leaf (first tiller) stage before establishing full flood.
- Flood the field based on typical triggers such as plant growth stage, presence of weeds, and soil moisture.
- Implement a cyclical drying-wetting regime throughout the growing season as follows:
  - Terminate irrigation and allow the field to “dry down” to a saturated soil condition.
  - For sloping fields, the upper 10% of each paddy should reach saturated soil condition prior to the next flood cycle.
After dry-down, resume irrigation flooding to typical levels.

Repeat the cycle throughout the growing season.

Near the end of the season, terminate irrigation based on plant growth stage as recommended by local Land Grant University personnel and allow the field to “dry down” prior to harvest.

- Comply with the requirements of the NRCS Conservation Practice Standard Irrigation Water Management (Code 449) and your site-specific Irrigation Water Management Plan.
Documentation and Implementation Requirements

Participant will:

☐ Prior to implementation, acquire an irrigation water management plan meeting NRCS Conservation Practice Standard Irrigation Water Management (Code 449) requirements.

☐ During implementation, record irrigation data such as location, date, duration, and flow rate of all irrigation operations, rainfall, evapotranspiration, and water level data.

☐ During implementation, utilize dated digital photography to document “dry down” conditions. Each photo should indicate the location and field where the photo was taken.

☐ After implementation, make the following items available for review by NRCS to verify implementation of the enhancement:
  o Irrigation water management plan and records kept.
  o Dated digital photography used to document “dry down” conditions.

NRCS will:

☐ Prior to implementation, provide and explain NRCS Conservation Practice Standard Irrigation Water Management (Code 449) as it relates to implementing this enhancement.

☐ During Implementation, provide additional technical assistance to the participant as requested.

☐ After implementation, verify implementation of the irrigation water management plan, by reviewing records kept during enhancement implementation.
NRCS Documentation Review:

I have reviewed all required participant documentation and have determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name ______________________________ Contract Number ________________

Total Amount Applied ________________ Fiscal Year Completed ____________

______________________________ ______________________
NRCS Technical Adequacy Signature Date
CONSERVATION ENHANCEMENT ACTIVITY

E449C

Advanced Automated IWM – Year 2-5, soil moisture monitoring

Conservation Practice 449: Irrigation Water Management

APPLICABLE LAND USE: Crop (Annual & Mixed); Crop (Perennial); Pasture

RESOURCE CONCERN: Water

PRACTICE LIFE SPAN: 1 year

Enhancement Description

Advanced automated irrigation water management using soil moisture or water level monitoring (installed as per IWM plan) with data loggers.

Criteria

Irrigation water management plan is followed and includes, as per NRCS Conservation Standard Practice Irrigation Water Management (Code 449):

- An irrigation system layout map showing the main pipeline(s), irrigated area, soil moisture locations and depths (if used), and soils. If water level sensors are used, show locations and number of sensors used.

- Methods used to measure or determine the flow rate or volume of the irrigation applications.

- Measurement records showing the amount of water used to irrigate as it comes onto the farm and goes to each field.

- Documentation of the scientific method used for scheduling the timing and amount of irrigation applications.

- Irrigation water management plan explains:
How irrigation system meets crop needs, while maximizing irrigation water efficiency.

Seasonal or annual planned water application volumes by crop.

Management allowable depletion (MAD) and depth of the managed crop root zone or water level for each crop and stage of growth.

Evaluation of irrigation system distribution uniformity and necessary changes to insure uniform irrigation.

Information on how to recognize irrigation induced erosion and how to mitigate it.

How data from the sensor locations and depths will be considered to make field-wide irrigation decisions.

Water application scheduling based on soil moisture or water level monitoring and or evapotranspiration monitoring from the weather station.

Recordkeeping documents for the irrigator to use during operation and management.
Documentation and Implementation Requirements

Participant will:

☐ Prior to implementation, acquire an irrigation water management plan meeting NRCS Conservation Practice Standard Irrigation Water Management (449) requirements.

☐ During implementation, record irrigation data such as location, date, duration, and flow rate of all irrigation operations, rainfall, evapotranspiration, and soil moisture or water level data.

☐ After implementation, make the following items available for review by NRCS to verify implementation of the enhancement:
  - Irrigation water management plan and records kept
  - Changes made to address distribution uniformity deficiencies

NRCS will:

☐ Prior to implementation, provide and explain NRCS Conservation Practice Standard Irrigation Water Management (CPS 449) as it relates to implementing this enhancement.

☐ As needed, provide additional technical assistance to the participant as requested.

☐ After implementation, verify implementation of the irrigation water management plan, by reviewing participant records kept during enhancement implementation.

NRCS Documentation Review:

I have reviewed all required participant documentation and have determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name ______________________________ Contract Number ________________

Total Amount Applied ______________________ Fiscal Year Completed ___________

____________________________________ _______________

NRCS Technical Adequacy Signature  Date
CONSERVATION ENHANCEMENT ACTIVITY

E449D

Advanced Automated IWM – Year 1, Equipment and soil moisture or water level monitoring

Conservation Practice 449: Irrigation Water Management

APPLICABLE LAND USE: Crop (Annual & Mixed); Crop (Perennial); Pasture

RESOURCE CONCERN: Water

ENHANCEMENT LIFE SPAN: 1 year

Enhancement Description

Installing and monitoring soil moisture or water leveling equipment for advanced automated irrigation water management

Criteria

• Equipment may include; weather station, sensors, flow meter, data loggers, cellular service, as needed to monitor soil moisture, determine and forecast crop water use and remotely control irrigation system.

• Subscription service provided by others may be used as an alternative.

• Data to be monitored includes crop water use, status of heat and/or frost conditions to permit the producer to make informed irrigation decisions.

• The installation includes the purchase and installation of equipment, and a data logger to log continuous weather data including rainfall, temperature, solar radiation, humidity, wind
speed and soil moisture/water level sensors data that can be downloaded to a personal computer and associated graphing software.

- Producer monitors the station during the growing season to determine timing and amounts of water to apply based on soil moisture/water level sensors, field checks and weather station data.

- Producer keeps records of collected data and resulting irrigation decisions. This enhancement only applies to year one of IWM. The appropriate labor-only IWM enhancements apply in subsequent contract years.

- If a weather station is installed, install within 1 mile of fields where practice is implemented. The weather station will record each of the following (at a minimum of four times per hour),
  - High and low temperature
  - Precipitation
  - Humidity
  - Wind speed and duration
  - Solar radiation

- Sensors, datalogger and required telemetry are installed on fields where practice is implemented as indicated in the Irrigation water management plan.

- Irrigation water management plan is followed and includes, as per NRCS Conservation Standard Practice Irrigation Water Management (Code 449):
  - An irrigation system layout map showing the main pipeline(s), irrigated area, soil moisture locations and depths (if used), and soils. If water level sensors are used, show locations and number of sensors used.
  - Methods used to measure or determine the flow rate or volume of the irrigation applications.
  - Measurement records showing the amount of water used to irrigate, as it comes onto the farm and goes to each field.
  - Documentation of the scientific method used for scheduling the timing and amount of irrigation applications.
  - The Irrigation water management plan explains;
• How irrigation system meets crop needs, while maximizing irrigation water efficiency.

• Seasonal or annual planned water application volumes by crop.

• Management allowable depletion (MAD) and depth of the managed crop root zone or water level for each crop and stage of growth.

• Evaluation of irrigation system distribution uniformity and necessary changes to insure uniform irrigation.

• Information on how to recognize irrigation induced erosion and how to mitigate it.

• Indicate how data from the sensor locations and depths will be considered to make field-wide irrigation decisions.

• Water application scheduling based on soil moisture or water level monitoring and or evapotranspiration monitoring from the weather station.

  o Recordkeeping documents for the irrigator to use during operation and management
Documentation and Implementation Requirements

Participant will:

- Prior to implementation, acquire an irrigation water management plan meeting NRCS Conservation Practice Standard Irrigation Water Management (Code 449) requirements.
- Prior to implementation, acquire NRCS approval of selected weather station, sensors, data logger, etc. or subscription service.
- During implementation, ensure installation meets manufacturer recommendations.
- During implementation, record irrigation data such as location, date, duration, and flow rate of all irrigation operations, rainfall, evapotranspiration, and soil moisture or water level data.
- After implementation, make the following items available for review by NRCS to verify implementation of the enhancement:
  - Irrigation water management plan and records kept (i.e., date, duration, and flow rate of all irrigation operations, rainfall, evapotranspiration, and soil moisture or water level data)
  - Changes made to address distribution uniformity deficiencies
  - Documentation of equipment installed (i.e. weather station, sensors, data logger, etc.) to NRCS
  - If a subscription service is used, provide location of equipment, date, duration, and flow rate of all irrigation operations, rainfall, evapotranspiration, and soil moisture or water level data.

NRCS will:

- Prior to implementation, provide and explain NRCS Conservation Practice Standard Irrigation Water Management (Code 449) as it relates to implementing this enhancement
- As needed, provide additional assistance to the participant as requested.
- Prior to implementation, review and approve producer’s selected weather station, sensors, data logger, etc. or subscription service.
☐ As needed, provide additional technical assistance to the participant as requested.

☐ After implementation, verify installation of weather station, sensors, etc.

☐ After implementation, verify implementation of the irrigation water management plan, by reviewing records kept during enhancement implementation.

NRCS Documentation Review:

I have reviewed all required participant documentation and have determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name ______________________________ Contract Number ________________

Total Amount Applied __________________________ Fiscal Year Completed ____________

___________________________________________ Date

NRCS Technical Adequacy Signature
CONSERVATION ENHANCEMENT ACTIVITY

E449E

Convert from Cascade to Furrow Irrigated Rice Production – reduce irrigation water consumption

Conservation Practice 449: Irrigation Water Management

APPLICABLE LAND USE: Crop (Annual & Mixed)

RESOURCE CONCERN: Water

ENHANCEMENT LIFE SPAN: 1 Years

Enhancement Description

Field currently flooded through a cascade levee system will be converted to furrow irrigation.

Criteria

Currently, water distribution to the field must be delivered through a cascade system, with the field having enough slope for water to advance. The irrigation water management plan is followed and includes, as per NRCS Conservation Standard Practice Irrigation Water Management (Code 449):

- Field(s) will be leveed on the lower end and sides prior to implementing the enhancement.
- An irrigation system layout map showing the main pipeline(s), irrigated area, location of layflat tubing and water control structure on the lower corner of the field.
- Methods used to measure or determine the flow rate or volume of the irrigation applications.
- Measurement records showing the amount of water applied each field.
- Documentation of the method used for scheduling the timing and amount of irrigation applications.
Documentation and Implementation Requirements

Participant will:

Prior to implementation

☐ Prior to implementation, acquire an irrigation water management plan meeting NRCS Conservation Practice Standard Irrigation Water Management (449) requirements.

☐ Install a flow meter at well location(s).

During implementation

☐ Record irrigation data such as location, date, duration and flow rate (to derive volumetric estimates) of all irrigation operations. Record rainfall amounts during the production season.

After implementation

☐ Make the following items available for review by NRCS to verify enhancement adoption:
  o Irrigation water management plan and records.
  o Changes made to address distribution uniformity deficiencies.

NRCS will:

Prior to implementation

☐ Provide and explain NRCS Conservation Practice Standard Irrigation Water Management (CPS 449) as it relates to implementing this enhancement.

☐ Provide additional assistance to the participant as requested

After implementation

☐ Verify implementation of the irrigation water management plan by reviewing participant records kept during enhancement implementation (i.e. Record of irrigation dates, duration and rainfall amounts during the production season.)
NRCS Documentation Review:

I have reviewed all required participant documentation and have determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name ______________________________ Contract Number ________________

Total Amount Applied ________________________

Fiscal Year Completed __________

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NRCS Technical Adequacy Signature  Date
CONSERVATION ENHANCEMENT ACTIVITY

E449F

Intermediate IWM—Year 1, Equipment with soil moisture or water level monitoring

Conservation Practice 449: Irrigation Water Management

APPLICABLE LAND USE: Crop (Annual & Mixed); Crop (Perennial); Pasture

RESOURCE CONCERN: Water

ENHANCEMENT LIFE SPAN: 1 year

Enhancement Description

This activity involves monitoring soil moisture or water levels within an irrigated field for intermediate irrigation water management. This includes installation of equipment year 1.

Criteria

- Equipment may include: soil moisture sensor with data collection systems; weather stations that collect solar radiation, wind speed and direction, rainfall, temperature; water level sensor with data collection system; permanent flowmeter.
- Data to be monitored includes: irrigation water applied, crop water use, status of heat and/or frost conditions to permit the producer to make informed irrigation decisions.
- The installation includes the purchase and installation of equipment with data collection systems that can continuously record data throughout the irrigation season.
- Irrigation water management plan is followed and includes, as per NRCS Conservation Standard Practice Irrigation Water Management (Code 449):
An irrigation system layout map showing the main pipeline(s), irrigated area, soil moisture sensor/water level sensor locations (if used) and soils.

Method used to measure or determine the flow rate or volume of the irrigation water applications.

Measurement records showing the amount of water used to irrigate as it comes on to the farm and goes into each field.

Documentation of the scientific method used to schedule the timing and amount of irrigation application.

Irrigation water management plan explaining:
- How irrigation meets crop needs while maximizing irrigation water efficiency.
- Seasonal or annual planned water application volumes by crop.
- Management allowable depletion (MAD) and depth of the managed crop root zone or water level for each crop and stage of growth.
- Evaluation of irrigation system distribution uniformity and necessary changes to ensure uniform irrigation.
- Information on how to recognize irrigation induced erosion and how to mitigate it.
- Indicate how data from the sensor location and depths will be considered to make field-wide irrigation decisions.
- Water application scheduling based on soil moisture or water level monitoring and/or evapotranspiration monitoring from the weather station.

Recordkeeping documents for the irrigator to use during the operation and management.

**Additional Criteria of soil moisture devices**

- Installation of each soil moisture set will include the ability to collect data at a minimum of 2 approved depths based on crop and soil characteristics of the region.

- Number of soil moisture sets will be installed based on the irrigation water management plan designed per water source using the following criteria: field topography, crop rotation and the soils throughout the field.
Additional Criteria of flow measurement devices

- Permanent flow meters will be installed at all wells/reliefs that are included in the approved IWM plan.

Additional Criteria of water level devices

- Sensor is installed in a basin field with a data logger with the ability to capture an image of the movement of the gauge. Images are captured at a minimum of twice a day.

Additional Criteria of weather stations

- Weather station is installed in a central location as defined by the irrigation water management plan, but no more than 2 miles separation.

- Weather stations will record each of the following at a minimum of four times per hour:
  - High and low temperature
  - Precipitation
  - Humidity
  - Wind speed and duration and direction
  - Solar radiation
Documentation and Implementation Requirements

Participant will:

Prior to implementation

- Acquire an irrigation water management plan meeting NRCS Conservation Practice Irrigation Water Management (Code 449) requirements
- Acquire NRCS approval of all irrigation water management devices that will be utilized for the plan implementation

During installation or implementation

- Ensure each irrigation water management device is installed to manufacturer recommendations
- Record irrigation data such as location, date, duration, and flow rate of all irrigation operations, rainfall, evapotranspiration, and soil moisture or water level data
- Monitor the devices during the growing season to determine timing and amounts of water to apply based on soil moisture/water level sensor, field checks and weather data.

After implementation

- Make the following items available for review by NRCS to verify implementation of the enhancement:
  - Irrigation water management plan is followed, and records kept.
  - Changes made to address distribution uniformity deficiencies.
  - Utilization documentation of any sensor used throughout the growing season as well as certification of their proper installation.

NRCS will:

Prior to implementation

- Provide and explain NRCS Conservation Practice Standard Irrigation Water Management (Code 449) as it relates to implementing this enhancement.
• Provide additional assistance to the participant as requested.
• Review and approve producer’s selected equipment After Implementation.
• Verify installation of all irrigation water management equipment.
• Verify implementation of the irrigation water management plan by:
  reviewing records kept during enhancement implementation.

NRCS Documentation Review:

I have reviewed all required participant documentation and have determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name ______________________________ Contract Number _______________
Total Amount Applied __________________________ Fiscal Year Completed ___________

____________________________________________________________________________
NRCS Technical Adequacy Signature          Date ________________________________
**CONSERVATION ENHANCEMENT ACTIVITY**

**E449G**

**Intermediate IWM—Years 2-5, soil or water level monitoring**

Conservation Practice 449: Irrigation Water Management

**APPLICABLE LAND USE: Crop (Annual & Mixed)**

**RESOURCE CONCERN: Water**

**ENHANCEMENT LIFE SPAN: 1 year**

**Enhancement Description**

Field currently flooded through a cascade levee system will be converted to furrow irrigation. It is required that field is leveed on the lower end and approximately 25% up the sides for furrow irrigation prior to implementing the enhancement. After the previous year’s crop is harvested, elevated planting beds and furrows will be reshaped as needed to guarantee proper irrigation of the rice crop. Layflat tubing will be utilized with the correct holes or gates installed to advance water down the furrows at the appropriate rate across the length of the field as prescribed by an NRCS “PHAUCET” design, Delta Plastic® Pipe Planner® or similar.

**Criteria**

- Equipment may include: soil moisture sensor(s) with data collection systems; weather stations that collect solar radiation, wind speed and direction, rainfall, temperature; water level sensor with data collection system
- Data to be monitored includes: irrigation water applied, crop water use, status of heat and/or frost conditions to permit the producer to make informed irrigation decisions.
- Irrigation water management plan from year one is followed in accordance to the NRCS Conservation Standard Practice Irrigation Water Management (Code 449):
An irrigation system layout map showing the main pipeline(s), irrigated area, soil moisture sensor/water level sensor locations (if used) and soils.

- Method used to measure or determine the flow rate or volume of the irrigation water applications.
- Measurement records showing the amount of water used to irrigate as it comes on to the farm and goes into each field.
- Documentation of the scientific method used to schedule the timing and amount of irrigation application.
- Irrigation water management plan explaining:
  - How irrigation meets crop needs while maximizing irrigation water efficiency.
  - Seasonal or annual planned water application volumes by crop.
  - Management allowable depletion (MAD) and depth of the managed crop root zone or water level for each crop and stage of growth.
  - Evaluation of irrigation system distribution uniformity and necessary changes to ensure uniform irrigation.
  - Information on how to recognize irrigation induced erosion and how to mitigate it.
  - Indicate how data from the sensor location and depths will be considered to make field-wide irrigation decisions.
  - Water application scheduling based on soil moisture or water level monitoring and/or evapotranspiration monitoring from the weather station.

- Recordkeeping documents for the irrigator to use during the operation and management.

**Additional Criteria of soil moisture devices**

- Each year re-install the soil moisture set to collect data at a minimum of 2 approved depths based on crop and soil characteristics of the region.
- Number of soil moisture sets will be installed based on the irrigation water management plan designed per water source using the following criteria: field topography, crop rotation and the soils throughout the field.
Additional Criteria of water level devices

- Re-install sensor/gage each year in a basin field with a data logger with the ability to capture an image of the movement of the gauge. Images are captured at a minimum of twice a day.
**Documentation and Implementation Requirements**

**Participant will:**

**Prior to implementation**

- Review the irrigation water management plan to make any necessary adjustments from the previous year.
- Ensure the irrigation water management plan continues to meet the NRCS Conservation Practice Irrigation Water Management (Code 449) requirements.

**During installation or implementation**

- Ensure each irrigation water management device is re-installed to manufacturer recommendations
- Record irrigation data such as location, date, duration, and flow rate of all irrigation operations, rainfall, evapotranspiration, and soil moisture or water level data
- Monitor the devices during the growing season to determine timing and amounts of water to apply based on soil moisture/water level sensor, field checks and weather data

**After implementation**

- Make the following items available for review by NRCS to verify implementation of the enhancement:
  - Irrigation water management plan is followed, and records kept
  - Changes made to address distribution uniformity deficiencies
  - Utilization documentation of any sensor used throughout the growing season as well as certification of their proper installation

- **NRCS will:**

  **Prior to implementation**

  - Provide and explain NRCS Conservation Practice Standard Irrigation Water Management (Code 449) as it relates to implementing this enhancement.
• Provide additional assistance to the participant as requested After Implementation

• Verify re-installation of all irrigation water management equipment each year

• Verify implementation of the irrigation water management plan by:
  o Reviewing records kept during each year of enhancement implementation

**NRCS Documentation Review:**

I have reviewed all required participant documentation and have determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name ______________________________ Contract Number ________________

Total Amount Applied ______________________ Fiscal Year Completed ____________

________________________________ _______________
NRCS Technical Adequacy Signature Date
Manage livestock access to waterbodies to reduce nutrients or pathogens to surface water

Conservation Practice 472: Access Control

**APPLICABLE LAND USE:** Crop (Annual & Mixed); Crop (Perennial); Pasture; Range; Forest; Associated Ag Land; Farmstead

**RESOURCE CONCERN:** Water

**ENHANCEMENT LIFE SPAN:** 10 years

**Enhancement Description**

Installation of structures and implementation of grazing management actions that restrict livestock access to waterbodies in order to reduce nutrient loading or reduce the introduction of pathogens from manure, bio-solids, or compost to surface waters.

**Criteria**

- Manage livestock access to provide positive benefits to surface water quality, resulting in better manure distribution and reduction of nutrient input into surface waters like streams, ditches and other waterbodies.

- Use-regulating activities (e.g., gates, fences, and other barriers) shall be implemented to eliminate livestock access to streams to reduce nutrients in surface water.

- Limit stream access to hardened stream crossings or water access points. Preferably, install alternative water sources away from water courses and waterbodies.

- Implement riparian area grazing management strategies, including herding and seasonal exclusion with a rotational grazing system.
• Activities will complement the application schedule and life span of other practices specified in the conservation plan.

• Livestock activity will be monitored and regulated, and management plans will specify the intent, intensity, amounts, and timing of livestock exclusion access or exclusion from the target water course or waterbody. Activities may involve temporary or permanent livestock exclusion.

• Placement, location, dimensions, materials (e.g., gates), frequency of use (e.g., continuous), and frequency of monitoring shall be described for each activity.
**Documentation and Implementation Requirements**

**Participant will:**

- Prior to implementation, obtain a written grazing plan with guidelines and recommendations for matching the forage quantity and quality produced with the grazing and/or browsing demand from a qualified professional.

- For riparian grazing management strategies, prior to implementation, provide a grazing plan that includes a written narrative describing planned season of livestock grazing use.

- During implementation, keep pasture/herd in/out records.

- After implementation, make the following items available for review by NRCS to verify implementation of the enhancement:
  - Written grazing plan
  - Pasture/herd in/out records
  - Map showing locations of installed structures

**NRCS will:**

- As needed, provide additional technical assistance to the participant as requested.

- After implementation, complete forage utilization job sheet for NRCS Conservation Practice Standard Prescribed Grazing (Code 528).

- After implementation, verify implementation of the written grazing plan by reviewing plan and pasture/herd in/out records kept during enhancement implementation.
NRCS Documentation Review:

I have reviewed all required participant documentation and determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name ______________________________ Contract Number _______________

Total Amount Applied _________________ Fiscal Year Completed ___________

_________________________ ______________________
NRCS Technical Adequacy Signature Date
Mulching to improve soil health

Conservation Practice 484: Mulching

APPLICABLE LAND USE: Crop (Annual & Mixed)

RESOURCE CONCERN: Soil

ENHANCEMENT LIFE SPAN: 1 year

Enhancement Description

Implement a crop rotation which utilizes mulch and addresses all four principle components of soil health – increases diversity of the cropping system; maintains residue throughout the year; keeps a living root; and minimizes soil chemical, physical, and biological disturbance. Plant-based mulching materials will be applied at least once during the rotation. The rotation will include at least four different crops and/or cover crops grown in a sequence that will produce a positive trend in the Organic Matter (OM) subfactor value over the life of the rotation, as determined by the Soil Conditioning Index (SCI). The current NRCS wind and water erosion prediction technologies must be used to document the rotation and SCI calculations.

Criteria

- Use plant-based mulching materials of suitable quantity and quality to add organic matter, provide food and shelter for soil biota, and protect the soil surface from raindrop impact and crusting while allowing for adequate soil aeration.

- Apply plant-based mulching materials with a carbon to nitrogen ratio (C:N) less than 30 to 1 to reduce soil nitrogen immobilization by soil biota (typical ratio examples – hairy vetch cover crop 11:1, fresh grass clippings 17:1, mature alfalfa hay 25:1, corn stalks 60:1, wheat straw 80:1, and pine needles 80-110:1).

- Do not apply mulch with C:N less than 20:1 to an area of designed flow in watercourses.
The crop rotation includes at least four crops and/or cover crops grown in a sequence.

An evaluation of the system using the current approved SCI procedure results in zero or higher.

Use mulch of sufficient ground cover and suitable thickness and texture to provide habitat for ground beetles, spiders, and other predators of weed seeds and crop pests.

Select crops to be mulched, mulching materials, and rates of application that do not contribute to pest problems.

For all organic or transitioning-to-organic operations, follow all National Organic Program (NOP) rules.
**Documentation and Implementation Requirements**

Participant will:

- Prior to implementation, provide NRCS with the planned crop rotation and tillage operation(s) used for each crop. The crop rotation must include at least four crops and/or cover crops grown in a sequence.

<table>
<thead>
<tr>
<th>Field</th>
<th>Acres</th>
<th>Planned Crops (in sequence)</th>
<th>Length of Crop Rotation (years)</th>
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- Prior to implementation, provide NRCS with the planned mulching information. Select crops to be mulched, mulching materials, and rates of application that do not contribute to pest problems.

<table>
<thead>
<tr>
<th>Field</th>
<th>Crop</th>
<th>Mulching Material</th>
<th>Planned Rate of application (pounds/acre)</th>
<th>Planned Application Date</th>
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- During implementation, notify NRCS of any planned changes in the cropping system, crop management, or mulching to verify the planned system meets the enhancement criteria.

- During implementation, use mulch of sufficient ground cover and suitable thickness and texture to provide habitat for ground beetles, spiders, and other predators of weed seeds and crop pests.
After implementation, provide NRCS with the applied mulching information.

<table>
<thead>
<tr>
<th>Field</th>
<th>Crop</th>
<th>Mulching Material</th>
<th>Actual Rate of application (pounds/acre)</th>
<th>Actual Application Date</th>
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If changes were made to crop rotation or tillage operation(s) after implementation, complete the tables above to document the changes.

NRCS will:

- As needed, provide technical assistance to meet the criteria of the enhancement.
- Prior to implementation, verify that the crop rotation includes at least four crops and/or cover crops grown in a sequence.
- Prior to implementation, use information provided from the participant to calculate the Management SCI value using current NRCS wind and water erosion prediction technologies. Management SCI Value = ________
- During implementation, evaluate any planned changes in the cropping system, crop management, or mulching to verify the planned system meets the enhancement criteria.
- If changes were made from the planned system after implementation, use information provided from the participant to calculate Management SCI value to document that the applied system met the enhancement criteria. Management SCI Value = ________
NRCS Documentation Review:

I have reviewed all required participant documentation and determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name ______________________________ Contract Number ________________
Total Amount Applied _________________________ Fiscal Year Completed ____________

____________________________________ ________
NRCS Technical Adequacy Signature Date
Additional Criteria for Ohio

In addition to the criteria specified in the National job sheet E484A the following additional criteria and criteria definitions apply in Ohio:

- Apply plant-based mulching materials with a carbon to nitrogen ratio (C:N) less than 30 to 1 to reduce soil nitrogen immobilization by soil biota.

- Do not apply mulch with C:N less than 20:1 to an area of designed flow in watercourses.
  - mature alfalfa hay 25:1
  - fresh grass clippings 17:1
  - hairy vetch cover crop clippings 11:1
CONSERVATION ENHANCEMENT ACTIVITY

E484B

Reduce particulate matter emissions by using orchard or vineyard generated woody material as mulch

Conservation Practice: 484 Mulching

APPLICABLE LAND USE: Crop (perennial)

RESOURCE CONCERN: Air

ENHANCEMENT LIFE SPAN: 1 Year

Enhancement Description

Reduce particulate matter emissions by using orchard- or vineyard-generated woody materials as mulch. At least 90% of all woody materials are to be used as mulch on the operation. An exception may be made when it is determined that infected material must be burned to preserve crop health.

Criteria

• Non-infected, woody material will not be burned, but instead will be chipped and used as mulch. Infected material may be burned to preserve crop health, but 90% of all woody material must be mulched in order to count this enhancement as met.

• When mulching with wood products such as wood chips, bark, shavings, or other wood materials, apply a minimum two-inch thickness of particles that will remain in place during heavy rainfall or strong wind events, or both, if applicable.

• Mulching plan must be developed. Mulched material must meet guidelines laid out in a mulching plan for size of chips and thickness of cover applied.

• Mulch does not have to be applied to the immediate source area (orchard or vineyard), but instead may be applied anywhere needed on the operation that is designated in the mulching plan (e.g., other areas of farmstead or cropland).

• Avoid excessively thick or tightly packed mulches that can result in soggy, anaerobic conditions at the soil surface during wet weather or prevent rainfall or
overhead irrigation from reaching the soil during times of moisture deficit.

- Keep mulch three to six inches away from plant stems and crowns to prevent disease and pest problems. Additional weed control may be needed around the plant base area.
- For all organic or transitioning-to-organic operations, follow all National Organic Program (NOP) rules.
**Documentation and Implementation Requirements**

**Participant will:**

- Prior to implementation, provide NRCS with information for review about current and proposed management of orchard or vineyard generated woody materials.

<table>
<thead>
<tr>
<th>Field</th>
<th>Crop</th>
<th>Acres</th>
<th>Current Management</th>
<th>Proposed Management</th>
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- Prior to implementation, provide NRCS with the proposed mulching plan for development. NRCS can provide assistance, as needed, in plan development. At a minimum, the plan must include:
  
  - Purpose of mulching
  - Type of mulch material
  - Approximate amount of mulch material to be utilized
  - Size of mulch pieces (size range or maximum size of pieces)
  - Placement timing (planned and actual)
  - Depth of mulch cover
  - Any required site preparation
  - Operation and maintenance information
  - Map(s) of area where material is to be applied

<table>
<thead>
<tr>
<th>Field</th>
<th>Crop/Location</th>
<th>Mulching Material</th>
<th>Planned Mulching Depth or Rate of Application (inches or pounds/acre)</th>
<th>Planned Application Date</th>
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E484B - Reduce particulate matter emissions by using orchard or vineyard generated woody material as mulch

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During implementation, notify NRCS of any planned changes in the mulching plan to verify changes meet the enhancement criteria.

During implementation, use mulch of sufficient ground cover and suitable thickness and texture to provide habitat for ground beetles, spiders, and other predators of weed seeds and crop pests.

During implementation, take photos of area mulched that document the average size of mulched material and depth of layer applied.

After implementation, provide NRCS with the applied mulching information.

<table>
<thead>
<tr>
<th>Field</th>
<th>Crop</th>
<th>Mulching Material</th>
<th>Actual Mulching Depth or Rate of Application (inches or pounds/acre)</th>
<th>Actual Application Date</th>
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After implementation, provide mulching plan and photos for review of the area(s) mulched to document the average size of mulched material and depth of layer applied and to verify the planned system meets the enhancement criteria.

**NRCS will:**

As needed, provide technical assistance to meet the criteria of the enhancement.

Prior to implementation, review current and proposed management of orchard- or vineyard-generated woody materials. **Plan/contract the actual acres of the crop producing the woody materials to be managed.**

Prior to implementation, verify that the mulching plan meets all criteria of the enhancement.

During implementation, evaluate any planned changes in the mulching plan to ensure enhancement criteria are met.

If changes were made after implementation, use information provided from the participant to verify the applied system meets the enhancement criteria.
NRCS Documentation Review:

I have reviewed all required participant documentation and determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name ______________________________ Contract Number _______________

Total Amount Applied ________________ Fiscal Year Completed ____________

________________________________  _______________
NRCS Technical Adequacy Signature   Date
Mulching with natural materials in specialty crops for weed control

Conservation Practice 484: Mulching

APPLICABLE LAND USE: Crop (annual & mixed), Crop (perennial)

RESOURCE CONCERN ADDRESSED: Plants

ENHANCEMENT LIFE SPAN: 1 Year

Enhancement Description

Application of straw mulch or other state-approved natural material (such as wood chips, compost, green chop, dry hay, or sawdust) for weed control in specialty crops.

Criteria

Use mulch of sufficient ground cover, thickness, and texture to provide habitat for ground beetles, spiders, and other predators of weed seeds and crop pests. Mulch thickness will be determined by the size of the plant being mulched. Thickness of the mulch shall be adequate to prevent emergence of targeted weeds, but no less than four inches deep for dry mulches.

Grass-based green chop should be applied no greater than three inches deep as it will compact and rot. Add additional layers of green chop as decomposition occurs to maintain weed control. Do not use green chop from areas recently treated with herbicides.

Mulches shall be kept a minimum of three inches away from the stems of plants where disease is likely to occur. Depending on the crop, mulch distance may need to be up to six inches away from the stems.

Mulches applied around growing plants or prior to weed seedling development shall have 100% ground cover.
Avoid finely divided residues (e.g. sawdust) and those rich in soluble carbohydrates (e.g. fresh chopped corn or other grasses) with a carbon to nitrogen ratio (C:N) greater than 30 that tie up soil nitrogen (N) and necessitate supplemental N applications.

Avoid excessively thick or tightly packed mulches that can interfere with the movement of ground beetles and other beneficial organisms and may result in soggy, anaerobic conditions at the soil surface and increase the incidence of crop pests and diseases.
Documentation and Implementation Requirements

Participant will:

- Prior to implementation, provide a map showing location of mulch application.
- Prior to implementation, provide NRCS with the planned mulching information. Select crops to be mulched, mulching materials, and rates of application that will provide weed suppression and do not contribute to pest problems.

<table>
<thead>
<tr>
<th>Field</th>
<th>Crop</th>
<th>Mulching Material</th>
<th>Planned Rate of application (pounds/acre)</th>
<th>Planned Depth of Mulch (inches)</th>
<th>Planned Application Date</th>
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- During implementation, notify NRCS of any planned changes in the cropping system, crop management, or mulching to ensure enhancement criteria are met.
- During implementation, take photos of mulch after application, during the growing season, and at harvest.
- During implementation, use mulch of sufficient ground cover and suitable thickness and texture to provide habitat for ground beetles, spiders, and other predators of weed seeds and crop pests.
- During implementation, maintain all receipts or other records showing the quantity of mulch used.
- After implementation, provide NRCS with the applied mulching information and any additional information related to the mulching impacts on weed control or crop production.

<table>
<thead>
<tr>
<th>Field</th>
<th>Crop</th>
<th>Mulching Material</th>
<th>Actual Rate of application (pounds/acre)</th>
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NRCS will:

☐ As needed, provide technical assistance to meet the criteria of the enhancement.

☐ Prior to implementation, verify mulching materials to be used, depth of mulch, and quantity needed, and document on implementation requirements.

☐ Prior to implementation, use information provided from the participant to calculate the Management Soil Conditioning Index (SCI) value using current NRCS wind and water erosion prediction technologies. **Management SCI Value = ________**

☐ During implementation, evaluate any planned changes in the cropping system, crop management, or mulching to ensure enhancement criteria are met.

☐ After implementation, review the applied mulching information and records and recommend adjustments to the mulch specifications for subsequent years based on success of the enhancement.

**NRCS Documentation Review:**

I have reviewed all required participant documentation and determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name ______________________________ Contract Number _______________
Total Amount Applied ______________________ Fiscal Year Completed ____________

______________________________       _______________
NRCS Technical Adequacy Signature       Date