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2023 Irrigation and Water Management Survey

Census Follow-on

Interviewer's Manual

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Chapter 1 - Purpose

General

This chapter contains information about the 2023 Irrigation and Water Management Survey, formerly known as the Farm and Ranch Irrigation Survey (FRIS). Included in this chapter is information on how the survey will be conducted, why it is needed, and how the data will be used.

Purpose and Scope of the Survey

Surface water supply, ground water use, water quality, and competition for available water supplies are consistent national concerns. Agricultural production relies on water supplies for irrigation. Therefore, high quality data on agricultural water uses are needed to help public and private sector officials understand and manage this important national resource.

Selected farm irrigation data have been collected in the Census of Agriculture since 1890. A census of farms reporting irrigation in the 1900 Census of Agriculture was authorized by Congress. Surveys of irrigation use in humid areas were taken in connection with the 1954 and 1959 censuses. Since 1979, a survey of irrigation has been conducted every five years as a supplement to the Census of Agriculture. It is conducted as a separate survey aimed at collecting comprehensive data for irrigation while reducing the respondent burden and cost on operators compared to gathering this information as part of a census data collection. Beginning in 1998, the survey was expanded to include all 50 states. Previously, the surveys only focused on the contiguous portion of the United States, reporting state level data for the 27 leading irrigation states while the remaining 21 states were treated as a single total. This irrigation series has provided the only source of nationally consistent data on water-management practices and water use in American agriculture.

The 2023 Irrigation and Water Management Survey's aim is to supplement the basic irrigation data collected from all farm and ranch operators, including nursery, greenhouse, and other horticulture operations on the 2022 Census of Agriculture. The data items collected include acres irrigated and equipped for irrigation by land use, acres of irrigated crops alongside the quantity of water applied and method of application, and the area irrigated with the quantity of water applied by source. The data also contains information on infrastructure, such as the type of water distribution system used, as well as the number of

irrigation wells and pumps. Economic measures collected in the survey are cost of water purchased, capital expenditures, irrigation maintenance and energy costs, irrigation labor costs, purchased water costs, and a measurement of factors which irrigators use to judge when to irrigate.

Authority and Area Covered

The census of agriculture is authorized under the provisions of the “Census of Agriculture Act of 1997,” Public Law 105 -113 (Title 13, United States Code). This law authorizes the Secretary of Agriculture to conduct surveys deemed necessary to furnish annual or other data on the subjects covered by the census. The 2023 Irrigation and Water Management Survey falls under the provisions of this section and is therefore required by law.

Farm Definition

The farm definition has been changed nine times since 1850, when minimum criteria defining a farm for census purposes were first established. The current definition, used since 1974, is any place from which \$1,000 or more of agriculture products were produced and sold, or normally would have been sold, during the census year.

Methods of Enumeration and Data Collection

The 2023 Irrigation and Water Management Survey is primarily a mailout/mail back survey, except for a small percentage of records that are reserved for field enumeration due to the need for special handling. Respondents will also have the option to report via the internet using a Computer Assisted Self Interview (CASI). All mailouts will be conducted from the Census Bureau’s National Processing Center (NPC) in Jeffersonville, Indiana. A pre-survey pressure sealed letter will be mailed to all sampled operators in late November 2023. The letter will provide instructions and encourage operators to complete the survey online. The initial mail package will be sent in early January 2024 and will include a questionnaire, instruction booklet, and a letter requesting a prompt response. The operator is asked to return the completed questionnaire to NPC in the pre-paid reply envelope. A thank you/reminder letter will be mailed to all operators in late January 2024. A second mail package which will include a reminder letter and questionnaire, is scheduled for early February for those operators that have not responded. Respondents that do not respond by mail or online may receive a phone follow-up call via the Computer Assisted Telephone Instrument (CATI). Follow-up phoning will take place beginning in mid-April 2024.

Uses of the Irrigation Data

Numerous government agencies, research organizations, irrigation industries, Land Grant Universities, and many farm operators/managers are extensively using the data this survey provides. Some of the data users are listed below.

- The Economic Research Service (ERS) of the United States Department of Agriculture (USDA) relies on irrigation data to assist policy makers and to provide essential data for economic models which are used to analyze the impact of alternative farm policies on the irrigated sector.
- The Natural Resource Conservation Service (NRCS) of the USDA uses the data (in addition to that of the Census of Agriculture) for appraising the status and condition of water and water-use trends on non-federal lands. Also, NRCS uses the data to plan and evaluate a national water-conservation program.
- The United States Geological Survey (USGS) uses the data for preparing national water summaries, which are used by the Environmental Protection Agency, the Army Corps of Engineers, and other agencies for developing water-related programs.
- The Bureau of Reclamation of the United States Department of the Interior relies on the data for conducting feasibility studies of irrigation projects.
- Both the United States Congress and State legislative bodies use the data for formulating and assessing natural resource legislation.
- State water resource agencies use the survey results to develop programs and prepare descriptive information.
- Planning agencies use the survey information regarding water supplies and uses by States and water resource regions to evaluate ground water withdrawals and their depletions in major irrigation areas.
- Irrigation system manufacturers and related businesses use the data to monitor trends in equipment use, irrigation expansion, and other market production related activities.
- Land Grant Universities and other research organizations use the data to study irrigation technology development and adoption rates to promote agricultural productivity.

- Growers use the economic data to determine the feasibility of investing in irrigation systems. Examples of these data include investing in irrigation equipment, facilities, and land improvements; and figuring maintenance and repair expenditures of irrigation equipment and facilities.

Chapter 2 - Terms and Definitions

Survey Terms

Abnormal Farms

Abnormal farms include institutional, experimental, and university research farms. Institutional farms are those operated by hospitals, penitentiaries, churches, schools, and grazing associations. The only abnormal farms included in the survey universe were American Indian Reservations and Tribal Government operations. For these records the entire reservation acreage is to be included in the Irrigation and Water Management Survey questionnaire.

Acres and Quantity Harvested

In Sections 10, 12, and 13 of the Irrigation and Water Management Survey, if two or more crops were harvested from the same land during the same crop year, the acres should be counted for each crop. Therefore, the summed acres of all crops harvested may exceed the total acres of harvested cropland. The exception to this procedure is hay crops. When more than one cutting of hay was taken from the same acres, the acres are counted only once, but the quantity harvested includes hay from all cuttings. For interplanted crops or “skip-row” crops, acres are to be reported according to the portion of the field occupied by each crop.

Acre-Foot of Water

An acre-foot of water is the quantity of water required to cover 1 acre to a depth of 1 foot. This is equivalent to 43,560 cubic feet or approximately 325,851 gallons.

Acres Irrigated

Acres irrigated are the acres of agricultural land to which at least one application of water is artificially applied by controlled means including preplant, partial, supplemental, and semi-irrigation. Land flooded during high water periods is to be included as irrigation only if the water is diverted to agricultural land by dams, canals, or other works for the purpose of irrigating.

Backflow Prevention Devices

These are one-way valves designed to prevent water from returning to the ground water source when the pump is shut off. In the past it was considered a cost-saving device by irrigators. Today, the increased use of irrigation systems to apply chemicals (chemigation) is placing new importance on these devices. They are necessary to prevent ground water contamination from chemicals placed into

the irrigation system.

Cablegation

An automated furrow irrigation system in which the irrigation set moves at a slow constant rate across the field.

Chemigation

Chemigation is the process of applying an agricultural chemical (fertilizer or pesticide) to the soil or plant surface with an irrigation system by injecting the chemical into the irrigation water.

Crop Unit of Measurement

Respondents are instructed to report each crop in the same unit of measurement in all states. For example, corn for grain or seed is reported in bushels and rice is reported in hundredweight.

Cropland Harvested

Cropland harvested is land from which crops are harvested or hay is cut. This includes acres of land in bearing and nonbearing orchards - citrus or other groves vineyards, berries, Christmas trees, short rotation woody crops, nursery crops, greenhouse crops, and nut trees regardless of whether the crop was harvested or failed. However, abandoned orchards are to be reported as cropland not harvested or grazed (Section 2, item 1c).

If a field crop was planted but not harvested, the acreage is not to be reported as harvested. These acres are to be reported in Section 2, item 1c, Cropland not harvested or grazed. Land from which two or more crops are harvested is counted only once in Section 2, even though there is more than one use of the land.

Cropland Not Harvested or Grazed

This land use category includes cover crops, soil-improvement crops, land on which all crops failed, summer fallow, idle cropland, and land planted in crops that are to be harvested after the survey year such as sugarcane and pineapples.

Cropland Used Only for Pasture or Grazing

This is reported as Other Pasture and Grazing Land in Section 2, item 2c. This is land that was used only for pasture or grazing that could have been used for crops without additional improvement. Also include all cropland used for rotation pasture and land in government conservation programs that is pastured. However, cropland that was pastured before or after crops are harvested should be included as harvested cropland rather than cropland for pasture or grazing.

Depth to Bowls or Impellers

This is the location of the pump within the well. The unit of measurement is nearest whole Feet.

Depth to Water

The depth to the level of the water within the well. This is dependent upon the water table and not the depth of the well. Depth to water varies throughout the season as pumps draw water from the well. The water depth is usually highest in the spring. The unit of measurement is nearest whole Feet.

Depth of Well

This is the depth to the bottom of the well and should not be confused with depth to water. The unit of measurement is nearest whole Feet.

Drip, Trickle, or Low-Flow Micro Irrigation

This is a low pressure method of delivering water below the crop canopy by using small plastic drip tubing, micro sprinklers, or underground tape. The tapes may have small openings allowing water to drip out at the root zone. These are usually permanent installations and are not easily moved. They are most common in vegetable and fruit crops.

Equipped Acres

Land that has irrigation infrastructure in place and the potential to be irrigated regardless of water rights and/or availability.

Flowing or Artesian Wells

Flowing or artesian wells are wells which flow freely and provide water used for irrigation without being pumped from the ground. These wells are most common in Florida and some western states. Pumps may be used to distribute water through the irrigation system. Often an artesian well will provide water to a pond or other holding structure from which it is pumped. All flowing or artesian wells are excluded from pumping data in Section 3, item 5. Any pumps for these systems are reported in Section 6.

Gravity Irrigation

This is the practice of irrigating crops by allowing water to flow into or across a field using only gravity to distribute the water. Water can either be directed down furrows, as is common with row crops, or can flood the field as is done with some pasture and rangeland. The water is usually from a surface source and is delivered to the farm by canals and controlled by gates.

GPM

This is an abbreviation for gallons per minute.

Groundwater

This is water from a well or wells located on this operation.

Hydroponics

Hydroponics is the technique of growing plants using a water-based nutrient solution rather than soil, and can include an aggregate substrate, or growing media, such as vermiculite, coconut coir, or perlite.

Irrigated Farms

Irrigated farms or ranches are those with any agricultural land irrigated in the specified calendar year. The acreage irrigated may vary from a very small portion of the total acreage in the farm or ranch to irrigation of all agricultural land in the farm or ranch.

Land in Farms

Acreage designated “land in farms” consists primarily of agricultural land used for crops, pasture, or grazing. It includes woodland and wasteland not actually under cultivation or used for pasture or grazing, provided it was part of the farm’s total operation. Land in farms is an operating unit concept that includes land owned and operated as well as land rented from others. Land used rent free is to be reported as land rented from others. All grazing land, except land used under government permits on a per-head basis, is included as “land in farms” provided it is part of a farm or ranch.

Laser (Precision) Leveling

For even distribution of gravity irrigation the field needs to be level. Laser leveling is a method of leveling a field by sighting on a laser and using it as a level. Zero grade means the field is perfectly level from one end to the other.

On-Farm Surface Supply

On-farm surface supply is water from a surface source not controlled by a water supply organization. It includes sources such as streams, drainage ditches, lakes, ponds, tailwater pits, and reservoirs on the operated land.

Off-Farm Water Supply

Off-farm water supply is water from off-farm water suppliers, such as the U.S. Bureau of Reclamation; irrigation districts; towns; mutual, private, cooperative, canals, or neighborhood ditches; commercial companies; or community water systems and would include off-farm supplied reclaimed water.

Other Land, All

Other land includes land in house lots, barn lots, ponds, roads, and wasteland.

PSI

An abbreviation for pounds per square inch. A unit measuring force per unit area.

Recharge - the practice of purposefully increasing the amount of water that enters an aquifer through human-controlled means. For example, groundwater can be artificially recharged by redirecting water across the land surface through canals, infiltration basins, or ponds; adding irrigation furrows or sprinkler systems; or simply injecting water directly into the subsurface through injection wells.

Reclaimed Water

Wastewater that has been treated for non-potable reuse purposes. Includes any reclaimed water used from livestock operations or from off-farm wastewater sources such as a municipal or industrial wastewater.

Recycled Water

The reuse of surface or groundwater for irrigation that has already been used to irrigate a crop on the operation (i.e. water recycled from a tailwater reuse pit). This is an on-farm source of irrigation water.

Seepage

This is maintenance of a water table at a predetermined depth below the field surface by using ditches, pipes, or sub-surface drains and water-control structures. This is generally controlled by gravity but in rare cases could be implemented by an underground piping system. If it is a gravity system, the water must be distributed to the field by dams, canals, or other man-made irrigation works. Lateral movement of water through the soil provides water to the crop root zone. Conditions for use of this system are limited. Land must be flat and suitable for rapid lateral water movement.

Sprinkler Irrigation

Sprinkler irrigation is divided into four pressure categories: 1) high pressure delivery, which has water at 60 psi or greater; 2) medium pressure delivery, which has water at 30 to 59 psi; 3) low pressure delivery, which is any system that uses water at 15 to 29 psi; and 4) very low pressure delivery, which is any system that uses water at less than 15 psi.

Center-pivot irrigation, also called water-wheel and circle irrigation, is a method

of crop irrigation in which equipment rotates around a pivot and crops are watered with sprinklers. The mechanical-move systems are classified as either linear or wheel move systems. These are self-mobile systems that cross fields under their own power. Hand move systems are small systems requiring manual labor to be moved. They are most often found in small horticulture or vegetable operations.

Surge-Flow Irrigation

The intentional application of water to furrows or borders creating a series of on and off periods of constant or variable time spans.

Tailwater

Tailwater is the water that is captured after an irrigation application. It may be captured through ditches or drain tile. It is returned directly to the irrigation system or held in pits to be pumped out and recycled later.

Water-Soluble Polyacrylamide (PAM)

PAM is an environmentally safe industrial flocculent widely used in municipal water treatment, paper manufacturing, food processing and other sensitive applications. Polyacrylamide treatment of irrigation water is one of the fastest growing conservation technologies in irrigated agriculture. Furrow irrigation-induced erosion is nearly eliminated by small additions of water-soluble polyacrylamide (PAM) to irrigation water

Woodland

Woodland includes natural or planted woodlots or timber tracts, cutover and deforested land with young growth which has or will have value for wood products, or is pastured, except for Christmas tree production or land for short rotation woody crops. Land covered by sagebrush or mesquite is to be reported as other pastureland and rangeland or other land.

Types of Pressure Irrigation Systems and Codes

The codes listed below are used in Section 11 of the questionnaire.

Hand-Move System

(Code 01)

Portable pipe system, usually aluminum pipe, which must be moved by hand one or more times per day during irrigation periods. Irrigation requirements of the field are met by successive moves of the system to water one strip of the field at a time (an irrigation set). The system's sprinklers can use a variety of orifice sizes and configurations. The system may be adapted to most soil types, topography, field size and shapes; however, it is not suited for all crops since tall crops, such

as corn, hinder pipe movement. The sprinkler line(s) are served water by mainlines of aluminum or PVC that may be buried or above ground.

Solid Set or Permanent System

(Code 02)

A buried pipe system with only the risers and sprinklers above ground, or a portable pipe system which is placed in the field at the start of the irrigation season and left in place to the season end. Both of these system types require no labor to move the system to a new location for the irrigation season. This system may be adapted to most crops, soil types, topography, field sizes and shapes.

Side-roll or Wheel-Line System

(Code 03)

A wheel-move, lateral-line system which moves as a unit in fixed increments (irrigation sets) across the field. Some variations of the system may have tow lines trailing the main lateral line with additional sprinklers on each tow line. Tow line systems irrigate a wider strip at each set, up to 180 feet compared to the 60-foot strip of standard side-roll systems. The system is designed for reasonably flat, rectangular or square fields and is suited to crops less than 4 feet in height. The sprinkler may use flexible hose, aluminum pipe, or PVC pipe to connect to mainlines (above or below ground) or on-site pressurization pumps.

End-Tow Sprinkler System

INCLUDE as a side-roll system (Code 03)

Wheel or skid, lateral-line system which is end-towed via tractor or utility vehicle to new locations in the field. The system is stationary while irrigation is taking place. Designed for hay and pasture irrigation, the system may be used on some row crops and orchards.

Carousel Sprinkler-Traveler System

INCLUDE as a side-roll system (Code 03).

Wheel-mounted system with a rotating boom that sprinkles or sprays water. The system may be self-propelled with a mounted engine or towed via pick-up or tractor to the next field location (irrigation set). Water is supplied to the system by hose or supply ditch.

Big Gun System

(Code 04)

A single, large gun-type sprinkler mounted on a trailer, carriage, or skid. Water is supplied to the sprinkler through a flexible hose. The mounted gun sprinkler is either pulled or moved across a field using a self-propelled drive system for each irrigation set. An irrigation set is the area of the field that is irrigated by the gun sprinkler as it moves across the field. When an irrigation set is completed, the

entire system is moved and the process repeated. The system is designed for straight rows, flat topography, and medium to high infiltration soils. It is best suited for crops that can withstand heavy bursts of water. Systems are high pressure, greater than 60 psi. There are three specialty-type big-gun systems, covered in further detail below: self-propelled gun traveler system, a reel-type hose pull system, and a reel-type cable pull system.

Self-Propelled Gun Traveler

INCLUDE as a big gun system (Code 04).

Single, large gun on a four-wheel trailer. Self propelled by a separate engine or a hydraulic continuous move. Water is supplied through a flexible hose. Systems are generally high pressure, greater than 60 psi.

Reel-Type Hose Pull

INCLUDE as a big gun system (Code 04).

Single, large gun-type sprinkler on a carriage. A flexible, but non-collapsible hose is attached to a large reel at one end of the field. The carriage and sprinkler are attached to the unrolled hose and stationed at the other end of the field. Water movement through the hose activates a drive system that rolls the hose on the reel, drawing the sprinkler and carriage across the field. When an irrigation set is completed, the reel, sprinkler, and carriage may be moved and the process repeated. Systems are generally high pressure, greater than 60 psi.

Reel-Type Cable Pull

INCLUDE as a big gun system (Code 04).

Similar to hose-pull system, except a cable is used to reel the gun-type sprinkler and carriage across the field. This enables a flexible, collapsible hose to be pulled behind the carriage. When an irrigation set is completed, the cable, reel, hose, sprinkler, and carriage may be moved and the process repeated. The system often requires a grass strip on which to operate since the hose is pulled behind the unit. Systems are generally high pressure, greater than 60 psi.

Linear Move and Center Pivot Systems – General Discussion

There are many types of irrigation systems, but most farmers have limited choices for their farm or field. Some systems are inherently more water and energy efficient while others are designed to overcome limitations such as irregular field shapes, sloping land, or limited water supplies. All of these factors should be considered before an operator selects a particular type of system. The center pivot and linear- move type irrigation systems are usually the most practical system for irrigating large, rectangular or regular shaped fields.

Linear Move System

Self-propelled, continuous-move sprinkler system that travels laterally (linear move) across a field. The linear move machine can best be described as an adaptation of the center pivot. But instead of moving in a circle, the linear system moves in a straight line through the field, generally at right angles to the row direction. Linear move machines use spray nozzles or low pressure impact sprinklers. The linear move machine is designed to be used on a rectangular field. An ideal field layout allows a travel distance which is two to three times the length of the machine. Shorter travel distances increase the cost of owning the machine, making it economically feasible only for high cash value crops. The linear move machine can have water supplied at any convenient place along the length of the lateral line. Water is delivered by hose or supply ditch for lateral move systems.

PSI Less than 15

Use code 05 for linear move systems that are powered with less than 15 pounds per square inch (PSI).

PSI 15 - 29

Use code 06 for linear move systems that are powered with at least 15 pounds per square inch (PSI) but less than 29.

PSI 30 - 59

Use code 07 for linear move systems that are powered with at least 30 pounds per square inch (PSI) but less than 60.

PSI 60 and Above

Use code 08 for linear move systems that are powered with at least 60 pounds per square inch (PSI) or more.

Center Pivot System

The center pivot is a self-propelled continuous move machine that rotates around a central pivot point. The propulsion system may be oil hydraulic, water hydraulic, or electric. Pivots are available as low, medium and high pressure units. This refers to the sprinkler or spray nozzle operating pressure. The early pivots were high pressure units with typical sprinkler pressures of 70 to 90 psi. Later, smaller rotary impact sprinklers were used and pressures were reduced to 40 to 60 psi, with a booster pump for the end gun. Also, low pressure spray nozzles can operate at pressures as low as 10 to 15 psi.

PSI less than 15

Use code 09 for center pivot systems that are powered with less than 15 pounds

per square inch (PSI).

PSI 15 - 29

Use code 10 for center pivot systems that are powered with at least 15 pounds per square inch (PSI) but less than 29.

PSI 30 - 59

Use code 11 for center pivot systems that are powered with at least 30 pounds per square inch (PSI) but less than 60.

PSI 60 and Above

Use code 12 for center pivot systems that are powered with at least 60 pounds per square inch (PSI) or more.

Low-flow Irrigation System (Drip, Trickle, Micro Sprinkler)

(Code 13)

Low-pressure systems are designed for frequent water applications using small-diameter tubing and low-volume emitters to distribute water directly to the crop root zone. Tubing and emitters can be installed below ground, under plastic or mulch, or above ground. Alternatively, tubing may be installed below ground with emitters on risers above ground. These systems are used primarily on trees, vines, and vegetable crops, and are in limited use on field crops due to the high initial capital costs. Drip and trickle systems have been adapted to all crop types; micro-sprinklers are generally used on perennial crops where a larger irrigated area is needed to encourage root development. These systems are adaptable to most soils and may be used on topography where slope prevents irrigation from other system types.

Other Pressure System

(Code 14)

Include any other pressure system that does not fit into the categories listed. Hydroponic systems should be included here.

Types of Gravity-Flow Irrigation Systems and Codes

The codes listed below are used in Section 11 of the questionnaire.

Down Rows or Furrows with Unlined Ditches

(Code 15)

This distribution method from unlined ditches may use siphon tubes, ditch portals or ditch gate openings with covers, or tubular openings closed with a gate. The water may go directly to the furrows or the water may be distributed across the

head of the field then down furrows.

Siphon tubes are curved to fit over the ditch bank and most are 1 to 3 inches in diameter and 3 to 5 feet in length. A portal or ditch-gate system uses openings in the ditch bank, either portals with covers or tubular openings closed with a gate, to discharge water onto a field from an unlined ditch across the head of the field. Portals in the ditch bank can be of any diameter and are covered with a metal, plastic, or wood cover to regulate water flow onto the field. Ditch openings can be any size, including openings for the entire flow of the ditch, and water-flow control gates can be made of wood, metal, plastic, or canvas.

Down Rows or Furrows with Lined Ditches

(Code 16)

Same distribution options as for Code 15 except the ditch may be lined with concrete, plastic, clay, or other nonporous material. The ditch is permanent and is reused each year.

Down Rows or Furrows from Poly Pipe, Lay-Flat Tubing, or Above Ground or Underground Pipe

(Code 17)

Poly-Pipe or Lay-Flat Tubing System uses a flexible, collapsible, plastic (polyethylene) tube up to 18 inches in diameter. The poly-tubing is unrolled along the head of the field and holes punched or closeable gates installed to match furrow, border, or dike width. A well or supply canal provides water to the tube. The tube is installed at the beginning of the irrigation season, and since it lays flat when not in use, can remain in the field the entire season. The tubing may be reused for more than one year, but single season use is most common.

A Gated-Pipe System uses rigid PVC plastic or aluminum pipe with manually operated closeable gates at regular intervals. The pipe is installed at the head of the field but may need to be removed or moved to new field locations through the season. The gates usually match row widths so water can flow directly into rows.

The pipe is reused for many years. Note: Gated-pipe systems may also be used for flood irrigation, Code 19 or 20. So as you determine the correct code with the respondent you must differentiate whether the method is down rows and furrows versus flood irrigation.

Improved Gated-Pipe System (Surge Flow or Cablegation) uses rigid PVC plastic or aluminum pipe with manually operated closeable gates at regular intervals, but with an automated water-control system. Automated water control is achieved by (1) using a surge valve to alternate pipe sets receiving water, (2) using a moveable plug inside the gated pipe, controlled by a cable, to adjust the water flow from open gates, or (3) other automated methods using the gated pipe to control water

flow and improve the uniformity of water applications, such as pneumatically controlled bladders to regulate water flow on individual gates. Gated pipe is installed across the head of the field but may need to be removed or moved to new field locations through the season. The gates usually match row widths so water can flow directly into rows. Improved gated pipe is very unlikely to be used for flood irrigation. The system is designed to efficiently distribute water down furrows or rows. This efficiency of the improved gated-pipe system is not achieved with flood irrigation. The pipe is reused for many years.

Controlled Flooding Within the Field Borders from Unlined Ditches

(Code 18)

This distribution method from unlined ditches may use siphon tubes, ditch portals or ditch gate openings with a cover, or tubular openings closed with a gate. The water may go directly to the furrows or the water may be distributed across the head of the field then down furrows.

Siphon tubes are curved to fit over the ditch bank and most range 1 to 3 inches in diameter and 3 to 5 feet in length. A portal or ditch-gate system uses openings in the ditch bank, either portals with covers or tubular openings closed with a gate, to discharge water onto a field from an unlined ditch across the head of the field. Portals in the ditch bank can be of any diameter and are covered with a metal, plastic, or wood cover to regulate water flow onto the field. Ditch openings can be any size, including openings for the entire flow of the ditch, and water-flow control gates can be made of wood, metal, plastic, or canvas.

Controlled Flooding Within the Field Borders from Lined Ditches

(Code 19)

Same distribution options as for Code 18 except the ditch may be lined with concrete, plastic, clay, or other nonporous material. The ditch is permanent and is reused each year.

Controlled Flooding Within the Field Borders from Poly Pipe, Lay-Flat Tubing, or Above Ground Pipe (Code 20)

Poly-Pipe or Lay-Flat Tubing System uses a flexible, collapsible, plastic (polyethylene) tube up to 18 inches in diameter. The poly-tubing is unrolled along the head of the field and holes punched or closeable gates installed to match furrow, border, or dike width. A well or supply canal provides water to the tube which is installed at the beginning of the irrigation season, and since it lays flat when not in use, can remain in the field the entire season. The tubing may be reused for more than one year, but single season use is most common.

A Gated-Pipe System uses rigid PVC plastic or aluminum pipe with manually

operated closeable gates at regular intervals. The pipe is installed at the head of the field but may need to be removed or moved to new field locations through the season. The gates usually match row widths so water can flow directly into rows.

The pipe is reused for many years. Note: Gated-pipe systems may also be used for down row furrows, Code 17. So, as you determine the correct code with the respondent you must differentiate whether the method is down rows and furrows versus flood irrigation.

Controlled flooding may also use open or controlled discharge from an above ground pipe. There may be, depending on the size of the field, only one point or several points of discharge into the field. To flood within the field borders this system is used in conjunction with levees or dikes to maintain an even water depth throughout the field. The water remains on the soil until irrigation needs are met, at which time the water is either drained from the field or allowed to infiltrate the soil. Land forming is often required with this system.

Controlled Flooding Within the Field Borders from Underground Pipe (Code 21)

Controlled flooding may also use open or controlled discharge from underground pipe. There may be, depending on the size of the field, only one point or several points of discharge into the field. The discharge may be controlled by manual or electronically controlled valves. To flood within the field borders, this system is used in conjunction with levees or dikes to maintain an even water depth throughout the field. The water remains on the soil until irrigation needs are met, at which time the water is either drained from the field or allowed to infiltrate the soil. Land forming is often required with this system.

Uncontrolled Flooding Including Open Discharge from a Well or Pump (Code 22)

This practice does not have field borders, levees, or dikes to retain the water within the border of the field or at a specific depth. This method is generally used for pastureland, rangeland, or hay production. The water source may be from open canals, ditches, or from open discharge from a well or other pump.

Water Resource Regions (WRR)

Data from the Irrigation and Water Management Survey are tabulated by WRR. These areas are essentially the same as the water resource regions as delineated and defined by the U.S. Water Resources Council. The areas differ somewhat from the Water Resource Regions because of the method used for boundary delineation. Regional boundaries are delineated on the basis of topographic drainage characteristics; whereas WRR areas are delineated on the basis of county

boundaries which approximate actual drainage-basin boundaries. Geographic descriptions of the Water Resource Regions are listed below.

01 New England Region - The drainage within the United States that ultimately discharges into the Bay of Fundy and the Atlantic Ocean. These points of discharge are located within and between Maine and Connecticut and Long Island Sound and the St. Francis River, a tributary of the St. Lawrence River.

02 Mid-Atlantic Region - The drainage within the United States that ultimately discharges into the Atlantic Ocean whose point of discharge is located within and between New York and Virginia, and the Richelieu River, a tributary of the St. Lawrence River.

03 South Atlantic-Gulf Region - The drainage that ultimately discharges into the Atlantic Ocean whose point of discharge is located within and between North Carolina, Florida, and the Gulf of Mexico, whose point of discharge is located within and between Florida and Mississippi, including the Pearl River.

04 Great Lakes Region - The drainage within the United States that discharges into the Great Lakes system, including the Lakes' surfaces and the St. Lawrence River as far east as, but excluding, the Richelieu River.

05 Ohio Region - The drainage of the Ohio River, excluding that of the Tennessee River.

06 Tennessee Region - The drainage of the Tennessee River.

07 Upper Mississippi Region - The drainage of the Mississippi River above the mouth of the Ohio River, but excluding the drainage of the Missouri River above a point immediately below the mouth of the Gasconade River.

08 Lower Mississippi River - The drainage of the Mississippi River below the mouth of the Ohio River, but excluding the drainage of the Arkansas, White, and Red Rivers and above the points of highest backwater affects of the Mississippi River in those parts. Also included are the coastal streams, other than the Mississippi River, that discharge into the Gulf of Mexico from the boundaries of, but excluding, the Pearl and Sabine Rivers.

09 Souris-Red-Rainy Region - The drainage within the United States of the Souris, Red, and Rainy Rivers.

10 Missouri Region - The drainage within the United States of the Missouri River above a point immediately below the mouth of the Gasconade River and the

Saskatchewan River.

11 Arkansas-White-Red Region - The drainage of the Arkansas River above the point of highest backwater affect of the Mississippi River, the Red River above the point of highest backwater affect of the Mississippi River, and the White River above the point of highest backwater affect of the Mississippi River near Peach Orchard Bluff, Arkansas.

12 Texas-Gulf Region - The drainage that discharges into the Gulf of Mexico from and including Sabine Pass to, but excluding, the Rio Grande and the Lower Rio Grande Valley.

13 Rio Grande Region - The drainage within the United States of the Rio Grande which includes the San Luis Valley, North Plains, San Augustine Plains, Mimbreas, Estancia Jonado del Muerto, Tularosa, Salt, and various smaller closed basins, and the Lower Rio Grande Valley.

14 Upper Colorado Region - The drainage of the Colorado River above the Lee Ferry Compact Point which is about one mile below the mouth of the Paria River and the Great Divide closed basin.

15 Lower Colorado Region - The drainage within the United States of the Colorado River below the Lee Ferry Compact Point which is about one mile below the mouth of the Paria River, the Rios Yaqui, Magdalena, Sonoita, and other lesser streams that ultimately discharge into the Gulf of California. Also includes the drainage of the Colorado River that discharges into the Animas Valley, Wilcox Playa El Dorado Valley, and other smaller closed basins.

16 Great Basin Region - The drainage of the Great Basin that ultimately discharges into Utah and Nevada.

17 Pacific-Northwest Region - The drainage within the United States that ultimately discharges into the Straits of Georgia and Juan de Fuca and the Pacific Ocean. The point of discharge is within Washington and Oregon, including the Columbia River.

18 California Region - The drainage within the United States that ultimately discharges into the Pacific Ocean, whose point of discharge is within California which includes the Central Valley and that portion of the Great Basin and other closed basins in California.

19 Alaska

20 Hawaii

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Chapter 3 - Survey Procedures

This chapter describes materials and procedures for conducting interviews, guidelines for completing questionnaires, and instructions for turning in completed work. The NASDA Enumerator Handbook covers administrative matters. The handbook is available at:

<https://www.nasda.org/nass>

You may receive the following from your Regional Field Office:

- Copies of pre-survey publicity materials mailed to each respondent
- Blank questionnaires with labels identifying assigned operations
- Extra questionnaires without labels
- Envelopes for mailing completed questionnaires

You should already have these items on hand:

- iPad
- iPad Charger
- Interviewer's Manual (digitally available)
- Highway and street maps
- Black lead pencils
- Name tag
- NASDA Identification Card
- NASDA Enumerator Handbook
- Calculator

Supervision and Quality Control

Your supervisor may set up an appointment to meet with you early in the survey. This visit will help you get off to a good start by spending time reviewing a few of your completed interviews. Hold all your completed work until this review takes place unless your supervisor tells you to do otherwise.

Planning Your Work

The operator and/or operation name, mailing address, and ID number are on the questionnaire label and CAPI assignment listing. The Field Office may provide other information, either on the label, CAPI system, or on a separate form that might be helpful to you in finding the selected operation.

It is suggested you map the locations of your assignment to work efficiently. This can be done in CAPI or by marking the location of each operation assigned to you on a highway map before you start to interview. Show the location by a small circle with the ID number written beside it. Use the map to plan your daily travel; this will help keep travel expenses down and save time.

You may need to ask the Post Office or Farm Service Agency employees for directions to some operations. Try to do this early in the survey so you can work efficiently with your entire assignment. Tell your supervisor about any operator whose home or office you cannot find.

Interview and Call Back Procedures

Interview the farm operator, if possible, because information collected from other people may be less accurate. If the operator says someone else is more knowledgeable, interview that person.

Generally, you can contact the operator and complete the interview on the first attempt; but occasionally, you may need to make one or more callbacks. Plan each follow-up attempt to arrive at a different time of day. The following instructions are a guide.

1. First Attempt

If the farm operator is not present but is expected shortly, wait for the interview. If the operator is extremely busy, set up an appointment. It is very important to keep the appointment or call back if it cannot be kept.

Make notes of observations or any information learned while trying to contact the operator. This information will be useful if you are unable to contact the operator on a later visit.

If the operator is not available until after the survey is over, interview a well-informed person such as the spouse, partner, adult child, or hired person. Try to interview the person most knowledgeable about the farming operation.

2. Second Attempt

If a second attempt is required, try again to interview the operator by setting up an appointment. If you cannot meet with the operator, interview a well-informed person associated with the operation.

After completing each interview, be sure to review the questionnaire while the interview is still fresh in your mind. Make sure you recorded all answers correctly and the questionnaire is complete. Check your calculations. Make sure all notes are clear.

Respondent Burden

You will reduce the burden on the respondent if you are thoroughly familiar with the questionnaire and instructions. Pay close attention to skip instructions in the questionnaire to avoid asking questions that are not needed. When skip instructions are not printed after an item, you will continue with the next item.

Also, be aware of the estimate of average completion time in the Burden Statement. The estimated average completion time is based on experience with previous Irrigation and Water Management surveys, pretest, and the judgments of NASS and the Office of Management and Budget (OMB). OMB is an agency that approves all surveys conducted by the Federal government. The expected average interview length for the Irrigation and Water Management Survey is 60 minutes. The burden statement is printed on the face page of the questionnaire.

Respondents often ask, “How long will this survey take?” Enumerators should note the burden statement average time requirement and never directly contradict it. However, enumerators may provide additional information such as:

“The official average for this survey is 60 minutes, but interviews I have been conducting in this area are averaging around 30 minutes.”

Refusals

Most people you contact cooperate and furnish the needed information. The Irrigation and Water Management Survey is required by law. However, there are always a few people who are reluctant to provide information. It is important to be courteous and friendly. Make a diligent effort to obtain the respondent's cooperation by explaining the purpose of the survey, confidentiality of the data, and the need for accurate agricultural statistics. The NASDA Employee Handbook explains why reports issued from these surveys are important and suggests ways the respondent might use the reports to make decisions.

If a respondent refuses to report, note it on the questionnaire and proceed to the next respondent.

Important: Do not spy or deceptively try to obtain data, as this can hurt cooperation with other respondents in the area. Do not interview hired workers or other family members after the operator has refused.

Don't become discouraged if you get a refusal. Some people won't talk to anyone, and experience tells us most refusals are from operators caught at a bad time for a survey or interview. On your next interview, continue to meet people with ease and friendliness.

Computer Assisted Personal Interview (CAPI)

The Computer Assisted Personal Interview (CAPI) is used to collect respondents' data utilizing your iPad. CAPI will be used for the 2023 Irrigation and Water Management Survey data collection.

Questionnaire

There is only one questionnaire version. Sections of the questionnaire are identified by number and title. For example, Section 2 is "Land in 2023." Chapter 5 of this manual discusses the questionnaire sections.

Completing the Questionnaire

Make all entries clear and easy to read. The Irrigation and Water Management Survey questionnaire is designed for mail data collection. The electronic version of the questionnaire, which is available to the respondents via www.agcounts.usda.gov and on the CAPI instruments will have a slightly different look and flow, but the content will be the same.

Boxes or Entry Cells (item code boxes)

Answers must be written entirely within the box or space provided (including YES and NO check boxes) and properly located in relation to preprinted decimals and zeros. If the answer to a question is NONE, check the “None” box. A zero may be mistaken for a “6.” Write all numbers clearly so a 3 and 5 are not confused, or a 1 and a 7 are not confused.

Respondent/Enumerator Instructions

Since the questionnaire is designed to be self-administered, it is necessary to provide the respondents with instructions throughout the questionnaire. It is important that the respondent is made aware of these instructions. Here are a few examples:

1. Statements sometimes are used at the beginning of a section that include definitions and instructions about the next questions. The respondent must be made aware of this information.

Report the energy expense by power source. Report the fuel used and power expense for pumping irrigation water for the pumps reported above. Report energy expense for acres in the open and area under protection. If both exist for a single energy source, report their combined expenses. Include the cost of any additional charges such as the fuel adjustment charge or any other type of charge which was based on the amount of power or fuel purchased. Include landlord's share. If irrigated acres in the open were less than one acre, round to one acre.

2. An example of instructions that require action by the respondent/enumerator is listed below.

	Total Acres on this Operation	Total Acres with Access to Irrigation Systems or Equipment	Total Acres Irrigated
	BOX B	BOX C	BOX D
TOTAL ACRES – Add acres in each column and enter the totals	0041	1133	0042
(BOX B above should be the same as BOX A on page 1.)			

In the sample instructions you are told to add the column of numbers. These instructions should not be read to the respondent.

2023 Irrigation and Water Management Survey

Interviewer's Manual

- Prompts, "includes and excludes," and other instructions for respondents help you and the respondent when a question arises as to the intent or meaning of the question. Read these when needed to clarify the meaning of the question.

Did this operation irrigate with off-farm water in 2023?

INCLUDE

- acres in the open and area under protection irrigated with off-farm water from all suppliers
- all off-farm surface water, municipal (such as town or city) water, and rural water suppliers
- area irrigated with reclaimed water from off-farm sources such as treated municipal sewer water (blue water), industrial, off-farm livestock operations, or other off-farm sources

0457 1 Yes - Continue 3 No - Go to Section 6

- Always ask the next question, unless instructed to do otherwise with a skip instruction.

Did this operation irrigate any fields in the open in 2023?

- Include acres of horticultural crops grown in the open or under natural shade.
- Exclude crops grown under protection: glass, rigid plastic, plastic film, including "tunnel" protection. (Methods for crops grown under protection will be reported in Section 13.)

0489 1 Yes - Continue 3 No - Go to Section 13

- Make notes about answers outside of expected ranges. Any notes you provide should be made outside of the answer cell. One example would be if the operation was irrigated many times due to drought. Your note provides an explanation to the reviewer when the questionnaire is received in the field office.

Acreage Entries

All entries should be in whole acres except where it is designated to report to the nearest tenth of an acre. If the total area irrigated in the open is less than one acre, report as one acre.

Report total acres and irrigated acres for nursery and other horticultural crops grown in the open (including natural shade)	None <input type="checkbox"/>	Acres in the Open			
		Total Acres		Irrigated Acres	
			Tenths		Tenths
		0737		0738	

Yes / No Check Boxes

If the respondent doesn't know if the answer is YES or NO, then record DK (don't know) next to the code box. If the respondent refuses to answer, then record "REFUSED" in notes outside the box. Most check boxes have a "GO TO" instruction associated with either the YES or NO answer. However, if there is no "GO TO" instruction, then continue to the next question.

Were any irrigated nursery or greenhouse crops, floriculture, mushrooms, vegetable seeds, propagative materials, or other horticultural crops grown under protection on this operation in 2023? Include crops grown under glass, rigid plastic, plastic film, shade cloth, fiberglass, "tunnel" protection, and hoop houses. Exclude crops temporarily covered for early germination, frost protection, etc. Report crops grown under natural shade in Section 12.

0627

1

Yes - Continue

3

No - Go to Section 14

Completed Questionnaires

Turn in your completed questionnaires according to the instructions you received from your supervisor. If you think the last few questionnaires you complete might not reach the Field Office before the final due date, call your supervisor.

Keep a record of when you completed each questionnaire and when you passed it on to your supervisor or mailed it to the Field Office. This will help the Field Office find survey materials if they are delayed.

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Chapter 4 - Screening

Face Page

Introduction

Before beginning data collection, develop an introduction you are comfortable using. In the introduction, include who you are, whom you represent, and the purpose of the visit. You should be familiar with the information in Chapter One of this manual.

Most operators have already been informed about the Irrigation and Water Management Survey through the pre-survey letter. They may also have read about the survey in the newspaper or farm magazine articles.

When making your introduction, remind the respondent that data they report will be kept strictly confidential. All information they provide will only be used to make state, regional, and national estimates.

Be prepared to answer questions the respondent may have about the purpose of the survey and uses of the data.

Identifying the Sampled Operation

The Irrigation and Water Management Survey is considered a follow-on to the 2022 Census of Agriculture. The operations sampled for this survey reported irrigation and/or irrigation equipment/expenses on the Census. The sample may contain records where the name identified on the label is associated with other operation(s). Each operation is sampled independently, therefore be sure you identify the correct operation to the respondent. Abnormal farms such as institutional, experimental, and research farms are excluded from the sample, except for American Indian Reservations and tribal government operations.

Target Operation and Address Verification

All questionnaires will have one label. The first thing you will do is verify the name and address for the target name.

Examples of common corrections are:

The diagram shows four examples of address verification corrections, each in a white box with a black border, set against a light orange background. Each example has a handwritten annotation above it with an arrow pointing to the correction.

- Example 1:** CRAIG BRADLEY
~~RR 1~~ 5 Elm Drive
RED OAKS YS 46725
- Example 2:** Middle name is Alan
MARK HAYES
RR 1 BOX 50
DEARCREEK YS 54670
- Example 3:** Bob isn't a partner
TOM ~~& BOB~~ SANDERS
TOM SANDERS
9295 OLD HWY 22
AMHERST YS 26477
- Example 4:** New manager: Dave Hagel
FLYING J RANCH
~~BOB R. ELLIOTT MGR~~
RR 2 BOX 99
EDNA YS 43212

If using CAPI, these corrections can be made on the address confirmation screens.

Out-of-Business Determination

If Section 1, item 4, (**Box A**) is zero, then the selected operation is considered to be out-of-business for the 2023 Irrigation and Water Management Survey. Therefore, the interview should be ended. Go to **SECTION 18** on the back page and complete.

Out-of-Scope Determination

If Section 2, item 5 is No, then the selected operation is considered to be out-of-scope for the 2023 Irrigation and Water Management Survey. However, the interview does not end before answering a few parts of the questionnaire beginning with **SECTION 16**.

Chapter 5 - Completing the Questionnaire

Overview

This section contains question-by-question instructions for every item in every section of the questionnaire.

General Instructions

The 2023 Irrigation and Water Management Survey is designed as a mailout/mailback survey. Therefore, most of the instructions for answering the questionnaire are contained on the questionnaire itself. Most of what an enumerator will need to know can be learned by reviewing the questionnaire. Instructions in this manual will provide more detail than is contained on the questionnaire to help the enumerator in dealing with unique situations not addressed on the questionnaire.

Please remember to check the “None” boxes where applicable, as this will aid in the review process.

Please note the need for consistency across items. For example, if the total acres of cropland harvested in Section 2, item 1a is greater than the sum of the individual crops harvested in Section 10, then further questioning of the respondent is necessary to verify if double cropping occurred. The need for these consistencies will be noted throughout the manual.

It is possible you may be assigned an operator who has never irrigated. The sample for this survey is based upon answers to the 2022 Census of Agriculture, and due to the large quantity of reports handled in the census, a few non-irrigators may have been reported as irrigators.

You may also have operators that irrigated land in 2022, but not in 2023. In both instances, it is important to answer Section 1, Section 2, and Section 16 even if the respondent did not irrigate in 2023.

If an operation stopped farming during 2023, complete the questionnaire for the portion of 2023 that was farmed. Record “Stopped farming in 2023” and the date the operator stopped farming below the address area.

Section 1 – Acreage in 2023

Report land owned, rented, or used by the target, spouse, partnership, corporation, or organization identified on the questionnaire. If the respondent did not operate any land in 2023, go to Section 18 on the back page and complete the remainder of the questionnaire. Include all land, regardless of location or use; cropland, pastureland, rangeland, woodland, idle land, greenhouses or other area under protection, Conservation Reserve Program (CRP), Wetlands Reserve Program (WRP), Farmable Wetlands Program (FWP), Conservation Reserve Enhancement Program (CREP), and house lots. All responses in this section should be rounded to whole acres. Area under protection less than one acre should be reported as one acre. Exclude land used under a grazing permit.

Item 1: All Land Owned

Includes all land owned in 2023 by the operation named on the questionnaire label, regardless of location. Include all fields and tracts of cropland, pastureland, woodland, wasteland, idle land, greenhouses or other area under protection, and farmsteads.

Item 2: All Land Rented or Leased From Others

Includes land worked by the respondent on shares, used rent free, used in exchange for services, for taxes, etc., even if used for part of the year. It also includes Federal, State, and railroad land. Do not include land used on a per head basis or animal unit month (AUM) under a grazing permit.

Item 3: All Land Rented or Leased to Others

Include land rented or leased to others for cash or a share of the crops or for free. Include land whether the target on the label owned the land or rented the land and subleased it to others.

Item 4: Total Acres

Report all land operated in 2023 by the operation named on the questionnaire label. Include all fields and tracts of cropland, greenhouses and other area under protection, pastureland, woodland, wasteland, idle land, and farmsteads. The acres in item 4, Box A, should equal item 1 plus item 2 minus item 3. It is important that this number is correct as it is used to establish consistency throughout the questionnaire. The acreage of this operation must equal the acreage reported in Section 2, item 4, column 1, Box B.

Section 2 – Land in 2023

Account for total acres in the target operation in column 1, acres with access to irrigation systems or equipment in column 2, and irrigated land in the target operation in column 3. If the same land had more than one use in 2023, report that land only once in the first use that applies. Irrigation refers to the one or more applications of water to land or crops by any artificial or controlled means.

In column 3, report any fully irrigated land or any land to which partial, supplemental, or semi-irrigation was applied. Also include any acreage which received only preplant irrigation (watered before planting). Hayland, pastureland or rangeland should be reported as irrigated if spring flood water was spread by man-made canals, ditches, spreader dikes, pipes, or other water works. Include acres where lagoon wastewater from livestock operations was distributed by a sprinkler or flood system.

For conservation program land, if the operator was allowed to cut conservation program land for hay, then this land should be considered cropland harvested; if it was grazed it is other pasture and grazing land. Except for disaster designation uses, almost all conservation program land will be reported in item 1c, cropland not harvested or grazed.

Item 1: Cropland

Item 1a: Cropland Harvested in the Open

Include as cropland harvested in the open: field crops, hay and forage, land in vegetables, citrus groves, vineyards, berries, nuts, orchards, Christmas trees (whether harvested in 2023 or not), short rotation woody crops, nursery and other horticultural crops such as bedding and garden plants, nursery stock, and propagative materials.

For winter wheat, report the 2023 acres harvested.

For double cropped acres if more than one crop was harvested from the same land in 2023, report those acres only once as cropland harvested.

Item 1b: Nursery, Greenhouse, and Other Horticulture Under Protection

Include as nursery, greenhouse, and other horticulture under protection: crops grown under glass, rigid plastic, plastic film, shade cloth, fiberglass, “tunnel” protection, and hoop houses. Crops covered only temporarily, such as for frost

protection, to be further grown in the open should not be included for area under protection.

Item 1c: Cropland Not Harvested or Grazed

Include cropland used for cover crops, cropland on which all crops failed, idle cropland, cropland in summer fallow, and cropland in government programs, including conservation program land unless used for grazing, hay, or forage. Land on which sugarcane and pineapples were grown but not harvested in 2023, are reported here.

Item 2: Pasture

Item 2a: Permanent Pasture and Rangeland

This land use item includes pastureland and rangeland, other than woodland pasture or other pasture that could have been used for crops, normally used for pasture or grazing. It usually includes land referred to as meadow, prairie, or range and consists of various types of grasses, such as bunch grass, shortgrass, buffalo grass, bluestem, bluegrass, switch grass, etc. It also includes land predominantly covered with brush or browse. Pastureland or rangeland containing desert shrubs, sagebrush, mesquite, greasewood, mountain browse, salt brush, cactus, juniper, pinion, etc., are to be reported here. Also, include grazing lands that were improved by seeding, liming, fertilizing, irrigating, drainage, or controlling brush or weeds.

Item 2b: Woodland Pastured

Woodland includes natural or planted woodlots or timber tracts, cutover and deforested land with young growth which has or will have value for wood products, or is pastured, except for Christmas tree production. The woodland to be reported in this section provides little economic return to the landowner and has no reason to be irrigated. If a respondent reports irrigation for woodland it is necessary to probe as to whether it should be reported as permanent pasture or other pasture.

Item 2c: Other Pasture and Grazing Land

Include any pastured land other than cropland and woodland pastured. Include rotation pasture and grazing land that could have been used for crops without additional improvements.

Item 3: All Other Land

Include any land that does not fit into one of the prior categories. Include land in roads, buildings, farmsteads, ponds, lakes, woodland not pastured, and wasteland.

Item 4: Total Acres

This is sum of all land uses reported in items 1 through 3. Also, Box B acres must equal acres in the target operation reported in Section 1, item 4, Box A. **Anyone who irrigated any land in 2023 (box D is positive) should complete the entire questionnaire.**

Item 5: Any Area Irrigated in 2023

This question helps determine if this operation irrigated any area in the open or under protection in 2023 but forgot to report it in column 3. If Box D is positive, the answer to this question is 'Yes'. **If the operator did not irrigate any area in the open or under protection, check the 'No' box and go to Section 16 on Page 19.**

Section 3 – Ground Water From Wells

Sections 3, 4, and 5 could likely be the most difficult Sections to complete since many farmers and ranchers do not keep complete records of water usage. Receiving a best estimate from the respondent will be adequate. Each operator may have their own system for estimating water usage.

Water usage is published in acre-feet. This is the quantity of water needed to cover one acre to the depth of one foot, or 325,851 gallons. The questionnaire allows the respondent to report in whichever value is available. The range of answers to expect for average acre-feet per acre is from less than one acre-foot to six acre-feet. In 2018, the national average was 1.5 acre-feet per acre. When a respondent answers in gallons or inches per acre the computer system will convert these responses to acre-feet. Item 3 in these three sections asks for area under protection irrigated by the source of water, depending on the section, but not the amount of water applied. The respondent can report recycled and reclaimed water applied to area under protection in Sections 4 and 5, if any.

Item 1: Irrigate With Ground Water From Wells

Report if the target operation irrigated any land using ground water from wells at any time during 2023. Ground water is water from a well or wells located on the

target operation. If ground water from wells was used, check “YES” and then continue. If no wells were used to supply ground water for irrigation on the target operation in 2023, then check the “NO” box and go to Section 4. If the respondent used municipal or rural water supplies, and the respondent knows that the water originated from wells, report the data in Section 5.

Item 2: Acres in the Open Irrigated With Ground Water and the Amount Applied

Report acres in the open irrigated with ground water from wells and the estimated quantity of ground water used in one of the following units:

- 1) total acre-feet;
- 2) total gallons; or
- 3) average inches applied per acre

Item 3: Area Under Protection Irrigated with Ground Water

Report the area under protection irrigated with ground water in square feet. Report the area only once, regardless of how many crops were grown for sale from the same area.

Item 4: Number of Wells Used in 2023

Report the total number of wells used on this operation in 2023 for irrigation. Do not include a well if it was only used for farmstead water supply.

Item 4a: Use of Backflow Prevention Devices

Report the number of wells reported in item 4 above that used backflow prevention devices (check valves) in 2023. Report the number of acres and area under protection irrigated in 2023 with water pumped from wells with backflow prevention devices. Check the “none” box, if appropriate.

Item 4b: Wells with Flow Meters or Other Flow Measurement Devices

Report how many wells reported in item 4 above used flow meters or flow measuring devices. Report the number of acres and area under protection irrigated in 2023 with water from wells with flow measurement devices. Check the “none” box if appropriate.

Item 4c: Number of Free Flowing Wells

Report the number of free flowing (artesian) wells used in 2023. Free flowing wells do not require pumping the water to the surface. Water flows to the surface under natural pressure. These are most commonly found in Florida and some western states.

Item 5: Primary Wells Pumped in 2023

Report the characteristics for up to 3 primary wells pumped on this operation in 2023. Note: The 3 primary wells should include those wells with the greatest quantity of water pumped in 2023. Report the characteristics for each individual well even if these values are similar across wells. If less than 3 wells were pumped in 2023, then only report for those wells used. If a well is an open discharge well and the operating pressure is unknown, report the pressure as 20 pounds per square inch (PSI). Example: the respondent may pump the well as an open discharge into a cistern or pond to use as a supply for a pressurized system.

Item 5a: All Other Wells Pumped in 2023

If the target operator used more than 3 wells in 2023, then for all other wells (excluding the 3 primary wells), report the average value for well characteristics.

Item 6: Depth to Water for Wells Used on Operation

Change in depth to water is defined as a change in the depth of water from the well-head to the water table that has occurred over the last five years prior to 2023. Mark the choice that best describes the change in depth to water.

Section 4 – On-Farm Surface Water

On farm surface water is a water supply not controlled by a water supply organization and includes water from a stream, drainage ditch, lake, pond, spring, or reservoir on or adjacent to the target operator's farm. Include recycled water and on-farm reclaimed water. For this survey, recycled water is the reuse of irrigation water that was previously used to irrigate a crop on the operation. Reclaimed water is treated wastewater used for irrigation.

Item 1: Irrigate with On-Farm Surface Water

Report if the target operation irrigated any land using on-farm surface water at any time during 2023. If on-farm surface water was used, check "YES" and then continue. If no on-farm surface water was used for irrigation on the target operation in 2023, then check the "NO" box and go to Section 5.

Item 2: Acres in the Open Irrigated With On-Farm Surface Water and the Amount Applied

Report acres in the open on this operation irrigated with on-farm surface water and the estimated quantity used in one of the following units:

- 1) total acre-feet;
- 2) total gallons; or
- 3) average inches applied per acre

Item 3: Area Under Protection Irrigated with On-Farm Surface Water

Report the total area under protection irrigated with on-farm surface water in square feet. Report the area only once, regardless of how many crops were grown for sale from the same area.

Item 4: Recycled Water Use

Report whether this operation used recycled water to irrigate any crops in 2023. Irrigators may have furrows or a drain filed that collects the excess irrigation water for reuse in a tailwater pond. This is a common method to recycle water.

Item 4a: Area Irrigated with On-Farm Recycled Water

Report the area on which one or more applications of recycled water for irrigation were made in 2023. Report the acres only once even if multiple applications were made to the same acreage.

Item 5: Reclaimed Water Use From On-Farm Livestock Facilities

Report whether this operation used reclaimed water from on-farm livestock facilities to irrigate any crops in 2023. For the purposes of this irrigation survey, to be considered an irrigation application of reclaimed water, at least 0.5 inches of reclaimed water must be applied on the area during the growing season to differentiate irrigation from manure disposal. If this minimum is not met, mark the 'No' box.

Item 5a: Area Irrigated From Reclaimed Water From On-Farm Livestock Facilities

Report the area on which one or more applications of reclaimed water for irrigation were made in 2023. Report the acres only once even if multiple applications were made to the same acreage.

Item 5b: Amount of Reclaimed Water From On-Farm Livestock Facilities Used

Report how much reclaimed irrigation water was used on this operation in 2023. Report the quantity of reclaimed water in acre-feet or total gallons.

Section 5 – Off-Farm Water

Off-farm water from all suppliers could be surface or ground water from U.S. Bureau of Reclamation, other Federal agencies, municipal water suppliers, rural water suppliers, irrigation districts, or other suppliers.

Item 1: Irrigate with Off-Farm Water

Report if the target operation irrigated any land using off-farm water at any time during 2023. If off-farm water was used, check “YES” and then continue. If no off-farm water was used for irrigation on the target operation in 2023, then check the “NO” box and go to Section 6.

Item 2: Acres in the Open Irrigated With Off-Farm Water and the Amount Applied

Report acres in the open on this operation irrigated with off-farm water and the estimated quantity used in one of the following units:

- 1) total acre-feet;
- 2) total gallons; or
- 3) average inches applied per acre

Item 3: Area Under Protection Irrigated with Off-Farm Water

Report the total area under protection irrigated with off-farm water in square feet. Report the area only once, regardless of how many crops were grown for sale from the same area.

Item 4: Off-farm Supplied Water Purchased and Total Cost

Report if the target operation paid for any off-farm water and total cost, if any was purchased. Report in whole dollars.

Item 5: Supplier of Off-farm Water

Identify the amount of off-farm supplied water by source, including off-farm water that was delivered or transferred through a project financed, constructed, or managed. If the supplier was not the U.S. Bureau of Reclamation or another Federal agency, enter the name of the supplier in item 5c.

Item 6: Use of Reclaimed Water from Off-Farm Sources

Report whether this operation used reclaimed water from off-farm sources to irrigate any crops in 2023.

Item 6a: Area Irrigated From Reclaimed Water From Off-farm Sources

Report the area on which one or more applications of reclaimed water from off-farm sources for irrigation were made in 2023. Report the acres only once even if multiple applications were made to the same acreage.

Item 6b: Amount of Reclaimed Water From Off-farm Sources Used

Report how much reclaimed water from off-farm sources was used for irrigation on this operation in 2023. Report the quantity of reclaimed water in acre-feet or total gallons.

Item 6c: Sources of Reclaimed Water

Identify the source(s) of reclaimed water used on the target operation by marking an 'X' in all the sources that apply.

Section 6 – Pumps and Pump Expenses

This section collects information related to use of pumps used to irrigated land on the target operation. Include all pumps used for irrigation in 2023 including pumps that are used to move water into tanks and/or holding areas. Do not include pumps used exclusively for home use or aquaculture or pumps that are not owned/rented by the operation.

Item 1: Pumps Used on This Operations

Report if this operation used any pumps for irrigation during 2023. These are pumps that were used for pumping water from wells, rivers and streams, irrigation channels, ponds, boosting system pressure, tailwater pits, and other water holding systems. If pumps were used, check “Yes: and then continue. If no pumps were used on the target operation in 2023, then, check the “No” box and continue to Section 7.

Item 2: Pumps by Use

In the table, report all pumps used for irrigation in 2023. If the same pump has multiple uses, report that pump only once for what its primary purpose is.

Well pumps should only include the primary pump for each well. This is also reported in Section 3, Item 4. Some irrigation systems using water from wells may also have pumps in place other than their well pumps to provide additional lift, especially on farms with large distribution systems or irregular terrain. These pumps are often referred to as relifting or booster pumps. Include these booster pumps in item 2d.

Tailwater pits hold water that was recovered from previously irrigated land for recycling.

Vertical lift refers to the average surface-level feet-of-lift the pumps must raise the water in order to distribute the water through the field irrigation system.

Discharge capacity refers to average pumping capacity in gallons per minute (GPM).

Discharge operating pressure refers to the average operating pressure in pounds per square inch (PSI) at the point of discharge. If the pump has an open discharge and the operating pressure is unknown, report the pressure as 20 pounds per square inch (PSI). Example: the respondent may pump from a stream to a holding pond to build up supplies or use it to feed a field gravity system.

Item 3: Power Source

For each power source report the number of well pumps and other pumps, the cost of the energy used to power pumps (include the landlord’s share of pumping costs), and the number of acres irrigated by water source. The sum of acres irrigated across all energy types may be less than the total acres irrigated for the

operation reported in Section 2, item 4, column 2, Box D. The difference should equal those acres irrigated using no pumps to supply water to the field. The sum of acres across all energy types may also be larger than Box D if some acres, or area under protection, had water supplied by multiple pumps using different power sources.

Section 7 – Expenditures for Irrigation Infrastructure

For each expenditure type category, report the cost of the expenditure in column 1, the irrigated acres affected in column 2, the primary purpose code of the expenditure in column 3, and the primary source code of the funding assistance in column 4 if any were received. Only report expenses associated with the irrigation infrastructure. Primary purpose codes and source codes of the funding can be found at the top of the page. Code = 1 is used if no funding assistance was received.

EXPENDITURE AND FUNDING ASSISTANCE CODES – USE IN THE TABLE BELOW			
CODE	PRIMARY PURPOSE OF EXPENDITURE	CODE	PRIMARY SOURCE OF FUNDING ASSISTANCE
1	= New expansion	1	= No funding assistance or loans
2	= Water conservation	2	= NRCS Environmental Quality Incentives Program (EQIP)
3	= Energy conservation	3	= Other USDA financial assistance or loans
4	= Scheduled replacement or maintenance	4	= Non-USDA and all other financial assistance or loans

Section 8 – Methods of Water Distribution in the Open

This section refers to the method used to spread water over the land. In 2018, 36 percent of irrigated land used the gravity flow method, while 56 percent used a sprinkler system. Report the acres of land irrigated by each of the distribution systems listed. If the same land was irrigated by more than one method, then report acres irrigated by each method used.

Remember: Do not report information for the delivery system used to convey water from the source to the field. Report only information for the field distribution system.

Item 1: Fields Irrigated in the Open

Report whether this operation irrigated any fields in the open, including horticultural crops grown in the open. If the target operation irrigated fields in the open, check “Yes and then continue. If no fields in the open were irrigated on the target operation in 2023, then check the “No” box and continue to Section 13.

Item 2: Gravity Irrigation

Gravity irrigation refers to free flowing application of water across a field. The water is distributed across a field using either above or below ground pipes, poly-tubing, or open ditches near the head of the field from which water is released to flow down furrows or to flood the field.

Report the total acres used by method, then record the acres for each conveyance system. The total of gravity irrigated acres should not be greater than the total reported for item 4, Section 2, **Box D** (total acres irrigated).

- (a) Down rows or furrows - Row crops are generally irrigated by water flowing down furrows.
- (b) Controlled flooding between borders or within basins - Some crops such as rice or cranberries are flooded across the entire field with water contained within borders or basins within or surrounding the field.
- (c) Uncontrolled flooding - This method is often used to water pasture or rangeland. There are no dikes or borders that surround the field when uncontrolled flooding is used.
- (d) Other gravity systems - Include all other acres irrigated by gravity systems if not reported in any of the above categories.

Item 3: Sprinkler Irrigation

Sprinkler irrigation is separated into six categories: center pivot systems, linear move tower systems, solid set and permanent systems, mechanical move systems, hand move systems, and all other sprinkler irrigation systems. It is important to report sprinkler irrigated acres by the pressure at the system inlet. Some respondents may want to report acres by pump pressure; however, we are looking for the acres covered by the pressure at the system inlet.

- (a) Center pivot - A center pivot system uses a boom half the width of the field. It is anchored at the center of the field and sweeps in a circle creating the familiar circular fields common in some irrigated areas. Center pivot irrigation accounts for over half of the sprinkler systems in use nationally.

- (b) Linear move tower systems - Similar to a center pivot system, except that the lateral line and towers move in a continuous straight path across a rectangular field.
- (c) Solid set and permanent systems - A system that is permanently in place, usually with a buried water pipe throughout the field with attached riser pipes and sprinklers equally distributed along the field pipe distribution system.
- (d) Mechanical move systems - These are self-propelled systems that travel in straight lines across the field.
 - (i) Side roll, wheel move, or other mechanical move systems - includes systems that have large diameter wheels mounted on a pipeline, enabling the line to roll as a unit to successive positions across the field.
 - (ii) Big gun or Traveler systems- these are similar to the pulsating sprinklers used in nurseries or lawns which sweep across the area being watered.
- (e) Hand move systems - Any non-self-propelled sprinkler system which must be moved manually.
- (f) Other sprinkler systems – Include acres irrigated by sprinkler systems not reported in any of the above categories.

Item 4: Drip, Trickle, or Low-flow Micro Irrigation

For these systems, the water is distributed down rows through tapes or small diameter tubes which meter out small amounts of water at low pressure through small holes or emitters near the plants' root zone.

- (a) Surface drip - a drip or trickle system with the tape or small diameter tube and emitters placed above ground and near the plants' root zone.
- (b) Sub-surface drip - a drip or trickle system with the tape or small diameter tube and emitters placed below ground level and near the plants' root zone.
- (c) Low-flow micro (spray) sprinklers - a variation of low-flow systems that use a similar tube-based water supply system, but with low volume sprinkler (spray) heads located about one-foot above ground.

- (d) Other drip, trickle, or low-flow micro systems – Include all other acres irrigated by a drip, trickle, or low-flow micro system here if not reported in any of the above categories.

Item 5: Hydroponics

Hydroponics is the technique of growing plants using a water-based nutrient solution rather than soil, and can include an aggregate substrate, or growing media, such as vermiculite, coconut coir, or perlite. Hydroponic production systems are used by small farmers, hobbyists, and commercial enterprises.

Section 9 – Additional Practices for Irrigation Methods in the Open

Report any conservation and/or efficiency practices used in conjunction with gravity irrigation systems on this operation in 2023.

Item 1: Gravity Irrigation

If gravity irrigation systems were reported as being used on this operation in Section 8, item 2 then select “Yes” and complete Section 9. If there were no gravity systems used on this operation, select “No” and skip to Section 10.

Item 2: Acres by Practice

Record the number of acres associated with the practices listed.

- a) Tailwater pits hold water that was recovered from irrigated land for recycling.
- b) Precision-leveling, also referred to as Land Laser Leveling (LLL) is done using a laser-controlled scraper pulled by a tractor.
 - i. Zero grade is when a field is leveled to a zero percent decline.
- c) Report acres using special furrowing practices or the use of polyacrylamide (PAM).
- d) Surge flow irrigation refers to the application of water to furrows through an intermittent schedule of on and off periods to reduce excess runoff and improve irrigation efficiency compared to traditional furrow irrigation.
- e) Cabledation is a form of gated-pipe system in which the gates or outlets are positioned near the top side of the pipe and are always open. The pipe is laid on a precise grade, and a plug moves slowly through the pipe, causing water to flow through the outlets, in sequence, to furrows in the field.
- f) Report acres where mulch or other row covers were used in order to conserve water.

Item 3: Use of Computer Software

Report whether any computer software was used to assist with the measuring or planning of the gravity irrigation systems on this operation. Software features include determining the location for the pipes or tubes, the location for drilling holes into the pipes or tubes, the diameter of the holes, and the distance between holes for optimal irrigation.

Section 10 – Acres Irrigated in the Open

If any acres were irrigated in the open, mark “Yes” on Question 1 and complete the entire table in Section 10.

For each crop listed in items 2 – 16, record the irrigated acres that were harvested in the open along with the yield for those irrigated acres, and quantity of water applied. Record all crops harvested, even if multiple crops were harvested off the same land. For winter wheat, report the acres harvested in 2023.

For items 17 – 20, report all acres that were irrigated in 2023 along with the quantity of water applied. It is important to include nursery and other horticulture crops grown in the open in item 18.

For the quantity of water applied per acre in 2023, record water applied in average feet per acre (acre-feet) or in inches per acre (acre-inches), but not both. Feet per acre should be reported to the nearest tenth of a foot (for example, 1.6 or 2.3 feet per acre), while inches per acre should be reported to the nearest whole inch (for example, 19 or 28 inches per acre).

Acre-Foot – The volume of water needed to cover one acre of land to a depth of one foot (equivalent to 325,851 gallons).

Acre-Inch – The volume of water needed to cover one acre of land to a depth of one inch (equivalent to 27,154 gallons).

The sum of irrigated acres should be equal to or greater than the amount reported in Section 2, item 4, **Box D** (total acres irrigated). **Note:** Double cropping can result in a higher number being recorded in Section 10.

Any crop grown which is not pre-listed should be entered under item 16 “All Other Crops Grown in the Open and not listed.” Be sure to record the type of crop being reported. If an irrigated commodity has failed acres, split the acres and report the failed acres under item 20.

Note: The method of water distribution for these crops should also be reported in the following Section 11.

Section 11 –Water Distribution Methods and Sources Used in the Open

For each crop with irrigated harvested acres reported in Section 10, ask the respondent to report the primary type of irrigation system in column 1 by selecting the appropriate irrigation system code from the Water Distribution Code list located at the beginning of Section 11. If more than one water distribution method was used for a crop, report the primary method used.

WATER DISTRIBUTION CODES – USE IN THE TABLE BELOW			
CODE	PRESSURE SYSTEM	CODE	GRAVITY SYSTEM
01	= Hand-move system	15	= Down rows or furrows from unlined open ditches
02	= Solid set or permanent system	16	= Down rows or furrows from lined open ditches
03	= Side roll or wheel line system	17	= Down rows or furrows from poly pipe, lay-flat tubing, or above ground or underground pipe
04	= Big gun or traveling gun system	18	= Controlled flooding within borders, levees, or basins from unlined open ditches
05	= Linear move system (under 15 PSI)	19	= Controlled flooding within borders, levees, or basins from lined open ditches
06	= Linear move system (15 to 29 PSI)	20	= Controlled flooding within borders, levees, or basins from poly pipe, lay-flat tubing, or above ground pipe
07	= Linear move system (30 to 59 PSI)	21	= Controlled flooding within borders, levees, or basins from underground pipe
08	= Linear move system (60 PSI or more)	22	= Uncontrolled flooding (rangeland, pastureland, etc.) including open discharge from a well or pump
09	= Center pivot system (under 15 PSI)	23	= Other gravity system – Specify: _____
10	= Center pivot system (15 to 29 PSI)		
11	= Center pivot system (30 to 59 PSI)		
12	= Center pivot system (60 PSI or more)		
13	= Low-flow irrigation (drip, trickle, or micro sprinkler system)		
14	= Other pressure system – Specify: _____		
	1006 _____		1007 _____

Then, for each crop with reported irrigated harvested acres, follow the instructions in the column heading. It is possible to have more than one source of water for a crop.

For the final two columns, for each irrigated crop, record the number of acres that were irrigated applying chemigation, that is, the application of fertilizers or pesticides through the irrigation water. Record the acres of chemigation separately for commercial fertilizer application and for pesticide application.

Note: For each crop, an irrigated acre harvested may be reported here in both the fertilizer and pesticide columns. Therefore, for each crop, the sum of chemigation acres may total more than the corresponding harvested irrigated acres reported for that crop in column 1 of Section 10.

Finally, ensure consistency between crops reported in Sections 10 and 11. Any crop reported as irrigated in Section 10 should have an entry in Section 11. Crop specific responses in these two sections must be consistent.

Section 12 – Irrigation for Nursery and Other Horticultural Crops Grown in the Open

Item 1: Irrigated Horticultural Crops in the Open

Report whether the selected operation grew any nursery, greenhouse, floriculture, sod, propagative materials, Christmas trees and short rotation woody crops, or other horticultural crops in the open in 2023. If any horticultural crops on the selected operation were grown in the open, check “Yes” and continue. If no horticultural crops were grown in the open on the target operation in 2023, then check the “No” box go to Section 13.

Item 2: Total and Irrigated Acres in the Open

Report the total acres and irrigated acres for horticulture crops grown in the open to the nearest tenth acre. Report the acres only once even when multiple crops were harvested off the same land. Irrigation refers to the application of water to land or crops by any artificial or controlled means.

Item 3: Acres Irrigated or Watered in the Open by Category

Report acres for each horticulture crop listed to the nearest tenth acre. Report acres of each crop harvested, even when multiple crops were harvested off the same land. For example, if annual bedding plants and a nursery crop were harvested from the same 2 acres, enter 2.0 acres in the Floriculture and bedding crops category and 2.0 acres in the Nursery crop category. Christmas trees that sold for transplanting are included in Nursery crops. Christmas trees that were in production for cut Christmas trees are included in item 3e. For each category, enter the total acres grown in the open and irrigated acres.

Report crops grown on the selected operation in the appropriate category:

- (a) **Floriculture and bedding crops** - Bedding/garden plants - annuals, herbaceous perennials, vegetable plants; cut flowers and cut florist greens; indoor foliage plants; potted flowering plants; hanging baskets
- (b) **Nursery crops** - Nursery stock - ornamentals, shrubs, flowering trees, evergreens, live Christmas trees, fruit and nut trees and plants, vines, palms, ornamental grasses, bareroot herbaceous perennials; aquatic plants
- (c) **Sod**
- (d) **Propagative materials** - Bulbs, corms, rhizomes, tubers, cuttings, seedlings, liners, plugs, flower seeds, tobacco plants, vegetable seeds, vegetable transplants to farm fields

- (e) **Christmas trees and short rotation woody crops** – The acres reported for Christmas trees are the area in production for cut Christmas trees, not just the acres cut in 2023. A short rotation woody crop is a tree that grows from seed to a mature tree in 10 years or less. These are trees for use as paper or pulp, or as engineered wood or for ethanol. The wood is too soft to be used directly for lumber. Exclude nursery stock or trees that will be harvested for lumber, fence posts, telephone poles, etc.
- (f) **Other** - If more than one crop was grown for this category, report the primary type of crop in the specify area.

Item 4: Acres Irrigated or Watered in the Open by Method Used

Report the area irrigated or watered for horticultural crops grown in the open in 2023 by irrigation method used on the selected operation. If more than one method was used, report area in all methods that apply. Report quantity of water in the unit of measure most used for each method, either in columns 2a and 2b, OR in columns 3a, 3b, and 3c.

Report for the following irrigation methods:

- (a) **Hand Watered**
- (b) **Gravity Irrigation** - refers to the free-flowing application of water.
- (c) **Sprinkler** - Exclude hand-held sprinklers.
- (d) **Drip, trickle, or low-flow micro irrigation** – the water is distributed down the rows by tapes which meter out small amounts of water at low pressure near the plant's roots.
- (e) **Hydroponics** – a technique of growing plants using a water-based nutrient solution rather than soil, and can include an aggregate substrate, or growing media, such as vermiculite, coconut coir, or perlite.

The total area reported, by method used, should be equal to or greater the irrigated acres reported in item 2.

Item 5: Irrigation of Horticultural Crops in the Open by Water Source

Report the percentage of water source applied each irrigation method listed. The percentage for ground water, on-farm water, and off-farm water should add to 100% for each method (row).

Definitions of Water Sources

Ground water is water from a well or wells located on the target operation.

On farm surface water is a water supply not controlled by a water supply organization and includes water from a stream, drainage ditch, lake, pond, spring, or reservoir on or adjacent to the target operation.

Off-farm surface water is surface or ground water from municipal water suppliers, rural water suppliers, U.S. Bureau of Reclamation, other Federal agencies, irrigation districts, or other suppliers.

Section 13 – Irrigation for Nursery, Greenhouse, and Other Horticultural Crops Grown Under Protection

Item 1: Irrigated Horticultural Crops Grown Under Protection

Report whether the selected operation grew any nursery, greenhouse, floriculture, mushrooms, propagative materials, or other horticultural crops under protection. Under protection includes horticultural crops grown under glass, rigid plastic, plastic film, including “tunnel” protection. If any horticultural crops on the selected operation were grown under protection, check ‘Yes’ and then continue. If no horticultural crops were grown under protection on the target operation in 2023, then check the ‘No’ box and go to Section 14.

Item 2: Total and Irrigated Area Under Protection

Report the total area and irrigated area under protection in square feet. Report the area only once, regardless of how many crops were grown for sale from the same area. Irrigation refers to the one or more applications of water to land or crops by any artificial or controlled means.

Item 3: Total and Irrigated Area Under Protection by Category

Report the area irrigated in square feet for each horticultural category listed. Report the area of each horticulture crop, even when multiple crops were harvested off the same land. For example, if two crops of annual bedding plants were grown from 1,000 square feet, enter 1,000 in the Floriculture and Bedding Crops category. If 500 square feet of food crops were also grown in the same area, then also report 500 in the food crops grown under protection category. For each category, enter the total area under protection that was irrigated.

Report crops grown on the selected operation in the appropriate category:

- (a) **Floriculture and bedding crops** - Bedding/garden plants, cut flowers and cut florist greens, indoor foliage plants, potted flowering plants
- (b) **Nursery crops** - Ornamentals, shrubs, shade trees, fruit and nut trees, vines, palms, ornamental grasses, evergreens not for Christmas trees, deciduous trees and shrubs, aquatic plants
- (c) **Propagative materials** - Bulbs, corms, rhizomes, and tubers; cuttings, seedlings, linings, and plugs; flower and vegetable seeds; tobacco transplants; vegetable transplants
- (d) **Food crops grown under protection**
- (e) **Mushrooms**
- (f) **Other** - If more than one crop was grown for this category, report the primary type of crop in the specify area.

Item 4: Area Irrigated Under Protection by Method Used

Report the area irrigated for horticultural crops grown under protection in 2023 by irrigation method used. If more than one method was used, report area in all methods that apply. Report quantity of water in the unit of measure most used for each method, either in columns 2a and 2b, OR in columns 3a, 3b, and 3c.

Report for the following irrigation methods:

- (a) **Hand Watered**
- (b) **Gravity Irrigation** - refers to the free-flowing application of water.
- (c) **Sprinkler** - Exclude hand-held sprinklers.
- (d) **Drip, trickle, or low-flow micro irrigation** – the water is distributed down the rows by tapes which meter out small amounts of water at low pressure near the plant's roots.
- (e) **Hydroponics** – a technique of growing plants using a water-based nutrient solution rather than soil, and can include an aggregate substrate, or growing media, such as vermiculite, coconut coir, or perlite.

The total area irrigated, by method used, should be equal to or greater than the irrigated area in item 2.

Item 5: Irrigation of Horticultural Crops Grown Under Protection by Water Source in 2023

Report the percentage of water source applied for each irrigation method listed. The percentage for ground water, on-farm water, and off-farm water should add to 100% for each method (row).

Definitions of Water Sources

Ground water is water from a well or wells located on the operation.

On farm surface water is a water supply not controlled by a water supply organization and includes water from a stream, drainage ditch, lake, pond, spring, or reservoir on or adjacent to the target operation.

Off-farm surface water is surface or ground water from municipal water suppliers, rural water suppliers, U.S. Bureau of Reclamation, other Federal agencies, irrigation districts, or other suppliers.

Section 14 – Irrigation and Water Management Practices

Item 1: Scheduling Water Use

Report on the method(s) or approach(es) used to decide when to schedule water applications in 2023. Mark all that apply.

Item 2: Discontinue Irrigation

Report whether this operation had to discontinue irrigation in 2023 long enough to affect crop yield.

Item 2a: Number of Irrigated Acres Discontinued

Report the acres which had discontinued or reduced irrigation long enough to reduce crop yields.

Item 2b: Reasons for Discontinuing Irrigation

Report the reason(s) for discontinued or reduced irrigation. Mark all that apply. If “other” is marked, report the reason for discontinuing irrigation in the “specify” response area.

Item 3: Sources of Irrigation Information

Report the sources that this operation relied on for guidance in reducing irrigation costs or to conserve water. Mark all that apply. If none of the listed sources were used, select the last option 'None'.

Item 4: Groundwater Recharge

Report whether this operation participated in ground water recharge. Recharge is the practice of increasing the amount of water that enters an aquifer through human-controlled means. For example, groundwater can be artificially recharged by redirecting water across the land surface through canals, infiltration basins, or ponds; adding irrigation furrows or sprinkler systems; or simply injecting water directly into the subsurface through injection wells.

Item 5: Barriers to Implementing Improvements

Report any issues which prevented the target operator from implementing improvements to reduce energy use or conserve water to the existing irrigation systems during the past five years. Mark all that apply.

Item 6: Irrigation or Drainage Improvements

If the target operator made irrigation and/or drainage improvements above regular maintenance in the past five years, then mark item 6 'Yes'. If not, skip to Section 15.

Item 7: Technical or Financial Assistance Received

If the target operator received technical or financial assistance for irrigation and/or drainage improvement, then mark 'Yes'. If not, mark 'No' and skip to Section 15.

Item 7a: Source of Technical or Financial Assistance

If the target operator received technical or financial assistance for irrigation and/or drainage improvement, mark all sources of the assistance that apply.

Section 15 – Labor Used for Irrigation

Labor costs here pertain only to the operation and maintenance of the irrigation system and facilities.

Item 1: Total Hours and Average Hourly Wage for Irrigation Labor

If the target operator paid for any labor for the irrigation activities, report total hours for the year and average hourly wage in item 1a. Include the landlord's share of irrigation labor costs. Exclude costs for custom work and contract labor for harvesting.

Item 2: Contract Irrigation Labor Expenses

If the target operation incurred any contract labor expenses for irrigation activities, report total expenses in item 2. Include the landlord's share of irrigation labor costs.

Section 16 – No Irrigated Land or Land with Unused Irrigation Systems

Item 1: Section Instructions

Complete this section ONLY if the target operator farmed in 2023 but did not irrigate any land in 2023 or if they had tracts of land equipped with irrigation equipment that was not irrigated in 2023. If all land equipped with irrigation systems were irrigated in 2023, skip to Section 17. Items 2 and 3 reference 2022 and Item 4 references 2023.

Item 2: Land Equipped with Irrigation in 2022

Report whether any land on this operation had access to irrigation systems and/or equipment regardless of water rights or availability in 2022.

Item 3: Land Irrigated in 2022

Report whether any land was irrigated on the target operation in 2022.

Item 4: Reasons for Not Irrigating in 2023

Report the reasons for not irrigating in 2023. Mark all that apply and if ‘other’ is marked, report the reason in the “specify” response area.

Item 5: Discontinuance of Irrigation

Report whether the discontinuance of irrigation is permanent.

Section 17 – Value of Sales in 2023

Item 1: Gross Value of All Agricultural Products Sold

Select the appropriate category for the gross value of sales of all agricultural products sold from the target operation in 2023. Agricultural products include all crops and livestock sold from the target operation.

Item 2: Percent of Total Sales from Irrigated Crop Sales

Report the percent of the total gross value of sales that were from irrigated crops.

Item 3: Percent of Total Sales from Non-Irrigated Crop and Livestock Sales

Report the percent of the total gross value of sales that were from non-irrigated crop or livestock sales. The sum of items 2 and 3 should equal 100 percent.

Section 18 – Person Completing this Form

Complete the name of the respondent, telephone number, and date.

Date

Record the date the questionnaire was completed. If the interview took multiple contacts, record the latest date.

Survey Results

The survey results will be released on November 14, 2024. Inform the respondent that the report will be available at <https://www.agcensus.usda.gov/>.

Administrative – Office Use

Response Code

Upon completion of the interview, enter the response code in cell 9901 on the back page of the questionnaire. Response codes are:

Code 1 - Complete: The questionnaire is complete, including questionnaires for respondents that are no longer in business or did not irrigate any land.

Code 2 - Refusal: The respondent refused to cooperate or grant an interview.

Code 3 - Inaccessible / Incomplete: The operator was not available throughout the survey period (inaccessible). You will also use code 3 if the respondent gave an interview but could not or would not answer a lot of the questions (incomplete questionnaire).

Respondent Code

The respondent code identifies the person who was interviewed. Enter the code identifying the person who provided most of the data in cell 9902.

Code 1 = Operator or Manager

Code 2 = Operator's Spouse

Code 3 = Accountant or Bookkeeper

Code 4 = Partner

Code 9 = Someone Other than Code 1, 2, 3, or 4

Mode Code

The mode code identifies how the person was interviewed.

Code 1 = PASI – Personal Assisted Self Interview (Mail)

Code 2 = PATI – Personal Assisted Telephone Interview (Telephone)

Code 3 = Face-to-Face

Enumerator Name

Sign the questionnaire and record your enumerator ID number in cell 9998.

Optional Use

Item codes 9907, 9908, 9901, and 9916 are reserved for your Regional Field office use. These cells should remain blank unless your Regional Field office directs you otherwise.

Review the entire questionnaire before forwarding it to your supervisor. Make sure all items are complete, including 'Yes' and 'No' boxes checked, and dashes are entered in cells when the response is 'None' or 'No' as appropriate. Make sure notes are present and complete for unusual situations.

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