~~U~~nited States Department of Agriculture

National Agricultural Statistics Service

August 2000

2000 Agricultural Resource Management Survey (ARMS)

Phase II - Production Practices

Interviewers Manual

Chapter 1 - ARMS Purpose

Data collected in the Agricultural Resource Management Study (ARMS) is the primary source of information to the U.S. Department of Agriculture on a broad range of issues about agricultural resource use and costs, and farm sector financial conditions. The ARMS is the only source of information available for objective evaluation of many critical issues related to agriculture and the rural economy.

The ARMS replaced the former Cropping Practice Survey (CPS) and the Farm Costs and Returns Survey (FCRS) in 1996. The initiative to combine these surveys came from:

- A growing interest in tying the resources used in agricultural production with farm financial information to allow more detailed examination of the relationships between various production practices (such as chemical and tillage use) and farm financial conditions;
- The need to improve the efficiency of data collection by combining identical information collected in both the CPS and the FCRS into one survey.

The number of questionnaire versions used for the ARMS reflects the variety of topics this survey is designed to address. For example, specific versions are rotated every 5-6 years to focus on resource use and production costs for specific commodities. Other versions appear from time to time to address policy relevant resource use or financial issues. National irrigation use, animal waste management, and risk management strategies are current topics of interest.

The ARMS is conducted in three phases. The initial phase (Screening), conducted from May through July, collects general farm data such as crops grown, livestock inventory, and value of sales. Screening survey data are used to qualify (or screen) farms for the other phases. With screening data, we can choose respondents for Phases II and III based on whether they have commodities of interest.

The second phase (Phase II), is conducted from September through December. This phase collects data associated with agricultural production practices, resource use, and variable costs of production for specific commodities.

Phase III, conducted from February through April, will collect data to examine farm sector financial conditions, including income, assets, and debt.

In years where the National Agricultural Statistics Service (NASS) surveys producers of selected commodities for Costs of Production data, some Phase II respondents are asked to complete a Phase III follow-on report to obtain financial data for the entire operation. It is vital that both the Phase II and Phase III questionnaires be completed for these operations. Data from both phases provide the link between agricultural resource use and farm financial conditions. This is the cornerstone of the ARMS design.

Uses of ARMS Data

Generally, farmers benefit from ARMS data indirectly. They see the information through contact with extension advisors, in reports issued by State colleges and universities, in farm magazines, newspapers, and on radio or TV spots. Most respondents probably do not realize the data come from this study.

Farm organizations, commodity groups, agribusiness, Congress, and the USDA use information from ARMS to evaluate the financial performance of farm/ranch businesses and to make policy decisions affecting agriculture. Producer associations and the USDA Farm Service Agency (FSA) use ARMS data on costs of production, particularly when developing proposals for commodity programs.

Specifically, the ARMS:

- gathers information about the relationships among agricultural production, resources, and the environment. ARMS data provide the necessary background information to support evaluations of these relationships. The data are used to understand the relevant factors in producing high quality food and fiber products while maintaining the long term viability of the natural resource base.
- determines what it costs to produce various crop and livestock commodities, and the relative importance of various production expense items.
- helps determine net farm income and provides data on the financial situation of farm and ranch businesses, including the amount of debt.

ARMS data provide the only national perspective on the annual changes in the financial conditions of production agriculture.

- provides the farm sector portion of the Gross Domestic Product (GDP) for the Nation. If ARMS data were not available, the Bureau of Economic Analysis (BEA) would have to conduct their own survey of farm operators to collect this data.
- helps determine the characteristics and financial situation of agricultural producers and their households, including information on management strategies and off-farm income.

Pesticide Data Program

NASS has collected agricultural fertilizer and pesticide use data for major field crops and selected fruit, vegetables, melons and strawberries for several years. These data have been used in building a database for the USDA Pesticide Data Program (PDP). The PDP is used by USDA to evaluate the safety of the Nation's food supply.

In 1996, the implementation of the Food Quality Protection Act (FQPA) increased the need for actual, reliable chemical use data. FQPA requires the Environment Protection Agency to conduct an accelerated review of tolerance levels for re-registration of pesticide products.

Part of the EPA review includes using actual chemical usage data. **Only the grower can provide these data.** If these data are not available, EPA could assume maximum label rates are being applied on all crop acreage. This would likely over count the true amount of pesticides being used to produce field crops. The result would be cancellation of the product registrations for chemicals farmers rely on.

Other USDA agencies are closely involved in the PDP and the FQPA with NASS. The other agencies are the Agricultural Marketing Service (AMS), Economic Research Service (ERS), and Human Nutrition Information Service (HNIS). These agencies collect and analyze agricultural chemical use and residue data to estimate potential human exposure to pesticide residues in the U.S. food supply. The results of their analysis will be used to help make decisions concerning product registration issues, risk assessments, benefit assessments, and for marketing commodities at the State, National and international level.

Field crop growers have a vested interest in the risk analysis because many pesticides they rely on are classified as “minor use”. Growers often have no alternatives to these chemicals. If re-registration is not allowed on products used on speciality crops, such an action could have serious consequences for both farmers and consumers.

The important benefits gained from responding to the survey are:

- Growers have a chance to tell how they use chemicals responsibly to maintain a safe and abundant food supply.

- The survey results are official USDA estimates and help to establish the facts about chemical use. Accurate data can be used to lessen concern relating to marketing and exports to other countries.

- Accurate and timely information on actual usage can be used in the decision making process for product registration, re-registration and product alternatives.

Natural Resource Data and Farm Practices

To guide policy makers in the decision-making process, it is necessary to have reliable information about production practices used and the relationship of the practices to changes in water quality and changes in the rate of erosion. Decisions affecting agricultural policy and producers will be made with or without data. It is much better to have factual information to guide the decision process. Farm production covers a major share of the natural resources of the country and, as policy about how to manage production is formed, a better understanding of the production process can prevent uninformed choices.

The agricultural community is currently faced with many complex issues concerning the environment, such as fertilizer and pesticide use, soil erosion, and pesticide residue and restriction. ARMS data is useful in addressing some of these concerns. For instance, fertilizer and pesticide data are used to study water quality. Data on production practices such as machinery use and crop rotation help to identify tillage systems and crop residue levels affecting soil erosion. Pesticide data help measure the economic impact on agricultural production from restricting use or cancellation of a pesticide product or to determine the human and environmental risk of continued use. Data measuring the extent and intensity of pesticide use will aid in the development of residue monitoring programs to improve food safety.

Cost of Production

Congress or USDA mandates exist for the development of annual estimates of the cost of producing wheat, feed grains, cotton, peanuts, rice, tobacco, sugar, and dairy commodities. Rice and Sugar Beets are the cost of production commodities targeted for the 2000 ARMS Phase II.

To assure accurate and reliable estimates, a comprehensive survey is needed to obtain data on production practices and on the amounts of inputs used. Crop and livestock costs and returns estimates provide a basis for understanding changes in the relative efficiency of crop and livestock production and the break even prices needed to cover all costs.

ARMS provides data needed to develop commodity accounts showing costs and input use by size and type of farm in different regions of the country. Commodity accounts show the costs of resources provided by the operation and any landlords involved with producing a specific commodity. Exhibit 1 contains an example of a commodity account.

Detailed information is needed for several farm inputs to estimate commodity costs. Most farm operations produce more than one commodity, such as corn and soybeans. This diversity causes special problems in determining commodity costs. For example, seed corn can easily be allocated to commodity costs for corn because it is only used to grow corn. However, machinery such as tractors and implements can be used for many activities on the farm, and costs for a commodity like corn cannot easily be separated from whole farm costs. Therefore, it is necessary to collect detailed data on each field operation in order to estimate machinery costs for the commodity being surveyed.

USDA is required to update commodity costs annually. However, ARMS focuses on a specific commodity only once every five or six years. With ARMS data for physical inputs (such as seed, fertilizer, and chemicals used), analysts can update cost estimates using input prices from other annual surveys. For example, state-level seed prices from the NASS Prices Paid Survey are used with seeding rates from ARMS to update estimates of seed expense. To estimate fuel costs, annual fuel prices are updated yearly, while fuel use estimates from the survey year are kept constant. Minor adjustments can be incorporated each year based on changes in acreage and yields.

Income, Financial, and Household Data

In addition to Phase II resource management and cost of production data, Phase III of the ARMS obtains detailed information about farm finances, debt, assets, and household characteristics. ARMS is the only national data source for determining the effect of price, debt, and other financial variable changes on different types and sizes of operations on an on-going basis. Responses to questions about farm assets and debts are used to develop a balance sheet for the farm as well as to provide a variety of financial ratios for use in measuring financial performance.

The 1996 Farm Bill includes a provision establishing the Commission on 21st Century Production Agriculture. This commission is charged with conducting a comprehensive review of effects of the Agricultural Market Transition Act, the future of production agriculture, and the appropriate role of the Federal Government in production agriculture. ARMS data will be used by the Commission to address these issues.

Publication of ARMS

Most State offices use information from several NASS and ERS reports in preparing publications for their State.

NASS reports are available on the Internet at: http://www.usda.gov/nass/

ERS reports are available on the Internet at: http://www.ers.usda.gov/

The NASS publication, Agricultural Chemical Usage - Field Crops, provides estimates of acreage treated with fertilizer and chemicals and total amounts applied, using data from the ARMS Phase II. The results of the 2000 Phase II will be released in May 2001.

NASS publishes Farm Production Expenditures using data from Phase III. This report shows expenditures for the U.S., 10 farm production regions, 5 U.S. economic sales classes, and U.S. crop and livestock farms. The 2000 survey results will be released in July 2001.

ERS also prepares or updates several state, regional, and national reports using ARMS data. These reports show operating and financial characteristics by type of farm, and by income and debt/asset categories. Some of the ERS publications resulting from ARMS include:

Agricultural Resources and Environmental Indicators. Research report issued September 1997. This ERS basebook contains a wealth of information covering a broad range of subjects in resource and environmental economics. Topics include land use, quality, and ownership; farm real estate values; water use and quality; fertilizer, pesticides, energy, and farm machinery; technology; and the conservation reserve, compliance, wetlands, and non-USDA programs that affect agriculture.

Genetically Engineered Crops for Pest Management in U.S. Agriculture. Research report issued May 2000. Adoption of genetically engineered crops with traits for pest management has risen dramatically since their commercial introduction in the mid-1990's. The farm-level impacts of such crops on pesticide use, yields, and net returns vary with the crop and technology examined. Adoption of herbicide-tolerant cotton led to significant increases in yields and net returns, but was not associated with significant changes in herbicide use. On the other hand, increases in adoption of herbicide-tolerant soybeans led to small but significant increases in yields, no changes in net returns, and significant decreases in herbicide use. Adoption of Bt cotton in the Southeast significantly increased yields and net returns and significantly reduced insecticide use.

Pest Management in U.S. Agriculture. Research report issued October 1999. This report describes the use of pest management practices, including integrated pest management (IPM), for major field crops and selected fruits and vegetables. The data came chiefly from the 1996 Agricultural Resource Study (ARMS). Because different pest classes may dominate among different crops and regions, requiring different pest management techniques to control them, the extent of adoption of pest management practices varies widely. For example, insects are a major pest class in cotton production, while minor for soybeans. As insect management has a wider variety of nonchemical techniques than weed control, cotton growers are expected to be further ahead on the IPM continuum than soybean producers.

Annual Report to Congress on the Status of Family Farms

Financial Performance of U.S. Farm Businesses

Farm Operating and Financial Characteristics

Characteristics of Farms with Sales of $50,000 or more

U.S. "Commodity" Production Costs and Returns: An Economic Basebook

The Economic Well-Being of Farm Operator Households

National Financial Summary

Productivity & Efficiency Statistics

ARMS expense, income and financial data are used in the Farm Business Economics Report publication which includes the State and National financial summary and costs of production.

ARMS data are also used to develop USDA's Agricultural Income and Finance Situation and Outlook report.

Exhibit 1: Example of a Commodity Account

The example on the next page shows that in 1996, wheat growers, on average, produced $152.29 of wheat grain, seed, and straw per acre. For simplicity, consider this to be the gross cash income for an acre of wheat.

Cash income is directly offset by cash expenses. There are two subparts to cash expenses: Variable Cash Expenses and Fixed Cash Expenses.

Variable cash expenses represent direct costs paid to produce an acre of wheat. These include seed, fertilizer, pesticides, paid labor, repairs, and other cash expenses resulting directly from production of wheat. These amounted to $70.01 in 1996.

Added to the variable cash expenses are Fixed cash expenses. These represent the portion of a farm's overhead costs 'charged' to each part of the operation, including each acre of wheat produced. Fixed cash expenses are expenses paid by an operation regardless of what crops or livestock are produced. These are also called general business expenses. In 1996, each acre of wheat was 'charged' $25.45 as a share of the entire farm's overhead expenses.

Thus, actual fixed and variable cash expenses associated with producing wheat in 1996 totaled $95.46 per acre. When subtracted from the cash value of production, a **cash profit** of $56.83 is estimated for each acre of wheat grown. Unfortunately, this isn't the end of the story.

A second category of expenses are not 'cash expenses'. These expenses are not paid by the operation in the common sense of the term 'paid'. The value of these items, commonly called 'non-cash' expenses, are measures of the economic cost of producing the commodity. For instance, if a farm operator's labor is given a value of $18.00 per hour, and he spends an average of ½ hour over the course of the year working to grow an acre of wheat, then his labor contributes $9.00 to the cost of growing the wheat, even if he is self-employed and thus, not paid directly in the traditional sense.

In addition to the 'price' of unpaid labor, non-cash expenses such as depreciation, the fair rental value of land, and the cost of capital required to farm, must be charged to the commodity.

By the time the 'non-cash' expenses are added to cash expenses, the economic cost of producing an acre of wheat raise to $180.48. Subtracting this from the cash value of production results in an **economic loss** of $28.19 per acre of wheat. In this simple example, the value of the operator's management risk and time to produce wheat in 1996, when compared with the cash value of the production from that acre of wheat, was -$28.19.

Commodity Account, All Wheat Source: Economic Research Service (ERS), USDA			
U.S. Wheat 1996 Gross value of production (excluding direct Government payments)		**Dollars per Planted acre**	
Harvest-period price (dollars/bu.)	4.84		
Yield (bu./planted acre)	30.36		
Wheat, gross value of production		146.94	
Wheat straw, gross value of production		5.35	
Total gross value of production			**152.29**
U.S. Wheat production cash costs and returns, 1996			
Variable cash expenses:			
Seed		9.26	
Fertilizer, lime, and gypsum		21.11	
Chemicals		6.23	
Custom operations		5.35	
Fuel, lube, and electricity		9.71	
Repairs		13.26	
Hired labor		4.69	
Other variable cash expenses 1/		0.40	
Total variable cash expenses		**70.01**	
Fixed cash expenses:			
General farm overhead		5.80	
Taxes and insurance		10.02	
Interest		9.63	
Total fixed cash expenses		**25.45**	
Total cash expenses		**-**	**95.46**
Gross value of production less cash expenses		**=**	**56.83**
U.S. Wheat production economic costs and returns, 1996			
Economic (full ownership) costs:			
Variable cash expenses		70.01	
General farm overhead		5.80	
Taxes and insurance		10.02	
Capital replacement		24.95	
Operating capital		1.78	
Other nonland capital		12.16	
Land		46.40	
Unpaid labor		9.36	
Total economic costs		**-**	**180.48**
Residual returns to management and risk		**=**	**-28.19**

1/ Cost of purchased irrigation water and baling.

Chapter 2 - Terms and Definitions

Enumerators working on the ARMS should be familiar with the definitions of the terms listed below. Appendix A of the "Interviewer's Manual" provides definitions for these terms. Descriptions of irrigation systems are also provided at the end of Appendix H. Those systems not described in that appendix have been described in this manual (Refer to Exhibit 5.3 on page G-5122 and Exhibit 5.4 on page G-5125).

actual nutrients
active ingredients
adjuvant
beneficial insects
Bt
carryover
commodity
confidentiality
conservation tillage
contour farming
Cooperative State Research, Education, & Extension Service (CSREES)
cost of production
cropland
crop insurance
crop rotation
date, due
date, reference
date, release
defoliant
double crop
editing
EIN
electronic information service
fallow
farm
fertilizer
fertilizer analysis
field
fungicide
gallons per minute
grassed waterways
harvested acres
hay
highly erodible land (HEL)
herbicide
hundredweight (cwt)
idle land
implement
improvements
inaccessible
input
input provider
insecticide
integrated pest management (IPM)
irrigation set
landlord
lime
micronutrient
military time
N-P-K
Natural Resources Conservation Service (NRCS)
nitrogen (N)
nitrogen crediting
nonresponse
no-till
operator
out-of-business
partner
pesticide

phosphate (P_2O_5)
plant tissue test
potash (K_2O)
questionnaire
refusal
rent
rent, cash
rent, share
respondent
sample, list
sample, multi-frame
sample, probability
sampling frame
sampling unit
scouting
seed
skip-row planting
SSN
straw
strip cropping
sub-irrigation
surface water sources
surfactant
survey
survey period
tank mix
terrace
underground outlets
wetting agent
worker
wetlands
yield map
yield monitor

Chapter 3 - Survey Procedures

This chapter provides an overview of the questionnaire and other materials for ARMS, and general guidelines for collecting data. The NASDA Enumerator Handbook covers administrative matters.

As a minimum, the State Office will provide the following:

- Copies of pre-survey publicity materials mailed to each respondent
- Questionnaires with labels identifying assigned operations
- Extra questionnaires without labels
- Screening Survey Information Forms from the Screening Survey
- Respondent Booklets containing code tables and a burden statement
- Supplements for questionnaires
- Maps for marking field locations
- Envelopes for mailing completed questionnaires
- Several copies of NAS-011 (Time, Mileage, and Expense Sheet) and envelopes for mailing them

You should already have these items on hand:

- Interviewer's Manual
- Highway and street maps
- Black lead pencils
- Name tag
- NASDA Identification Card
- NASDA Enumerator Handbook
- Ball point pens for completing NAS-011
- Calculator

Questionnaire Versions

Exhibit 3.1 shows the name, version number, and paper color of each questionnaire version used this year.

Exhibit 3.1: Questionnaire Versions and Colors

Questionnaire	Version	Color
Rice Prod Practices and Costs (PPCR)	2	Buff
Sugar Beets Prod Practices and Costs (PPCR)	3	Blue
Corn Production Practices (PPR)	5	White with Blue Ink
Soybean Production Practices (PPR)	6	Green
Winter Wheat Production Practices (PPR)	7	Yellow
Spring Wheat Production Practices (PPR)	7	White with Black Ink
Durum Wheat Production Practices (PPR)	7	Pink
Upland Cotton Production Practices (PPR)	8	Pink
Multi-crop Production Practices (PPR)	10	White

Versions 1,4 and 9 are not used in Phase II, 2000.

Versions 2, 3, 5, 6, 7 and 8 are used to collect information for one target commodity.

Version 10 is used to collect data for TWO PPR target commodities from the same respondent. *Version 10* contains all questions present in *Versions 5, 6, 7, and 8*. Random number labels placed inside the Version 10 questionnaire will show what two crops you will collect data for when using Version 10.

Some questionnaires will have a Screening Supplement inserted in the questionnaire by the State Office. Chapter 4 of this manual provides instructions for completing the Face Page and Screening Supplement.

Sections of the questionnaire are identified by letter and title. For example, Section D is "Pesticide Applications -- Selected Field." Chapter 5 discusses these sections. The detail asked in a section may vary from one questionnaire version to another. To help find instructions, the page number shows the letter of the section discussed on that page (i.e., A-5003).

Respondent Booklets

You will use one or more Respondent Booklets for each interview. The Respondent Booklets, the questionnaire version to use them with, and their paper colors appear in Exhibit 3.2.

Exhibit 3.2: Respondent Booklet Versions and Colors

Booklet Version	Questionnaire Versions	Color
Rice	2	Buff
Sugar Beets	3	Blue
Corn	5, 10	White with Blue Ink
Soybean	6, 10	Green
Wheat	7, 10	Yellow
Upland Cotton	8, 10	Pink

When using *Version 10* to collect data for two crops, you will need the Respondent Booklet for both crops. For example, when using *Version 10* for a sampled operation reporting both soybeans and cotton, you will need both a Soybean Respondent Booklet and an Upland Cotton Respondent Booklet for the interview.

The Respondent Booklet provides information respondents need to reference when answering some survey questions, such as Code Lists. Often, this information does not appear in the questionnaire. Using the Respondent Booklet can prevent confusion and save interview time.

Occasionally, the respondent may need help in becoming familiar with how to use the booklet. This is especially important when using the longer Code Lists, such as the Chemicals and Pesticides list. While conducting the interview, take a moment when first turning to a questionnaire section to show respondents how to reference the appropriate code lists in the booklet. This should help the interview go more quickly.

Some lists in the Respondent Booklet are there to let the respondent know what type of response we are looking for to certain questions. For example, in Section C or D, when asking the respondent “How was this (fertilizer or pesticide) product applied?”, show the respondent the Fertilizer/Pesticide Application Method Code List printed in the Respondent Booklet. Otherwise,

the respondent may take additional time explaining in detail how he applied the material, when all you really wanted to know was that the material was "banded in the row" (method code 7.)

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 needlessly. 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 for each version. The estimated average completion time is based on the length of pretest interviews, experience with previous ARMS Phase II surveys, and the judgement 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 each questionnaire version appears in Exhibit 3.3.

Exhibit 3.3: Expected Interview Lengths by Version

Questionnaire	Minutes
Rice Production Practices and Costs Report	75
Sugar Beets Prod Practices and Costs Report	75
Corn Production Practices Report	45
Soybean Production Practices Report	45
Winter Wheat Production Practices Report	45
Spring Wheat Production Practices Report	45
Durum Wheat Production Practices Report	45
Upland Cotton Production Practices Report	45
Multi-Crop Production Practices Report	70

Burden statements are printed on the back cover of the Respondent Booklet used with each questionnaire version. At the end of the interview, call the respondent's attention to the Burden Statement on the Respondent Booklet for that questionnaire version.

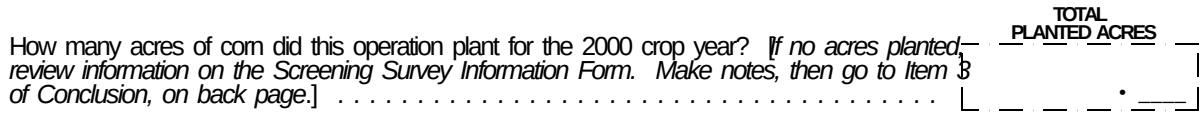
Questionnaire Format

The following formatting conventions apply to ARMS questionnaires.

Interviewer instructions

Interviewer instructions are printed in italics, and enclosed in square brackets. These instructions will provide important directions you will need to pay attention to when completing the questionnaire.

Figure 1 Example of interviewer instructions.



Include Statements and Check Lists

Include statements and check lists are used to ensure that items sometimes forgotten are not missed. These include statements and check lists should **NOT** be considered complete lists of items to be included in the response.

Data fill-ins

When the reference to a previous item number is printed in italics and enclosed in brackets, take the <u>data</u> entered in that previous item and use it to FILL IN when you read the question. In the example below, if 110 was the data reported in Item 1, you would read the question saying "How many of the 110 acres were owned by this operation?".

Figure 2 Example of 'data fill-in' questions.

Text fill-ins

Questions in table headers frequently refer to text in the rows used to FILL IN the wording of the question. In this example, the question to ask is "What crop was planted on the field in fall of 1999?"

Figure 3 Example of a 'text fill-in' question.

1	2 **What crop was planted on the field--** [*column 1*]		3 **Was this crop irrigated on this field?**
	NAME	CODE	YES=1
FALL of 1999?			

Instructions for respondents

Prompts, "includes and excludes," and other instructions for respondents are in italics and enclosed in parentheses. These prompts are to 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.

Figure 4 Example of instructions to read to respondents.

What was the **total** number of inches of water applied **per acre** to this field during the entire growing season?
(***Include*** *ALL water used from both on-farm and off-farm sources*.) . . . . . INCHES PER ACRE

Optional Wording

Optional wording is in plain print enclosed in parentheses. Usually, reading optional wording is not necessary. However, if the respondent hesitates or shows uncertainty after hearing the initial question, you may want to reread the question completely, including the optional wording.

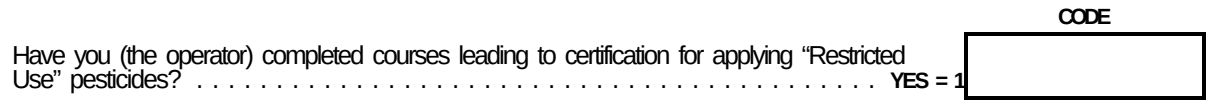
Figure 5 Example of 'optional question wording'.

Did you alternate pesticides (*use pesticides with different mechanisms of action*) **to keep pests from becoming resistant to pesticides in this field?** . . . . . YES=1

Item code boxes for interviewer use

Code boxes for interviewer use generally have thin solid lines.

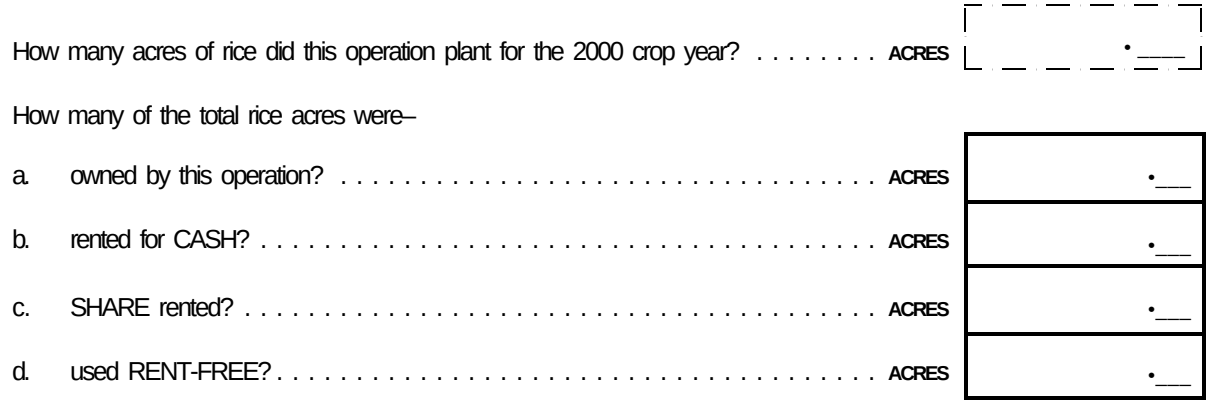
Figure 6 Example of code boxes for interviewer use.



Boxes with bold dot-dash lines

Boxes with bold dot-dash lines are for data which will be broken down into greater detail in later questions.

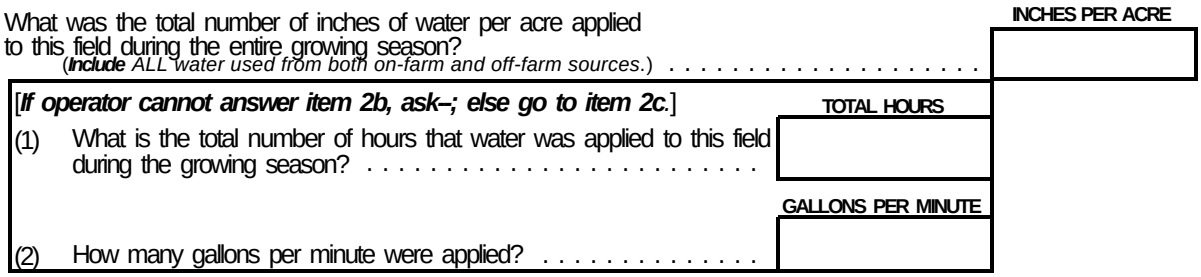
Figure 7 Example of a 'total' cell box to be broken down in subsequent questions.



Boxes with dotted outlines (less preferred method for reporting)

For some items, respondents have a choice of two different methods for reporting. When boxes for two reporting methods appear for an item, use only one box. The outline of the box suggests which unit, if any, is the preferred unit for reporting. If one box in a pair of boxes has a dotted outline and the other box has a solid outline, The box with the dotted outline is okay, but is less preferred. The box with the solid outline is the preferred cell for reporting.

Figure 8 Example of boxes for a 'less preferred' reporting method.

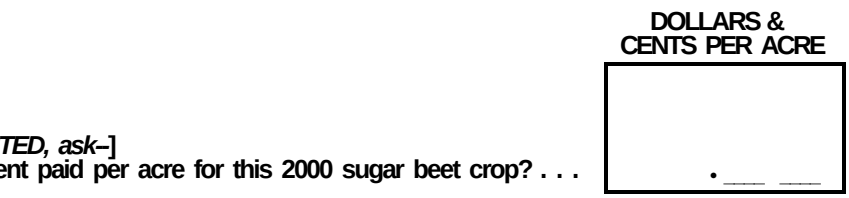


Item code boxes with decimal points

Some code boxes have a printed decimal point followed by one or two marked spaces. They show that you should record data to the tenth or hundredth place. When entering data into these cells, place the number correctly in relation to the decimal points, and fill every space printed after them. Fill in zeros when the respondent does not give answers to the number of decimal places needed, or when he gives answers in whole numbers.

For example, if a cell has a decimal point followed by one underlined space, you should record responses in TENTHS. Record an answer of "18" as "18.0."

Figure 9 Example of code boxes for recording data to one or more decimal places.



Item code boxes for recording dates

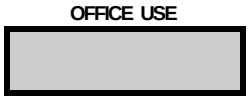
Some item code boxes are set up for recording dates in MM DD YY format. These cells have six preprinted underlines. MM stands for the two digits that refer to the month, DD is for the 2-digit date for the day, and YY is for the two digits for the year. For example, April 2, 2000, should be entered as 0 4 0 2 0 0.

Figure 10 Example of a code box for recording a date value.

Office Use Boxes

Shaded boxes with thick solid lines are for Office Use only. You will not make entries in office use boxes.

Figure 11 Example of an 'office use' box.



Yes / No Questions

Questions that can be answered YES or NO are of one of the following two formats. If the respondent doesn't know if the answer is YES or NO, then record DK next to the code box. If the respondent refuses to answer, then record "REFUSED" in notes outside the box.

YES/NO check boxes

One format for YES/NO questions is to use check boxes. Check boxes are used when there is a "GO TO" instruction associated with either the YES or NO answer.

Figure 12 Example of a Yes / No check box question.

Was a Nitrogen soil test performed on this field? **CODE**

☐ **YES** - [*Enter code 1 and continue.*] ☐ **NO** - [*Go to item 7.*] . . . . . [ ]

YES=1 boxes

Another format for YES/NO questions is the response code YES=1 printed next to the code box. If the answer to a YES/NO question is YES, enter code 1. If the answer is NO, then enter a dash in the box to show the question was asked and the respondent answered NO. Since you are not entering a number for NO, this is the only way to show you asked the question, and the answer was NO.

Figure 13 Example of a 'Yes = 1' question.

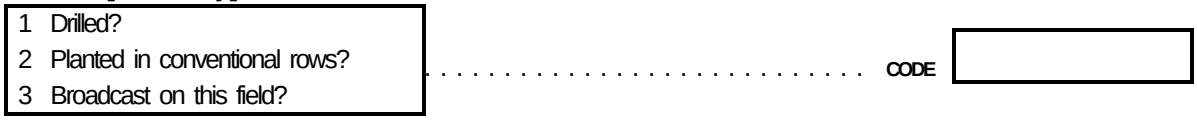
CODE

Has harvest of this field been completed? . . . . . **YES = 1** [ ]

Multiple choice questions with coded response categories

Multiple choice questions allow the respondent to choose only ONE answer from several possible answer choices offered. Each response category is given a code number and the group of answer choices are enclosed in a box with a solid outline. You will enter the respondent's answer as a code number.

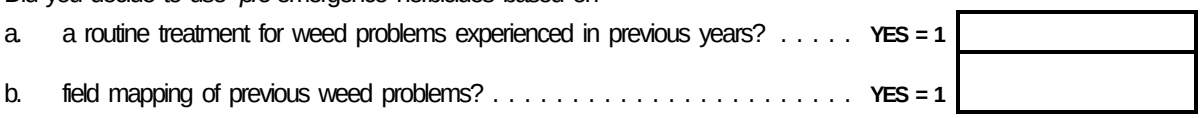
Figure 14 Example of a question with coded response categories.



Questions with more than one sub-part

Questions with more than one sub-part are separate questions. The main question (the "stem") has an item number. Sub-parts to the question are identified with a lower-case letter. Each sub-part is a separate question and must be asked separately. You should read the question stem followed by the ending sub-part associated with the letter. If there are lots of sub-parts, you will probably only need to read the stem for the first two or three sub-parts. Once the respondent understands that the stem is repeated, though unspoken, then continue reading only the sub-parts.

Figure 15 Example of a question with multiple subparts.



Direction through tables showed by an arrow

In some tables, arrows show the direction to go through the table. A vertical arrow pointing down means to go down each column in the table, completing all the rows for the column before moving to the next column. A horizontal arrow pointing right means to complete all the columns for a row before moving to the next row. In this example, you would complete all columns for a row before continuing with the next row.

Figure 16 Arrows indicate the direction to follow when completing a table.

LINE	2 MATERIALS USED [*Enter percentage analysis or actual pounds of plant nutrients applied per acre.*]			3 **What quantity was applied per acre?** [*Leave this column blank if actual nutrients were reported.*]	4 [*Enter material unit code.*] 1 POUNDS 12 GALLONS 19 POUNDS of ACTUAL NUTRIENTS	5 **When was this applied?** 1 Before seeding (fall) 2 Before seeding (spring) 3 At seeding 4 After seeding	6 **How was this applied?** 1 Broadcast, ground without incorporation 2 Broadcast, ground with incorporation 3 Broadcast, by air 4 In seed furrow 5 In irrigation water 6 Chisel, Injected or Knifed in 7 Banded/Sidedressed in or Over Row 8 Foliar or Directed Spray 9 Spot treatments	7 **How many acres were treated in this application?**
	N Nitrogen	P_2O_5 Phosphate	K_2O Potash					**ACRES**
01								. ___

Completing Version 10

The *Version 10* (Multi-crop) questionnaire may be used in your State to collect information for operations sampled for two PPR target commodities. Random Number Labels placed in Section A identify the two target crops the respondent should report.

Additional questionnaire formatting conventions used in *Version 10* will guide you through the questionnaire and help keep the respondent on track.

[commodity] Text fill-ins

Fill in the name of the target commodity when you see the [*commodity*] notation.

Figure 17 Example of a '*commodity*' fill-in question.

	CORN	SOYBEANS	UPLAND COTTON
Were commercial FERTILIZERS applied to the [*commodity*] field for the 2000 crop? . . . . . YES = 1			

Commodity-specific cell boxes

Enter the data for the target commodity in the column of cells labeled with the commodity name in the header. Answer cell boxes for a particular commodity are always in the SAME column position throughout the questionnaire. If a cell is missing in that commodity's column for a particular question, then you will skip that question for the commodity. In this example, pheromone questions are only asked for Upland Cotton.

Figure 18 Example of a question asked only for some crops in the Multi-crop version.

	CORN	SOYBEANS	UPLAND COTTON
Did you use soil analysis to detect the presence of insects, diseases, or nematodes in this field? . . . . . YES = 1			

[*For Upland Cotton, ask–*] Did you use pheromones on the Upland Cotton field to –	UPLAND COTTON
a. monitor pests by trapping? . . . . . YES = 1	
b. control pests by disrupting mating? . . . . . YES = 1	

When you are completing *Version 10*, proceed with the interview by asking each question first for the selected [*commodity 1*] field, then for the [*commodity 2*] field. For some items, such as harvested acreage and yields, you will ask a series of questions for the selected [*commodity 1*] field, and then ask a similar series for the [*commodity 2*] field.

For many questions on *Version 10*, you will be able to "abbreviate" the question when you ask it for *commodity 2*. For example, an operation has been selected for both corn and soybeans. You may ask if harvest has been completed for corn first, like this: "Has harvest of the corn field been completed?" Then you immediately follow this question by asking "How about the soybean field?"

Be careful not to over use this procedure. Using this procedure for EVERY question will not be possible, because some questions are not so straightforward.

You need to be sure that the respondent is answering each question for the correct commodity field. You may find that it helps the respondent to stay focused on each selected field if you refer to them occasionally during the interview using the same description that the respondent used when first listing the fields for you.

For example, when you originally listed the operation's fields of corn, the respondent described the selected field as "45 acres on Smitty's." The respondent described the selected soybean field as "30 acres north of the highway." Several times during the interview, refer to the selected corn and soybean field using these same words. When you ask Item 4 in Section C, say, "What fertilizers did you apply to the 45 acres on Smitty's for the 2000 corn crop?" Then ask, "What fertilizers did you apply to that 30 acre soybean field north of the highway for the 2000 crop?"

Referring to the fields using the respondent's words as you alternate between the two target commodities can reduce or prevent confusion for the respondent. It will also reassure you that the respondent's answers are for the correct field. As you continue, the respondent will catch onto the procedure, and the interview will go quickly, smoothly, and efficiently.

Be sure you record the response for each question in the cell box for the appropriate commodity.

Most States will only have two target commodities listed in the *Version 10* questionnaire. If your State has three or more target commodities, you may find it helpful to circle the crop name headers over the answer boxes for the two commodities you will be enumerating, or highlight them with a colored highlighter pen before going to the interview. This will help you identify the answer cells for recording data for each target commodity quickly and easily during the interview.

Entering Data

Use a black lead pencil to record data and notes; never use ink on a questionnaire. Make all entries clear, and easy to read. Entries in check boxes and item code boxes must be entirely inside the boxes.

Record responses in the unit shown in the questionnaire (such as acres, bushels, or dollars). If a respondent gives an answer in a different unit, write the answer outside the printed box, convert it to the required unit, and record the converted data in the box.

If the respondent answers "none" to a question, enter a **dash** (-----) in the box, and **not** a zero.

For questions answered with a code number, enter the number that goes with the respondent's answer. If the respondent answers using only the code number, verify that the code is correct by repeating the answer in words.

For YES/NO questions, enter code 1 if the answer to the question is YES. If the answer is NO, most often you must enter a dash in the box to show that you asked the question and the respondent answered NO. Since you are not entering a code number for NO, this is the only way to show that the answer was NO.

The office must be able to tell the difference between questions asked and the answer was NO or ZERO, and questions asked, but the respondent could not answer (DK) or did not answer (REFUSED). For any question, if the respondent doesn't know the answer, then record DK or "DON'T KNOW" next to the question. If the respondent refuses to answer, write "REFUSED" next to the question.

Record data to the nearest whole number, unless a decimal point is in the box. Place numbers correctly in relation to decimal points, and fill in every space

printed after them. Use zeros as fill when answers are not given to as many decimal places as required by the data cell.

If answers appear unusual, but really are correct, make notes in the margins to explain. Do not write notes or make unnecessary entries in answer boxes.

Planning Your Work

The operator or operation name, mailing address, and ID number are on the questionnaire label. The State Office may provide other information, either on the label or on separate forms, that might be helpful to you in finding the selected operation.

Mark 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 this map to plan your daily travel; this will help keep travel expenses down and save time.

You may need to ask Post Office or Farm Service Agency employees for directions to some operations. Try to do this early in the survey so you can put the information on your map when possible. Tell your Supervisor about any operator whose home or office you cannot find.

Interviewing

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

If the operator is not present when you visit, but is expected soon, wait for the operator, or make other contacts nearby and return a little later.

If the operator is too busy to be interviewed at that time, set up an appointment at his or her convenience. Be sure to keep the appointment, and be on time! If an emergency prevents you from keeping the appointment, inform the operator beforehand and reschedule the interview.

If the operator will not be available before the survey is over, try to interview someone who is well informed about the operation. A partner, family member or an employee may know enough about the aspects of the farm operation covered in the questionnaire to give you the information needed.

The NASS rule-of-thumb is to make up to three visits (the first visit plus two call backs), if necessary to get an interview. If you have an appointment or information from a neighbor on when to try to reach the operator, you should return then. If not, make each visit at a different time of the day or evening.

Respondents often ask how long the interview will take. Never contradict the Burden Statement printed on the Respondent Booklets; however, adding to it is okay. For example, you might say something like this: "The official nationwide average for this survey is 45 minutes, but the interviews I have done in this area averaged about __ minutes." Be honest about the average time, even if your interviews average longer than the time estimate in the Burden Statement.

Encourage respondents to have farm records at hand. Using records encourages accurate information and completing the interview will take less time.

The first time you ask a question, always read the question exactly as worded in the questionnaire. If the respondent did not hear or did not understand the question, repeat it using the same wording. Use any optional wording or explanations printed with the question in the questionnaire. If the respondent still doesn't understand, or asks you to explain, use what you learned in training and information from this manual to explain what we need.

Ask questions in the order they appear in the questionnaire. Do not skip any questions unless skip instructions printed in the questionnaire allow you to do so.

Sometimes, a respondent will volunteer information before you ask a question. When you get to a question the respondent already answered, take the opportunity to verify the information. Say something like, "I think you told me this earlier, but let me just be sure I got it right." Then ask the question exactly as worded. This doesn't make you look like you weren't listening. On the contrary, it emphasizes to the respondent the need to get things right.

Sometimes you will need to probe to get an adequate answer to a question. You should probe when the respondent cannot answer the question, when the answer isn't exact enough to record, when you think the answer may be incorrect because it doesn't fit with information you've already obtained, or when you think the respondent didn't understand the question.

The purpose of probing is to verify unusual data or to correct misreported data. You must be careful when you phrase your probing questions that you do not influence the respondent's answers. Probes should be "neutral," that is, they should not suggest one answer over another.

For example, don't say things like, "Use beneficial organisms in this field, you didn't do any of that, did you?" Instead, say, "Did you use any beneficial organisms to control pests in this field?" If the respondent asks for more information, explain that, "Beneficial organisms include insects like green lacewings or ladybugs that are natural enemies of crop pests."

As another example, if a respondent tells you that a value is between two amounts, such as, "Oh, I used a seeding rate of between 1 and 2 bushels per acre," you should ask, "Would you say it was closer to 1 bushel per acre or 2 bushels per acre, or what amount exactly?"

Probes should also be "nonthreatening." Be careful that you don't appear to be questioning or challenging the respondent's answers. Don't say, "That can't be right, three bushels of seed per acre is way too much!" Instead, say, "Does that three bushels include reseeding? I only want the seeding rate for the first time the field was seeded." Then make corrections to data items if necessary or make notes of the respondent's answer if it is correct.

Be sure to make good notes. This is especially important when you find unusual situations or the respondent explains why information that seems incorrect is correct. Also write down any complicated calculations you have to make to come up with an answer.

The notes you record in the questionnaire will help the survey statistician understand this operation when reviewing the questionnaire. Make sure the notes are clear and can be read. Notes can be the single most valuable editing tool available to the office statistician.

Never erase a note unless it is wrong!

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.

Framework and Reference Period for Reporting Data

ARMS questionnaires are designed to collect information about production practices used to produce the 2000 crop of the target commodity on a randomly selected field. Only *Versions 2 & 3* collect expense items associated with production of the 2000 crop. Many of these expense items should be reported in the dollar per acre cost for the selected field.

Fertilizer and pesticide data cover a period of immediately **after** harvest of the most recent crop (before this year's target crop), and continue through all applications made for this target crop. Post-harvest pesticide applications to the harvested crop are excluded.

In PPR Versions 5 (corn), 6 (soybeans) and 7 (wheat) field operations data are reported **beginning** with the first tillage operation **after** removal of the most recent crop before the 2000 target crop from this field, and **ending** with the seeding (planting) operation for the 2000 target crop.

In PPCR Versions 2 (rice) and 3 (sugar beet) field operations data are reported **beginning** with the first tillage operation **after** removal of the most recent crop before the 2000 target crop from this field, and **ending** with the harvest and hauling of the 2000 crop to storage or first point of sale.

Nonresponse

If you are unable to conduct an interview, note the reason on the questionnaire. Also, make a note about whether the operation is a farm, whether it appears any of the target commodities were grown, and any other information you think might be helpful to the State Office.

Most farmers are willing to furnish the information asked for in NASS surveys, but in every survey some will refuse to do so.

The key to reducing the chances of getting refusals is to be courteous and friendly, but persistent. Try to get cooperation by explaining the purpose of the survey, the need for accurate agricultural statistics, and the confidentiality of the data. Make use of materials explaining the survey purpose provided by your State Office.

Above all, do not become discouraged when you get a refusal. Continue to meet farm operators with ease, friendliness and optimism as you contact other assigned operators.

Supervision

Your Supervisor will 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.

Your Supervisor or someone from the State Office will contact a few of your respondents to conduct a quality check. The quality check will verify that you spoke with the person named in the questionnaire and that the respondent understood the survey procedures.

Completed Questionnaires

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

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

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.

Some operators may have already heard about the ARMS on radio or television farm show broadcasts or short spots. They may also have read about the survey in a pre-survey letter from the State office or in 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. Mention that some farm records, particularly records of fertilizer or pesticide applications, will be useful along with any notes or records of when field operations took place.

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

Response Codes

Upon completion of the interview, enter the response code in cell 0910 on the Face Page of the questionnaire. Response codes are:

Code 3- **Complete**: The questionnaire is complete, including questionnaires for respondents that are no longer in business. Also, use Response Code 3 for operations that you have determined DID NOT grow the target commodity this year, even if the operator refused to complete the interview or you were unable to locate the operator during the data collection period. **Complete** means you have obtained all of the data needed for the questionnaire.

Code 5 - **Out of scope**: Operations, such as prison farms, private or university research farms, high school FFA farms, not-for-profit farms

operated by religious organizations, and Indian reservations produce agricultural commodities, but do not meet the ARMS definition of a farm or ranch. These types of operations are considered "out of scope" for the survey. Production practices, costs, and income characteristics of these operations are not representative of the general farm population. Assign Response Code 5 to these types of operations, and describe the specific type of operation on the face page with a note. No other information is required for these types of operations. **Do not** use response code 5 for operations that are out-of-business (use code 3).

Code 8 - **Refusal**: The respondent refused to cooperate or grant an interview. If you determine that the target operation does not produce the selected commodity, code the questionnaire complete (code 3) and indicate the source of your information with a note.

Code 9 - **Inaccessible / Incomplete**: The operator was not available throughout the survey period (inaccessible). You will also use code 9 if the respondent gave an interview but could not or would not answer a lot of the questions (incomplete questionnaire). If you determine that the target operation does not produce the selected commodity, code the questionnaire complete (code 3) and indicate the source of your information with a note.

Starting Time

Record the **starting time** (military) of the interview when the respondent agrees to cooperate on the survey and you actually start the interview. We use interview times to find out how much respondent time we are using (as a measure of respondent burden) in collecting data. We are trying to reduce interview times as much as possible and still collect the high quality data that we need.

Name, Address, and Partners Verification

All questionnaires will have one or more labels. If the first line (primary name line) of the label under the ID number line shows an individual's name (JOHN SMITH), this is the target name (unless the opDomStatus is 99). If the first line contains a combination of individual names (JOHN AND BILL SMITH) or an operation name (SMITH FARMS), then the individual's name on the next line down is the target name.

If the opDomStatus is 99, then the name of the operation shown below the ID line is the target name.

Remember: The target name NEVER CHANGES. The person operating the farm (the farm operator) may change, but the target name is always the person identified on the label.

The first thing you will do is verify the name and address for the target name. If there are partner labels, be sure that partner names and addresses are correct, and that all partners are listed. Mark through the names of any partners no longer involved in the operation. Record the names and addresses of any partners who are not listed.

Screening Survey Information Form

Operations sampled for ARMS Phase II were interviewed during the Screening Survey. The State office will insert a Screening Survey Information Form inside the questionnaire with information collected during the Screening Survey interview.

The Screening Survey Information Form shows:

- acreage of the target commodity reported in Screening Survey.
- type of operation reported (individual, partnership, managed).
- who reported in Screening Survey.
- how the screening data was obtained.
- the ID for the enumerator who conducted the screening interview.
- the sequence (sample) number. This number also appears on the ID label. This sequence (sample) number is used in marking field locations on maps. (See Figure 5.27 on page 5132)
- the name of the crop that is designated as *Commodity 1* on all versions, and the name of crop that is designated as *Commodity 2* on *Version 10*.

Verify the type of operation listed on the Screening Survey Information Form is still correct, particularly if you made corrections to the name, address, or partners on the Face Page.

Screening Box on Face Page

The State office may want you to rescreen the target operation by asking the screening questions again. This may be because the respondent to the Screening Survey may have been someone other than the operator, or incomplete information was obtained on the Screening Survey (for example, partner information was not collected).

If the Screening Box (cell 0006) on the Face Page is coded with a "1", the Office will include a Screening Supplement for you to complete. Complete this supplement after verifying the name and address labels on the questionnaire, but before you begin asking questions in Section A of the questionnaire.

Completing the Screening Supplement

Farm operations in each State are sampled for the screening phase of the ARMS based on list frame information about crop acreage, livestock, and gross value of farm sales. Agribusiness firms and agricultural services that do not produce crops or livestock of their own should have been excluded from the sample, but it is possible some names were misclassified. Screening questions help determine if the selected name is eligible for this survey.

Institutional farms such as prison farms, private or university research farms, high school FFA farms, not-for-profit farms operated by religious organizations, and Indian reservations are excluded from the study. Production practices, costs, and income characteristics of these operations are not representative of the general farm population. If your assignment includes any of these farms, notify your supervisor or the survey statistician.

If an operation was in business during part of 2000 but went out of business during the year, **complete a questionnaire for the part of the year during which the operation did business**. If the operation was taken over by another operator or operation when it went out of business, make a note of this. This note should include a name, address, phone number, and any other pertinent information about the new operation.

There are two versions of the Screening Supplement. The version used for opDomStatus 99 records only determines if the selected operation is in-business for 2000. The second version, used for operations that are NOT opDomStatus 99 operations, determines if the selected operation is in-business, and obtains additional information about other operations the target name is involved in. The State Office will insert the correct version into the questionnaire for you to use if the operation requires rescreening in Phase II.

Item 1: Other operation name

Even though you have already verified the label, you need to ask this item to avoid duplication and to make sure the State Office sampling list is up-to-date.

Item 2: Crops, livestock or poultry

Check YES if the operation grew **any** crop (field crops, fruit/nut crops, vegetables, oilseeds, specialty crops, hay) or had cattle, hogs, sheep, poultry or

other livestock during 2000 on the total land operated. If YES, go to Item 6. If NO, continue with Item 3.

For an operation to qualify as growing a crop, it must have made the decisions on planting, caring for and harvesting the crop.

Include: field crops, fruit and nut crops, vegetables, mushrooms, flowers, nursery stock, greenhouse crops, hay, Christmas trees, etc.

Exclude: home gardens, crops received in the 2000 crop year as payment for land rented to someone else, and crops grown by anyone other than the target name on land this operation rents to others.

This screening question would also be checked YES if the target name had any livestock or poultry, regardless of ownership, on the total acres operated at any time during 2000.

Include: All cattle, hogs, sheep, mules, goats, chickens, turkeys, ducks, geese, bees, rabbits, mink or other fur bearing animals, and fish that are raised commercially or for home consumption. FFA and 4-H livestock projects should also be included.

Exclude: Horse boarding operations, riding stables, or race horse training operations that do not have other agricultural items. Also exclude slaughter or packing houses, auction barns, stockyards or order buyers. These operations have livestock which are committed for slaughter. The presence of these livestock alone does not qualify an operation for the survey.

Item 3: Sales of agricultural products or receipt of government agricultural payments

Include sales of crops, livestock, fish and other products from the total land in the operation. Include any government payments received under the 7-year market transition program, conservation programs, etc.

This item should be answered NO when the respondent is a landlord who only sells agricultural products from, or only receives government farm payments for, land which was rented out.

If this item is checked YES, go to Item 6.

If Items 2 and 3 are both NO, continue with Item 4.

Item 4: Out of business determination

If both items 2 and 3 are NO, then the selected operation is considered to be out-of-business for 2000.

Determine if anyone else is now operating the land formerly operated by the target name on the Face Page. Ask this item only if the respondent answered NO to questions 2 and 3. If another operation has taken over from the target name on the label, record the name of the operator or operation now operating the land.

This item gives us the information we need to update the list when operations have gone out of business. Record the name, address, and phone number (if available) of the individual or operation now operating land that used to be operated by the target name. If the respondent answers NO to this item, probe to determine what happened to the land, and make notes.

Item 5: Enumerator Action

These instructions only apply in rare cases and the interview will not be conducted based on information recorded on the screening supplement.

If the operation is out-of-business, any data obtained in the questionnaire would be excluded from the summary process. Therefore, the Interview should be ended before burdening the respondent to complete the questionnaire.

1) On the Screening Supplement, enter code “9" for the reporting unit in item 6 (cell 0921).

2) Go to the questionnaire Face Page and enter code “3" in cell 0910.

3) Go to the questionnaire Back Page and complete the administrative items inside the large black box at the bottom of the back page, including Respondent code, Ending Time, Date, and Enumerator ID.

Item 6: Decision-Maker For This Operation

This item is only completed if the operation is in-business for 2000 (item 2 or 3 is checked 'YES').

We are interested in how the operation was **managed** on a day-to-day basis. We **do not** care what the ***LEGAL*** definition of the operation is.

Definitions of individual, partnership, and managed land are printed in the *Interviewer's Manual*. Landlord-tenant, cash-rent and share crop arrangements should not be considered partnerships.

When an individual operation is reported, enter code 1.

When a partnership is reported, enter the number of partners. Include the person listed on the Face Page and all of the other partners.

When a manager is reported, enter code 8.

Item 7: Other operations

This item is only completed for non-opDomStatus 99 operations that are in-business during 2000.

If the State Office already knows about additional operations associated with the target name, there should be labels for Operation 2 on the Screening Supplement. There will be an additional Screening Supplement for Operation 3, if there is a third operation.

This question determines if the target name made day-to-day decisions for any other operations in 2000. Each additional operation must be listed or verified on the back side of the Screening Supplement. Additional copies of the Screening Supplement should be used if there is more than one additional operation. The information collected on the Screening Supplement will be used to update your State's list sampling frame and to adjust the data collected in the questionnaire to represent multiple operations.

If The Operator Does Not Have Other Operations

If there were not any other operations, enter '1' in cell 0923, then go to Section A of the questionnaire and begin the interview.

If the operator has other operations:

Item 7a - Total Number of Operating Arrangements

Enter the TOTAL number of operating arrangements, *including the sampled operation labeled on the face page of the questionnaire* in cell 0923.

Entering a "2" for this item indicates the operator makes day-to-day decisions for two operations (the one labeled on the Face Page of the questionnaire and one additional operation).

Item 7b - Identifying additional operating arrangements

Complete or verify the names and addresses, including partners, for each additional operation. If the operator had a third operation, complete or verify the information on an additional Screening Supplement for this operation.

Mark out any operations the target name was not associated with in 2000. If any partner names are not listed, add them.

If the target name is involved (either as individual operator or as a partner) with any other operations which are not listed on a Screening Supplement, record these. In the partner space record the names of all of the partners other than the target name associated with each additional operation.

Item 7c - Day-to-day Decisions for Additional Operations

For each of the additional operations, check the appropriate box to explain how the day-to-day decisions were made in 2000.

We are interested in how day-to-day decisions were made for this additional operation, not the legal definition of the operation.

After obtaining names and addresses for all individuals involved in all additional operating arrangements, begin the interview with Section A.

Special Situations

Do not include operations not already listed for which the target name is a hired manager.

A special situation exists if the operation on the Face Page of the questionnaire is a managed operation. If the target name is still the hired manager, there is no problem; handle it as you would normally.

If the label for the operation on the Face Page is a managed operation and was still in business in 2000 under a new hired manager, you will contact the new hired manager and collect data for the operation named on the Face Page. You will also need to contact the original target name to verify any other operations listed, and if that originally selected target individual has additional operations you will list them on one or more Screening Supplement(s).

Chapter 5 - Completing the Questionnaire

Overview

This section provides an overview of how Chapter 5 is organized. It also describes notations used in the chapter for guidance.

Chapter 5 contains question-by-question instructions for every item in every section of questionnaires for Phase II. The ARMS questionnaire sections are listed in Exhibit 5.1 at the end of this overview.

Questions have the same numbering and instructions on all versions. Particular questions do not appear in every version or are not asked for every target commodity. For these questions, two notations are used to identify the version number and the crop:

1. The notation ***V#*** (in *BOLD ITALICS*) appears under the question item number in the question-by-question instructions in this manual. This indicates version(s) in which the question appears. For example, if the notation ***V5, V7, V10*** appears, this indicates that the item applies only to *Versions 5, 7,* and *10.*

2. The name of the *Crop(s)* for which the question is asked appears in *italics* beneath the ***V#*** indication. This will help you keep track of which questions are asked for more than one crop OR for only one crop on the ***V10****: Multicrop* version.

For example, the following notation indicates that the discussion only applies to questionnaire versions 5 (corn), 6 (soybean), 8 (upland cotton) and 10:

> ***V5, V6, V8, V10***
> *Corn, Soybeans, Upland Cotton*

As you read the manual, refer to copies of your State's questionnaire(s). If you are working in a state not doing a particular version, ignore instructions that do not apply to your State.

Exhibit 5.1: Questionnaire Sections

Section	Section Title
A	Field Selection (All Versions)
B	Field Characteristics (All Versions)
C	Fertilizer and Nutrient Applications (All Versions)
D	Pesticide Applications (All Versions)
E	Pest Management Practices (All Versions)
F	Field Operations (All Versions)
G	Irrigation (All Versions)
H	Drying and Storage (Version 2 only)
I	Landlord Costs (Versions 2 & 3 only)
J	Operator and Operation Characteristics (All Versions except 2 & 3)
K	Total Cotton Acreage (Version 8 for NC only)

Section A - Field Selection

What is Section A for anyway?

Field level samples supply the specific details needed for the economic and chemical use analysis for field crops. Each field must be randomly selected from all of the operation's fields of the target crop of interest for the field sampled to be representative of all fields of the target commodity of interest. Simple random sampling procedures are used for field selection.

Beginning with Section B, questions in the questionnaire refer only to the field selected in Section A.

Screening Survey Information

Your State Office should have inserted a **Screening Survey Information Form** into the questionnaire. This form will provide you with information reported during the Screening survey. Information contained on the Screening Survey Information Form includes operation characteristics, total acres operated, and total target crop acres. The form is intended to assist you (and the respondent) in making sure the correct operation is reported for Phase II. You should review this form prior to conducting the Phase II interview.

Item 1: Total acreage of target commodity

Enter the total number of acres of the target commodity that this operation **planted for any purpose** for the 2000 crop year.

***V3** Sugarbeets* - Sugarbeets have different growing periods in some areas of the country. For instance, in California there are two growing periods: (1) spring planted and fall harvested and (2) spring planted and spring/summer harvested in the following year. Therefore, sugarbeets harvested in 2000 could have been planted in the spring of 1999. You will need to be very clear that the 2000 crop year refers to sugarbeets harvested during 2000, regardless of when planted.

***V7** Winter Wheat* - Winter wheat is generally planted during the fall of 1999 for the 2000 crop year.

Exclude acres custom planted for others, acres rented out, and acres planted on land operated by someone else.

Acres should be recorded in tenths (1/10) of acres. For example, 180 acres should be entered as 180.0.

INCLUDE:

1) all acres planted to the target crop, even if they were abandoned, grazed off, or cut for forage or silage. The reason we include these acres is that the operator usually has expenses and chemical applications associated with them.

2) acres planted and later replanted to the same target crop. Even if the operator had to replant some of the acres (poor seed germination and weather are common causes of replanting), count these acres only one time.

3) acres planted to the target commodity which were later plowed down and planted to some other crop for harvest. Even if this field is replanted to another crop, we are still interested in costs and production practices associated with planting the **abandoned target** crop.

   For instance, a field of winter wheat plowed down and replanted to corn would be eligible for both the Winter Wheat Production Practices Report and the Corn Production Practices Report.

   Likewise, acreage in a winter wheat / soybean double-cropped field for the 2000 crop year is eligible to be counted as both Winter Wheat and Soybeans.

EXCLUDE:

1) Acres planted on land operated by someone else. For instance, exclude acres planted by someone else who rents cropland from this operator.

2) Grain mixtures planted for hay only. For example, wheat mixed with oats or peas for hay are considered 'an other crop' for NASS surveys. These

acres should not have been included in the total acres of wheat planted for all purposes in the Screening Survey, and are also excluded in Phase II.

Each sampled operator was screened for inclusion in ARMS Phase II based on data reported in a screening interview in June/July. The number of selected commodity acres reported in the Screening Survey was very important in determining which strata the operator would be sampled for Phase II and how estimates of production practices are ultimately made. If there are big differences between Screening Survey reported commodity acres and Phase II commodity acres, make notes on the Screening Survey Information Form to assist the survey statistician in editing the questionnaire.

There are many good, logical reasons why the Item 1 acreage may be different from the screened acreage. The information on the Screening Survey Information Form is useful for determining likely reasons for any differences. For example, the respondent to the Screening Survey may have been a different person from the respondent you are interviewing, or the acreage reported in the Screening Survey may have represented intentions to plant, and not crops already planted.

Don't assume that something is wrong if the Screening Survey acreage differs from the acreage reported in Item 1. It may not be wrong, just different. You may tell the operator your notes from the Screening Survey conducted in June and July show the operation with "X" acres, and ask the operator to explain the difference. Make a note of the explanation on the questionnaire, or make corrections to Item 1 acreage, if necessary.

If no acres of the target commodity are reported in Item 1, review the information on the Screening Survey Information Form. Make explicit notes about the reason why the current report of zero acres is different from the information reported on the Screening Survey Information Form. If the operator has no acres of the target commodity (no acres of both commodities on the multicrop version), then go to Item 4 of the Conclusion, and conclude the interview. This is considered a 'complete' interview.

Items 1a, 1b, & 1c: Rice Variety (Acres and Number of Fields)

V2

Rice

Items 1a, 1b & 1c ask the respondent to break their total rice acreage out by variety planted and number of fields. The total of the variety acres must equal the total rice acres reported in Item 1. The total of the variety fields must equal the total number of field planted that will be reported in Item 3.

Item 2: Tenure of Total Commodity Acres

V2, V3

Rice, Sugarbeets

Item 2 asks tenure arrangements for the total commodity acres. The sum of the acres reported in Items 2a, 2b, 2c & 2d must equal the acres reported in Item 1.

Item 3: Total Number of Fields

Item 3 asks for the number of fields planted to the target commodity on the operation for the 2000 crop. Do not skip this question, rush through it, or accept vague estimates of the number of fields. It is absolutely essential that this question be enumerated correctly. The accuracy with which statisticians can make estimates from the one selected field to represent the whole commodity enterprise is seriously jeopardized if this item is incorrect. This total number of fields will be used to expand the field level data collected in this questionnaire.

Version 8, Upland Cotton Production Practices Report and *Version 10*, Crop Production Practices Report: Include only fields of Upland Cotton. Exclude fields of American Pima cotton.

If the operator had only 1 field of the target commodity, enter a “1" in Item 3 and a “1" in Item 5. Then go to Item 6 and explain to the respondent that the remainder of the questions will be about this specific field.

When the operator has more than 1 field of the target commodity, enter the number of fields in Item 3 and continue with Item 4.

In some instances the respondent may begin listing the commodity fields in order to determine a count of fields. If this happens, you should be prepared to enter the fields in Item 4 and then return to Item 3 to record the total number of fields. **The important things to remember are: <u>All fields must be listed</u> to ensure a random selection; and the <u>total number of fields must be accurate</u> to ensure the data are correctly expanded.**

Item 4: Identification of Fields

Item 4 uniquely identifies every field of the selected commodity. It is <u>extremely important</u> that all fields are listed and that the actual number of fields are accurately recorded in Item 3.

Ask the respondent to list the fields of the target commodity for the operation. If there are more than 18 fields, list only the 18 fields closest to the operator's permanent residence. Record each field on the lines provided in the questionnaire.

After listing all individual fields, the operator may report a more accurate number of total fields. In this situation, update the number of fields in Item 3 to reflect the correct number.

You may list fields in any order. Do not skip any lines when completing this listing.

Operators can list fields using any description that is meaningful to them. Some operations have a formal field numbering or naming system, but others may use informal names or descriptions for their fields. Many operators identify fields of crops using some combination of their location and acreage. Many refer to their fields by the name of the current or previous property owner. It does not matter what kind of field identification system is used, as long as the respondent can list the fields by these names, numbers, or other description and knows which field is which.

If the operator is unable to list the fields of the target commodity by name, number, or other description, use the field selection grid to draw off (up to 18 of) the operation’s fields closest to the operator’s permanent residence. The field selection grid is printed on a separate Field Selection Supplement.

Prior experience has shown the grid to be very beneficial in the rare cases when the respondent cannot adequately describe the target commodity fields without drawing them.

Item 5: Random Number Selection

If there is only ONE field of the target commodity (Item 3 is 1), enter “1" for Item 5 and go to Item 6.

If there is more than one field, you must use the **Random Number Label** to randomly pick one field to focus on for the rest of the interview.

The State Office will place a Random Number Label (see Figure 5.2 on page A-5010) on the Field Selection page in each questionnaire. Read across the FLD (field) line to match the number of fields you listed in Item 3. On the SEL (selected) line immediately below the FLD line is the number of the randomly selected field.

Circle the pair of numbers on the label associated with the last numbered field line in Item 4. Write the randomly selected field number in Item 5. Circle the randomly selected field in the Item 4 listing. This helps both you and the respondent identify the randomly selected field.

Practice this procedure until you are comfortable with using the Random Number Label. Randomness of field selection is another essential element in making accurate estimates for the whole commodity enterprise from just one selected commodity field.

Item 6: Informing Respondent of Field Selection

Tell the respondent which field is selected, and be certain that both of you can identify that field.

For the remainder of the interview, the respondent must be able to focus on the selected field, and provide you with information for only that field.

V8 - North Carolina only

Upland Cotton

Write the field number and description on the postharvest postcard that the operator will return after harvest is complete.

Field Selection on Version 10: Multi-crop

When you've completed field selection for *Commodity 1* identified on the Random Number label on page 4 in Section A, proceed with field selection for *Commodity 2* identified on the Random Number label on the page 5. Use the same procedures for Items 3, 4, 5 and 6. Be sure the respondent understands that you will be asking questions about **each** of these fields, and **only** these selected fields of each commodity.

Proceed with the interview, asking each question first for the selected [*commodity 1*] field, then for the [*commodity 2*] field. For some items, such as harvested acreage and yields, you will ask a short series of questions for the selected [*commodity 1*] field, and then ask a similar series for the [*commodity 2*] field. As you continue, the respondent will catch on to the procedure, and the interview will go quickly, smoothly, and efficiently.

Be sure you record the response for each question in the cell box for the appropriate commodity.

If the respondent did not plant *target commodity 1* AND did not plant *target commodity 2*, make notes, then go to Item 4 of the Conclusion and conclude the interview.

Field Selection Grid Supplement

This procedure is rarely necessary, but be prepared to use it so that the interview begins smoothly. The reason we use the field selection grid is to be able to list the respondent's fields systematically so that a single field may be randomly selected.

You will not need this procedure if the respondent has names or numbers for the fields, or is able to describe them. The exception may be when the operator has more than 18 fields, and it is difficult to identify the 18 fields closest to the operator's permanent residence.

Mapping Fields on the Field Selection Grid Supplement

Beginning with the field of the target commodity closest to the operator's residence, draw off the operation's fields. There is no need to draw off more than 18 fields, since the Random Number Label accounts for up to 18 fields. Sketch in any boundaries such as roads and rivers which may help you and the respondent locate the fields accurately. It may be helpful to use a county map along with the grid.

Do not spend a lot of time trying to make your map a work of art. Drawing to scale is not important, but the relative location of fields to the operator's permanent residence is important. The field furthest north should be nearest the top of the grid, and the field furthest west should be at the far left of the grid.

Once fields are drawn on the grid, you are ready to begin numbering them. Number the (up to 18) fields drawn from 1 to 18, and then continue with the random field selection with the random number label.

Using Farm/ranch Maps

If the respondent has a farm or ranch map for you to write on, locate and mark (an X is fine) up to 18 of the operation's fields of the target commodity. Begin numbering the fields as you mark them. Remember, we are locating the fields closest to the operator's permanent residence. Continue marking and numbering up to a maximum of 18 fields per operation.

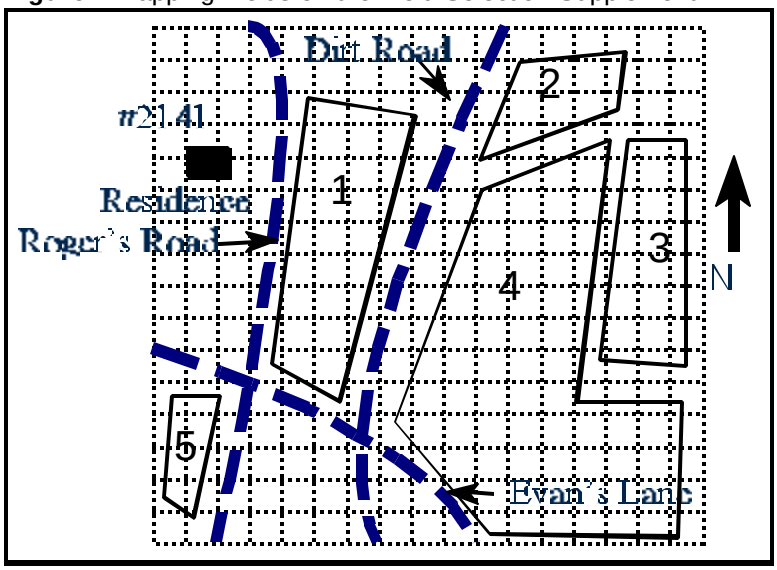
Some operators have copies of maps or aerial photos from their local county office of USDA's Farm Service Agency (FSA). The operator's fields are drawn off on these maps or aerial photos and identified with letters and numbers. These maps may also be helpful in the field selection process for this survey. On these FSA field maps, identify the operation's fields of the target commodity, mark them and number them beginning with number 1. Or you may use the FSA letters and numbers when listing the fields in Item 4.

Whatever method you (and the respondent) use to number the fields, it is important that you and the operator can identify the selected field when you've completed field selection. Do not proceed with the interview until you are sure he can specifically reference the selected field.

Numbering the Fields

Begin numbering the fields. If there are 18 or less fields, you can number in any sequence you want. If there are 19 or more fields, number the 18 fields closest to the operator's permanent residence. However, the field closest to the residence does **not** have to be "1", and the next closest "2". You only need to list the closest 18 fields to the residence.

Figure 1 Mapping Fields on the Field Selection Supplement



Example 1: Random Field Selection

The respondent tells you that there are 5 fields of corn in the operation, but does not have identifying names or numbers for them. The respondent does not feel confident about describing them very well, but says drawing them would help. Refer to Figure 5.1.

1) For Item 3, enter "5".

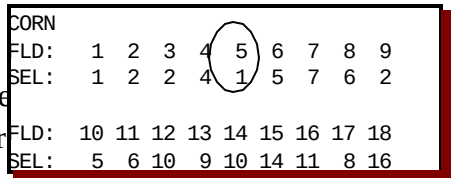
2) Get a Field Selection Grid Supplement. Copy the ID, Tract and Subtract from the questionnaire to the supplement and enter the commodity name OR you may use a map of fields supplied by the respondent.

3) Draw the 5 fields on the grid (or map) in relation to the operator's residence.

4) Number the fields drawn on the grid (map). Continue with Item 4, and list the 5 fields as the respondent identifies them.

5) Locate the number 5 on the FLD line of the Random Number Label (Figure 5.2).

Figure 2 Example of a Random Number Label



6) Circle the pair of numbers on the label associated with the number 5. For this example, the random number selected is '1'. The corn field listed on line 1 of Item 4 is selected as the random field. Circle field 1 in the Item 4 listing and on the grid (or map).

7) Record the randomly selected field number, number 1, in Item 5.

8) Identify this field for the respondent as the selected field for this interview. Be sure that the respondent knows which field this is. Tell the respondent that most of your questions will be about this selected field, and that these questions should be answered with information about this field only.

It may help the respondent to stay focused on the selected field if you refer to it occasionally during the interview using the same description reported to you. For example, when you originally listed the operation's 5 fields of corn, the respondent called field #1 "45 acres on Smitty's." Several times during the interview, refer to this field using these same words. For example, when you ask Item 1 in Section C, say, "Were commercial fertilizers applied to these 45 acres on Smitty's for the 2000 corn crop?"

This procedure may be especially helpful when completing the *Version 10* questionnaire, where you will be alternating questions for fields of two different target commodities. It may also reduce confusion and reassure you that the respondent's answers are for the correct field.

Section B - Field Characteristics

What's Section B for anyway? How is the information used?

Section B obtains information used to calculate cost of production per planted acre on the selected field. If a crop is planted, some costs are incurred, regardless of whether the crop is harvested or not.

Data from Section B are also used to study land tenure, conservation practices, and adoption of new technologies such as genetically modified seed technology. Even though there are no direct cost questions in the PPR questionnaires used for 2000, much of the data collected in Section B are used to update Cost of Production estimates for field crops.

In some parts of the country, it is common to let land lie fallow (no crop harvested) for an entire season to conserve moisture and/or improve soil quality. In calculating cost estimates, fallow land incurs a cost which is assigned to the crop following the fallow period. If the fallow acres are planted to a cover crop, the cost of the cover crop seed is also considered in updating cost of production estimates. In non-survey years, knowing the cover crop allows ERS to adjust cover crop seed costs using NASS' annual seed prices.

Seeding rate is needed to determine the cost of planting the target crop. The seeding rate allows ERS to adjust seed expenses between survey years using NASS' annual seed prices.

Previous crop data provide information on cropping patterns, important in analyzing fertilizer and pesticide use. In addition, USDA is required to evaluate conservation tillage systems. The previous crop is used in conjunction with the machinery data collected in Section F to estimate residue levels and determine tillage systems. The resulting information is used to evaluate soil erosion losses and water quality.

Item 1: Field acres

Enter the number of acres **planted** in the selected commodity field. Round to nearest tenth (1/10) of an acre. Exclude areas of waste, roads, and ditches that are not planted to the target crop.

V8
Upland Cotton

In fields where cotton is inter-planted or skip-row planted, the acres actually planted to cotton are less than total acres in the field. The following table shows factors to use in converting total field acres to cotton acreage for common planting patterns:

Planting Pattern		
Cotton Rows	Skip Rows	Factor
2	1	.667
2	2	.500
2	4	.333
4	2	.667
4	4	.500

Multiply the total acres in the field by the factor to determine net acres planted to cotton. For a 40 acre cotton field planted in a 4 cotton row/2 skip row pattern you would record 26.7 acres (40 * .667). If the 40 acre field was planted in a 2 cotton row/2 skip row pattern you would record 20 acres (40 * .500).

Item 2: Tenure arrangement

V2, V3, V5, V6, V8, V10

Rice, Sugarbeets, Corn, Soybeans, Upland Cotton

This item is used to determine the cost of land for crop production, and whether production practices used for owned fields differ from those on rented fields. In most cases the entire field will either be owned, rented or used rent free and you will record the appropriate code for the type of tenure arrangement. If the field contains acreages of different tenure types, record the code that reflects the tenure of the majority of the acres in the field.

INCLUDE:

1) acres in the field for which the operator paid cash rent on a per acre basis (**CODE=2**).

2) acres in the field for which the operator paid the landlord a share of the crop (either standing or harvested), (**CODE=3**). Include acres of the target commodity planted on share rented land, even if the crop was plowed under or abandoned and, therefore, the landlord's share was zero, as long as the rental agreement specified the rental fee was to be a share of the crop grown.

3) acres in the field belonging to others (private individuals, federal, state, railroad, etc.) which the operator used rent free (**CODE=4**). If the rental agreement specifies the landlord only receives a share of the government payments, and no share of the crop, then this should be counted as land used rent free.

Item 3: Cash rent paid

V2 , V3

Rice, Sugarbeets

If the selected field is cash rented (Item 2 = 2), ask how much was paid in cash rent. Record cash rent in dollars and cents per acre. If this figure cannot be obtained, ask for the total dollars paid in cash rent for the field and write in a comment.

Sugar beet growers in some areas will commonly have 4-year cash rent contracts for a field that they plant in a crop rotation schedule. For instance in North Dakota the common 4-year rotation would be wheat-wheat(or barley)-pinto beans-sugarbeets. They could allocate a larger portion of cash rent to sugarbeets as compared to other crops in the rotation because sugar beet returns are higher than other crops. Therefore, just asking average rent paid over the 4-year contract will be lower than what the operator actually allocated to sugarbeets. ***If you encounter sugarbeets grown in this type of multi-year cash rent contract, probe the respondent for the amount per acre allocated to sugarbeets and be sure to make complete notes*** concerning the contract arrangement.

Item 4: Landlord's share of the crop

V2 , V3

Rice, Sugarbeets

If the selected field is share rented (Item 2 = 3), record the percent of total production from the selected field that belonged to the landlord.

If the crop failed or the field was abandoned, then the landlord's share would have been zero, regardless of the original rental agreement. In this case, note in the margin that the crop failed in the field, and record the percent of the crop the landlord would have received (based on the original rental agreement) had the crop not failed in Item 4.

Item 5: Year began operating field

Analysts are interested in the effect of land ownership on the adoption of long-term practices such as terracing and building levees. These items, along with information from Item 29, provide information needed for this analysis.

Record the year this operator began operating land inside the field. If part of the field is owned, and part is rented, enter the earliest of either the year of the lease arrangement or when the field was purchased. If 2000 was the first year the field was farmed by the operator, enter '2000'.

Item 5a: Long-term expectations

Analysts are interested in the relationship between the expected length of the operator's use of the field and the application of long-term land improvements to the field. This item will help answer the question of whether or not operators who do not intend to operate a field for the long term are more or less likely to apply more costly long-term conservation improvements to the field.

Enter a code "1" if the operator expects to be operating this field for the next five years (through the 2005 crop year).

Item 6: Type of rice planted

V2

Rice

Enter the code indicating the type of rice planted in the selected field.

Item 7: Planting date

Record the date the selected field was planted. If the field was reseeded or replanted to the target crop, record the date the field was planted the first time. If more than one day was needed for planting the field (the first time), enter the date planting was completed.

If the operator does not know the planting date, ask what week the field was planted. Then enter the date for the WEDNESDAY of that week.

Record month, day, and year, in digits. For example, May 12, 2000, will be entered as 05 12 00.

Item 8: Sugar Beet row width

V3

Sugarbeets

Enter the average row width in whole inches.

Item 9: Type of tillage used

V8 - North Carolina only

Upland Cotton

Enter the code indicating the type of tillage used in the selected upland cotton field.

Item 10: Seeding rate

Determine the initial (first) seeding rate per acre for the selected field. Do NOT include any reseeding or over seeding (full or partial) as part of this rate.

V2

Rice

Enter the RATE of seeding per acre in POUNDS PER ACRE to the nearest TENTH(1/10).

V3

Sugarbeets

Enter the RATE of seeding per acre in POUNDS PER ACRE to the nearest TENTH(1/10). In some areas respondents may only know SEEDS PER ACRE so we have allowed this reporting option. If SEEDS PER ACRE are reported we must also know seed size (small, medium, large, or extra large). The preferable reporting unit is POUNDS PER ACRE. If the seeding rate is reported in SEEDS PER ACRE, you MUST also report seed size.

V5, V6, V7, V8, V10

Corn, Soybeans, Wheat, Upland Cotton

Enter the RATE of seeding and also the UNIT for the seeding rate. Rate and unit may vary by crop. Record the units to the nearest TENTH (1/10). For example, if the operator responds in bushels per acre, be sure to record the tenths of bushels.

Valid codes for the seeding rate units are:

1 = **Pounds**
2 = **Cwt** (hundredweight, 100 pounds)
4 = **Bushels**
25 = **Kernels / Seeds**

For example, a seeding rate of 1 bushel per acre is recorded as:

Figure 3 Coding seeding rate and units.

	UNITS PER ACRE	UNIT CODE 1=POUNDS 2=CWT. 4=BUSHELS 25=KERNELS/SEEDS
What was the seeding rate per acre the first time this field was seeded?	1.0	4

Item 10a: Method of seeding

V2

Rice

Refer the respondent to the List of Seeding Methods in the Respondent Booklet. For the selected field, determine what method of seeding was used. If more than one method was used, record the acreage of each in the margin, and enter the code for the method used for most of the acres.

Item 11: Acres reseeded

V2, V3

Rice, Sugarbeets

Record the total number of acres of the selected field that were reseeded to the target commodity. Enter acres to the nearest TENTH of an acre.

If some acres were reseeded more than once, count them again: number of acres reseeded times number of times reseeded. Example: In a 30 acre field, if 10 acres were reseeded three times and 10 acres were reseeded once, the total acres reseeded would be 40.0 acres.

Item 12: Seed source

V2, V6, V7, V8, V10

Rice, Soybeans, Wheat, Upland Cotton

Record the source of the seed used on the selected field. Use the following response categories:

Code 1 - **Purchased**: This is seed that was bought from a seed dealer or another operator.

Code 2 - **Homegrown or Traded**: "Homegrown" is seed grown on the farm by the respondent and used for planting the selected field for the 2000 crop. "Traded" is when the operator swaps seed with no cash changing hands, such as swapping with a neighbor.

Code 3 - **Both**: The operator used both homegrown or traded AND purchased seed to plant the selected field. If both were used on the farm and the operator cannot determine which was used on the selected field, use code 3 (BOTH).

Item 13: Amount of home grown or traded seed

V2

Rice

If any of the seed used was grown on this operation or traded (Item 12 = 2), then record the amount of home grown / traded seed used in the selected field in Item 13. Although percent can be entered, the actual number of pounds is the preferred response.

Items 14 & 14a: Cost for cleaning and treating seed

V2

Rice

Usually, homegrown seed is cleaned before being planted. It is also common for the seed to be treated with an insecticide or fungicide prior to planting.

Record the cost of cleaning the seed, plus any cost of chemically treating the seed, in dollars and cents per pound. Include only chemical treatments made to the seed before planting. Exclude the cost of chemicals applied at planting time, as these will be obtained in the Pesticide Applications section.

If there was no cost for cleaning and treating this seed be sure to write a comment explaining why there was no cost in Item 14a

Item 15: Reason for choice of rice seed variety

V2

Rice

Show the RICE SEED REASONS code list in the Respondent Booklet. The code list for Rice is different from the other crops.

Point out the reason list in the respondent booklet, and ask the respondent for his primary reason for selecting the variety of rice seed used in the selected field for the 2000 crop.

Item 16: Use of a Hybrid seed variety

V2

Rice

Various hybrid seed varieties are available to rice growers. Ask the respondent if any type of hybrid seed (*for example, Ricetec, XL6, etc.*) was planted in the selected rice field. Code “1" for YES.

Item 17: Seed cost

V2

Rice

If any rice seed was purchased (Item 12 = 1 or 3), record the per unit cost of the purchased seed for the selected field. If both homegrown or traded seed and purchased seed were used on this field, record the cost per unit for the portion that was purchased only.

Include landlord's cost.

Record the cost in dollars and cents per unit and enter the code for the appropriate unit.

Example: The seed cost $11.90 per bushel.

	DOLLARS AND CENTS PER UNIT	UNIT CODE 1=POUNDS 2=CWT 4=BUSHEL 22=ACRE 23=50 POUND BAG
17. [If any seed purchased, ask-] **What was the total cost per unit of purchased seed for this field?** [***include*** *landlord's share*] [***include*** *cost of seed treatments*]	11.90	4

Item 18: Sugarbeet seed cost

V3

Sugarbeets

Record the per unit cost of the purchased seed for the selected field. **Be sure to include** landlord's costs and the cost of seed treatments. In some cases sugarbeet seed will be treated by the operator, so be sure to include these costs.

Record the cost in dollars and cents per unit and enter the code for the appropriate unit. Example: The sugar Beet seed cost was $15.95 per acre.

	DOLLARS AND CENTS PER ACRE
18. **What was the total cost per unit of sugarbeet seed for this field?** [***Include*** *landlord costs]* [***Include*** *cost of seed treatments]*	15.95

Items 18a, 18a(1) & 18a(2): Cover/Nurse crop and costs

V3

Sugarbeets

Sugar beet growers plant cover crops or nurse crops (mainly barley) with beets to protect seedlings against wind erosion. Once the beet seedlings are established, they kill the nurse crop with a grass herbicide. This is a fairly new practice which is becoming more popular. This planting and killing of a nurse crop is a cost to the sugar beet enterprise, therefore, the seed and chemical costs need to be collected.

If a cover/nurse crop was planted, enter code "1" in Item 18a and ask Items 18a(1) and 18a(2).

For Item 18a(1) show the operator the Crop List in the Respondent Booklet and ask what crop was planted as a cover/nurse crop.

For Item 18a(2) ask for **total seed costs per acre** for the cover/nurse crop and enter the response in dollars and cents.

NOTE: Be sure that the field operations associated with the planting of the cover/nurse crop are included in the Section F, Field Operations Table and that any chemical applications are included in the Section D, Pesticide Applications Table.

Items 19a & 19b: Resistant seed varieties

V5, V6, V8, V10

Corn, Soybeans, Upland Cotton

Show the operator the Seed Variety Code List in the Respondent Booklet. The Code Lists printed in the Respondent Booklet identify various types of seed varieties. The operator may need this visual aid as a reminder that such a variety was planted. It may also help him properly categorize the variety. Determine if one of the TYPES of seed listed was used for the 2000 crop. If a non resistant seed type was used, enter a "6" in the code box.

If the same crop was planted **in the selected field** for the 1999 crop, find out the type of variety planted for 1999. For example, if corn was planted in the selected field in both 1999 and 2000, you would ask item 19b.

If more than one type of variety was used on the field, select the variety used on the most acres in the field.

For corn and cotton code 3 is for seed varieties containing a Bt gene for insect resistance. "Bt" means *Bacillus thuringensis*, which is a bacteria that is used to control many larva, caterpillar, or insect pests. Some new seed varieties contain genes from the bacteria Bt, which provides resistance to certain insect pests as the plants grow.

For soybeans, code 2 (Non GM herbicide resistant) caused some confusion last year. Many comments were made that there was no such thing as a Non-GM herbicide resistant soybean seed and that may be true in your area but at the national level it is not true. An example of a Non-GM herbicide resistant soybean seed is STS (sulfonylurea tolerant soybeans).

Items 19a(1), 19a(2) & 19a(3): Seed variety issues

V8 - North Carolina only

Upland Cotton

Item 19a(1): If a stacked-gene variety was planted in 2000 (Item 19a = 4), ask the respondent if they would have used a non-stacked genetically modified (GM) variety had it been available. If the respondent indicates that he/she would have used another variety had it been available, enter code "1".

Item 19a(2): If a Non-GM variety was planted in 2000 (Item 19a = 6), ask the respondent if they would have used a resistant variety if a non-stacked genetically modified (GM) variety had been available. If the respondent indicates that he/she would have used another variety had it been available, enter code "1".

Item 19a(3): Show the respondent the list of Upland Cotton Seed Varieties from the Respondent Booklet and ask them to choose the code for the variety planted in the selected field in 2000.

Item 20: Reason for use of resistant seed

V5, V6, V8, V10

Corn, Soybeans, Upland Cotton (Except North Carolina)

Ask only if the seed planted in the selected field in 2000 WAS a resistant variety (Item 19a is NOT = 6).

Resistant seed varieties usually add to the cost of producing a particular crop. For this reason, analysts are interested in the reason a producer would incur the additional cost. This item is intended to determine if the decision to use a resistant variety was driven **primarily** by economic reasons (the extra cost of the variety is offset by reduced herbicide costs because a lower cost herbicide can be used), environmental reasons (the variety is resistant to an overall less toxic herbicide), or some other reason.

If the producer indicates some other reason led to the choice of the resistant variety, record a '8' in the answer cell and write a note to describe the producer's reason.

Show the operator the list of Reasons to use Resistant Seed in the Respondent Booklet and ask for their primary reason for choosing resistant seed. **If the respondent indicates that more than one reason led to the choice of the variety, probe to obtain which reason was the most important in making the decision.**

V8 - North Carolina Only

Show the operator the list of Reasons to use Resistant Seed in the Respondent Booklet and ask them to rank their **top three reasons** for choosing resistant seed. The primary reason code will be recorded in item code 1749. The other 2 reasons should be recorded in item codes 1940 and 1941.

Item 21: Harvest complete at time of interview

Determine if harvest of the selected field has been completed at the time of the interview. If harvest has not been completed, use alternative wording in parentheses in the next few questions about what the operator expects to be the result of harvest.

If the crop in the selected field was abandoned, leave this item blank.

Item 21a: Cotton harvesting dates

V8 - North Carolina only

Upland Cotton

Enter the beginning and ending harvesting dates in the MMDDYY format. For instance, if they began harvesting the cotton field on September 12 and completed harvest on September 14, you would record 0 9 1 2 0 0 in harvest beginning date and 0 9 1 4 0 0 in harvest ending date.

Item 22: Acres harvested and yield

This item obtains the disposition of acres of the crop planted in the selected field and actual or expected yields.

Item 22a: Acres harvested

Determine acres in the selected field harvested for:

grain (V5/V10: corn; V7/V10: wheat),

beans (V6/V10: soybeans),

lint (V8/V10: cotton),

grain, first crop (V2: rice)

depending on the commodity. If harvest of the field has not been completed at the time of the interview, use the alternative wording in parentheses and ask how many acres **will be** harvested or used for the appropriate crop. Record acres to the nearest TENTH of an acre.

For corn, count *high moisture shelled* and *high moisture ear corn* as corn for grain.

Yield per acre

If the selected field has been harvested, record the average yield per acre for the purpose indicated. Record the yield per acre to the nearest tenth of a unit.

For crops other than cotton and sugarbeets, record the appropriate unit code for the reported yield. For upland cotton, yield must be reported in **pounds of lint** per acre. For sugarbeets, yield must be reported in **tons** per acre.

If harvest of the selected field is not complete, use the alternative wording in parentheses and ask the operator what yield per acre is expected at harvest.

Item 22b: Acres harvested for silage / greenchop / ratoon crop

V2, V5, V7, V10

Rice, Corn, Wheat

For corn and wheat determine acres in the selected field harvested for silage or greenchop. For rice, if a ratoon crop was harvested from the selected field, record the number of acres of ratoon crop harvested. If harvest of the field has not been completed at the time of the interview, use the alternative wording in parentheses and ask how many acres **will be** harvested. Record acres to the nearest TENTH of an acre.

Do not include *high moisture* corn as silage. Count *high moisture* corn, whether shelled or ear, as corn for grain in Item 22a.

Yield per acre

For corn and wheat, if the selected field has been harvested for silage or greenchop, record the average yield per acre to the nearest tenth of a **ton** per acre. For rice, if a ratoon crop has been harvested, record the average yield per acre and the appropriate yield unit.

If harvest of the selected field is not complete, use the alternative wording in parentheses and ask the operator what yield per acre is expected at harvest.

Item 22c: Acres harvested for seed

V2, V5, V7, V10

Rice, Corn, Wheat

Determine acres in the selected field harvested for seed. If harvest of the field has not been completed at the time of the interview, use the alternative wording in parentheses and ask how many acres **will be** harvested or used for seed. Record acres to the nearest TENTH of an acre.

Yield per acre

If the selected field has been harvested for seed, record the yield per acre to the nearest tenth of a unit and the appropriate unit code for the reported yield.

If harvest of the selected field is not complete, use the alternative wording in parentheses and ask the operator what yield per acre is expected at harvest.

Item 22d: Acres abandoned

Determine acres in the selected field that were abandoned before harvest. Record abandoned acres to the nearest tenth of an acre. Indicate with a note why the acres were abandoned. Abandoned acres are different than acres for 'other purposes.' Include as acres abandoned **only** acres that were planted with the intention of harvest, but were not harvested for any reason.

Acres planted for cover crop, hay, or for a purpose other than those covered in 22a, 22b, or 22c should be recorded in 22e, Acres used for some other purpose.

Item 22e: Acres used for other purpose

Determine acres in the selected field that were used for some purpose other than those covered in Items 22a, 22b, or 22c. This includes acreage harvested for hay and acres used for a cover or nurse crop. Record these acres to the nearest tenth of an acre.

Do not count acres for other uses as acres abandoned and vice versa. Acres abandoned are those that were planted with the intention of harvest, but then abandoned prior to harvest for any number of reasons.

Acres for other purpose are those acres that were planted and used for some purpose other than those listed in Items 22a, 22b, or 22c.

Item 23: Reason for not harvesting rice

V2

Rice

If **any** of the rice acres in the field were not harvested (ratoon acres, abandoned acres or acres for 'other uses' are positive), determine the primary (most important) reason why.

Items 24& 24a: Dollars received for sales/grazing

V3

Sugarbeets

Determine the total dollars received (or expected to be received) by the operation for the sale of beet tops and fees for grazing livestock on beet tops after harvest. The total amount received by the operator should be reported in Item 24 and any dollars received by the Landlord should be reported in Item 24a.

Item 25: Normal cotton rotation

V8 - North Carolina only

Upland Cotton

Enter the number of years the operator would normally grow cotton in the selected field before rotating to another crop.

Item 26: Crops Planted in Previous Years

This item obtains the crop planted in the selected field for the previous 3 crop years. Information about previous crops grown, along with tillage practices obtained in Section F, allow researchers to assess the residue of previously-harvested crops. For example, corn for grain leaves the field 85% covered, while corn for silage essentially strips the field bare.

In the series of Items 26a-f, you will ask the operator to identify the crops that were previously **planted** on the selected field during the time periods working backwards to 1997.

Include cover crops planted during the indicated period.

The **action** of planting the crop must have occurred during the time period named in each individual item.

If a crop was growing on the field during a particular time period, but it was not planted during that period, then code 318 (no crop planted during time period) should be entered in the appropriate cell. Perennial crops, such as alfalfa,

clover, or other grasses, should only be captured in the time period during which they were actually planted. The **one exception** to this rule is Item 26f (SPRING/SUMMER of 1997). If a perennial crop was growing on the field at that time, it should be recorded, even if it was not planted at that time.

Completing this question has presented some difficulties, especially when double-cropping occurs. To address these problems, we have defined the planting periods as Spring/Summer and Fall.

The reason for including summer in the spring planting period is that in some States when double cropping occurs, the second crop may not be planted until late June or early July. Thus, the spring/summer period really extends up to the fall planting period. The fall period would be for planting winter crops, such as winter wheat or cover crops.

General instructions for completing Item 26

Enter the crop code for the crop previously planted on the selected field for **each** of the designated time periods. Use the Partial Crop Code List printed in the questionnaire. For any crops not listed in the Partial Crop Code List, write the crop name in the space provided, and leave the code box for the crop code blank. The survey statistician in the Office will fill in the correct crop code for that crop.

If the operator did not operate the field in any of the previous time periods and doesn't know what crops were planted, note this in the margin.

Record crops if they were **planted** during the time period, even if the crop was abandoned before harvest because of drought, hail, or some other event.

If the current field was subdivided into two or more fields in a previous period, record the crop that occupied the largest portion of the current field. For example, if the current field is 100 acres and last year 60 acres were fallow and 40 acres were wheat, record fallow (Code = 318) as the previous crop.

After recording the crop planted during each period, ask if that crop was irrigated. If no crop was planted, then leave the irrigated cell blank.

Item 26a: Crop planted fall 1999

Record the code for the crop **planted** on the selected field in the fall of 1999. If a crop was planted, it would likely be a cover crop or a winter crop. If a crop was planted during the fall of 1999, ask if that crop was irrigated.

Use code 318 if **no** crop was planted during that period. If no crop was planted, then leave the irrigated cell blank.

This question is not asked for winter wheat fields; for these fields, the target crop would have been planted during the fall/winter of 1999.

Item 26b: Crop planted spring/summer 1999

Record the code for the crop **planted** on the selected field in the spring/summer of 1999. If a crop was planted during the spring/summer of 1999, ask if that crop was irrigated.

Use code 318 if **no** crop was planted during that period. If no crop was planted, then leave the irrigated cell blank.

Item 26c: Crop planted fall 1998

Record the code for the crop **planted** on the selected field in the fall of 1998. If a crop was planted, it would likely be a cover crop or a winter crop. If a crop was planted during the fall of 1998, ask if that crop was irrigated.

Use code 318 if **no** crop was planted during that period. If no crop was planted, then leave the irrigated cell blank.

Item 26d: Crop planted spring/summer 1998

Record the code for the crop **planted** on the selected field in the spring/summer of 1998. If a crop was planted during the spring/summer of 1998, ask if that crop was irrigated.

Use code 318 if **no** crop was planted during that period. If no crop was planted, then leave the irrigated cell blank.

Item 26e: Crop planted fall 1997

Record the code for the crop **planted** on the selected field in the fall of 1997. If a crop was planted, it would likely be a cover crop or a winter crop. If a crop was planted during the fall of 1997, ask if that crop was irrigated.

Use code 318 if **no** crop was planted during that period. If no crop was planted, then leave the irrigated cell blank.

Item 26f: Crop planted spring/summer 1997

Record the code for the crop **planted** on the selected field in the spring/summer of 1997. If a crop was planted during the spring/summer of 1997, ask if that crop was irrigated.

Use code 318 if **no** crop was planted during that period. If no crop was planted, then leave the irrigated cell blank.

If a perennial crop, such as alfalfa, clover, or other grasses, was growing on the selected field in the spring/summer of 1997, enter the code for the perennial crop, even if it was not planted during this period.

Examples of completing Item 26

We know that the target commodity was planted in the fall of 1999 (for winter wheat) or spring/summer of 2000 for other target crops.

Example 1: Crop Rotation: Continuous crop example

Continuous soybeans, not irrigated; **target commodity soybeans**.

Items 26b, 26d, and 26f are coded with 26 for soybeans.

Items 26a, 26c, and 26e are coded with 318, even though this is only a normal time period between continuous crops. No crop was **PLANTED** on the selected field during these fall periods.

Figure 1: Previously planted crops, continuous crop soybeans.

Next I need to know what crops were previously PLANTED on this field, **including cover crops**.

What crop was planted on this field –

a.	FALL of 1999?	Crop Name	*none*
		Crop Code	*318*
b.	SPRING/SUMMER of 1999?	Crop Name	*soybeans*
		Crop Code	*26*
c.	FALL of 1998?	Crop Name	*none*
		Crop Code	*318*
d.	SPRING/SUMMER of 1998?	Crop Name	*soybeans*
		Crop Code	*26*
e.	FALL of 1997?	Crop Name	*none*
		Crop Code	*318*
f.	SPRING/SUMMER of 1997?	Crop Name	*soybeans*
		Crop Code	*26*

Example 2: Crop Rotation: Double crop soybeans / wheat example

Double crop soybeans with winter wheat, neither crop irrigated; **target commodity is soybeans**.

Figure 2: Previously planted crops, double crop example.

Next I need to know what crops were previously PLANTED on this field, **including cover crops**.

What crop was planted on this field –

a.	FALL of 1999?	Crop Name	*w. wheat*
		Crop Code	*165*
b.	SPRING/SUMMER of 1999?	Crop Name	*soybeans*
		Crop Code	*26*
c.	FALL of 1998?	Crop Name	*w. wheat*
		Crop Code	*165*
d.	SPRING/SUMMER of 1998?	Crop Name	*soybeans*
		Crop Code	*26*
e.	FALL of 1997?	Crop Name	*w. wheat*
		Crop Code	*165*
f.	SPRING/SUMMER of 1997?	Crop Name	*soybeans*
		Crop Code	*26*

Example 3: Crop Rotation: Perennial (hay) crop example

Alfalfa crop planted prior to the spring 1997. Target crop planted in spring of 2000.

Figure 3: Previously planted crops, perennial crop example.

Next I need to know what crops were previously PLANTED on this field, **including cover crops**.

What crop was planted on this field –

a.	FALL of 1999?	Crop Name	*alf*
		Crop Code	*318*
b.	SPRING/SUMMER of 1999?	Crop Name	*alf*
		Crop Code	*318*
c.	FALL of 1998?	Crop Name	*alf*
		Crop Code	*318*
d.	SPRING/SUMMER of 1998?	Crop Name	*alf*
		Crop Code	*318*
e.	FALL of 1997?	Crop Name	*alf*
		Crop Code	*318*
f.	SPRING/SUMMER of 1997?	Crop Name	*alf. hay*
		Crop Code	*1*

Item 27: Land-use practices

Analysts are interested in the relationship between land tenure (owned vs. rented) and adoption of long-term capital improvements. To obtain the required information, you will ask when certain practices were established

Determine whether the land use practices in Items 27a-h were used on the selected field for the target commodity. Include land not planted to the target commodity if the operator considers it to be part of the selected field. For example, corn may be strip cropped with alfalfa in the same field. Only the acres planted to corn were counted in Item 1. However, since the entire field features strip cropping, the answer to Item 27f described below would be code 1= YES.

Each of the individual Items 27a, 27b, 27c, 27d, 27e, 27f, 27g and 27h must be asked. This is not a multiple choice question -- that is, there may not be just one single answer. The operator may use more than one of the land use practices listed. Enter code "1" = YES for each practice the operator used.

Item 27a: Terraces

V5, V6, V7, V8, V10

Corn, Soybean, Wheat, Upland Cotton

Terraces are ridges of soil that channel or divert water to tile intakes or grassed waterways.

Determine if the selected field has terraces.

If yes, ask when (what year) the terraces were first established. In the case of redesigned terraces, record the year of the most recent redesign. The operator may not know the year if the terraces were in place when he first began to operate the field. In this case, leave the year cell blank and enter a code '1'.

Item 27b: Temporary or permanent levees

V3, V5, V6, V7, V8, V10

Sugarbeets, Corn, Soybean, Wheat, Upland Cotton

Levees are walls or banks of soil spaced across or around the field that identify points of equal elevation. Levees are used for water control for irrigation, seasonal drainage, flood management, and ponding for weed control. Levees are used in some types of flood irrigation systems to control the water level throughout the field, most often with rice and the crops grown in rotation with rice. Gates may be installed in levees to assist in water control.

Levees may be permanent structures of the field (typically around the outside), or rebuilt each year during field preparation and leveled at harvest.

Determine if the selected field has temporary or permanent levees.

If yes, ask when (what year) the temporary or permanent levees were first established. The operator may not know the year if the temporary or permanent levees were in place when he first began to operate the field. In this case, leave the year cell blank and enter a code '1'.

Item 27c: Grassed waterways

V3, V5, V6, V7, V8, V10

Sugarbeets, Corn, Soybean, Wheat, Upland Cotton

Grassed waterways are water drainage channels in a field. Often they have been shaped or graded, and a permanent cover of vegetation has been established. Include waterways that are used as outlets for terraces and for disposing of runoff from diversion channels, stabilization structures, contoured rows, and natural depressions.

Determine if grassed waterways are in the selected field.

If yes, ask when (what year) the grassed waterways were first established. The operator may not know the year if the grassed waterways were in place when he first began to operate the field. In this case, leave the year cell blank and enter a code '1'.

NOTE - New question this year. Ask if they have received or expect to receive an annual rental payment from the federal or State government for keeping these grassed waterways in place. If Yes, enter a code "1" in column 3.

Item 27d: Filter strips or riparian buffers

V3, V5, V6, V7, V8, V10

Sugarbeets, Corn, Soybean, Wheat, Upland Cotton

A grass filter strip is an area of grass or other permanent vegetation used to reduce sediment, organics, nutrients, pesticides, and other contaminants from runoff and to maintain or improve water quality. Filter strips slow the velocity of water, allowing the settling out of suspended soil particles, infiltration of runoff and soluble pollutants, adsorption of pollutants on soil and plant surfaces, and uptake of soluble pollutants by plants.

A riparian buffer is an area of trees and shrubs located adjacent to streams, lakes, ponds, and wetlands. Riparian buffers of sufficient width intercept out-of-bank flood flows. In addition, the vegetation closest to the stream or waterbody provides litter fall and large woody debris important to aquatic organisms. Also, the woody roots increase the resistance of streambanks and shorelines to erosion caused by high water flows or waves.

Determine if filter strips or riparian buffers are on or adjoining the field. If 'Yes', enter a code '1'.

If yes, ask when (what year) the filter strips or riparian buffers were first established. The operator may not know the year if the filter strips or riparian buffers were in place when he first began to operate the field. In this case, leave the year cell blank and enter a code '1'.

NOTE - New question this year. Ask if they have received or expect to receive an annual rental payment from the Federal or State government for keeping these filter strips or riparian buffers in place. If Yes, enter a code "1" in column 3.

Responses to these new questions (27c & 27d - column 3) will identify operators who participate in the continuous signup of the CRP or similar State programs. With this information, we will be able to analyze characteristics of continuous signup participants, participants who receive cost-share but no annual rent and producers who install conservation practices but choose NOT to participate in programs. Knowing these characteristics will help target resources to enhance enrollment in the continuous CRP and the EQIP.

Item 27e: Contour farming

V3, V5, V6, V7, V8, V10

Sugarbeets, Corn, Soybean, Wheat, Upland Cotton

Contour farming is when producers perform tillage operations and plant crop rows across the slope of the land. Furrows and crop rows across the slope help retain water so that it can seep into the soil, instead of running off, taking loose topsoil with it. Contour farming can often be present when terraces are also in the field.

Determine if the operator uses contour farming in the selected field. If 'Yes', enter a code '1' and continue.

Item 27f: Strip cropping

V3, V5, V6, V7, V8, V10

Sugarbeets, Corn, Soybean, Wheat, Upland Cotton

Strip cropping is when strips of row crops and other cultivated crops alternate with grasses or other close growing crops. These alternating strips are planted across the slope of the land. Water runoff from the row crop is slowed down by the grasses, allowing it to seep into the soil better.

Determine if the operator uses strip cropping in the selected field. If 'Yes', enter a code '1' and continue.

Items 27g & 27h: Agricultural drainage

V3, V5, V6, V7, V8, V10

Sugarbeets, Corn, Soybean, Wheat, Upland Cotton

Agricultural drainage is the removal of excess water from the soil surface and/or soil profile of cropland, by either gravity or artificial means. ***Subsurface or tile drainage*** is designed to remove excess water ***from the soil profile.*** The water table is controlled through a series of perforated drainage pipes (tile or plastic tubing) that are installed below the soil surface, usually just below the root zone. Subsurface drainage pipes are typically installed at a depth of 30 to

40 inches, and at a spacing of 20 to 80 feet. A subsurface drainage network for a field generally outlets to an open ditch or stream. A ***channel or diversion (ditch) drainage system*** is designed to remove standing water ***from the soil surface***. A ditch drainage system involves the construction of open ditches within and/or around the field perimeter to catch and direct the flow of excess surface water.

Item 27g: Underground outlets

V3, V5, V6, V7, V8, V10

Sugarbeets, Corn, Soybean, Wheat, Upland Cotton

Underground outlets control water runoff by carrying water through underground pipe or tile to areas where it can run away without disturbing the soil.

Determine if the operator uses underground outlets such as tile drainage or drainage pipe in the selected field. If 'Yes', enter a code '1' and continue.

Item 27h: Other drainage or diversions

V3, V5, V6, V7, V8, V10

Sugarbeets, Corn, Soybean, Wheat, Upland Cotton

Other drainage channels or diversions include any other types of structures used to control or dispose of surface water runoff. Their purpose is to prevent or reduce soil erosion.

Determine if the operator uses other drainage channels or diversions in the selected field. If 'Yes', enter a code '1' and continue.

Item 28: NRCS classification of Highly Erodible Land

V3, V5, V6, V7, V8, V10

Sugarbeets, Corn, Soybeans, Wheat, Upland Cotton

NRCS would have evaluated the selected field and notified the operator of its classification if the operator had requested any kind of federal program benefits for the selected field.

Whether a field is classified as Highly Erodible depends on rainfall, the potential for soil erosion, and the length and slope of the field. NRCS uses these characteristics and other information to classify fields as Highly Erodible or not.

Enter code “1" if the Natural Resources Conservation Service or NRCS has notified the operator that the selected field has been classified as "Highly Erodible" or HEL land.

Item 29: Wetland designation

V3, V5, V6, V7, V8, V10

Sugarbeets, Corn, Soybeans, Wheat, Upland Cotton

Wetlands are areas where the normal condition of the soil is to be wet enough for long enough to support the continued growth of the kinds of plants that prefer wet soil conditions.

Enter code “1" if the NRCS has notified the operator that the selected field has been designated a wetland or contains a wetland.

General Information on Assistance and Cost-sharing

NRCS, Conservation Districts, Extension, State Agencies, consultants and contractors assistance in planning and installation of a vast array of resource conservation projects, many of which could be overlooked by producers. Specific practices and systems include:

Access Road
Animal Trails and Walkways
Bedding
Brush Management
Channel Vegetation
Chiseling and Subsoiling
Clearing and Snagging
Commercial Fishpond
Composting Facility
Contour Buffer Strips
Conservation Cover
Conservation Crop Rotation
Contour Farming
Contour Orchard and Other Fruit Area
Controlled Drainage
Cover and Green Manure Crop
Critical Area Planting
Cross Wind Ridges
Cross Wind Strip cropping
Cross Wind Trap Strips

Dam (diversion, floodwater, multi-purpose)
Dike
Diversion
Fence
Field Border
Filter Strip
Firebreak
Fish Raceway or Tank
Fish Stream Improvement
Fishpond Management
Floodwater Diversion
Floodway
Forage Harvest Management
Forest Harvest Trails and Landings
Forest Site Preparation
Forest Stand Improvement
Grade Stabilization Structure
Grassed Waterway
Grazing Land Mechanical Treatment
Heavy Use Area Protection
Hedgerow Planting
Herbaceous Wind Barriers
Hillside Ditch
Irrigation Canal or Lateral
Irrigation Field Ditch
Irrigation Land Leveling
Irrigation Pit or Regulating Reservoir Pit
Regulating Reservoir
Irrigation Storage Reservoir
Irrigation Systems
Irrigation Water Management
Land Clearing
Land Reclamation
Land Reconstruction
Land Smoothing
Manure Transfer
Mine Shaft and Audit Closing
Mole Drain
Mulching
Nutrient Management
Obstruction Removal
Open Channel
Pasture and Hayland Planting
Pest Management
Pipeline
Pond
Pond Sealing or Lining
Precision Land Forming
Prescribed Burning
Prescribed Grazing
Pumped Well drain
Pumping Plant for Water Control
Range Planting
Recreation Area Improvement
Recreation Trail and Walkway
Regulating Water in Drainage Systems
Residue Management
Riparian Forest Buffer
Rock Barrier
Roof Runoff Management
Row Arrangement
Runoff Management System
Sediment Basin
Soil Salinity Management
Spoil Spreading
Spring Development
Streambank and Shoreline Protection
Stream Channel Stabilization
Strip cropping
Structure for Water Control
Subsurface Drain
Surface Drainage
Surface Roughening
Terrace
Toxic Salt Reduction
Tree/Shrub Establishment
Tree/Shrub Pruning
Trough or Tank
Underground Outlet
Use Exclusion
Vertical Drain
Waste Management System
Waste Storage Facility
Waste Treatment Lagoon
Waste Utilization
Water Harvesting Catchment
Water and Sediment Control Basin
Waterspreading
Water Table Control
Well Decommissioning
Wetland Development or Restoration
Wildlife Wetland Habitat Management
Windbreak/Shelterbelt Establishment
Windbreak/Shelterbelt Renovation

Item 30: Assistance provided for conservation practices

Enter a code "1" if the operator received ***technical*** assistance from any source in the last year for planning, installing, establishing, maintaining, or using conservation practices or systems in the selected field. Be sure to include assistance from any source whether paid or free, public or private.

Item 31: Cost sharing assistance for conservation practices

Enter a code "1" if either the operator or the landlord received cost-sharing or incentive payments from any source in the last year for conservation practices or systems on the selected field. Exclude rental payments for keeping land in grassed waterways, filter strips or riparian buffers as reported in Items 27c & 27d column 3.

Item 32: Management plans

New question this year. This question will determine which, if any, management plans are in effect on the selected field. This information will contribute to analysis of adoption of improved systems and to the effects of approved plans on conservation, nutrient, pest, and irrigation management practices based on other data in the survey.

For each of the Items 32a, 32b, 32c, 32d and 32e enter a code "1" if a formal plan of the type described covered the selected field during 2000. If a formal plan was in place, enter the year that the plan was first implemented on this field.

A formal plan is a written plan prepared by a government agency or by others in accordance with government program requirements and standards. **Exclude** recommendations by commercial dealers, consultants, or advisors that are not specifically directed toward meeting government program requirements.

Item 33: Crop insurance

New question this year. This information will be used in adoption studies and in analyses of the relationship between risk management practices and cropping practices. For example, one question that will be addressed is whether farmers who purchase crop or revenue insurance use different production practices from those farmers who do not purchase insurance.

If the selected field is covered by Crop Insurance in 2000, enter “1" and continue with Items 33a, 33b, 33c and 33d. Otherwise, continue with Section C. The questions in this item relate to the types of insurance the operation purchased in 2000 for this field. For each of the Items 33a, 33b, 35c, and 33d enter a code “1" if the selected field is covered by the type insurance described.

Item 33a: Basic Catastrophic Insurance (CAT)

Crop insurance is offered by the USDA Office of Risk Management as two components; basic catastrophic coverage and buy-up catastrophic coverage. The premium for basic catastrophic coverage is fixed for all farms and covers 50 percent of the yield at 55 percent of an established price for the commodity grown on the area covered. This is sometimes called CAT or 50/55 coverage.

Enter a code “1" if the operation purchased basic catastrophic insurance (CAT coverage) in 2000 for this field.

Item 33b: Buy-up Catastrophic Insurance

Additional crop insurance can be purchased to supplement the catastrophic coverage. This coverage is bought to protect crops at higher yields and/or prices (for example: 65 percent yield at 100 percent of expected price). It can only be purchased from private insurance companies but is subsidized by the USDA. When farmers purchase this insurance, they sometimes use the term “buy-up” or “add-on”.

Enter a code “1" if the operation purchased buy-up on catastrophic insurance for higher levels of yield and price protection that covered this selected field.

Item 33c: Federal Revenue Insurance

Enter a code “1" if the operation purchased Federal Revenue Insurance such as Income Protection (IP), Crop Revenue Coverage (CRC), and Revenue Assurance (RA) that covered this field.

Item 33d: Other Federal Insurance

Enter a code “1" if the operation purchased other Federal insurance such as Group Risk Plan, Adjusted Gross Revenue, Risk Income Protection, etc. that covered this field.

Item 33e: Other Private Insurance

Enter a code “1" if the operation purchased other private crop insurance such as hail or freeze insurance that covered this field.

Section C - Fertilizer and Nutrient Applications

What is Section C for? How is the information used?

The purpose of this section is to identify fertilizers and nutrients used to produce the 2000 crop on the selected commodity field.

USDA is responsible for publishing estimates of the amount of fertilizer used in crop production. Accurate data on fertilizer application rates are needed for conducting sound economic analyses to address many complex issues concerning water quality and food safety. These analyses enable policy makers to make informed decisions.

Specifically, fertilizer application data are used to analyze issues and policies in the following general areas:

- Water Quality: Fertilizer data enable a determination of the geographic extent and intensity of use.
- Food Safety: Data are needed to determine the extent and intensity of fertilizer use to aid in the development of residue monitoring programs.

Nutrient management practices help farmers adjust fertilizer application to crop needs, and reduce losses to the environment. Legume production, storage and use of livestock and poultry manure, soil, plant, and tissue testing are all methods for computing nutrient balances that establish the basis of sound nutrient management.

In Cost of Production years, ERS uses cost data to estimate fertilizer expense for the year of the survey. For non-survey years, data for actual materials applied and application rates are used with data from other surveys to create a cost index that is then applied to the expense estimates from the previous cost of production survey.

Use of Supplements

You will use a FERTILIZER SUPPLEMENT if more lines are needed to record fertilizer applications than the number of lines available in the table.

Copy the identification as it appears on the questionnaire to the identification box on the supplement. Assign the next Table number (002, 003, 004, etc.) to

each additional supplement used. You begin numbering the supplements with Table 002 because Table 001 appears in the questionnaire. Use as many supplements as you need.

Item 1: Screening for Fertilizer applications

Determine if COMMERCIAL chemical fertilizers (nitrogen, phosphate, and/or potash) were applied to the selected field. If any commercial fertilizers were applied, enter Code "1" for YES.

Include:

- all chemical fertilizer materials applied specifically for the 2000 crop,
- fertilizer applied in the fall of 1999,
- fertilizers applied during the summer of 1999 or earlier years if the selected field was fallow in 1999,
- fertilizers applied by custom applicators,
- nitrogen products applied with herbicides to make the herbicide more effective,
- commercially prepared manure products.

Exclude:

- micro-nutrients, such as iron, zinc, and boron,
- lime and gypsum,
- non-purchased manure and manure produced and used on the operation.
- fertilizers applied to previous crops planted in this field (even if the carryover was beneficial to the crop currently in the field).

Item 2: Enumerator action

If commercial fertilizers were applied to the field for the 2000 crop, continue. If no commercial fertilizers were applied to the selected field, skip to Item 5 (V2, V3: Rice, Sugarbeets) or Item 7(All Other Versions).

Item 3: Number of commercial fertilizer applications

The number (and timing) of fertilizer applications is one of the key indicators of an operator's attempt to manage nutrients. Split applications are typically recommended as one way to enhance yields while reducing environmental risks.

There has been some anecdotal evidence that the number of acres treated with fertilizers may be under-estimated, when acres are treated with multiple applications. This stems from the fact that operators may readily know the total nutrients applied per acre per year but are not able to quickly calculate the amount applied during each application. Hence, we only get one line of data even though one or more applications were made.

Ask the operator how many trips were made across the field to apply commercial fertilizers. Include aerial applications. Exclude trips to apply manure and fertigation (applying fertilizer through irrigation water). A "trip" is an application made to all or part of the field. DO NOT count each pass across the field as a trip.

Item 4: Fertilizer applications table

Commodity Code (Column 1)

V10

Multi-crop

Enter the commodity code for each selected field as you enumerate the fertilizer applications for that target commodity.

When fertilizer applications are completely enumerated for the selected *[commodity 1]* field, proceed to list fertilizer applications for the selected *[commodity 2]* field.

If the respondent remembers an additional fertilizer application to the selected *[commodity 1]* field after you begin listing the applications for the *[commodity 2]* field, just record it on the next available line. Be sure to enter the correct commodity code in Column 1.

Materials Used (Column 2)

Record the plant nutrients (nitrogen (N), phosphate (P_2O_5), and potash (K_2O)) of each fertilizer material applied to the selected field for the target commodity. These nutrients can be reported in either of two ways:

1. **Percent analysis**: This is the percentage composition of the product expressed in terms that the law requires and permits.

Percent analysis is the preferred method of obtaining the data. Use actual plant nutrients only if absolutely necessary. Percent analysis is preferred because products used can be more easily identified this way.

2. **Pounds of actual plant nutrients**. Use pounds of actual plant nutrients only if absolutely necessary.

Record the fertilizer data in terms of pounds, gallons, or pounds of actual plant nutrients applied PER ACRE. Be careful that the respondent does not give you the total amount of fertilizer applied to the entire field. If a respondent knows only the total pounds of fertilizer or plant nutrients applied to the field, you must calculate rate per acre and enter it in the table. Rate per acre is calculated as the total quantity applied divided by the acres to which the application was made. Show the computations for deriving the rate per acre in the margin of the form.

For some crops, farmers may say that fertilizer applied to the previous crop grown on the field was partly for the benefit of the target commodity. Only part of this fertilizer was actually carry-over for the target commodity. Watch out for this because we **DO NOT** want to include these fertilizer applications in the fertilizer table.

Important: Record each individual fertilizer application made to the selected field on a separate line.

When fertilizer materials are bulk blended for application (for example, 10-10-10 combined with 18-46-0), record each product on a separate line in the fertilizer table, even though the fertilizer blend was applied in one trip over the field.

Percent Analysis

The most common method for reporting fertilizer materials is by percent analysis of their content of Nitrogen (N), Phosphate (P_2O_5) and Potash (K_2O), in that order. For example, 13-13-13 is 13 percent Nitrogen, 13 percent Phosphate and 13 percent Potash. This means that thirty-nine (13+13+13) out of every one hundred pounds of this fertilizer is active ingredients (N, P_2O_5 and K_2O). Sixty-one (100 - 39) pounds of every one hundred pounds of this fertilizer is carrier material (inert ingredients).

Two of the more common fertilizers used in crop production are 18-46-0 (diammonium phosphate or DAP) and 82-0-0 (anhydrous ammonia). If 18-46-0 were reported, you'd record 18 in Column 2 under N (nitrogen) and 46 under P_2O_5 (phosphate). The K_2O (potash) column would be dashed since there is no potassium (potash) in the mixture. For anhydrous ammonia, you'd record 82 under N. Since there is no phosphorus or potash in anhydrous, the phosphate and potash columns should be dashed.

Some fertilizer materials are applied in liquid form. A common liquid fertilizer material used in crop production is 32-0-0 (nitrogen solution). For this material you would record a 32 under N for nitrogen and dash the columns for phosphate and potash.

No fertilizer reported by analysis will have total N-P_2O_5-K_2O analysis of more than 85. Carrier or filler material makes up the rest of the total weight for commercial fertilizers. If a farmer reports 35-45-20, he's probably reporting pounds of actual nutrients instead of analysis since the three amounts (35 + 45 + 20) add up to more than 85 percent.

For fertilizer applications reported by percent analysis, record the quantity applied per acre (including carrier) in Column 3 and the appropriate unit of measure, pounds (code 1) or gallons (code 12), in Column 4.

For bulk blended fertilizer materials, use a separate line for each of the fertilizers that the dealer blended in the mixture. If the dealer mixed 150 pounds of 18-46-0 and 250 pounds of 0-0-60 together, record each on a separate line. DO NOT just add it up and record it on one line as 400 pounds of 18-46-60. This would be a major error, because the correct analysis of this fertilizer is 7-17-38, calculated by:

N (150 ÷ 400) x .18 = .068 (or 7%)

because there were 150 pounds of 18-46-0 in the mixture and of those 150 pounds, 18% was Nitrogen.

P_2O_5 (150 ÷ 400) x .46 = .173 (or 17%)

because 46 percent of the 150 pounds was available Phosphorus.

K_2O (250 ÷ 400) x .60 = .375 (or 38%)

because 250 pounds of the total 400 were 0-0-60 and this material is 60 percent Potash.

Actual Plant Nutrients

Another way farmers might report fertilizer use is in terms of Actual Plant Nutrients (APN) applied per acre. This may also be called pounds of active ingredients. If the farmer knew he applied 60 pounds of nitrogen; 35 pounds of phosphorus; and 40 pounds of potash PER ACRE, record this information in Column 2 and record code 19 in Column 4. In this case, no entry is needed in Column 3 because we know the actual amount applied for each of the three materials so we don't need to calculate it from percentages.

When farmers report "units" of N, P_2O_5, or K_2O, this is usually a clue that they are reporting pounds of actual nutrients. Fertilizer materials will amount to more than the actual nutrient contents of the products applied, because part of the material applied is carrier material, just like when the farmer reports by percent analysis.

For example, if the farmer reported that he applied 100 units of Nitrogen in the form of anhydrous ammonia, he would have applied about 122 pounds of 82% nitrogen. (100 ÷ .82 = 122) If this were reported by percent analysis, 82 would be recorded in the N column, 122 in Column 3 and 1 in Column 4. If it were reported as pounds of actual nutrients it would be recorded as 100 in the N column and 19 in Column 4. Column 3 would be left blank.

When actual plant nutrients (active ingredients) or "units" of a fertilizer are reported, you should probe to be sure the quantity applied is correct. One way to do this is to ask (when units were reported) if the actual weight of material applied was more than the number of units reported.

For example, "You said you put down 100 units of UAN32 per acre. Did the material you applied actually weigh more than 100 pounds per acre?"

Other Methods of Reporting Fertilizer Use

Farmers may also report fertilizers by name. Exhibit 5.2 on page C-5058 (and in the Respondent Booklet) shows some of the more common fertilizers with their usual analysis.

Anhydrous ammonia is the strongest nitrogen fertilizer available. It must be stored in a tank under pressure. It is applied by injection into the ground or into

irrigation water. Anhydrous is a liquid when under pressure, but turns into a gas when released and is lost if not injected into the soil. Anhydrous ammonia is a very popular fertilizer because it is often cheaper (per pound of nutrient) than other forms. It may be reported as "anhydrous", "gas", "NH_3", "82-0-0", "units of nitrogen", or as "pounds of actual nitrogen" (N).

Aqua ammonia is one of the more common types of liquid nitrogen fertilizers. It is made up of anhydrous ammonia and water and is often used in Western states. It may be reported in pounds (actual N) or gallons (material or product). Although it is a liquid, it is usually reported in pounds of actual N.

Urea is another commonly used nitrogen fertilizer because it has a high nitrogen analysis. It may be added through an irrigation system, usually as a nitrogen solution.

Calcium nitrate contains not less than 15 percent nitrogen and 19 percent calcium. Limestone or lime contains 40 percent calcium and 12 percent carbonate. Approximately 100 pounds of limestone contains the calcium equivalent of 210 pounds of calcium nitrate (100 * .4 = 40 pounds and 210 * .19 = 40 pounds). For example, if 200 pounds per acre of calcium nitrate were applied to the selected field, “15" would be recorded in column 2 (Nitrogen), “200" in column 3 (quantity) and a “1" in column 4 (pounds). ***Don’t forget*** that you must also report the limestone amount in Item 15b. In this example, .475 (19/40) * 200 = 95 so, 95 would be added to the total quantity of lime applied and reported in Item 15b.

With many of the other fertilizers listed in the Exhibit 5.2, the analysis may vary. Probe to find out if the farmer knows the analysis or the pounds of actual nutrients applied. If he doesn't know the analysis but knows the name, use the analysis shown in this section of the manual.

Quantity Applied per Acre (Column 3)

If percent analysis is reported, record the amount of material applied to the selected field in terms of pounds or gallons applied per acre. If pounds of actual nutrients were reported in Column 2, leave this column blank.

Be careful that the respondent does not give you the total amount of fertilizer applied to the entire field. If a respondent knows only the total pounds of fertilizer or plant nutrients applied to the field and not the rate per acre, you must calculate rate per acre and enter it in the table. In the margin of the form, show the computations for deriving the rate per acre.

Total Pounds ÷ Acres = Rate per Acre

For example, if the farmer applied a total of 1200 pounds to a sixty acre field, the rate per acre is calculated as:

1200 pounds ÷ 60 acres = 20 pounds per acre

Material Unit Code (Column 4)

If percent analysis is reported in Column 2, record either pounds of material (code 1) or gallons of material (code 12). If pounds of actual plant nutrients are reported in Column 2, enter code 19 in Column 4 and leave Column 3 blank.

When applied (Column 5)

Ask the respondent whether the **fertilizer application** was made before seeding in the fall, before seeding in the spring, at seeding, or after seeding.

Always record each application on a separate line. Do not combine multiple applications of the same fertilizer product on one line.

How applied (Column 6)

Show the respondent the Fertilizer/Pesticide Applications Method Codes in the Respondent Booklet. Ask the respondent which of the application methods was used to apply the fertilizer to the selected field.

The Application Method codes are:

Code 1 - **Broadcast, Ground without Incorporation**: Fertilizer material is applied to the entire surface area by land application equipment. Application may occur either before or after planting, usually before crop emergence. No mixing of the fertilizer material into the upper soil surface is needed or planned as part of the application.

Code 2 - **Broadcast, Ground with Incorporation**: Fertilizer material is applied to the entire surface area by land application equipment. Application usually occurs before planting, and a planned mixing of the fertilizer into the upper soil surface is completed at the time or shortly after the time of application. Incorporation of the fertilizer into the upper soil

surface is often performed with a field cultivator, disk, or other tillage implement.

Code 3 - **Broadcast by Aircraft**: Fertilizer material is applied to the entire surface area by air application equipment. Include only those applications made by airplane or helicopter.

Code 4 - **In Seed Furrow**: Fertilizer material is placed in the seed furrow **at planting** time, generally through a separate attachment on the grain drill.

Code 5 - **Irrigation Water**: Fertilizer material is mixed with water in either sprinkler or gravity fed irrigation systems. The term used for this procedure is fertigation. The product is metered into the water delivery system (generally a sprinkler irrigation system) and is distributed across the field in the irrigation water.

Code 6 - **Chisel, Injected or Knifed-in**: Fertilizer material is injected under pressure into the soil. This application method (using high pressure) is often used to apply anhydrous ammonia.

Code 7 - **Banded in or over Row**: Fertilizer material is placed in or over the crop row. This method is mainly used for row crops. Products are applied **at or after planting**. The area between the rows is not treated.

Fertilizer products applied at-planting are generally granular formulations and are placed in a 3 to 4 inch band on either side or above the seed. Early growing-season applications are also applied (either liquid or granular) on either side of the crop row.

Code 8 - **Foliar or Directed Sprays**: After planting, fertilizer material is sprayed on or under the plant foliage.

Code 9 - **Spot Treatments**: Fertilizer materials are only applied to spots in the field, even if the operator drives over the entire field to apply fertilizer only to these spots. Spot applications should not be confused with treatment of part of a field. When part of a field is treated, treated acres can usually be distinguished. For example, the north half of the field was treated. These applications are reported just like any other applications.

If the application **was** a spot treatment, you will have to calculate the per acre amount applied. To do this, you will need to know two things:

1. The total quantity of fertilizer applied as a spot treatment, and

2. The total acres to which spot treatments were made. This **does not** have to be the total acres in the field if spot treatments were made to only part of the field.

Record the number of acres 'spot treated' in Column 7. Calculate the quantity applied per acre by dividing the total quantity of product applied by the number of acres spot treated. Record the result in Column 3.

Do not enter the total field acres in Column 7 unless spot treatments were made over the entire field.

For example, if the operator estimates that only 10 acres in a 40-acre field were treated with a total of 200 pounds particular application of fertilizer, then enter 10.0 in Column 7 and 20 (200/10) in Column 3.

Spot Treatment vs. Partial Field Treatment

Spot treatments of fertilizers are rare. It is very important to distinguish between a 'spot treatment' and a treatment that covers only a portion of the field or 'partial field treatment'.

With **spot treatments,** only small 'spots' are treated over large areas of the field. It is nearly impossible to distinguish specific areas that are treated. For example, if the farmer sidedressed 320 pounds of 18-46-0 to various spots over the entire 40-acre field after the crop emerged, the line of the fertilizer table would be completed as follows. Note the quantity applied per acre is calculated as 320 pounds ÷ 40.0 acres treated = 8 pounds per acre.

Figure 9 Spot fertilizer treatment

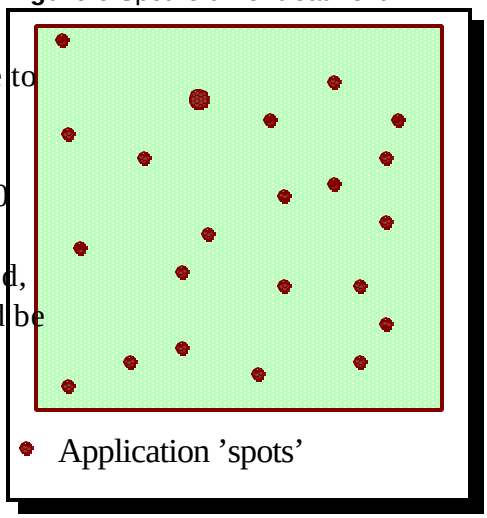


Figure 10 Recording a spot fertilizer treatment

LINE	2 MATERIALS USED [*Enter percentage analysis or actual pounds of plant nutrients applied per acre.*]			3 What quantity was applied per acre? [*Leave this column blank if actual nutrients were reported.*]	4 [*Enter material unit code.*] 1 POUNDS 12 GALLONS 19 POUNDS of ACTUAL NUTRIENTS	5 When was this applied? 1 In the Fall before seeding 2 In the Spring before seeding 3 At seeding 4 After seeding	6 How was this applied? 1 Broadcast, ground without incorporation 2 Broadcast, ground with incorporation 3 Broadcast, by air 4 In seed furrow 5 In irrigation water 6 Chisel, Injected or Knifed in 7 Banded/Sidedressed in or Over Row 8 Foliar or Directed Spray 9 Spot treatments	7 How many acres were treated in this application? ACRES
	N Nitrogen	P_2O_5 Phosphate	K_2O Potash					

With **partial field treatments,** the area of land treated can be identified. All land areas within the indicated area were treated with the fertilizer application. For example, if the farmer applied 320 pounds of 18-46-0 to 20 acres in the center of the 40 acre field after the crop emerged, the line of the fertilizer table would be completed as follows. Note the amount per acre is calculated as 320 pounds ÷ 20.0 acres treated = 16 pounds per acre.

Figure 11 Partial field fertilizer treatment

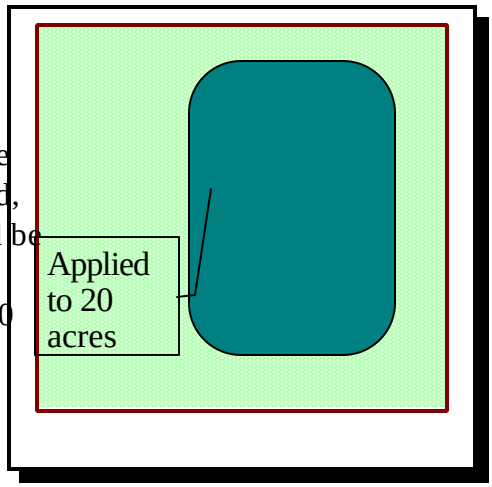


Figure 12 Recording a partial field fertilizer treatment

LINE	2 MATERIALS USED [*Enter percentage analysis or actual pounds of plant nutrients applied per acre.*]			3 What quantity was applied per acre? [*Leave this column blank if actual nutrients were reported.*]	4 [*Enter material unit code.*] 1 POUNDS 12 GALLONS 19 POUNDS of ACTUAL NUTRIENTS	5 When was this applied? 1 In the Fall before seeding 2 In the Spring before seeding 3 At seeding 4 After seeding	6 How was this applied? 1 Broadcast, ground without incorporation 2 Broadcast, ground with incorporation 3 Broadcast, by air 4 In seed furrow 5 In irrigation water 6 Chisel, Injected or Knifed in 7 Banded/Sidedressed in or Over Row 8 Foliar or Directed Spray 9 Spot treatments	7 How many acres were treated in this application? ACRES
	N Nitrogen	P_2O_5 Phosphate	K_2O Potash					
01	***18***	***46***	***—***	***16***	***1***	***4***	***7***	***20.0***

Acres treated (Column 7)

Record the number of acres in the selected field that were treated with the fertilizer materials recorded in Column 2. If only part of a field was treated, record only those acres. For example, if the operator made a particular application of fertilizer to only 25 acres in a 40 acre field, enter 25.0 in Column 7. Since each individual application of fertilizer must be recorded on separate lines, the figure entered in Column 7 can never be greater than the number of acres in the field.

Acres and tenths of acres must be reported in Column 7. Zero must be recorded after the decimal point if whole acres are recorded. For example, if the operator treated exactly 25 acres, the entry in Column 7 must be 25.0. Otherwise the summary will consider the entry to be 2.5 and serious errors will result when we summarize the amount of nutrient applied per acre.

Applications done at seeding will normally cover the entire planted acres. However, it is possible for the application to only cover a portion of the field, for different application rates to be used, or for different products to be applied to different areas at planting. When the acres covered by "at seeding" applications does not equal the planted acres, verify this with a note in the margin.

Figure 13 Example of a completed fertilizer application table.

LINE	2 MATERIALS USED [*Enter percentage analysis or actual pounds of plant nutrients applied per acre.*]			3 What quantity was applied per acre? [*Leave this column blank if actual nutrients were reported.*]	4 [*Enter material unit code.*] 1 POUNDS 12 GALLONS 19 POUNDS of ACTUAL NUTRIENTS	5 When was this applied? 1 In the fall before seeding 2 In the spring before seeding 3 At seeding 4 After seeding	6 How was this applied? 1 Broadcast, ground without incorporation 2 Broadcast, ground with incorporation 3 Broadcast, by air 4 In seed furrow 5 In irrigation water 6 Chisel, Injected or Knifed in 7 Banded/Sidedressed in or Over Row 8 Foliar or Directed Spray 9 Spot treatments	7 How many acres were treated in this application? ACRES
	N Nitrogen	P_2O_5 Phosphate	K_2O Potash					
01	18	46	—	100	1	1	1	50.0
02	82	—	—	120	1	1	6	50.0
03	28	—	—	125	1	4	1	50.0
04	60	35	40		19	4	7	50.0

In the above example:

Line 1 shows an application of 100 pounds per acre of diammonium phosphate broadcast without incorporation in the fall, before seeding to 50 acres.

Line 2 shows an application of 120 pounds per acre of anhydrous ammonia injected in the fall, before seeding to 50 acres.

Line 3 shows an application of a 125 pounds per acre of a 28 percent nitrogen solution broadcast without incorporation after seeding to 50 acres.

Line 4 shows an application of 60 pounds of nitrogen, 35 pounds of phosphate, and 40 pounds of potash per acre, banded/sidedressed after seeding to 50 acres.

Item 4a: Custom fertilizer applications

V8 - North Carolina only

Upland Cotton

Ask the operator how many of the applications recorded in the item 4 table were custom applied and record the number in item 4a.

Item 5: Custom fertilizer application cost

V2, V3

Rice, Sugarbeets

Record the cost of custom application of fertilizers to the selected field of the commodity. Record only the application cost. DO NOT include the cost of fertilizer materials. **Include** landlord costs. **Exclude** costs for custom application of lime. If material and application costs can't be separated, record the total in Item 6 and skip Item 5. Enter dollars and cents per acre or total dollars for the field.

Item 6: Total fertilizer materials cost

V2, V3

Rice, Sugarbeets

Record the TOTAL COST of MATERIALS for all fertilizer, soil conditioners, micronutrients, etc., applied to the selected field for the 2000 crop of the commodity. Include materials applied to this field last year if it was fallow in 1999. **Include** landlord costs. **Exclude** the cost of lime or purchased manure. If custom applied, include the cost of materials ONLY, unless materials and application costs cannot be separated.

Note: Even in cases where no fertilizers were applied, you must still ask Item 6. Though micronutrient applications are excluded from the Fertilizer table, the cost of applying them is included here in Item 6.

Item 7: Yield goal

New question this year. Recommended fertilizer application rates are often based on the yield goal of the producer. Estimates of producer yield goal compared with actual yield gives some indication of how realistic producer's expectations are. Furthermore, assessing the impact of adopting different nutrient practices requires information on the producers pre-season expected yield or yield goal which can be much different from actual yield.

V2, V5, V6, V7, V8, V10

Rice, Corn, Soybeans, Wheat

Enter the respondents yield goal for this field to tenths and the appropriate unit code.

V3

Sugarbeets

Enter the respondents yield goal for this sugarbeet field to tenths of tons.

Item 7a: Yield goal for ratoon crop

V2

Rice

If the respondent planned to harvest a ratoon crop from this field, record the yield goal for this ratoon crop to tenths and the appropriate unit code.

Item 8: Phosphorus soil test

If a SOIL test for phosphorus was done on the selected commodity field, enter code "1" for YES then ask Item 8a. If no phosphorus soil test was done, go to Item 9. The test may have been done in 2000 or in the Fall of 1999 for preparing for the 2000 crop on the field.

Item 8a: Pounds of Phosphorus recommended

The results of the phosphorus test usually will be in the form of "recommended pounds of Phosphorus per acre". Ask the respondent what rate of phosphorus application was recommended by the phosphorus soil test. If the respondent reports in a method other than in 'pounds per acre', make notes on the questionnaire so that the office can convert the recommendation to a standard pounds per acre value.

Item 9: Nitrogen soil test

If a SOIL test for nitrogen was done on the selected commodity field, enter code "1" for YES then ask Item 9a. If no nitrogen soil test was done, go to Item 10. The test may have been done in 2000 or in the Fall of 1999 for preparing for the 2000 crop on the field.

Item 9a: Pounds of Nitrogen recommended

Some nitrogen may be applied as "extra" or "insurance" nitrogen fertilizer. We want to quantify the extent of extra nitrogen applied as "insurance", and whether the number of operators who apply "insurance" nitrogen are offset by the number of producers who respond that they apply less than the amount recommended.

The results of the nitrogen test usually will be in the form of "recommended pounds of Nitrogen per acre". Ask the respondent what rate of nitrogen

application was recommended by the nitrogen soil test. If the respondent reports in a method other than in 'pounds per acre', make notes on the questionnaire so that the office can convert the recommendation to a standard pounds per acre value.

Item 10: Enumerator action

Refer back to the fertilizer application table (Item 4). If the table is complete, and no Nitrogen was applied (column 2 contains no entries for N for the selected field), skip to Item 13.

If the table was refused or coded incomplete, ask the respondent if any nitrogen was applied for the 2000 target crop in the selected field.

If nitrogen was applied, complete Items 11 and 12.

Item 11: Reason for nitrogen application rate

Items 11a-g obtain the reasons the operator had for deciding how much nitrogen to apply to the selected field. Each of these must be asked. If nitrogen was **not** applied, do not ask this question.

This is not a multiple choice question -- that is, there may not be just one single answer. The operator may have more than one reason for deciding how much nitrogen to apply. Enter code "1" = YES for each reason the operator used.

It is also possible for the operator to say NO to all Items 11a-g. If this happens, it will be apparent that the operator based decisions on some reason besides those named in Items 11a-f, because these are all NO.

In Item 11a, if the operator decided how much nitrogen to apply based on his own past experience or it was a routine practice for this crop in this field, enter code "1" for YES.

In Item 11b, if the operator based the decision on the results of a soil or plant tissue test, enter code "1" for YES.

In Item 11c, if the operator followed the recommendation of a crop consultant, enter code "1" for YES.

In Item 11d, if the operator followed the recommendation of a fertilizer dealer, enter code "1" for YES.

In Item 11e, if the operator followed the recommendation of an Extension Service agent or publication, enter code "1" for YES.

In Item 11f, if the operator based his decision on the expected economic return (the increased return from higher production more than offsets the cost of the nitrogen applied), enter code "1" for YES.

V3

Sugarbeets

In Item 11g, if the operator based his decision on a COOP or factory recommendation, enter code "1" for YES.

Item12: Use of product to slow breakdown of nitrogen

If nitrogen was applied to this field either by itself or combined in a mixed fertilizer product (any entry under N in Column 2 of the Fertilizer Table), then determine if any product was used to slow the breakdown of the nitrogen. If nitrogen was **not** applied, do not ask this question.

Item 13: Plant tissue test

Plant tissue tests are done on plants during or at the end of a growing season. Analysis of plant tissues provide information on how plants are using soil nutrients and help the operator adjust fertilizer applications up or down the following year.

If a plant tissue test was done on plants from the selected field to determine the needs of the current crop, enter code "1" for YES. Tests may have been performed on the harvested crop (such as the 1999 corn crop) to determine the needs for this year's crop (the 2000 corn crop).

Item 14: Cost of soil/plant tests

V2, V3

Rice, Sugarbeets

Record the total cost in dollars of the soil or plant tissue tests performed on the selected field for the 2000 crop. These tests are typically charged on a per sample basis. The number of samples taken per field will vary depending on

the precision the farmer needs for making decisions about nutrient and plant management. Include the cost of tests done in 1999 for the 2000 crop on the selected field. Include landlord's cost.

Sometimes, the farmer is unable to separate the costs of these tests from the cost of fertilizer or custom application charges, especially if the fertilizer dealer or custom applicator does the test. If the fee was included in the cost of the materials or custom applications reported in Section D, leave the cell blank and **record a note to explain**.

Item 15: Lime applications

Determine if the operator ever applies lime to the selected commodity field. Enter code "1" for YES and continue.

Item 15a: Years between lime applications

Record the average number of years between lime applications to this field. If lime is applied every year, enter "1". If this is the first time lime was ever applied, enter "1".

Item 15b: Lime rate

Record tons of lime applied per acre to the selected commodity field the last time lime was applied. Enter tons to the nearest hundredth (for example, 2.50). If the operator responds in another unit, such as pounds or hundredweight, convert the rate to tons.

For example, if the respondent reports 300 pounds per acre, then the number of tons applied per acre is 300 ÷ 2000= .15 tons. Enter .15 in Item 15b.

Item 15c: Lime cost to Landlord

V2, V3

Rice, Sugarbeets

If the selected field was rented, the landlord may have paid some of the cost of lime and its application. This is more common with share-rented land, but it can happen in cash and rent-free arrangements, too.

Note: Since lime is not typically applied to fields every year, this item asks for landlord's share of costs *the last time it was applied*-- not necessarily the cost in the calendar year of this survey

Item 16 : Sulfur applications

If sulfur (S) was applied as a specific nutrient application to the selected commodity field for the 2000 crop, enter code "1" for YES and ask Item 16a. If no sulfur was applied, go to Item 17.

Sulfur may be contained as part of a chemical fertilizer. In chemical fertilizers containing sulfur, it is the fourth number of a percent analysis. For example, the percent analysis for diammonium phosphate-sulfur is 16-40-0-13, which means that for every 100 pounds of this fertilizer, 16% is nitrogen (N), 40% is phosphate (P_2O_5), none was potash (K_2O), and 13 percent was sulfur (S).

Some common chemical fertilizers containing sulfur are ammonium sulfate or potassium sulfate. Other fertilizers containing sulfur are listed in the Exhibit 5.2 at the end of this section.

Item 16a: Sulfur application rate

If sulfur was applied to the selected field (Item 16 is code "1" = YES), then record pounds of sulfur applied per acre to the nearest tenth (for example, 2.5). If the response is in other units, convert the figure to pounds or make notes for the State Office.

If the producer does not know the quantity of sulfur but knows that a chemical fertilizer mix containing sulfur was applied, then determine the quantity of that product and record a note on the questionnaire. Sulfur is indicated as the fourth number of a percent analysis of chemical fertilizers containing sulfur.

The quantity of sulfur can be estimated from the analysis shown in the Exhibit 5.2. For example, ammonium sulfate contains 24 pounds of sulfur per hundred pounds of material, ammonium thiosulphate contains 26 pounds of sulfur per hundred pounds of material applied, and potassium sulfate contains 18 pounds of sulfur per hundred pounds of material applied. The percent analysis and application rate per acre can be used to calculate the quantity of sulfur applied per acre, which is entered in Item 16a. Be sure to record in notes all the necessary information for the State Office to make calculations.

Record the amount applied this season, even though the sulfur may be used by the plant over several years. Do not allocate the amount applied this year across several seasons.

Item 17: Gypsum

Crops, especially peanuts, use gypsum as a source of calcium. Calcium contained in gypsum is relatively water-soluble and enters into soil solution. In peanuts, calcium is not transported from leaves to pegs, and to the developing pods. Pegs and pods absorb calcium directly from the soil solution; therefore, calcium must be readily available in the pegging zone.

Determine if the operator ever applies gypsum to the selected field. Enter code "1" for YES and continue.

Item 18: Micro-nutrient applications

Micro-nutrients are nutrients that plants need in only small or trace amounts. Essential micro-nutrients include boron (B), chlorine (Cl), Copper (Cu), iron (FE), manganese (Mn), molybdenum (Mo), and zinc (Zn).

Some farmers use micronutrients or trace elements. They are generally mixed in bulk blended fertilizer materials and applied at low rates per acre. Micronutrients are involved in cell division, photosynthesis, fruit formation, carbohydrate and water metabolism, chlorophyll formation, protein synthesis, and seed development in plants.

If micro-nutrients were applied to the selected field, enter code "1" for YES.

Item 18a: Was zinc applied

Crops susceptible to zinc deficiency include corn, several bean species, cotton, flax, and many fruit and nut crops. In plants, zinc is involved in enzyme systems essential to protein synthesis, seed production, and rate of maturity. Zinc-deficient plants usually will mature at a later date than normal plants.

Zinc is the most widely used micronutrient among field crops. Fertilizer manufacturers are concerned about the use of industrial zinc wastes for field crop production.

If micro-nutrients were applied, ask if zinc was included in the micro-nutrients. If YES, enter code "1" and continue.

Item 19: Manure and raw nutrient applications

V5, V6, V7, V8, V10

Corn, Soybean, Wheat, Upland Cotton

Determine if livestock or poultry manure, biosolids, or other raw nutrient was applied to the selected field.

Exclude commercially prepared manure. Commercially prepared manure will have a nutrient analysis and should be included in the Fertilizer Table, Item 4. Commercially prepared manure can be manure composts, DRIED manure, bagged manure, etc. Very little is used in the production of major crops (corn, soybeans, cotton, etc.). Some farmers received manure from brokers, but the overall amount is very small according to past surveys.

If any type of unprocessed livestock manure (beef, dairy, hog, sheep, poultry, etc.), biosolid, or other raw nutrient was applied to this field, enter code "1" for YES and continue.

Exclude manure 'applied' by animals grazing on the field. Respondents would not be able to accurately quantify the amount of manure deposited by grazing animals. However, you should note on the questionnaire if the field was grazed.

Item 19a: Acres on which manure applied

Record the number of acres of the selected field on which manure was applied. Enter acres to the nearest TENTH of an acre.

Item 19b: Amount applied

Record the amount of manure applied to the selected field. Enter either total tons **or** total gallons **OR** tons per acre **or** gallons per acre. All figures must be entered to the nearest hundredth (example: 10.85) **New this year** is the option to enter amount applied per acre. Only one cell should be completed. That is, you can report amount applied as total tons, total gallons, tons per acre or gallons per acre. If the operator tells you that part of the total amount applied was dry, measured in tons, and part of the amount applied was liquid, measured in gallons, one of these units must be converted. Record this in notes so that the total amount of manure applied to the field can be calculated in the State Office.

If the operator does not know the amount of manure applied to the field and it cannot be estimated, instead find out the type and number of animals that produced the manure, and for what time period (all or just part of a year). Also find out how many other acres besides the acres of this field were covered with manure produced on the operation. Make good notes of all this information. The State Office can estimate the amount of manure applied using this information.

Items 19c & 19d: Manure transport

New questions this year. It is important to collect information about the distance between the site where manure is stored and where it is applied, and about the number of trips taken to complete the manure application to determine the cost of transporting manure. The cost of transporting manure for field application is an important factor that determines the value of manure applied.

Enter, in total miles, the hauling distance between the manure storage and the selected field in Item 19c.

Enter the total number of trips required to complete the manure application on this field in Item 19d.

Item 19e: When manure applied

New question this year. Timing of manure applications is also an important factor that determines the value of manure applied to the crop and the potential losses of manure nutrients to the environment. This information is important for the policy maker to assess the current timing practices and if needed, to provide incentive for farmers to apply the manure at the time of crop need to protect the environment.

Enter the percent of manure applied in the fall before planting of the target crop in Item 19e1.

Enter the percent of manure applied in the spring before planting of the target crop in Item 19e2.

Enter the percent of manure applied after planting of the target crop in Item 19e3.

The total of Item 19e1 + 19e2 + 19e3 must equal 100.

Item 19f: Application method

Since dry or liquid application and immediate incorporation affects runoff and nutrients available to the soil, specify whether the manure was applied dry or liquid form with or without incorporation. Also, liquid manure may be injected directly into the soil.

If manure was applied more than once and using different methods of application, record the primary method used. For example: The operator applied 70 % of the manure prior to planting by dry broadcast with incorporation and liquid broadcast without incorporation the remaining 30% after planting...you would code item 19f = 2.

The manure application method codes are:

Code 1 - **Dry Broadcast without Incorporation**: Dry manure is applied to the entire surface area by land application equipment.

Code 2 - **Dry Broadcast with Incorporation**: Dry manure is applied to the entire surface area by land application equipment. Incorporation of the manure into the upper soil surface is often performed with a field cultivator, disk, or other tillage implement.

Code 3 - **Liquid Broadcast without Incorporation**: Liquid manure is applied to the entire surface area by land application equipment.

Code 4 - **Liquid Broadcast with Incorporation**: Liquid manure is applied to the entire surface area by land application equipment. Incorporation of the manure into the upper soil surface is often performed with a field cultivator, disk, or other tillage implement.

Code 5 - **Injected or Knifed-in**: Manure is injected under pressure into the soil.

Item 19g: Type of raw nutrient

Different types of raw manure have different nutrient content. Determine whether the major source of the manure applied to the selected field was from beef cattle, dairy cattle, hogs, sheep, poultry, equine, a biosolid (such as municipal waste), or some other livestock.

When the **same** amount of two types have been applied, use the code for the type with the higher nitrogen value. The highest value is for poultry, followed by hogs, dairy, sheep and beef. Beef has the lowest nitrogen value. The code list for the type of livestock manure is:

Code 1 - **Beef Cattle**
Code 2 - **Dairy Cattle**
Code 3 - **Hogs**
Code 4 - **Sheep**
Code 5 - **Poultry**
Code 6 - **Equine (horse, mule, etc.)**
Code 7 - **Biosolids** (food waste, municipal sludge, etc.)
Code 8 - **Other** (record the type of manure or nutrient in a note.)

Item 19h: Source of manure

Determine if the manure was produced on this operation (code 1), purchased (code 2), or obtained at no cost from some other source (code 3).

Item 20: Manure application rate restrictions

New question this year. Because of the increasing regulation of manure applications by government (State and local) and because regulations are not implemented uniformly, it is important to quantify the extent of farm operators experience with manure regulations. Responses will identify which entity is the most likely to be doing the regulating, what differences might exist between locales, and to what extent manure applications, when regulated, are being governed by nitrogen or phosphorous application rate protocols.

If the application rate applied to this field was influenced by State or local restrictions enter a code “1" and continue with Item 20a.

If nitrogen requirement of the crop was the basis of the restriction which influenced the manure application on this field, enter code “1" in Item 20a1.

If phosphorus requirement of the crop was the basis of the restriction which influenced the manure application on this field, enter code “1" in Item 20a2.

Exhibit 5.2: Common Fertilizers and Their Percent Analysis

Name	Percent Active Ingredients				
	N	P_2O_5	K_2O	S	RANGE
Anhydrous ammonia	82	--	--	--	
Aqua ammonia	20	--	--	--	**16-30% N**
Ammonium nitrate	33	--	--	--	**33-34% N**
Ammonium sulfate	21	--	--	--	**20-21% N**
Nitrogen solutions	28	--	--	--	**7-58% N**
Sodium nitrate	16	--	--	--	
Urea	46	--	--	--	**45-46% N**
Urea ammonium nitrate	32	--	--	--	
Super phosphate (22 % & under)	--	19	--	--	**18-22% P**
Super phosphate (over 22 %)	--	30	--	--	**23-39% P**
Triple Super Phosphate	--	46	--	--	**40-54% P**
Ammonium phosphate	11	48	--	--	
Di-ammonium phosphate	18	46	--	--	
Mono-ammonium phosphate	11	52	--	--	
Potassium chloride	--	--	60	--	**50-62% K**
Potassium nitrate	13	--	44	--	
Potassium sodium nitrate	15	--	14	--	
Mixed Fertilizer	2	6	12	--	
	3	9	18	--	
	3	10	30	--	
	5	10	15	--	
	5	10	30	--	
	5	15	30	--	
	6	24	24	--	
	8	24	24	--	
	9	18	9	--	
	10	34	--		
Soil sulfur	--	--	--	92	
Sulfur-bentonite	--	--	--	90	
Sulfur dioxide	--	--	--	50	
Ammonium polySulfide	20	--	--	45	
Ammonium sulfate	21	--	--	24	
Ammonium thiosulphate solution	12	--	--	26	
Diammonium phosphate-sulfur	16	40	--	13	
Potassium sulfate	--	--	50	18	**48-52% K**
Potassium-magnesium sulfate	--	--	22	22	

Section D - Pesticide Applications

What is Section D for? How is the information used?

Pesticide data are needed because USDA is responsible for publishing estimates of pesticide use in crop production. NASS is charged with collecting these data so that issues related to food safety, water quality, and pesticide cancellation can be evaluated. The Economic Research Service conducts research on the impact of alternative regulations, policies, and practices.

This section is similar to the fertilizer section. Chemical mixes are described and application practices are enumerated. The mix information is used in non-survey years to create a cost index for updating survey responses. Chemical costs are a large part of the variable production costs for most crops, so getting correct information on chemical usage is important.

Include all chemicals applied for the 2000 crop on the selected field.

Exclude:

1) Chemical applications to fence rows, ponds, canals and ditch banks should not be recorded.

   This land should not be considered part of the survey acres of interest. Often the chemicals used for killing weeds and other pests in these areas are not labeled for use on the crop in the selected field.

2) The use of adjuvants.

   An adjuvant is used in a formulation to aid the operation or improve the effectiveness of the pesticide. Adjuvants include such materials as wetting agents, spreaders, emulsifiers, dispersing agents, foaming agents, foam suppressants, penetrans and correctives. A spray adjuvant may contain one or more surfactants, solvents, solubilizers, buffering agents, and stickers needed to formulate a specific type adjuvant. By using the proper adjuvant it is often possible to use certain chemical pesticides in a tank mix that otherwise would present compatibility problems. However, if you or the respondent are in doubt about whether a product should be included, record it anyway and write notes to explain the situation.

Use of Supplements

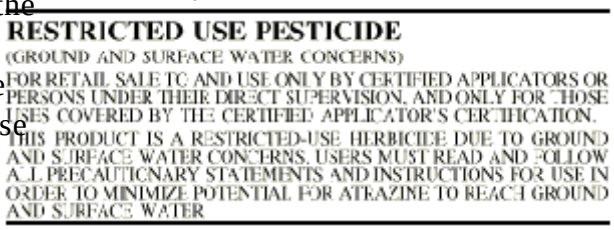
The Pesticide Applications table contains a column for entering the number of applications of a specified pesticide. This column (column 11) allows you to combine multiple applications of the same pesticide, at the same rate, covering the same area and targeting the same pest into one line in the table. This procedure should help reduce the need for a supplement.

If more lines are needed than the number available in the table, use a **Chemicals and Pesticides Supplement**. Copy the identification as it appears on the main questionnaire to the identification box on the supplement. Assign the next Table number (002, 003, 004, etc.) to each additional supplement used. Begin numbering the supplements with Table 002 because Table 001 already appears in the questionnaire. Use as many supplements as you need.

Use of Records

Because of record keeping requirements for restricted use pesticides, (sometimes called RUP's), most operators will have records of chemical applications for each field. Restricted use pesticides are identified as such on the product label (Figure 5.12.) Encourage the respondent to use these records if they are available.

Figure 14 Restricted Use Pesticides are identified on the product Label


RESTRICTED USE PESTICIDE
(GROUND AND SURFACE WATER CONCERNS)
FOR RETAIL SALE TO AND USE ONLY BY CERTIFIED APPLICATORS OR PERSONS UNDER THEIR DIRECT SUPERVISION, AND ONLY FOR THOSE USES COVERED BY THE CERTIFIED APPLICATOR'S CERTIFICATION.
THIS PRODUCT IS A RESTRICTED-USE HERBICIDE DUE TO GROUND AND SURFACE WATER CONCERNS. USERS MUST READ AND FOLLOW ALL PRECAUTIONARY STATEMENTS AND INSTRUCTIONS FOR USE IN ORDER TO MINIMIZE POTENTIAL FOR ATRAZINE TO REACH GROUND AND SURFACE WATER

Respondents can answer many of these questions without records. Where records help most is in jogging the farmer's memory about spot treatments, rare, irregular applications or mixes of chemicals, or deviations from usual spray schedules or rates of application.

Use of the Respondent Booklet

Both you and the respondent should use a Respondent Booklet. Most of the pesticide products used on each target commodity are listed in the Respondent Booklet for that commodity. It is very important to obtain the trade name as well as the formulation from the operator to insure that the correct product code is recorded. In order to report the formulation and whether the product is liquid or dry, the respondent may have to look at the product label or detailed itemized receipts for the product.

Some respondents may be willing to use the booklet and to report the product code for each of the products they used. You should encourage this since it makes the job of enumeration easier as well as making reporting faster and more accurate.

To aid in identification, the products in the Respondent Booklet are categorized as LIQUID(L) or DRY(D) formulations. Ask the respondent if the product was in a liquid or dry state when it was purchased. This should help you and the respondent find and record the correct product codes.

The Respondent Booklet also lists the type or class of each product:

- Herbicide (H),
- Insecticide (I),
- Fungicide (F),
- Miscellaneous (M),
- Miscellaneous Growth Regulator (MG),
- Miscellaneous Soil Fumigant (MS),
- Miscellaneous Defoliant (MD),
- Miscellaneous Rodenticide (MR), and
- Other products (O).

Some chemicals and pesticides have more than one use. Some products with more than one use may be listed twice if the second use is associated with a separate product code. For example,

	Gramoxone Extra	
4314	Gramoxone Extra	H
9037	Gramoxone Extra	MD

For products that are listed more than once, be sure to probe for what it was used for and record the product code associated with that use.

Note that each product code listed in the Respondent Booklet specifies the trade name and formulation. The numbers and letters after the product name identify the concentration and form. For example, Canopy 75DF: Canopy is the trade name and the 75DF indicates the formulation. The 75 indicates the concentration as the percent of active ingredient in a pound of product, and the DF indicates that the form of the product is Dry Flowable. For Basagran (4L): Basagran is the trade name and the 4L indicates the formulation. The 4

indicates 4 pounds of active ingredient in a gallon of product and the L indicates a Liquid Concentrate.

Also note that for several products there is more than one formulation for a given trade name: Ambush (2EC) and Ambush 25W or Diazinon 14G and Diazinon 4E and Diazinon 50W and Diazinon AG500(4E). Different formulations of a product have different concentrations of the active ingredient and inert materials.

It is extremely important that you get the correct product code because active ingredient concentrations for different products and different formulations vary greatly. Since we summarize by active ingredient in the product, recording a product or its formulation incorrectly will make a difference when the active ingredient application rate per acre is calculated. For example, if you record the code for Dyfonate II 20-G (1038) when you really should have recorded the code for Dyfonate II 10-G (1037), then we will summarize twice the amount of active ingredient than we should. That will make it look like operators apply more chemicals to crops than they actually do.

Also, if you record the Dyfonate II 10-G code when you really should have recorded the code for Dyfonate II 20-G, we will summarize half as much active ingredient as we should. This is not good either. We need the correct information listed in the questionnaire.

If you cannot find a reported product in the Pesticide Code List in the Respondent Booklet, complete the table in Item 2 to provide the information needed to classify and summarize unlisted products. The State Office will research the product and assign a new product code if necessary.

Item 1: Pesticide applications

Determine if any pesticides were applied to the selected commodity field for the 2000 crop. Include herbicides, insecticides, fungicides, defoliants, biological and botanical pesticides.

IMPORTANT NOTE: If the field has not yet been harvested you must be sure to probe the respondent for any pesticide applications he plans to make to this field prior to harvest and record them in this table.

Exclude fertilizers and seed treatments. The respondent may report foliar fertilizer sprays, especially if they were part of a tank mix. Fertilizer

applications should not be recorded in this section; they should have been recorded in the fertilizer section.

Herbicide materials may be applied before weeds emerge or after weeds have emerged. Some herbicides are used to “burn down” or kill weeds prior to planting in no-till systems. Some herbicides may also be used to defoliate the crop prior to harvest.

Insecticide materials are applied to control insects that damage plants by feeding on plant tissues.

Fungicides are applied to control disease organisms which affect the growth and development of the plant, such as pod-and-stem blight, anthracnose, brown spot, etc.

Other chemicals are used to fumigate the soil, regulate the growth of the plant, defoliate the crop prior to harvest, etc.

If any pesticides were applied, enter Code “1" for YES, then complete the Pesticide Table. If no pesticides were applied, check NO and go to Section E.

On *Version 10*: Multi-crop, enter code “1" for YES in the correct cell for each of the selected commodity fields. Complete the Pesticide Table for each commodity field that chemicals were applied to. If no chemicals were applied to the selected commodity field, dash the cell. If no chemicals were applied to either of the selected fields, then go to Section E.

Commodity code (Column 1)

V10

Multi-crop

Enter the commodity code for each selected field as you enumerate the pesticide applications for that target commodity.

It may help the respondent to remember the products if you ask for the chemical applications to be listed in the sequence in which they occurred on each field. When all pesticide applications are listed for the selected *[commodity 1]* field, proceed to list pesticide applications for the selected *[commodity 2]* field.

If the respondent remembers an additional chemical application to the selected [*commodity 1*] field after you've begun listing the applications for the [*commodity 2*] field, just record it wherever you're at in the table. Be sure to enter the correct commodity code in Column 1.

Product code (Column 2)

Ask the operator to identify the chemical or pesticide product applied to the selected commodity field. Record the product code for each chemical from the Pesticide Code List found in the Respondent Booklet.

Many enumerators also use the NOTES column to the left of the Pesticide Table to record the product name. This makes it easier to refer to the product, by name, while asking the remaining questions across the table. It also makes it easier to identify a product and its code when the same product is reported more than once.

Recording the product name in the NOTES column also assists the State Office in editing the questionnaire and in verifying unusual applications and/or rates. Therefore, you are encouraged to record the product name in the NOTES column.

Each different product applied must be recorded on a separate line. However, if a product is applied more than once at the same rate and to cover the same area, the applications can be recorded on one line, with the number of applications recorded in Column 11.

If two or more products are applied with a single application (tank mix) a separate line must be used for each product. Use Column 4 to identify products applied as a tank mix.

To help the respondent, start by asking if any pesticide products were applied **after the previous crop was harvested or plowed down**. Next, ask about other preplant products and then follow with products applied at planting and then after planting. Remind the operator to report all types of pesticides, including herbicides, insecticides, fungicides, defoliants, growth regulators, and desiccants.

Exclude seed treatments. Most crop seed is treated with an insecticide/fungicide product. If the seed is purchased, seed treatment is done by the seed company prior to delivery to the operator. If the operator uses his/her own seed, it may be treated prior to going to the field or the seed may

be treated in the field. Field seed treatment consists of coating the seed with the insecticide or fungicide product just prior to planting.

Herbicides applied at time of planting are generally applied to the entire soil surface (broadcast). Herbicides requiring soil incorporation may be mixed into the soil by the action of the planter or by attachments which are part of the planter. Incorporation also may be accomplished by a tandem hook-up of a tillage implement(s) behind the applicator or planter. Other herbicides are effective by being left on the surface without incorporation.

Granular insecticides are sometimes applied at planting and placed in the seed row (in-furrow) by a separate attachment.

Product form (Liquid/Dry) (Column 3)

Ask the respondent if the product was in a liquid or dry state when it was purchased. Record an "L" or a "D" in this column to indicate Liquid or Dry. Probe for clarification if the liquid or dry designation listed by the product code selected from the Respondent Booklet does not agree with what you record here for the product.

Common form abbreviations are:

L (Liquid): These products flow like water. Concentrations are usually expressed in pounds per gallon.

E (EC): Emulsifiable concentrates. These are usually thicker than water and are mixed with water and applied as sprays. They contain one or more active ingredients, one or more solvents and an emulsifier. Their concentrations are generally indicated in pounds per gallon.

F (FL) (Flowable): These products are in liquid form. They contain finely ground active ingredients suspended in the liquid. They are mixed with water for application. Their concentrations are indicated in pounds per gallon.

D (Dust): Dusts contain a low percentage of active ingredients on a very fine dry inert carrier such as talc, chalk or clay. They are usually applied directly as purchased. Their concentrations are expressed as percents.

WP (W), SP (S): Wetable or Soluble Powders. These are dry products, much like flour, which will dissolve or disperse in water. Their concentrations are indicated in percents.

G (Granular): Granular products contain active ingredients coated or absorbed onto coarse particles like clay, ground walnut shells or ground corn cobs. The pellets are about the diameter of the lead in a pencil (or larger); during shipment the granules have a tendency to break down and create dust. These are used as purchased. Their concentrations are expressed as percents.

DF (Dry Flowable), WSG (Water Soluble Granules): Also known as water dispersible granules. These are small pellets formulated to reduce the dust problem created with granules. They are like wetable powders except that the active ingredient is formulated on a granule instead of a powder. The product pours easily into spray tanks for mixing with water. Their concentrations are expressed as percents.

Bait: Bait products contain active ingredients mixed with food or another attractive substance. Concentrations are expressed in percents.

Tank mix (Column 4)

Most chemicals are applied to the field as single products. However, sometimes two or more individual products are mixed in the spray tank by the farmer/custom applicator and applied to the field as a tank mix.

Products applied in a tank mix must be identified as tank mixes. Since there is only space in the table for one product per line, the separate products in tank mixes must be recorded on separate lines. Identify the products in a tank mix by recording in Column 4 the line number of the first product in the tank mix.

For example, consider a tank mix where you recorded the first product on line 6, the second product on line 7 and the last product on line 8. In Column 4 of line 6 you should record 6 so we will know this was the beginning of the list of products in that tank mix. In Column 4 of line 7, you'll record 6 so we know that this product was part of the same tank mix that you started listing on line 6. In Column 4 of line 8, you will record 6 for the same reason.

For products not applied as part of a tank mix, enter a dash in Column 4.

For the first product in a tank mix, be sure to ask each question in Columns 5 - 14. For each additional product in the tank mix after the first product, be sure to ask the questions in Columns 6, 7, 8, 12, and 13 because the answers may be different than for the first product. Information recorded in Columns 5, 9, 10, 11, and 14 should be the same as for the first product in the tank mix. These data can just be copied from the entries in line for the first product.

DO NOT confuse tank-mixes and packaged premixes. A tank mix is any pesticide spray which is prepared immediately before use by mixing two or more chemicals and water in the spray tank. Packaged premixes are brand name products that contain two or more active ingredients. These are products where the manufacturer has taken individual active ingredients and combined them in a container. Examples include Ramrod/Atrazine, Lasso/Atrazine and Bicep (Dual & Atrazine). These manufactured mixes have their own code in the Respondent Booklet, so they don't have to be listed with separate codes for the chemicals included in the product.

New technologies such as variable rate applications that rely on Global Positioning Satellite (GPS) information to control the precise application of chemicals create unique situations. It is possible for an applicator to have more than one chemical product tank, and to apply more than one product unequally across a field depending on the specific needs of each small area. Some areas of the field may be treated with only one of the multiple products. Since the multiple products are not mixed and applied consistently together across the field, these are not considered tank mixes. This use of GPS is still very rare.

Figure 15 Recording pesticide tank mix information

APPLICATION CODES for column 9			APPLICATOR CODES for column 14
1 Broadcast, ground without incorporation 2 Broadcast, ground with incorporation	3 Broadcast, by air 4 In Seed Furrow 5 Irrigation water	6 Chisel, Injected or Knifed in 7 Banded In or Over Row 8 Foliar or Directed Spray 9 Spot treatment	1 Operator, Partner, Family member? 2 Custom applicator? 3 Employee/Other?

NOTES	LINE	2 What products were applied to this field? [*Use product codes from Respondent Booklet.*]	3 Was this product bought in liquid or dry form? [*Enter L or D*]	4 Was this part of a tank mix? [*If tank mix, enter line number of first product in mix.*]	5 When was this applied? 1 Before planting 3 At planting 4 After planting 5 Defoliation prior to harvest	6 or 7 How much was applied per acre per application?	6 or 7 What was the total amount applied per application in this field?	8 [*Enter unit code.*] 1 Pounds 12 Gallons 13 Quarts 14 Pints 15 Ounces 30 Grams	9 How was this product applied? [*Enter code from above.*]	10 How many acres in this field were treated with this product?	11 What was the number of times applied?	12 What was the PRIMARY target pest for this application? [*Use Target Pest codes from Respondent Booklet.*]	13 Prior to this application was this years pest problem-- 1 worse than normal? 3 normal? 5 less than normal? 7 unknown? 9 not applicable?	14 Were these applications made by-- [*Enter code from above.*]
									9					9
Far-go granular 10%	01	4211	D	- - -	1	12.00	. _ _	1	6	5.0	1	171	5	2
Banvel (4L)	02	4136	L	2	4	.	1.0 0	14	1	5.0	1	174	1	2
Express DF	03	4205	D	2	4	.13	. _ _	15	1	5.0	1	173	3	2

In this example,

- Product lines 2 and 3 are in a tank mix.
- For products mixed in a tank mix, columns 4, 5, 9, 10, 11, and 14 must be the same.

When applied (Column 5)

Ask the respondent when the product was applied to the selected field (before, at, or after planting), and enter the appropriate code.

"Before-planting" applications may occur the same day or a week or several months before planting. If a tillage implement is used to incorporate the herbicide into the soil, be sure to record this activity in Section F: Field Operations.

"At-planting" herbicide or insecticide materials are applied at the time the crop is planted. These applications may be band treatments covering a small section

of the row over the seed furrow or broadcast treatments covering the entire soil surface.

"After planting" herbicide, insecticide, or fungicide materials are applied after the planting operation is completed. They could be applied a few days or several weeks later.

"Defoliation prior to harvest" This distinction is important to measure the differences in the use of defoliants as part of the harvest process. In the past, combining herbicides used for "burn down" with chemicals applied to control weeds resulted in a distorted view of pest management.

Defoliants are usually foliar or directed sprays. This code should only be used for products applied specifically to defoliate the **target crop** for harvesting. Defoliating the target crop facilitates the harvest of the crop by eliminating leaves or by killing the plant (potato vine) to make it easier to harvest. This is a common practice for crops such as cotton and potatoes.

This code should not be used for products applied solely to kill ***weeds*** *before harvest.*

Application rate (Columns 6 & 7)

Column 6 (rate per acre) **or** Column 7 (total amount) may be used for each product reported. Don't use both on the same line.

Rate per acre per application (Column 6)

Record the chemical application rate per acre used on the selected commodity field. Rate per acre is the amount used in one application to one acre. Because rates per acre are often quite small with very toxic chemicals, rates are reported to hundredths of units. Be sure that if whole numbers are reported, zeros are entered after the decimal point.

If an application rate per acre is obtained in Column 6, then nothing should be entered in Column 7.

With variable rate technology and for spot treatments, application rates for a particular product or tank mix may vary across the field. In these cases, it would be best to obtain the total amount applied to the field using Column 7.

Total amount applied per application (Column 7)

If the respondent is not able to report the application rate per acre in Column 6, use Column 7 to record the total quantity applied per application to all acres treated in the selected commodity field. This figure should be a total quantity for one application if the same product was applied more than once.

If the respondent is able to give either total quantity applied per application or rate per acre, select the option which the respondent feels will give the most accurate data.

In some cases, respondents cannot report either the rate per acre per application of a product or the total amount of the product applied per application. In these cases, there is one additional way you might be able to collect the data we need. If the respondent knows

1) the amount of the product mixed in every 100 gallons of water,

2) the number of gallons in each tank, and

3) the number of tanks used to cover the acres,

make a note of these figures. The Survey Statistician will be able to calculate the amount of product used.

Other ways of reporting include parts per million (PPM) and rate per 100 gallons of water. In these cases, try to find out the amount of actual product (before mixing with water) used, and write lots of notes.

Do not record the spray volume applied to the field. The purchased (concentrated) product is mixed with water and the diluted spray solution is generally applied at rates of 20 - 60 gallons per acre with ground equipment and 5 - 10 gallons per acre by air.

Do not record the inclusion of surfactants or crop oil in the spray solution. They are added to the spray solution to enhance the ability of the pesticide to stick to the foliage and/or aid in the absorption into the plant system.

Do not record liquid fertilizer solutions applied in conjunction with a pesticide in the Pesticide Table. The information on liquid fertilizers should be recorded in the Fertilizer Table.

Unit code (Column 8)

Record the units using the unit codes listed in Column 8. The unit codes are:

Code 1 - **Pounds**
Code 12 - **Gallons**
Code 13 - **Quarts**
Code 14 - **Pints**
Code 15 - **Ounces**
Code 30 - **Grams**

Write notes if any unit other than the ones listed is reported.

When the reported unit is quite small, you may need to make conversions. Some conversion factors you may need to use are:

Liquid Products	Dry Products
1 Gallon = 4 Quarts	1 Pound = 16 Dry Ounces
1 Quart = 2 Pints	1 Ounce = 28.3 Grams
1 Pint = 16 Fluid Ounces	1 Pound = 453 Grams
2 Cups = 1 Pint	

Be sure to keep the unit code and product formulation consistent. If the operator purchased a LIQUID pesticide product, the unit code must be ounces, pints, quarts, or gallons. If a DRY pesticide product (granular, wetable powder, or dry flowable) was used the unit code must be ounces, pounds, or grams.

How applied (Column 9)

Obtain the physical application method used to apply the pesticide product to the selected field. The application methods codes are printed in the **APPLICATION CODES** box positioned above Column 9 of the Pesticide Table. Show the respondent the Fertilizer/Pesticide Applications Method Codes in the Respondent Booklet.

Herbicides, insecticides, and fungicides are most often applied as broadcast treatments to cover the entire soil surface with the pesticide material. Band treatments, where a narrow band of pesticide is applied over the row covering about one-third of the soil surface, is also a common method of application.

Less frequent methods include in-furrow, with irrigation water, or as spot treatments.

The Application Method codes are defined as follows:

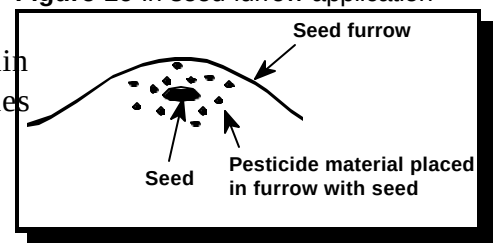
Code 1 - **Broadcast, Ground Without Incorporation**: Pesticide material (herbicide, insecticide, fungicide, or other) is applied to the entire surface area by land application equipment. Application may occur either before or after planting, usually before crop emergence. No mixing of the pesticide material into the upper soil surface is needed or planned as part of the application.

Code 2 - **Broadcast, Ground with Incorporation**: Pesticide material (herbicide, insecticide, fungicide, or other) is applied to the entire surface area by land application equipment. Application usually occurs before planting, and a planned mixing of the pesticide into the upper soil surface is completed at the time or shortly after the time of application. Incorporation of the pesticide into the upper soil surface is often performed with a field cultivator, disk, or other tillage implement.

Code 3 - **Broadcast by Air**: Pesticide material (herbicide, insecticide, fungicide, or other) is applied to the entire surface area by air application equipment. Include only those applications made by airplane or helicopter.

Code 4 - **in Seed Furrow**: Pesticide material (herbicide, insecticide, fungicide, or other) is placed in the seed furrow **at planting time** generally through a separate attachment on the grain drill. This method is sometimes used for granular insecticides applications.

Figure 16 In seed furrow application



Do not confuse this with seed treatments where the seed surface is coated with a pesticide product by the farmer or seed dealer before the seed is put in the planter box. **Do not record seed treatments.**

Code 5 - **in Irrigation Water**: Pesticide material (herbicide, insecticide, fungicide, or other) is mixed with water in either sprinkler or gravity fed irrigation systems. The term used for this procedure is chemigation. The

product is metered into the water delivery system (generally a sprinkler irrigation system) and is distributed across the field in the irrigation water.

Code 6 - **Chisel, Injected or Knifed-in**: Pesticide material (herbicide, insecticide, fungicide, or other) is injected under pressure into the soil. This application method (using high pressure) is used with pesticide spray materials for nematode control.

Code 7 - **Banded in or over Row**: Pesticide material (herbicide, insecticide, fungicide, or other) is placed in or over the crop row. This method is mainly used for row crops. Products are applied **at or after planting**. The area between the rows is not treated. Weed control between rows is accomplished with mechanical cultivation.

Application rates for band treatments are to be reported on a per acre basis and not the rate that was applied to the banded segment. Band treatments with the same pesticide product normally result in lower application rates than broadcast treatments. For example, if the band only covers one-third of the row, the application rate will normally be about one-third the broadcast application rate.

- At or after planting herbicides materials are applied by spraying the product in an 8 to 12 inch band over the crop row.
- At planting insecticide and fungicide applications are generally placed in a 4 to 6 inch band directly behind the planter shoe and in front of the press wheel.

Code 8 - **Foliar or Directed Sprays**: After planting, pesticide material (herbicide, insecticide, or fungicide) is sprayed on or under the plant foliage.

Code 9 - **Spot Treatments**: Pesticide material are only applied to "**hot**" spots in the field, even if the operator drives over the entire field looking for the hot spots. Spot herbicide applications are generally made to control problem weeds. Spot insecticide applications are sometimes made to control grasshoppers in the edges of the field. It is doubtful if any spot treatment of fungicides would ever be made.

Spot Treatment vs. Partial Field Treatment

It is very important to distinguish between a 'spot treatment' and a treatment that covers only a portion of the field or 'partial field treatment'. Spot applications should not be confused with treatment of part of a field.

When part of a field is treated, treated acres can usually be distinguished. For example, "*the north half of the field was treated*". These partial field applications are reported just like any other applications.

For spot applications, acres are usually nearly impossible to define. Often spot treatments involve workers walking or riding around with tanks on their backs spraying areas which appear to have infestations for which the treatment is being made. This may mean that ten little areas throughout the field are treated, and none of those areas may be near each other. Sometimes rope-wicks are mounted on booms to apply herbicides to weeds that are taller than the crop.

Spot applications are not common for field crops. The most common spot treatments reported on past surveys have been herbicide applications (mostly Roundup products) to scattered areas in cotton fields. Spot treatments to other field crops are very rare and should be verified.

If treatments were made with any product to just certain spots (hence the term spot treatment) in the selected field, record the total quantity of product applied (columns 7 and 8), and the total number of acres (column 10) spot treated in the field. If small, scattered spots were treated throughout the field, then the entire field acres should be recorded in column 10. If spot treatments were made to only a portion of the field (for example "*the west side*"), you will have to probe to obtain the operator's estimate of the number of acres to which spot treatments were made.

If the operator reports a rate per acre for a spot application, this may very well be a 'partial field treatment', and not a 'spot treatment'. Probe to determine the actual application method. One question to ask is "*Were only selected spots treated, or was the entire surface of a portion of the field treated?* The operator's response may help clarify if this was (or was not) a spot treatment.

IMPORTANT: Do not put a rate per acre (column 6) for spot treatments. Enter only the total amount applied (column 7) for spot treatments.

Take, for example, a farmer with a 40 acre field of cotton. He may identify a small area along a road with severe perennial grass infestation, and decide to spot treat this areas with Roundup Ultra. If he used 2 ounces to spot treat weeds over 8 acres of the field next to the road the line of the pesticide table would be completed as shown below.

Figure 17 Spot treatment to a portion of the field.

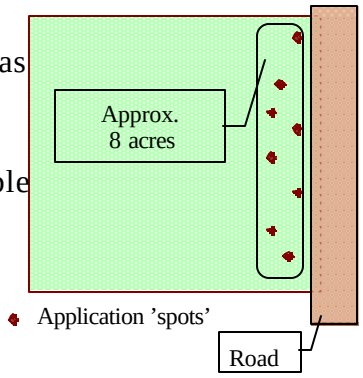


Figure 18 Recording a spot pesticide treatment

APPLICATION CODES for column 9

1 Broadcast, ground without incorporation
2 Broadcast, ground with incorporation
3 Broadcast, by air
4 In Seed Furrow
5 Irrigation water
6 Chisel, Injected or Knifed in
7 Banded In or Over Row
8 Foliar or Directed Spray
9 Spot treatment

APPLICATOR CODES for column 14

1 Operator, Partner, Family member?
2 Custom applicator?
3 Employee/Other?

NOTES	LINE	2 What products were applied to this field? [*Use product codes from Respondent Booklet.*]	3 Was this product bought in liquid or dry form? [*Enter L or D*]	4 Was this part of a tank mix? [*If tank mix, enter line number of first product in mix.*]	5 When was this applied? 1 Before planting 3 At planting 4 After planting 5 Defoliation prior to harvest	6 or 7 How much was applied per acre per application?	6 or 7 What was the total amount applied per application in this field?	8 [*Enter unit code.*] 1 Pounds 12 Gallons 13 Quarts 14 Pints 15 Ounces 30 Grams	9 How was this product applied? [*Enter code from above.*]	10 How many acres in this field were treated with this product?	11 What was the number of times applied?	12 What was the PRIMARY target pest for this application? [*Use Target Pest codes from Respondent Booklet.*]	13 Prior to this application was this years pest problem-- 1 worse than normal? 3 normal? 5 less than normal? 7 unknown? 9 not applicable?	14 Were these applications made by-- [*Enter code from above.*]
									9					9
Roundup Ultra	01	4561	L	—	4		200	15	9	8.0	1	172	1	1

If the farmer does a 'partial field treatment to the same area, the area treated can be readily identified. If he used 4 ounces per acre to treat weeds over 8 acres of the field next to the road the line of the pesticide table would be completed as shown below.

Figure 19 Partial treatment of the field.

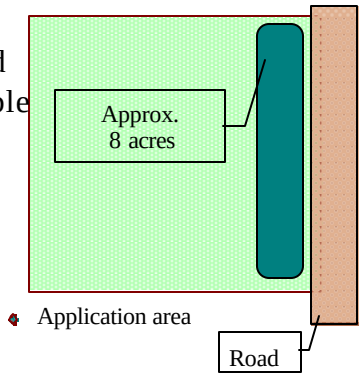


Figure 20 Recording a partial field pesticide treatment

APPLICATION CODES for column 9

1 Broadcast, ground without incorporation
2 Broadcast, ground with incorporation
3 Broadcast, by air
4 In Seed Furrow
5 Irrigation water
6 Chisel, Injected or Knifed in
7 Banded In or Over Row
8 Foliar or Directed Spray
9 Spot treatment

APPLICATOR CODES for column 14

1 Operator, Partner, Family member?
2 Custom applicator?
3 Employee/Other?

NOTES	LINE	2 What products were applied to this field? [*Use product codes from Respondent Booklet.*]	3 Was this product bought in liquid or dry form? [*Enter L or D*]	4 Was this part of a tank mix? [*If tank mix, enter line number of first product in mix.*]	5 When was this applied? 1 Before planting 3 At planting 4 After planting 5 Defoliation prior to harvest	6 or 7 How much was applied per acre per application?	6 or 7 What was the total amount applied per application in this field?	8 [*Enter unit code.*] 1 Pounds 12 Gallons 13 Quarts 14 Pints 15 Ounces 30 Grams	9 How was this product applied? [*Enter code from above.*]	10 How many acres in this field were treated with this product?	11 What was the number of times applied?	12 What was the PRIMARY target pest for this application? [*Use Target Pest codes from Respondent Booklet.*]	13 Prior to this application was this years pest problem-- 1 worse than normal? 3 normal? 5 less than normal? 7 unknown? 9 not applicable?	14 Were these applications made by-- [*Enter code from above.*]
									9					9
Roundup Ultra	01	4561	L	—	4	4.00	. _ _	15	8	8.0	1	172	1	1

Acres treated (Column 10)

Record the number of acres in the selected field that were treated with the pesticide product recorded in Column 2. This will be the same as the number of planted acres recorded for the field when the entire field was treated with the pesticide. If only part of the selected field was treated, then enter the number of acres representing the share of the field actually treated.

Here it is important to know the difference between treated acres and treatment acres. Treated acres are the actual physical (land) acres of crop which were treated -- it doesn't matter how many times they were treated, they are only counted once. Treatment acres are the total number of acres covered by applications of a product regardless of whether they are the same acres or different acres.

If the same 40 acres are treated 4 times, the number of treated acres is 40 and the treatment acres is 160 (4 x 40). In this example, 40 acres would be recorded.

Never record treatment acres in these questionnaires.

We account for multiple applications of the same product and formulation in one of two ways:

1) recording each event on a separate line, or

2) combining applications on one line and noting number of times in the next column, column 11.

Acres and tenths of acres must be reported in Column 10. Zero must be recorded after the decimal point if whole acres are recorded. For example, if the operator treated exactly 25 acres, the entry in Column 10 must be 25.0. Otherwise the summary will consider the entry to be 2.5 and we will get serious errors when we summarize active ingredients applied per acre.

Applications done at seeding will normally cover the entire planted acres. However, it is possible for the application to only cover a portion of the field, for different application rates to be used, or for different products to be applied to different areas at planting. When the acres covered by “at seeding” applications does not equal the planted acres, verify this with a note in the margin.

Number of applications (Column 11)

If the same product is applied more than once:

1. At the same rate, (Column 6&7)
2. In the same time period before or after planting, (Column 5), and
3. Covering the same area, (Column 10),

then the multiple applications can be recorded on one line. Column 11 is coded with the number of applications of **this** product and at **this** rate.

If the applications were at different rates, during a different time period, or covering different areas of the field, record each application on a separate line. For example, if 2,4-D was applied before planting, record it on one line. If a second application was made after planting, record it separately on another line.

Primary target pest (Column 12)

We need to know the primary purpose for the application. In most cases, chemicals are applied to target a specific pest, or class of pests, such as 'annual broadleafs' or 'aphids'. In other cases, a product may be applied as a harvest aid such as a 'defoliant' or 'desiccant'.

Ask the operator to identify the primary target pest (or reason) for the application of the product listed in Column 2. Use the **Target Pest Code List** printed in the Respondent Booklet.

If the respondent indicates that there were several pests for which a specific application was targeted, ask him/her to select the main one, or the most important one, for that product application. Only report general pest categories, such as broadleaf weeds, grasses, etc., when the respondent cannot identify a more specific target pest.

Pest infestation level (Column 13)

In this column, record the code which best describes the situation in the 2000 crop year for the target pest recorded in Column 12.

Consider a reported target of aphids; this question asks if the aphid problem was worse than normal in 2000, about normal, less problem than normal or unknown.

For applications of chemical thinners, defoliants, growth regulators, etc. enter code 9 to indicate that the question is not applicable.

Who applied (Column 14)

For each individual treatment, record who made the pesticide application on the selected field. The codes to identify who applied the chemicals are:

Code 1 - **Operator, Partner, or Family Member**
Code 2 - **Custom Applicator**
Code 3 - **Employee or Some Other Person.**

Item 2: Information for unlisted pesticides

If you could not find a product in the Pesticide Code List in the Respondent Booklet when completing Item 1, complete the table in Item 2 to provide the information needed to classify and summarize unlisted products. First, record the line number of the pesticide application that the information refers to. Then record what it was used for (herbicide, insecticide, fungicide). Next record the EPA registration number, if it is available, or the name and formulation of the product. Record whether the product was liquid or dry when it was purchased. Finally, record where the product was purchased. This will assist the State Office if questions arise about the product and additional information is needed.

The EPA Product Registration number (refer to Figure 5.19) is printed on the product label. These numbers are several digits long and look somewhat like many bank and credit card account numbers, such as 312-19-18713 and 2980-4. EPA Product Registration numbers are not the same thing as EPA Establishment numbers. In this example, the EPA Product Registration number is **100-673**. EPA Establishment numbers indicate which companies are also licensed to market the product, but do not uniquely identify the product.

Figure 21 EPA Numbers that appear on Pesticide Product Labels

EPA Reg. No. 100-673
EPA Est. 34704-MS-1Ⓟ, EPA Est. 11773-IA-01Ⓦ, EPA Est. 5905-GA-01Ⓗ

If the respondent does not know the EPA product number or the trade name and formulation, record as much information about the product as you can, especially the "where purchased." This information will enable identification of the product in the State Office. The "where purchased" is important because if more information is needed, we can then call the dealer.

For example, if the operator has a pesticide applied by a custom applicator, he/she might not know the formulation of the product, but if the "where purchased" is recorded the State Office can check to get the correct formulation.

A good, complete entry for Unlisted Products in the notes portion of the section is as follows:

Figure 22 Providing information needed for unlisted pesticide products.

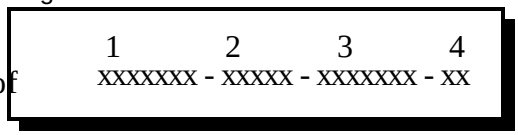
2. [*For pesticides not listed in Respondent Booklet, specify–*]

LINE	Pesticide Type (*Herbicide, Insecticide Fungicide, etc.*)	EPA No. or Tradename and Formulation	Form Purchased (Liquid or Dry)	Where Purchased [*Ask only if EPA No. cannot be reported.*]
22	*Insecticide*	*Danitol 2.4 EC, EPA # 39398-17*	*Liquid*	*Midland Chem Supply*

What's in a Registration Number?

All pesticide products, if properly registered, are identified by a unique number which is required to be located on the front panel of the label. This "registration number" is composed of several components, each of which has a specific meaning. These individual components are separated by a "-". Those products registered in California, have an extra component which identifies individual brand name registrations.

Figure 23 Layout of an EPA Registration Number



1. Firm or Establishment Number - This component identifies the company that is the primary registrant with the USEPA. The number may be as long as seven digits, or as short as 1. California assigns their own unique firm numbers to companies that register products which are not required to be registered by USEPA.

2. Product or Label Number - This five or less digit number is generally assigned sequentially to each company's individual product as it is registered with the USEPA.

3. Distributor or Sub-Registrant's Number - This number identifies any company that is marketing a product owned by another company, generally the primary registrant. This type of registration is called a distributor registration or a sub-registration and is allowed under existing agreement certified by the USEPA. For a product registered

in California, this number represents the company that holds the license for pesticide registration within the state.

4. California Revision Code - California requires companies to register and license individual brand names. The revision code, a sequence of (2) alphabetic letters, creates a unique identifier for each product. A single product may have many brand names registered within the state. Unique revision codes assigned to each one allows for identification of the specific brand name in question. These alphabetic letters may or may not appear on actual product labeling.

Item 3: Pesticide custom costs

V2, V3

Rice, Sugarbeets

You will know if any of the pesticide applications were made by custom applicators by looking at Column 14 in the Pesticide Table. Ask this question only if any CUSTOM applications were reported (code 2 entered in Column 14).

Item 3a: Custom application charge identifiable

First, ask the respondent if he is able to report the cost of custom applications (the charge for just the application of materials) separately from the costs of the materials applied. If yes, complete item 3b. If no, skip to Item 4 to obtain the total costs of materials, including the custom application charge.

Item 3b: Custom application charge

Record the amount spent for CUSTOM APPLICATION of chemicals and pesticides on the selected field for the 2000 crop. Include landlord cost. Record only the application cost. Do NOT include the cost of pesticides or chemical materials. Record the cost in dollars and cents per acre or in total dollars for the field.

If material and application costs can't be separated, record the total in Item 4 and skip Item 3b.

Item 4: Pesticide material costs

V2, V3

Rice, Sugarbeets

Record the TOTAL MATERIALS cost for all insecticides, herbicides, fungicides, surfactants, wetting agents, defoliants and growth regulators applied to the selected field for the 2000 crop. Include landlord costs.

Include materials applied to this field if it was fallow during 1999. Include materials applied to this field before planting. If custom applied, include the cost of materials ONLY, unless materials and application costs cannot be separated. Record the cost in dollars and cents per acre or in total dollars for the field.

Many operators know the cost per acre of chemicals and pesticides applied on their fields. Some operators will have records of chemical applications and the costs of chemicals applied on each field. Encourage the respondent to use records if they are available. You should always attempt to get the best figures from the respondent using this item. If the operator is unable to report the cost per acre or the total cost for chemical and pesticide materials used on the selected field, use the Dashed Column: Optional Item 4 in the Pesticide Table.

The Dashed Column: Optional Item 4 should only be used as a last resort, because operators may have a more accurate figure available that includes materials which are not captured in the Pesticide Table (such as surfactants and wetting agents).

Section E - Pest Management Practices

What is section E for? How is the information used?

This section provides data about pest management practices that growers use on their crops, either as alternatives to pesticides or practices which improve the effectiveness of pesticides. With this information, researchers can better analyze the effectiveness and performance of alternative pesticide treatment strategies, and potential impacts on the environment and public health.

Several years ago, USDA, along with the U.S. Environmental Protection Agency (EPA) and the Food and Drug Administration (FDA), presented joint testimony to Congress on a new, comprehensive, interagency effort designed to reduce the pesticide risks associated with agriculture. The threefold goal of this effort is:

1) to discourage the use of higher risk products;

2) to provide incentives for the development and commercialization of safer products; and

3) to encourage the use of alternative control methods which decrease the reliance on toxic and persistent chemicals.

This joint testimony also expressed support for 'integrated pest management', and set the goal of developing and implementing Integrated Pest Management (IPM) programs on 75 percent of total U.S. crop acreage by the year 2000.

Integrated Pest Management (IPM) is an approach used by farm operators to control pests in an environmentally responsible manner. IPM combines biological, cultural, and chemical methods of pest control such as monitoring of pest populations and use of natural enemies of pests. Other methods of cultural controls are used, including pest resistant crop varieties, traditional plowing and crop rotation, and use of pesticides when necessary.

Some producers may hire professionals to check their fields to determine the presence of pests. Proper identification of pest problems may reduce pesticide usage. These issues relate to and address food safety, water quality, and pesticide regulation. Data from these questions are vital to address these concerns.

Item 1: Introduction and definition of pests

This item introduces this section about pest management practices. The introductory statement does two things to help the respondent:

1) It explains that you will be shifting gears for a while and asking the operator about pest management practices used on the selected field and how decisions are made regarding those practices.

2) It defines PESTS for the operators to include WEEDS, INSECTS, AND DISEASES. Many operators tend to focus on one kind of pest depending on the crop, but we are concerned about other types of pests as well.

   For example, corn growers may think only about weeds as pests; cotton growers may focus only on insects as pests.

In this section, when the word PESTS is used, it refers to ALL three, WEEDS, INSECTS, AND DISEASES. If you don't introduce pests this broadly for all operators, operators may answer the questions with only one kind of pest in mind.

Item 2: Pest scouting

Was field scouted for pests

Determine if the selected field was scouted for weeds, insects or diseases.

Scouting is checking a field for the presence, population levels, activity, size and/or density of weeds, insects, or diseases. A variety of methods can be used to scout a field. For example, the methods used to scout for insect pests include sweep nets, leaf counts, plant counts, soil samples, and general observation.

For each type of pest (Item 2a - weeds, Item 2b - insects, Item 2c - diseases) for which the field was scouted, enter code "1" = YES, and then ask items 2a & 2b, who did most of the scouting for this type of pest. If no scouting was done, go to Item 6.

Who performed scouting for pests

Ask the respondent who did the majority of the scouting in the field for Item 2a (weeds) and Item 2b (insects). If two or more people did equal amounts and there is no clear-cut major "scouter", enter the first (lowest) code of those scouting. If the operator, a partner, or a family member did the most scouting, enter code “1". If most was done by an employee (other than the operator, a partner, or a family member), enter code “2". If most of the scouting was done by the dealer or an employee of a farm supply or chemical company, enter code “3". If a hired crop consultant or a commercial scouting service was used, enter code “4".

If a contractor provided the scouting services for the field, enter code “4" for CROP CONSULTANT OR COMMERCIAL SCOUT.

Item 3: Scouting Cost

V2, V3

Rice, Sugarbeets

Ask this question only if a hired crop consultant or commercial scout did most of the scouting for weeds or insects (code “4" appears in Column 3 of Item 2). Be sure to enter the cost per acre in dollars and cents or the total cost for scouting services on this selected field. **Include** landlord cost.

If Column 3 of Item 2 does not contain a code “4", then go to Item 4.

Sometimes, the farmer is unable to separate the costs of scouting from the cost of pesticides or custom application charges, especially if the chemical dealer or custom applicator does the scouting. If the fee was included in the cost of the materials or custom application, record a note to explain.

Although scouting costs may be considered a technical or custom cost, they are reported in this item and not in Section F, Item 5.

Item 3a: Insect scouting cost

V2, V3

Rice, Sugarbeets

Record the percent of the total scouting cost entered in Item 3 that was for insect scouting. Ask the respondent to give a best estimate if exact figures are not available.

Item 4: Hours Spent Scouting

V2, V3

Rice, Sugarbeets

Ask this question for the selected field only if the operator, a partner, a family member, or an employee did the scouting (code "1" or "2" appears in Column 3 of Item 2). Obtain the total number of hours spent scouting this field for all pests during the entire season.

If scouting was done by more than one person of the type recorded in Column 3 of Item 2, obtain the total hours spent by all of these people. For example, if two employees scouted the selected field, one for 1 hour and the other for 2 hours, enter "3" in Item 4.

Both Item 4 and Item 3 may contain positive answers. For example, if the operator did the scouting for weeds and a scouting service did the scouting for insects, then both Items 3 and 4 would be answered.

Item 5: Records kept to track pests

If the field was **not** scouted for pests (Item 2 is NO for weeds, insects, and diseases), then skip Item 5 and go to Item 6.

We only want to consider organized, formal records, not just notes jotted down on scraps of paper. It doesn't matter who kept the records -- it can be the operator or someone else. **Important Note: If scouting was performed by someone outside of the farm operation (Items 2a2 or 2b2 are coded "3" or "4"), we expect that some type of formal record would be provided to the operation. If not, please make a note as to why no records were provided.**

If this field was scouted for pests, determine if some type of formal or organized written, electronic, or map records were kept for this field of specific pest activity, infestation levels or numbers of each type of pest listed.

Example 5: Formal Pest Record

A specific example of keeping formal pest records comes from the North Carolina Cooperative Extension Service. Three steps are recommended to scout for weeds:

1) make at least 10 stops in each field;

2) at each stop, mark off approximately 30 feet of row (10 paces);

3) record the type and number of weeds found within a 1-foot band in the row. Then record the scouting results on a "weed threshold worksheet" like the one below:

Figure 24 Example of information recorded in written scouting records.

Weed	Number Counted	Number of Stops	Number of Weeds per Stop

The information recorded on the worksheet is used with other information to determine whether herbicide treatment is necessary.

Item 6: Enumerator Action: Were Herbicides Used?

If any HERBICIDES were recorded in the Pesticide Table in Section D, then Items 7 & 8 must be asked. Check back to responses recorded in Section D, Column 2 of Item 1. All herbicide products have a code number in the series 4000-4999.

If no HERBICIDES were used, go to Item 9.

Item 7: Were herbicides applied *before* weeds emerged?

Pre-emergence herbicides are applied before weeds emerge. Ask the operator if herbicide applications were made on the selected field **before weeds** emerged. If yes, enter code "1" and ask Item 7. If no, go to Item 8.

Items 7a - 7d: Reasons for applying herbicides *before* weeds emerged

Items 7a-d obtain the reason or reasons the operator may have had for using pre-emergence herbicides on the selected field. Each of these must be asked.

This is not a multiple choice question -- that is, there may not be just one single answer. The operator may have more than one reason for applying pre-emergence herbicides. Enter code "1" for each reason the operator used pre-emergence herbicides.

It is also possible for the operator to say NO to all Items 7a-d. If this happens, it will be apparent that the operator based decisions on some reason besides those named in Items 7a-d, because these are all NO.

In Item 7a, if the operator's reason for using pre-emergence herbicides was because it was a routine treatment for weed problems observed in previous years, enter code "1" for YES.

In Item 7b, if the operator based the decision to apply pre-emergence herbicides on a map drawn of the field indicating locations where specific weed species were present the previous year, enter code "1" for YES. These areas could be "spot treated" this year with selective herbicides.

In Item 7c, determine if recommendations from a chemical dealer were considered in the operator's decision to apply pre-emergence herbicides.

In Item 7d, determine if recommendations from an independent crop consultant were considered in the operator's decision to apply pre-emergence herbicides. Do not include recommendations or consultation with a farm supply or chemical dealer. Include only services for which the operator paid.

Item 8: Were herbicides applied *after* weeds emerged?

Post-emergence herbicides are applied after weeds emerge. Ask the operator if herbicide applications were made on the selected field **after weeds** emerged. If no post-emergence herbicides were used, then go to Item 9.

Items 8a-8d: Reasons for applying herbicides *after* weeds emerged

Items 8a-d obtain the reason or reasons the operator may have had for using post-emergence herbicides on the selected field. Each of these must be asked.

This is not a multiple choice question -- that is, there may not be just one single answer. The operator may have more than one reason for applying post-emergence herbicides. Enter code “1" for each reason the operator used.

It is also possible for the operator to say NO to all Items 8a-d. If this happens, it will be apparent that the operator based decisions on some reason besides those named in Items 8a-d, because these are all NO.

In Item 8a, if the operator’s reason for using post-emergence herbicides was because it was a routine treatment for weed problems observed in previous years, enter code “1" for YES.

In Item 8b, if the operator based the decision to apply post-emergence herbicides on the weed species or type of weed being present and/or the density or extent of the weed infestation, enter code “1" for YES. The type of weeds present normally determines which herbicide product to use. The density of the weeds would probably be the basis for the application rate per acre used in the treatment.

In Item 8c, determine if recommendations from a chemical dealer were considered in the operator’s decision to apply post-emergence herbicides, enter code “1" for YES.

In Item 8d, determine if recommendations from an independent crop consultant were considered in the operator’s decision to apply post-emergence herbicides, enter code “1" for YES. Do not include recommendations or consultation with a farm supply or chemical dealer. Include only services for which the operator paid.

Item 9: Enumerator Action: Were Insecticides Used?

If any INSECTICIDES were recorded in the Pesticide Table in Section D, check 'YES' for Item 9, and ask Items 10a-e. Check back to responses recorded in Column 2 of Item 1 of Section D. All INSECTICIDE products have a code number in the series 1000-2000.

If insecticides were not used, go to Item 11.

Items 10a-10e: Reasons for applying insecticides

Every operator decides whether or not to apply insecticides. That is, an operator may decide to apply insecticides or he/she may decide to not apply

insecticides. This series of questions is to find out the operator's reasons **to apply** insecticides to the selected field.

Each of the individual items must be asked. This is not a multiple choice question -- that is, there is no single right answer. An operator who decided to apply insecticides may have evaluated one or more of these criteria to make the decision. More than one of the listed reasons may have been considered. Enter code "1" for each reason the operator used.

It is also possible for the operator to say NO to all Items 10a-e. If this happens, it will be apparent that the operator based the decision to apply insecticides on some reason besides those named in Items 10a-e, because these are all NO.

In Item 10a, if the operator's reason for using insecticide was because it was a routine preventive treatment for insect problems observed in previous years, enter code "1" for YES.

In Item 10b, determine if the operator used scouting data and compared it to University or Extension guidelines for infestation thresholds. If this criteria was the reason for the operator's decision, enter code "1" for YES.

In Item 10c, enter code "1" if the operator decided to apply insecticides because this was standard practice or because there was a history of insect problems on this field..

In Item 10d, determine if the operator's decision to apply insecticides to this field was based on local information (from other farmers, radio, TV, newsletters, etc.) that the pest was present. Enter code "1" for YES.

In Item 10e, enter code "1" if the operator's own determination of the infestation level was a reason for the decision to apply insecticides to the selected field.

Other Pest Management Practices

Items 11 through 31 identify specific practices and strategies used on the selected field for the 2000 target crop as part of an Integrated Pest Management program. For each of these items, it is important to read each question as worded to help the respondent focus on strategies used on the **selected field** for the 2000 crop. For most of these questions, the term pest covers weeds, insects, and / or diseases.

Each of these items asks if the operator used the procedure for the purpose of controlling pests on the selected field. If the procedure was used for this purpose, enter code "1". If the procedure was not used for the purpose of controlling pests, then enter a dash for NO and continue with the next item.

In some cases, the operator may have used a particular procedure, but not for the purpose of controlling pests. If this is the case, probe to verify that the operator's purpose was other than to control pests, by saying, for example, "Did you do that to control pests?" If the purpose for the procedure was not for controlling pests, then the answer to the question is NO and a dashed entry should be made.

Item 11: Protection of beneficial organisms

Beneficial organisms are predators and parasites and other **natural** enemies of crop pests. Naturally occurring insect predators of mites, aphids and caterpillars in corn and soybeans include predatory mites, aphid predators, green lacewings, and lady beetles.

Some producers will try to protect the beneficial organisms which occur naturally in their fields. They consider the possible impact on beneficial insects when deciding to use pesticides, and what pesticides to use.

Find out if the operator considered beneficial insects in the selection and use of pesticides on this field. If yes, enter code "1".

Item 12: Used beneficial insects

Beneficial organisms are predators and parasites and other natural enemies of crop pests. Some kinds can be purchased by operators and used on their fields. An example of a beneficial organism that is used on corn pests is the

Trichogramma wasp, which is a very tiny parasite wasp that kills pests by laying eggs inside the pest's eggs.

Find out if the operator purchased and released any beneficial species of insects on this field. If yes, enter code "1".

Item 13: Water management practices

Water management practices include irrigation scheduling, drainage control, and other water management practices. Find out if water management practices were used to control pests in this field. If yes, enter code "1".

Item 14: Tilling, chopping, mowing, burning

Eliminating habitat where pests can breed and grow is an important pest management strategy. Farmers often mow or otherwise maintain areas immediately adjacent to fields to minimize the habitat where insects live.

Find out if practices such as mowing, burning, tilling, and chopping of field edges, lanes or roadways, were used to slow or control the spreading of pests into the field. If yes, enter code "1".

Item 15: Cleaning of equipment

Cleaning of equipment used in a field prevents carrying pests (such as weeds and disease) from one field to another. Find out if the operator cleaned the harvesting and/or tillage equipment used in this field to reduce or prevent the spread of pests to or from the selected field. If yes, enter code "1".

Item 16: Cultivation for weed control

V3, V5, V6, V8, V10

Sugarbeets, Corn, Soybeans, Upland Cotton

Determine whether this field was cultivated for weed control during the growing season (after the target crop was planted). If YES, enter code "1".

NOTE: New question this year. If field was cultivated, enter the number of times the field was cultivated in item 16a. This information about the number of cultivations will be useful in addressing the issue of substituting cultivation for herbicide use.

Item 17: Considered pest resistance when selecting seed variety

Find out if the operator considered pest resistance offered by different seed varieties in selecting the variety planted in this field. Enter code “1" if YES.

Item 18: Used seeds treated to control disease

Find out if the operator used treated seeds to control disease on this field. This includes the operator using his/her own seeds and treating them for disease control as well as purchasing seed that was treated for disease control. If treated seed was used for disease control, then enter code “1".

Item 19: Adjusted planting or harvesting dates

Find out if the planting or harvest date was adjusted on this field for the purpose of controlling pests. If yes, enter code “1".

Item 20: Biological soil analysis to detect presence of pests

Soil samples may be analyzed for the presence of soil borne pests or pathogens. Determine if the operator had such a biological soil analysis done for the selected field. Enter code “1" if YES.

Item 21: Alternated pesticides to prevent development of resistance

Find out if the pesticide products were alternated in this field from year to year for the purpose of slowing the development of pest resistance. To alternate pesticides means to use products with different active ingredients or from different pesticide families. Enter code “1" if YES.

Item 22: Adjusted row spacing or plant density

V3, V5, V6, V7, V8, V10

Sugarbeets, Corn, Soybeans, Wheat, Upland Cotton

Find out if row spacing (width) or plant density (number of seeds planted per acre) were adjusted in this field for the purpose of controlling pests. Enter code “1" if YES.

Item 23: Rotated crops to control pests

Find out if crops were rotated in the past 3 years **for the purpose of controlling pests**. Pest control is only one of several reasons crops could have been rotated. Be sure to probe to ensure that the control of pests was a reason for rotating crops on this field. If the control of pests was a reason crops were rotated, then enter a code "1".

Item 24: Biological pest control costs

V2, V3

Rice, Sugarbeets

Biological pest control methods include beneficial organisms (pest predators and parasites) that are used to control crop pests, biochemical agents such as pheromone, microbial organisms such as Bacillus thuringiensis (Bt) and other bacteria, viruses, fungi, and protozoa.

Record the TOTAL materials and custom application costs for all biological pest controls, including pheromone, pheromone traps, beneficial insects, and floral lures, attractants or repellants applied on this field for the 2000 crop.

Exclude seed technology assessment fees. These should be recorded in Section B.

Record in either dollars per acre or total dollars. Include any costs paid by the landlord

Items 25a & 25b: Pheromones

V8, V10

Upland Cotton

Insects of the same species can communicate with one another by releasing small quantities of chemical substances from their bodies into the air. These distinct scents, called pheromone [*pronounced fair-eh-moan*], attract others to the source of the scent. Because the chemical composition of the pheromone differs from species to species, the attraction of an insect's pheromone is specific to that species alone. Researchers have been able to chemically identify many of these individual pheromone and duplicate them. As

a result, it is now possible to attract certain insects by using these synthesized pheromone, enabling us to disrupt them from their normal behavior.

Producers may use pheromones in their effort to control insects. The two major ways pheromones are used in agriculture are to monitor insect populations and to control insects to disrupt mating.

Item 25a: Used pheromones to trap pests

In Item 25a, find out if the operator used pheromone **traps** and **lures** on the selected cotton field to **monitor** pests. Enter code "1" if YES.

Item 25b: Used pheromones to disrupt mating

Find out if the operator used pheromone mating disruption systems to control pests. Enter code "1" if YES.

Item 26: Adjusted grazing dates

V7

Wheat

Find out if the grazing dates were adjusted in the selected wheat field for the purpose of controlling pests. Enter code "1" if YES.

Items 27 & 27a: Non-chemical blackbird control cost

V2

Rice

Find out if non-chemical control for blackbirds was used on this rice field. If YES, enter code "1" and continue with Item 27a.

Item 27a asks for the total cost either in Total Dollars OR Dollars per acre for all shotgun shells, propane guns and other non-chemical blackbird control used on this rice field in 2000.

Item 28: Other pest management strategies used

It is possible for an operator to use many other strategies and/or practices to manage, control, or prevent pest problems. This item is used as a catch all to identify practices (not covered in items 2 through 27) used by the operator to manage pests on the selected field. If the operator used some practice other than those already listed, ask the operator to describe the practice used. Record a detailed description of the practice in item 28a. Make sure your description is clear; the office will use your recorded description to assign a practice code for each additional practice you list.

Item 29: Pest management information sources

Use the Respondent Booklet and show the operator the Pest Management Information Sources Code List. Have the respondent select the primary outside source of information on insect, weed and disease management recommendations for the 2000 crop grown in this field.

If the operator answers using the code rather than the words, verify the code by reading the associated category. For example, if the operator tells you code“2", verify that it means that the operator got pest control recommendations from a farm supply or chemical dealer.

If the operator used more than one source, probe to find out which ONE the operator considered the most important information source for helping control pests on the selected field in 2000. The codes for Pest Management Information Sources are:

Code 1 - **Extension Advisor, Publications or Demonstrations** (County, Cooperative or University). Many state extension services publish detailed bulletins on local pest densities and other pest management information on a regular basis as well as annual or periodic pest management reports, and conduct regular demonstrations on new technology.

Code 2 - **Farm Supply or Chemical Dealer**. Many farm supply or chemical dealers offer scouting and other pest management services to the farmers that buy inputs from them.

Code 3 - **Commercial Scouting Service**. Some consulting firms provide services that are focused exclusively on pest management. These firms will

offer scouting services, and may offer other insect, weed, and/or disease management services.

Code 4 - **Independent Crop Consultant or Pest Control Advisor**. In 1996, there were over 400 crop consulting firms located in over 36 states in the U.S. operating independently from chemical companies and other farm input suppliers. A wide variety of services are offered by these firms, including insect, weed, and disease management.

Code 5 - **Other Growers or Producers**.

Code 6 - **Producer Associations, Newsletters or Trade Magazines.** Farmer cooperatives and other producer associations sometimes provide pest management assistance, and many trade magazines offer pest management information, guidelines, and advice.

Code 7 - **Electronic Information Services** (*World Wide Web, DTN, etc.*): Information may be obtained electronically using computers. Using the Internet, producers can access the World Wide Web and obtain pest management information from a wide variety of sources. This is like a combination of a communication system and an electronic library.

> DTN stands for Data Transmission Network. This is an example of an on-line market information service or market news service that provides market and other agricultural information through a data line, satellite dish, and a "dumb" terminal, which cannot be programmed to carry out computerized functions.

Code 8 - **Other**: An outside source of information other than those already listed. If the operator didn't use an outside source of information, instead relying on experience or personal judgment, etc., use Code 9 for NONE.

Code 9 - **None**: No outside source of information was used. Use this code if the operator didn't use any other source of information for pest control decisions, besides experience or personal judgment, etc.

Item 30: Pest identification and management training

Determine if operator attended a short course, workshop, or other training session on pest identification and management sponsored by universities or the Extension Service since October 1, 1999. Do not include seminars put on by chemical dealers. If YES, enter a code “1".

Section F - Field Operations, Labor, and Custom Services

What is Section F for? How is the information used?

Machinery information is used to identify tillage systems and residue levels. This allows examination of the impact of the conservation compliance provisions of the 1995-96 Farm Bill (the FAIR Act) on tillage systems, cropping practices, and crop residue levels.

Use the checklist at the top of the field operations table to insure the proper operations are recorded by version.

V8, V10

Upland Cotton

Limited tillage data are collected for upland cotton in *Versions 8 and 10.* For Upland Cotton, Section F begins with Item 6.

Item 1: Tractor and Harvester Table

V2, V3

Rice, Sugarbeets

Include tractors and self-propelled harvesters owned, rented, leased or borrowed by the operation and used to produce the target crop on **the selected field**. Tractors and harvesters owned in partnership should be included if they were used for the target commodity on the selected field.

Exclude:

- equipment used by custom operators,
- equipment owned by the operation which were ONLY used for custom work,
- equipment ONLY used for other commodities,
- equipment ONLY used on other operations, and
- non-self-propelled harvesters.

Do not list the same piece of equipment on more than one line.

If more than the available number of lines are needed, continue to list the required information for the additional equipment at the bottom of the page or on a separate sheet of paper and make good notes for the State Office.

The line number is used to identify tractors used for field activities you will record in Item 2.

Make and model (Column 2)

List the make and model for each tractor and harvester used on the selected field, such as “John Deere 4050". Since PTO horsepower may need to be verified in the State Office, the make and model are important items.

List all tractors used on the selected field for the 2000 crop, not just those actually used in 2000. Be sure to use the 2000 crop year, not calendar year, because some of the fieldwork for the crop may have been done in the fall of 1999.

Model year (Column 3)

List the model year for each tractor and harvester recorded in Column 2, using the last two digits. For example, if the model year is 1990, enter 90.

Drive (Column 4)

Enter the code for the type of drive for the tractor listed in Column 2:

Code 2 - **2-Wheel Drive**
Code 3 - **2-Wheel Drive With Front Wheel Assist**
Code 4 - **4-Wheel Drive**
Code 5 - **Crawler or other tracked tractors**
Code 6 - **Other tractors**
Code 7 - **Self-propelled harvester**

PTO HP (Column 5)

Tractors only

Record the power take-off (PTO) horsepower rating. If the operator is not sure of the PTO rating, get a best estimate and write a note in the margin. Be

sure the make and model are correctly listed so the PTO horsepower can be looked up in the State Office.

Fuel type (Column 6)

Tractors only

Enter the code for the type of fuel used by the tractor:

Code 1 - **Diesel**
Code 2 - **Gasoline**
Code 3 - **LP Gas** (Liquefied Petroleum or Propane)
Code 9 - **Other**

In many states, products sold as gasoline contain ethanol. For the purposes of this survey, if the product is sold as gasoline or gasohol, record it as gasoline (code "2"). If the fuel used is ethanol or mostly ethanol, use code "9", and note so in the margin.

Item 1: Machinery Table

V8 - North Carolina only

Upland Cotton

Complete the machinery table for the selected field.

Item 2: Field Operations Table

V2, V3, V5, V6, V7, V10

Rice, Sugarbeets, Corn, Soybeans, Wheat

How you administer the Field Operations Table differs somewhat between questionnaire versions. You will need to be aware of the differences and be alert to them when you move from one questionnaire version to another. Use the check list in each version to insure you record the proper data.

There are three main reasons for the differences between versions:

1) The primary users of data from the Production Practices Reports have different data needs than do the primary users of the Production Practices and Costs Reports.

2) Both sets of users will be using the data from Production Practices and Costs Reports, so the different needs of both groups must be met with a single structure.

3) If certain information is not needed on a particular version to satisfy the data users, then we do not want to burden the farm operator by asking for information or for detail that will not be used by one set of data users or the other.

Although the amount of detail differs between the two versions of the Field Operations Table, the procedure you will follow to complete the table is the same, regardless of questionnaire version.

Exhibit 3 summarizes the differences among the questionnaire versions.

Exhibit 3: Field Operation Table Details

Instruction	Version	
	V5, V6, V7, V10 Corn, Soybean and Wheat Production Practices	**V2, V3** Rice and Sugarbeet Production Practices and Costs
Record operations beginning after harvest of the previous crop, and **END** with the current crop	Planting	Hauling the harvested crop from the field
Necessary to number the **SEQUENCE** of individual operations?	YES	YES
Multiple passes using the **same equipment** can be recorded on the **same line**?	NO	NO
How to record tandem implements?	Retain the same SEQUENCE NUMBER in Column 2. Leave columns 5, 9 - 11 blank.	Retain the same SEQUENCE NUMBER in Column 2. Leave columns 5 - 11 blank.
INCLUDE **fertilizer** and **pesticide** implements?	NO	YES
INCLUDE machines used by **custom operations**?	YES	YES
INCLUDE **harvesting equipment**?	NO	YES
INCLUDE **hauling equipment**?	NO	YES
Columns to complete:	1 (*V10* only), 2-5, 9-11	2-11

To summarize:

Version 2 (Rice) obtain all equipment operations starting after the harvest of the previous crop and continuing ***through harvest and hauling the target crop from the field to storage or point of first sale***. Custom operations and pesticide and fertilizer applications are included.

Version 3 (Sugarbeets) obtain all equipment operations starting after the harvest of the previous crop and continuing ***through harvest and hauling the target crop from the field to the receiving station or factory***. Custom operations and pesticide and fertilizer applications are included.

Versions 5, 6, 7 and 10 (Corn, Soybeans, Wheat) obtain tillage and land forming operations ONLY, beginning after the harvest of the previous crop, and continuing ***through planting of the target crop***. Excluded are harvesting, hauling, and pesticide and fertilizer applications. However, tillage equipment used to incorporate pesticides and fertilizers before or at planting are included.

All versions exclude equipment used to apply lime or gypsum. All versions include custom operations.

Where to Start?

Introduce the topic to the respondent by reading the introductory statement and instructions ("Begin with the first field operation after harvest of the previous crop," etc...).

After making sure the respondent understands which operations to report, begin by asking the respondent what happened after the previous crop was harvested from this field. In most cases, this will be the first tillage operation after harvest of the previous crop from this field.

Abandoned crops: If another crop was planted for the 2000 crop year, but abandoned and plowed under before the target crop was planted, begin with the operation of plowing down the abandoned crop.

Cover crop: If a cover crop was planted in the field after the harvest of the previous crop and plowed under before the target crop was planted, begin with the operation of plowing down the cover crop.

New renter: If the operator is a new renter of the field, field operations should be recorded for all operations performed by the renter since the last harvest and he should also report operations performed by another operator, if he knows what operations were done.

Planting on newly cleared land: Field operations should begin to be recorded with land forming and tillage after the clearing.

Replanting the target crop: If the target crop was planted, plowed up, and replanted due to poor germination, record the operations associated with both plantings, including the operation of plowing down the first planting.

Review the checklist as data are being reported and after completing the Field Operations Table (Item 2). This will insure whole categories of field operations are not omitted.

Item 2: Field Operations

V2, V3, V5, V6, V7, V10

Rice, Sugarbeets, Corn, Soybeans, Wheat

Record field operations performed by equipment in the order used to prepare the selected field for planting in the order they occurred.

- If this field was in fallow (idle, diverted) in 1999, record operations starting with the fall of 1998.
- If a crop was grown in 1999, begin with the first operation after the 1999 crop was harvested.
- If the field was double cropped in 2000, and the target crop was the second crop, begin with the first operation after the first crop was harvested in 2000.
- If a crop was planted for 2000, but abandoned before the target crop was planted, begin with the operation of plowing down the abandoned crop.

The best way to get the information in this item is to ask the operator to describe all of the field work done for the target commodity after harvesting the crop previously grown on the selected field.

Start by asking what happened after harvest of the preceding crop and then keep going in the order that the operations were performed. The sequence of operations and implements must be numbered accurately because it is very important for determining residue levels.

Try not to leave blank lines between operations because of the limited space in the table.

NOTE: Include field operations done by neighbors, friends, etc. on a "swap" basis. If these people use their own tractors or harvesters, the tractors and harvesters should be recorded in Item 1 in this section.

Production Practices Versions

V5, V6, V7, V10

Corn, Soybeans, Wheat

List the operations in the order they occurred AND maintain the order of tandem hook-ups. Enter the SEQUENCE NUMBER of each operation in the order it occurred. List the tillage and planting implements used on this field beginning with the first trip over the field after harvest of the preceding crop and continuing through planting this year's crop. If this field was fallow (idle, diverted) during 1999, list operations starting with the fall of 1998.

In sequential order, record all operations performed by tillage and land forming equipment. **End with (AND INCLUDE) the implement used to plant the target crop in this field.**

If the operator re-seeded acres to the target crop, include tillage operations associated with the replanting. Exclude field work done to prepare the field for another crop or planting a replacement crop **other** than the target crop.

Include:

- plowing,
- corrugation,
- land preparation,
- planting, and
- custom operations.

Exclude:

- fertilizer and pesticide applications.
- applications of lime and gypsum.
- harvesting operations
- hauling operations.

Production Practices and Costs Versions

V2, V3

Rice, Sugarbeets

After recording operations through planting, continue to list the operations through harvest and hauling of the target crop from this field. Record operations in the order they occurred AND maintain the order of tandem hook-ups. Enter the SEQUENCE NUMBER of each operation in the order it occurred. List all implements used on this field ***beginning with the first trip over the field after harvest of the preceding crop*** and ***continuing through hauling it out of the field*** to storage or first point of sale for rice and to the receiving station or factory for sugarbeets. If this field was fallow (idle, diverted) during 1999, list operations starting with the fall of 1998.

Include:

- plowing,
- corrugation,
- land preparation,
- planting,
- harvesting operations
- hauling operations
- custom operations, and
- fertilizer and pesticide applications.

Exclude:

- applications of lime and gypsum.

In sequential order, record all operations performed by tillage, land forming, harvesting, and hauling equipment. **Include the implement used to harvest the target crop from this field, and trucks, carts, trailers and wagons used to haul the crop from this field to storage or first point of sale (rice) or the receiving station or factory (sugarbeets).**

Field operations for fertilizer and chemical applications should agree with those reported earlier in Section C and Section D. For example, each fertilizer or pesticide application reported in the Fertilizer Table or in the Pesticide Table should show up here in the Field Operations Table, unless it was applied through the irrigation water (in this case make a note). Custom applications of fertilizers or pesticides should also appear in this section.

NOTE: Though multiple applications of the same pesticide may be recorded on a single line in the Pesticide Table, these applications must be reported separately in the Field Operations table. For example, if the same pesticide application was made twice, (Section D, item 1, column 11 equals 2), then two field operations would be recorded in the Field Operations Table.

If any of the target crop acres in the selected field were abandoned, all field work done on these acres until they were plowed under or cut should be included. Exclude the activity of plowing these acres under. If the operator re-seeded acres to the target crop, include all operations. Except where the target crop was replanted, exclude field work done to prepare the field for another crop. Also exclude the operations involved with planting a replacement crop other than the target crop.

Include hauling to barns, grain bins, dryers or cleaners**.** Include hauling the crop to market directly only if the crop is hauled directly to market from this field. Exclude hauling to market from storage at a later date.

It may help to review the checklist to insure that no field operations were missed.

All Versions

V2, V3, V5, V6, V7, V10

Rice, Sugarbeets, Corn, Soybeans, Wheat

If the operator uses two or more different cropping practices on the selected field (for example, irrigated and non-irrigated acres) and these have different field operations, be sure to enumerate operations for each of the cropping practices. Record each operation in sequence, entering the number of acres in Column 9 for which each practice was applied.

Completing the field operations table

Commodity code (Column 1)

V10

Multi-crop

Enter the commodity code for each selected field as you enumerate the tillage and planting operations for that target commodity.

Operation sequence number (Column 2)

V2, V3, V5, V6, V7, V10

Rice, Sugarbeets, Corn, Soybeans, Wheat

Correct sequence of the operations over the selected field must be maintained. Enter the SEQUENCE NUMBER of each operation, beginning with number "1" for the first operation after harvest of the previous crop. In *Version 10*, after completely enumerating the tillage and planting operations for the selected *[commodity 1]* field, start over with number "1" when you begin to list the operations for the *[commodity 2]* field.

Implements in tandem hook-ups should be entered on separate lines. For a tandem or multiple hookup of individual tillage implements, record the first implement of the set in Column 3 and its implement code in Column 4. When you record the second implement on the next line, keep the same SEQUENCE NUMBER in Column 2 that was entered for the first implement in the set. If more than two implements are in such a set, list them in the appropriate hookup order, each one on its own line, and record the same SEQUENCE NUMBER for all the implements in that same set.

For example, you've just enumerated the first operation (a chisel plow) on the selected field. Then for the next operation, the operator tells you that he used a flex-tine tooth connected to a field cultivator. After this operation, the respondent reported that he planted.

You would record this as follows:

Example 6: Recording operation sequence numbers

2 SEQUENCE No.	3 What operation or equipment was used?	4 [*Record machine code from Respondent Booklet.*] CODE
1	chisel plow	01
2	field cultivator	21
2	flex-tine tooth	33
3	conventional planter	114

Sometimes the respondent forgets to report an operation in its right order. When this happens, just add the forgotten operation wherever you are in the table when it is remembered, and enter its correct SEQUENCE NUMBER. Then go back and change the numbers you previously entered to reflect the correct order of machine operations. BE SURE to correct all SEQUENCE NUMBERS that are affected. The cell numbers do not have to be changed to correspond to the corrected order, only the SEQUENCE NUMBER entered in Column 2.

This is much simpler than erasing and re-entering in the correct order all the operations you had already recorded in Column 3.

For example, you have entered operations 1, 2 and 3 in the previous example, when the operator recalls another operation (a soil finisher) that occurred after the tandem tillage operation and before the planting operation.

Correct the SEQUENCE NUMBERS and continue recording operations in order as follows:

Example 7: Correcting operation sequence numbers

2 SEQUENCE No.	3 What operation or equipment was used?	4 [*Record machine code from Respondent Booklet.*] CODE
1	chisel plow	01
2	field cultivator	21
2	flex-tine tooth	33
~~3~~ 4	conventional planter	114
3	soil finisher	66
5	...	
6	...	

Equipment used (Column 3)

V2, V3, V5, V6, V7, V10

Rice, Sugarbeets, Corn, Soybeans, Wheat

Record either the operation or the equipment the operator reported, such as a plow, disk, harrow, planter, etc. In ***V2 (Rice)*** and ***V3 (Sugar beet)***, continue recording operations or equipment used following planting, such as a cultivator, combine, trucks, wagon or cart, etc. If the operator reports using a machine for which a code is not available, ask the operator which one of the implements in the Respondent Booklet best describes it, or describe the machine as completely as possible in notes.

Enter the name of each implement used on a separate line. Each line entry should indicate one complete pass over the field. Obtaining the total number of passes over a field is an important factor in estimating cost differences between tillage systems.

Try not to leave blank lines due to limited line space. For ***V5, V6, V7 and V10***, the last entry will always be the planting operation. For ***V2 and V3***, one of the last entries should be equipment used for hauling the harvested target crop from the field to storage or point of first sale.

Record each implement that was used on the field. If an implement was used on only a part of the field, the number of acres it covered will be obtained in Column 9. On some large acreage, two (or more) tractor-implement sets (for example, two tractors and plows) may have been used at the same time to perform an operation. Record each tractor-implement combination on separate lines and obtain the acres covered by each one in Column 9.

Include custom operations.

For hauling operations, the size recorded in Column 6 should be in pounds, bushels, or tons, with the appropriate unit code entered in Column 7.

If more operations were completed on the selected field than there are lines available on the questionnaire, use a FIELD OPERATIONS SUPPLEMENT. Copy the identification as it appears on the main questionnaire to the identification box on the supplement. Continue enumerating operations (numbered in sequential order) on the SUPPLEMENT.

Equipment code (Column 4)

V2, V3, V5, V6, V7, V10, V11

Rice, Sugarbeets, Corn, Soybeans, Wheat

For each operation SEQUENCE NUMBER in Column 2, record the appropriate implement in Column 3 and the appropriate code in Column 4. The codes are listed in the Respondent Booklet. **If the implement is not listed in the Respondent Booklet, write a description of that implement in notes on the questionnaire. Probe to see if any names in the Respondent Booklet may be applicable.**

For a tandem or multiple hookup of individual implements, record each implement of the set in separate lines and enter the appropriate implement code in Column 4. Maintain the order of tandem hook-ups. Retain the same SEQUENCE NUMBER in Column 2.

Treat the attachment of two implements of the same type (for example, two plows hooked side-by-side) for the purpose of allowing wider coverage with one pass over the field as one implement, not as a tandem or multiple hookup.

Implements that have several tillage components attached to a single frame should be recorded as one implement, not as a tandem or multiple hookup. For example, a "do-all" is a single implement that has disk blades, field cultivator shanks, and some type of harrow mounted on a single frame. Enter the appropriate code for the single implement from the Machinery Code List in the Respondent Booklet.

Only one code should be entered in Column 4, for example, enter code 5 for a moldboard plow.

If an implement is not included in the Machinery Code List in the Respondent Booklet, enter the implement name on the appropriate line in Column 3, and briefly describe the implement in notes. Be as complete as possible in your description. The equipment will have to be coded in the State Office based solely on what you record.

PROBE for the specific type of implement so that it can be coded correctly (for example, plow = regular chisel plow; disk = tandem disk; harrow or drag = spike tooth harrow).

For the second (third, fourth, etc..) implements in tandem operations, skip the remaining columns and go to the next operation. Columns 6, 7, 8, 9, 10, and 11 should be completed only for the first piece of equipment in tandem operations.

Equipment operator (Column 5)

V2, V3, V5, V6, V7, V10

Rice, Sugarbeets, Corn, Soybeans, Wheat

Enter the code for the type of worker that performed the operation recorded in Column 3, operating the machine or equipment recorded in Column 4. For **V2 and V3**, This information will be used (along with the *acres per hour* and *acres covered* recorded in Column 9 and 10) to determine the labor usage on the field by type of worker. This method of collecting labor within the Field Operations Table saves us from having to count these hours again the Labor Table. The Labor Table will only account for non-machinery hours.

The types of workers are:

Code 1 - **You (The Operator)**
Code 2 - **Partner**
Code 3 - **Unpaid Worker**
Code 4 - **Paid Part-time or Seasonal Worker**
Code 5 - **Paid Full-time Worker**
Code 6 - **Custom Applicator**

These codes are also listed in the Respondent Booklet under the heading MACHINE OPERATOR LABOR CODES. Point this out to the respondent to refer to as you complete the Field Operations Table.

Include family members in the appropriate category, depending on whether they were UNPAID, PAID PART-TIME or SEASONAL, or PAID FULL-TIME. For example, if the operator's daughter operated the piece of equipment, and she is considered a PAID PART-TIME worker on the operation, then enter code "4".

If more than one worker was used to conduct the field operation, report the type of worker that actually operated the machine recorded in Column 4, such as the tractor/truck driver. Labor hours for the other workers will be obtained in Item 3, Column 6, LABOR (in Versions 2 and 3). If two people alternated performing a single field operation, record the code for the person who operated the machine over the most acres.

For operations conducted by CUSTOM OPERATORS, with Code 6 entered in Column 5, go to Column 11. Columns 6, 7, 8, 9, and 10 should not be completed for custom operations.

Leave this column blank for the second, third, etc. equipment involved in tandem operations.

Equipment size (Column 6)

V2, V3

Rice, Sugarbeets

Enter the width of the area covered by the equipment on a single pass over the field. **Size means the swath covered by the machine, not necessarily how**

wide the equipment is. For instance, a broadcast fertilizer spreader may be only 6 feet wide, but it can spread fertilizer over a swath of 35 feet. In this case, “35" would be the right entry in Column 6, and code “1" for feet should be entered in Column 7.

Leave this column blank for custom operations and the second, third, etc. equipment involved in tandem tillage and land forming operations. However, this column must be completed for hauling operations using trailers and carts pulled by a truck.

Size code (Column 7)

V2, V3

Rice, Sugarbeets

Enter the code for the unit of width associated with the swath size recorded in Column 7. The unit codes for width are:

Code 1 - **Feet**
Code 2 - **Row**
Code 3 - **Moldboard** (Bottoms)

For example, if a 4-bottom moldboard plow was used, record “4" as the equipment size in Column 6 and enter code “3" in Column 7.

Unit codes for hauling operations are:

Code 4 - **Pounds**
Code 5 - **Bushels**
Code 6 - **Tons**

Unit codes 4, 5, and 6 should only be used for hauling operations using trucks, trailers, carts or wagons.

Leave this column blank for custom operations and the second, third, etc. equipment involved in tandem tillage and land forming operations. However, this column must be completed for hauling operations using trailers and carts pulled by a truck.

Tractor used (Column 8)

V2, V3

Rice, Sugarbeets

Enter the line number of the tractor (from the Tractor Table - Item 1) that was used to pull the equipment. If the equipment was self-propelled, enter code 99. If two tractors were used simultaneously to pull one piece of equipment, identify both tractors and write a note at the bottom of the page. If horses, mules or other draft animals were used to pull the equipment, enter code 66. If it was pulled by a pick-up, enter code 77. If a truck other than a pick-up was used to pull the piece of equipment, enter code 88. If trucks are used for hauling operations, enter code “99" and the appropriate truck code in column 4.

For the first implement in a tandem or multiple hookup, record the Item 1 line number of the tractor used in Column 8. Leave this column blank for the second and subsequent implements in tandem operations.

Also leave this column blank for custom operations.

Acres covered (Column 9)

V2, V3, V5, V6, V7, V10

Rice, Sugarbeets, Corn, Soybeans, Wheat

Record the number of acres covered for this operation on the selected field. Enter the number of acres covered on a single pass of the equipment over the field, not the total for multiple passes of the same equipment over the field. Multiple passes of the same equipment should be recorded on separate lines as separate operations in the correct sequence.

If only part of the field was covered, enter the number of acres in the part of the field covered. If more than one piece of equipment operated on the field at the same time, such as more than one combine doing harvesting, enter each piece of equipment on separate lines, along with the acres covered by each.

Record acres covered to the nearest TENTH of an acre.

Land forming equipment includes machines used to make or close ditches, or to change the slope of the land. The field acreage covered is not a good indicator

of total machine use. For land forming equipment, Column 9 should be completed by recording the **total hours** that the equipment was used in production of the target commodity. Then leave Column 10 blank.

When recording information about equipment used in hauling operations, such as carts and wagons, Column 9 should be completed by recording the total hours that the hauling activity took for the selected field. Then leave Column 10 blank.

Leave this column blank for the second and subsequent equipment lines involved in tandem operations.

Acres covered per hour (Column 10)

V2, V3, V5, V6, V7, V10

Rice, Sugarbeets, Corn, Soybeans, Wheat

This information will be used along with the tractor information to compute per acre labor, machine, and fuel costs.

Record the acres covered per hour for this operation on the selected field. Operators usually know this as the equipment speed. They usually know the speed at which the tractor used pulled the specific implement on a given field, saying something like " Well, this tractor pulling that piece of equipment on that land (or the type of land in that field, such as hills, flats, etc.) goes about X acres per hour."

If the operator does not know this precisely, obtain a best estimate. Ask how long this operation took on this field. If the total hours is unknown, ask for an estimate of how long it would normally take to do this operation. Then divide this total or estimated time into the number of acres covered:

Acres Per Hour = (Acres Covered) ÷ (Hours to Complete Operation).

Record acres per hour to the nearest TENTH of an acre.

If the respondent will not or cannot do this, leave Column 10 blank and write DK (for "don't know") in notes near the item cell.

An alternative method of estimating acres per hour is possible if the operator knows the machine width in feet and the speed that was traveled. Then use the following formula:

Acres Per Hour = (Machine Width in Feet) x (Speed in MPH) ÷ 10.

Leave this column blank for the second and subsequent equipment lines involved in tandem operations.

Month and year of operation (Column 11)

V2, V3, V5, V6, V7, V10

Rice, Sugarbeets, Corn, Soybeans, Wheat

This information is needed to allow wind erosion to be considered in identifying the tillage system.

Record the number of the month and year when the operation was performed. Use the four digit MM YY format for recording the month and year number. For example, operations completed in April 2000 are recorded as **0 4 0 0** .

How to Record Tandem Field Operations

Often farmers perform two or more field operations at the same time. A common example of this is a spike tooth harrow connected to a regular tandem disk, pulled by one tractor.

Equipment used for fertilizer and chemical applications included in the Field Operations Table in *Versions 2 (Rice) and 3 (Sugarbeet)* may also be commonly done as tandem operations with another operation. Each separate item of equipment must be identified to calculate costs or identify the tillage system used.

When a farmer reports a tandem field operation:

1. Record the first piece of equipment just like any single machine field operation. Record the SEQUENCE NUMBER in Column 2 in order from the previous operation. Enter the data for all remaining columns on that line.

2. On the next line, record the tandem operation in Column 3 and the machinery code of the second piece of equipment in Column 4. Record the same SEQUENCE NUMBER as the operation entered on the previous line in Column 2.

   V2 and V3: For equipment other than trailers and carts pulled behind trucks, skip Columns 5, 6, 8, 9, 10, and 11 and go to the next operation in sequence. For trailers and carts pulled behind trucks, skip column 5, enter the size and units of the trailer or cart in columns 6 and 7, skip columns 8, 9, 10, and 11 and go to the next operation.

   V5, V6, V7, V10: Skip Columns 5, 9, 10 and 11 and go to the next operation in sequence.

3. If more than two pieces of equipment were used in tandem, repeat step 2 for each additional piece of equipment.

Be sure each required column is completed for every piece of tillage and/or planting equipment used to prepare and plant the target commodity on the selected field.

NOTE: Columns 6-10 are skipped for custom operations.

Example 1: Field Operations, tandem and custom (V2, V3)

The following example illustrates how tandem operations would be recorded in the FIELD OPERATIONS TABLE on *Versions 2 (Rice) and 3 (Sugar beet).* In this example, you should note that:

- operation 1 occurred in 1998 because the field was fallow in 1999.
- operations 3, 4, and 7 are tandem operations. Columns 5 - 11 are left blank for tandem tillage and chemical application operations.
- operations 4 and 9 are custom operations, leave columns 6 - 10 blank,
- fertilizer and pesticide applications accounted for (operations 7, 9),
- hours (not acres) are entered in column 9 for the hauling operations (operations 11, 12, 14) and acres per hour column 10 is left blank.

2 SEQUENCE No.	3 What operation or equipment was used?	4 [*Record machine code from Respondent Booklet.*] CODE	5 Who was the machine operator-- [*Enter code from above.*] CODE	[*If CUSTOM (Column 5 = code 6), skip columns 6-10.*] 6 What was the size or swath of the [*machine*] used?	7 [*Record size code.*] 1 Feet 2 Row 3 Moldboard *(bottoms)* **Hauling** 4 Pounds 5 Bushels 6 Tons CODE	8 Which tractor was used? [*Record line number from Item 1*] 66 Animal Drawn 77 Pick-Up 88 Other Trucks 99 Self-Propelled CODE	9 How many acres were covered? 1/ ACRES	10 What were the acres covered per hour? ACRES PER HOUR	11 In what month was this operation done? MMYY
1	*stubble mulch*	*7*	*1*	*16*	*1*	*1*	*165.6*	*18.0*	*08 98*
2	*stubble-mulch*	*7*	*1*	*16*	*1*	*1*	*165.6*	*18.0*	*04 00*
3	*chisel*	*1*	*1*	*16*	*1*	*1*	*165.6*	*20.0*	*05 00*
3	*stubble mulch*	*7*							
3	*cond. harrow*	*31*							
4	*subsoiler*	*8*	*6*						*06 00*
4	*stubble mulch*	*7*							
4	*cond. harrow*	*31*							
5	*heavy cult.*	*26*	*1*	*12*	*1*	*1*	*165.6*	*15.0*	*07 00*
6	*heavy cult.*	*26*	*1*	*12*	*1*	*1*	*165.6*	*15.0*	*08 00*
7	*heavy cult.*	*26*	*1*	*12*	*1*	*1*	*165.6*	*12.0*	*09 00*
7	*fert. attach.*	*72*							
8	*press drill*	*107*	*1*	*20*	*1*	*1*	*165.6*	*10.5*	*09 00*
9	*airplane spray*	*91*	*6*						*03 00*
10	*combine*	*121*	*1*	*20*	*1*	*99*	*165.6*	*10.0*	*06 00*
11	*truck*	*301*	*3*	*150*	*5*	*99*	*18.0*		*06 00*
12	*grain wagon*	*194*	*3*	*200*	*5*	*88*	*18.0*		*06 00*
13	*baler*	*147*	*1*	*5*	*1*	*2*	*165.6*	*20.0*	*06 00*
14	*bale loader*	*144*	*1*	*5*	*6*	*88*	*20.0*		*06 00*

Example 2: Field operations, tandem and custom, PPR versions

The following example illustrates how the same tandem operations would be recorded in the FIELD OPERATIONS TABLE on *V5, V6, V7 and V10*. In this example, you should note that:

- operations 3, 4, and 7 are tandem operations.
- operation 4 is a custom operation,
- listing operations ends with the planting operation, and
- fertilizer and chemical applications are omitted.

2 SEQUENCE No.	3 What operation or equipment was used?	4 [*Record machine code from Respondent Booklet.*] CODE	5 Who was the machine operator-- [*Enter code from above.*] CODE	[*If CUSTOM (Column 5 = code 6), skip columns 9-10.*]		11 In what month was this operation done? MM YY
				9 How many acres were covered? 1/ ACRES	10 What were the acres covered per hour? ACRES PER HOUR	
1	*stubble mulch*	*7*	*1*	*165.6*	*18.0*	*08 99*
2	*stubble-mulch*	*7*	*1*	*165.6*	*18.0*	*04 00*
3	*chisel*	*1*	*1*	*165.6*	*20.0*	*05 00*
3	*stubble mulch*	*7*				
3	*cond. harrow*	*31*				
4	*subsoiler*	*8*	*6*			*06 00*
4	*stubble mulch*	*7*				
4	*cond. harrow*	*31*				
5	*heavy cult.*	*26*	*1*	*165.6*	*15.0*	*07 00*
6	*heavy cult.*	*26*	*1*	*165.6*	*15.0*	*08 00*
7	*heavy cult.*	*26*	*1*	*165.6*	*12.0*	*09 00*
8	*press drill*	*107*	*1*	*165.6*	*10.5*	*09 00*

Example 3: Field operations, target crop abandoned

The following example illustrates coding operations for a Sugarbeet field that is planted, replanted, and then abandoned when Sugarbeet is grown in the selected field. This example only applies to Versions 2 and 3, since Versions 5,6, 7 and 10 stop at planting. In this example, you should note that:

- all field operations and chemical operations up to the time the decision was made to abandon the field are included.
- the operation of plowing down the crop is not included (this would be the first operation of preparing the field for the next or replacement crop).

2 SEQUENCE No.	3 What operation or equipment was used?	4 [Record machine code from Respondent Booklet.] CODE	5 Who was the machine operator-- [Enter code from above.] CODE	[If CUSTOM (Column 5 = code 6), skip columns 6-10.] 6 What was the size or swath of the [machine] used?	7 [Record size code.] 1 Feet 2 Row 3 Moldboard (bottoms) Hauling 4 Pounds 5 Bushels 6 Tons CODE	8 Which tractor was used? [Record line number from Item 1] 66 Animal Drawn 77 Pick-Up 88 Other Trucks 99 Self-Propelled CODE	9 How many acres were covered? 1/ ACRES	10 What were the acres covered per hour? ACRES PER HOUR	11 In what month was this operation done? MM YY
1	stubble mulch	7	1	16	1	1	165.6	18.0	08 99
2	stubble-mulch	7	1	16	1	1	165.6	18.0	04 00
3	chisel	1	1	16	1	1	165.6	20.0	05 00
3	stubble mulch	7							
3	cond. harrow	31							
4	subsoiler	8	6						06 00
4	stubble mulch	7							
4	cond. harrow	31							
5	heavy cult.	26	1	12	1	1	165.6	15.0	07 00
6	heavy cult.	26	1	12	1	1	165.6	15.0	08 00
7	heavy cult.	26	1	12	1	1	165.6	12.0	09 00
7	fert. attach.	72							
8	press drill	107	1	20	1	1	165.6	10.5	09 00
9	airplane spray	91	6						03 00

Field abandoned in March.

Example 4: Field operations, target crop replanted

The following example illustrates replanting a winter wheat (target crop) field to winter wheat. **Note:** If only a portion of the field is replanted, then column 9 of the operations associated with the replanting would only show the acres for the portion replanted. In this example, you should note that:

- all operations, including those associated with plowing up the first planting, are included.
- there are two planting operations.

2 SEQUENCE No.	3 What operation or equipment was used?	4 [Record machine code from Respondent Booklet.] CODE	5 Who was the machine operator-- [Enter code from above.] CODE	[If CUSTOM (Column 5 = code 6), skip columns 6-10.] 6 What was the size or swath of the [machine] used?	7 [Record size code.] 1 Feet 2 Row 3 Moldboard (bottoms) Hauling 4 Pounds 5 Bushels 6 Tons CODE	8 Which tractor was used? [Record line number from Item 1] 66 Animal Drawn 77 Pick-Up 88 Other Trucks 99 Self-Propelled CODE	9 How many acres were covered? 1/ ACRES	10 What were the acres covered per hour? ACRES PER HOUR	11 In what month was this operation done? MM YY
1	*stubble mulch*	*7*	*1*	*16*	*1*	*1*	*165.6*	*18.0*	*08 99*
2	*stubble-mulch*	*7*	*1*	*16*	*1*	*1*	*165.6*	*18.0*	*04 00*
3	*chisel*	*1*	*1*	*16*	*1*	*1*	*165.6*	*20.0*	*05 00*
3	*stubble mulch*	*7*							
3	*cond. harrow*	*31*							
4	*subsoiler*	*8*	*6*						*06 00*
4	*stubble mulch*	*7*							
4	*cond. harrow*	*31*							
5	*heavy cult.*	*26*	*1*	*12*	*1*	*1*	*165.6*	*15.0*	*07 00*
6	*heavy cult.*	*26*	*1*	*12*	*1*	*1*	*165.6*	*15.0*	*08 00*
7	*heavy cult.*	*26*	*1*	*12*	*1*	*1*	*165.6*	*12.0*	*09 00*
7	*fert. attach.*	*72*							
8	*press drill*	*107*	*1*	*20*	*1*	*1*	*165.6*	*10.5*	*09 00*
9	*single disk*	*13*	*1*	*16*	*1*	*1*	*165.6*	*16.0*	*11 00*
10	*press drill*	*107*	*1*	*20*	*1*	*1*	*165.6*	*10.5*	*11 00*
11									
12									
13									
14									

Field replanted in November.

Example 5: Field operations, tandem and custom

The following example illustrates how the same tandem operations would be recorded in the FIELD OPERATIONS TABLE on *V5, V6, V7, and V10*. In this example, you should note that:

- Operation 2 is a tandem operation with a disk, roller packer and spring tooth harrow. Columns 5-8 are left blank for the second and third equipment lines in the tandem operation.
- operation 3 is a custom planting operation, Columns 6 and 7 are left blank for custom operations.
- listing of operations ends with the planting operation, and
- fertilizer and chemical applications are omitted.

Figure 32 Coding tandem and custom field operations

2 SEQUENCE No.	3 What operation or equipment was used?	4 [*Record machine code from Respondent Booklet.*] CODE	5 Who was the machine operator– [*Enter code from above.*] CODE	[*If CUSTOM (Column 5 = code 6), skip columns 6 & 7.*] 6 How many acres were covered? *1/* ACRES	7 What were the acres covered per hour? ACRES PER HOUR	8 In what month was this operation done? MM YY
1	*regular moldboard*	*5*	*1*	*8.2*	*3.0*	*4 99*
2	*regular tandem disk*	*15*	*1*	*8.2*	*4.5*	*5 99*
2	*attached roller*	*52*				
2	*spring tooth*	*39*				
3	*plain drill*	*106*	*6*			*5 99*

Example 6: Field operations, target crop replanted

The following example illustrates replanting a soybean (target crop) field to soybeans. **Note:** If only a portion of the field is replanted, then column 6 of the operations associated with the replanting would only show the acres for the portion replanted. In this example, you should note that:

- all operations, including those associated with plowing up the first planting, are included.
- there are two planting operations.

Figure 33 Recording field operations when the target crop is reseeded.

2 SEQUENCE No.	3 What operation or equipment was used?	4 [*Record machine code from Respondent Booklet.*] CODE	5 Who was the machine operator– [*Enter code from above.*] CODE	[*If CUSTOM (Column 5 = code 6), skip columns 6 & 7.*] 6 How many acres were covered? *1/* ACRES	7 What were the acres covered per hour? ACRES PER HOUR	8 In what month was this operation done? MM YY
1	*regular moldboard*	*5*	*1*	*8.2*	*3.0*	*4 99*
2	*regular tandem disk*	*15*	*1*	*8.2*	*4.5*	*5 99*
2	*attached roller*	*52*				
2	*spring tooth*	*39*				
3	*plain drill*	*106*	*6*			*5 99*
4	*tandem disk*	*15*	*1*	*8.2*	*5.0*	*6 99*
5	*plain drill*	*106*	*6*			*6 99*

Field replanted in June because of poor germination

Item 3: Labor used on the field

V2, V3

Rice, Sugarbeets

This item collects wage rates for ALL paid workers that worked on the field, including workers who only operated machinery and those who did not.

Acres covered and *acres per hour* from the Field Operations Table will be used to calculate labor hours spent operating machines for each field operation. This data will be combined with non-machine labor hours collected in Item 3 to estimate the total labor hours used to produce the target commodity on the selected field. These calculations save us from having to itemize labor hours for all field activities.

The Labor Table, Item 3, is the only place where labor hours spent on the selected field for activities *other than* operating machines is collected.

Important: All workers, including those who only operated machinery, must be listed in this item. For ***workers who operated machinery only***, the number of workers; whether they were paid or unpaid; part-time, full-time, or seasonal; and average wage must be completed. The column for hours of non-machinery labor will be blank for workers who only operated machinery.

Workers (Column 1)

V2, V3

Rice, Sugarbeets

First, ask the operator to identify and list **all** the workers that worked on the selected field. Include workers who operated machinery *in addition to* those who did not. Exclude custom and contract workers. Then ask how many hours each worker or each group of workers spent doing various activities (other than operating machinery accounted for in the field operations table) on that field to produce the target crop in 2000. Note: you must list all workers even though some may not have performed any non-machine labor.

It would be helpful to refer the respondent to the list of non-machinery work in the Respondent Booklet.

If the operator, partners, or the operator's spouse worked on the selected field, check the check-boxes in Column 1 and continue.

List workers using whatever identifier is comfortable for the respondent. If names are used, record first names only. Workers may be identified by their relation to the operator, or by the type of work. For example, the operator may identify a daughter, a grandson, a hired hand, and the tractor driver as workers on the field.

If several workers of the same type were used, they may be grouped and listed on a single line. Workers may be grouped in any manner convenient for the respondent. For example, the respondent may group workers by type of work, such as all workers hauling grain away from the field.

Data recorded in Columns 3, 4, and 5 must be the same for all workers grouped together. For example, a paid part-time worker making $8.00 per hour should be listed on a separate line from another paid part-time worker making $6.50 per hour. Also, if the same worker routinely worked both paid and unpaid hours, record these on separate lines.

Be sure to include ALL workers that worked on the selected field to produce the 2000 target crop. Be sure to include machinery operators and workers that did activities other than driving tractors or operating equipment on the selected field. Probe to include workers who worked on the field during the fall of 1999 (and earlier if the field was left fallow during 1999) to prepare for the 2000 crop.

Exclude contract or custom laborers.

Number of workers (Column 2)

V2, V3

Rice, Sugarbeets

After completing the list of **all** workers in Column 1, proceed to complete Columns 2-6 of the table for each worker or group of workers listed. It is important to identify all workers in Column 1 first before asking additional questions, because the respondent may decide to leave out some workers to avoid the additional questions you'll be asking about each one.

Enter the number of workers in the group listed in Column 1. If an individual worker is recorded in Column 1, enter the number "1." If the PARTNERS box

in Column 1 is checked, enter only the number of partners working on the selected field, not the total number of partners.

Paid or unpaid worker (Column 3)

V2, V3

Rice, Sugarbeets

Record whether the worker or group of workers listed in Column 1 was:

Code 1 - **Paid**
Code 2 - **Unpaid**.

If the box for the operator's SPOUSE is checked in Column 1, determine if he/she is a PAID or UNPAID worker on the operation.

Workers receiving only a "draw" or "allowance" should be considered unpaid.

For PAID workers (code 1), complete Columns 4, 5 and 6.

For UNPAID workers (code 2), skip to Column 6.

Type of paid worker (Column 4)

V2, V3

Rice, Sugarbeets

If Column 3 is Code "1" (PAID), determine whether each PAID worker or group of PAID workers listed in Column 1 is:

Code 1 - **Full Time**
Code 2 - **Part Time**
Code 3 - **Seasonal**.

Wage rate for paid workers (Column 5)

V2, V3

Rice, Sugarbeets

For PAID workers only (Column 3 is Code "1"), record the cash wage rate paid for ALL the work performed on this field by each worker or group of workers listed in Column 1. Enter the wage rate in dollars and cents per hour.

Include wages paid for operating machinery and for work other than operating machinery, such as loading materials into equipment, etc.

If multiple workers are recorded in Column 2, the wage rate entered in Column 5 should be the same for all workers. Enter the average wage per hour paid to each worker in Column 5. Do not multiply the average wage per worker times the number of workers! If two workers are paid $5.00 each per hour, enter 5.00, not 10.00 in Column 5.

If the worker is paid by the week or month, or is paid an annual salary, you will need to probe for an estimate of the average number of hours worked per week, month, or year. Then calculate the hourly wage. For example, if a worker is paid $1500 per month and works an average of 200 hours per month, then compute the hourly wage rate as 1500÷200 = $7.50 per hour, and enter "7.50" in Column 5.

If the worker is paid by the job, probe to be sure this worker is NOT a custom or contract laborer. Custom and contract work is excluded from this table.

Non-machinery hours worked (Column 6)

V2, V3

Rice, Sugarbeets

For each worker or group of workers listed in Column 1, record the total hours worked on this commodity field in ALL activities other than operating machines (already reported in Item 2). This includes, but is not limited to:

- scouting,
- irrigation,
- drying,
- time spent moving machinery and equipment to and from the field,
- time spent repairing farm machinery and equipment,
- time spent loading materials into equipment,
- time spent on manual weeding and manual thinning,
- time spent on manual rock picking,

- management activities associated with the selected field only, and
- other hours working in the field but not operating equipment.

Most respondents fail to recall these hours without additional prompting by the interviewer. Use the notes in column 6 to jog their memory.

Report the **total hours** worked by each worker or group of workers listed in Column 1, **only for activities done on this field**.

Note: It is possible for the total hours worked to be zero for a worker or group of workers if they only operated machinery on the selected field. In these cases, columns 1, 2, 3, 4 and 5 should still be completed, with a dash entered in Column 6 and a note to explain the worker(s) only operated machinery.

If multiple workers are recorded in Column 2, enter the total non-machinery hours worked by all the employees in Column 6. If two workers worked in the field (not operating machinery), one for a total of 8 hours and the second for a total of 4 hours, enter "12" in Column 6.

Items 3a & 3a(1): Contract labor costs

V3

Sugarbeets

If any contract labor was used in the selected sugar beet field, enter code "1" for YES and ask what was the average cost per acre for contract labor on this field. Enter the average cost per acre in dollars and cents.

Item 4: Percent of unpaid work done by those under 16

V2, V3

Rice, Sugarbeets

Considering the total hours worked by unpaid workers on this field (Column 1 workers with Code "2" (UNPAID) in Column 3 of Item 3), enter the percent of those hours worked by unpaid workers who were under 16 years old.

Remember that this question is about the percent of ALL the hours worked on this field by UNPAID workers, not just the hours recorded in Column 3 of Item 3 (which accounts for only non-machine hours).

We will value unpaid labor hours dedicated to the target crop with an appropriate wage rate to estimate the economic cost of unpaid labor. Since younger workers are often paid less than more experienced workers, we want to separate unpaid labor hours for workers under 16 so we can value their labor at a different wage rate.

Item 5: Custom and technical services

V2, V3

Rice, Sugarbeets

Custom operations and/or technical services performed on the field in 1999 for the 2000 crop should be included. Exclude custom fertilizer and chemical applications, and the costs of scouting for pests. These have been recorded in Sections C, D, or E.

Sometimes farmers rent and operate machines themselves. This isn't custom service, it's machinery rental. Exclude machinery rental from this item. Exclude "swap" labor (work done on the selected operation by a friend or neighbor in return for the selected operator's working on the friend or neighbor's operation).

Item 5 (Column 1): Custom or technical service

V2, V3

Rice, Sugarbeets

Several custom or technical services are listed. Since ALL custom machinery operations were obtained in the Field Operations Table, refer back to the Field Operations Table and identify which custom or technical services listed in Column 1 were performed on the selected field. Mark the check box in Column 1 for each custom operation reported in the Field Operations Table. Ask Column 2 for each item marked.

Item 5 (Column 2): Cost per acre for the custom/technical service

V2, V3

Rice, Sugarbeets

Record the operation's cost per acre for each custom operation or agricultural service done on the field. Include all custom work or technical service fees paid by landlords. Record the cost in dollars and cents per acre.

Item 6: Moldboard plow used on upland cotton

V8, V10

Upland Cotton

Ask the respondent if a moldboard plow was used to prepare the selected field for seeding the 2000 cotton crop. If YES, enter code "1" and ask Item 6a. If NO, go to Item 7.

Item 6a: Month and year moldboard plow used

V8, V10

Upland Cotton

If a moldboard plow was used (Item 6 is code "1" = YES), then ask what month and year the selected cotton field was plowed using the moldboard plow. Record the date in the MM YY format (for example, April 2000 would be recorded as **0 4 0 0**

Item 7: Stale seedbed system

V8, V10

Upland Cotton

A "stale seedbed" system has all tillage done in the fall after harvest. Either a cover crop is seeded or weeds are left. A "burndown" herbicide is applied in the spring before planting, with NO spring preplant tillage operations.

Determine if a "stale seedbed" system was used to prepare this field for seeding this cotton crop. Enter code "1" if YES.

Item 8: Yield monitor

Determine if the harvesting equipment (combine) used or to be used on the selected field has (had) a yield monitor.

A yield monitor is a piece of equipment mounted on harvesting equipment (e.g., combine) to measure the yield at regular intervals as the combine moves through the field. These yield measurements may or may not be tied to specific locations in the field through a global positioning system (GPS), which uses information from satellites to pinpoint field locations. If the yield measurements are tied to specific locations using the GPS, a map can be produced of yields across the field using the information.

If a yield monitor was (will be) used, continue with Item 8a. If a yield monitor was not used, go to Item 9.

Item 8a: Yield map

If the harvesting equipment has (had) a yield monitor (Item 8 coded YES = 1), then ask if a yield map was or will be produced from the data obtained by the monitor. If YES, enter code "1".

A yield map is a map prepared from information collected by a yield monitor tied into a GPS. It shows how yields vary for small areas within a field. A yield map can help the farm operator decide about any changes in management practices within the field, such as changes in fertilizer, lime or pesticide application rates.

Item 8a(1): Custom service/consultant used

NOTE: New question this year. If a yield map was prepared (Item 8a coded YES = 1), then ask if a custom service/consultant was hired to produce this map. If YES, enter code "1".

Item 9: Has field been grid sampled / mapped

Ask the respondent if the field has ever been grid sampled or mapped. This is a process of taking soil samples from precise locations across the field for the purpose of creating a 'map' of conditions across the field.

The information derived from a grid map includes soil nutrient levels, conditions, and soil type that may vary across the field. This information can then be used

by equipment outfitted with Global Positioning Satellite systems (GPS) to apply specific nutrients or chemicals to specific areas of the field.

Although soil grid sampling is an expensive, labor intensive practice, the benefits include reducing chemical applications and costs, and improving yields. Grid sampling, when properly used in conjunction with variable rate chemical applications, can help reduce the expense and use of crop chemicals by applying only what is needed where it is needed.

Item 10: Use of Remote Sensing

Remote sensing is an emerging technology available to field crop producers. While aerial photography is the most common form of commercial remote sensing currently available, on-the-go sensors and satellites will soon have the same capability. As the number of producers using various aspects of precision agriculture technologies grows, they will also become aware of the potential for remote sensing.

Enter a code “1" for YES if the field was remotely sensed (by airplane or satellite) and an image produced either before or during the 2000 growing season.

Item 10a: Custom service/consultant used

NOTE: New question this year. If the field was remotely sensed (by airplane or satellite) and an image produced (Item 10 coded YES = 1), then ask if a custom service/consultant was hired for this service. If YES, enter code “1".

Item 10a(1): Cost of custom service

V2, V3

Rice, Sugarbeets

If a custom service/consultant was hired to produce the remote sensing image (Item 10a coded YES = 1), then ask what was the total cost of this custom service.

Items 11a, 11b and 11c: Use of variable rate technology

Ask if variable rate technology was used to fertilize the field (Item 11a), seed the target crop (Item 11b), or to apply pesticides (Item 11c).

Use of variable rate technology does not require a soil sample or soil grid map. It is possible to create a grid map based on pest counts from scouting, which does not involve the taking of soil samples. Variable rate technology can then be used to apply varying amounts, or different pesticides across the field based on the scouting counts.

Items 11a(1), 11b(1) and 11c(1): Custom service/consultant used

NOTE: New questions for this year. For each of the Items 11a, 11b and 11c. If variable rate technology was used ask if a custom service/consultant was hired to perform the service. If YES, enter code "1".

Items 11a(1)a, 11b(1)a and 11c(1)a: Cost of custom service

V2, V3

Rice, Sugarbeets

If a custom service/consultant was hired for this variable rate technology service, then ask what was the total cost of this custom service.

Section G - Irrigation

What is Section G for? How is the information used?

These questions are designed to identify operating characteristics of irrigation system(s) and the amount and source of water used on the selected commodity field.

There can be more than one type of irrigation system used on a particular crop field.

Most irrigation methods use either pressurized or gravity-flow systems. Pressurized systems use various sprinkler or low-flow drip/trickle systems. Gravity-flow systems use various flood or furrow irrigation systems and subirrigation systems.

How water is applied depends on the crop, the physical features of the land (slopes, hills, and gullies), the type of soil, the amount of water available, how well special equipment would work, and the cost. To conserve both water and money, farmers try to control the amount of water applied and the distribution of water across a field. When crops are over-watered, minerals are washed from the soil, salts build up and soil erodes. When water is not applied uniformly across a field, crop yield is reduced.

Item 1: Acres of SELECTED CROP irrigated in this field

V3, V5, V6, V7, V8, V10

Sugarbeets, Corn, Soybean, Wheat, Upland Cotton

The respondent should only report the number of acres of the selected crop in the field that were irrigated for the 2000 crop. Record irrigated acres to the nearest TENTH.

Acreage should be counted as irrigated if water was **applied at least once during the growing season** or if the acres were **irrigated before planting**. If only part of a field was irrigated, count only the acres that actually were irrigated. Even though the crop may have received water several times, count irrigated acres only once.

In some states, non-irrigated land may also be called "dryland".

Exclude from irrigated acreage:

- acreage in the selected field which could have been irrigated (facilities were available) but which were not irrigated for the 2000 crop.
- land in and around the selected field in irrigation ditches, trenches, borders, levees and skip rows.
- fringe areas of the selected field (generally in fields with sprinkler systems such as center pivot systems) which did not receive water.

Item 2: Irrigation operations

Include only the irrigation system(s) used to irrigate the selected field for the 2000 crop year.

V3: You will record information for up to two systems used on the target crop for the 2000 crop year. If only one system was used on this field, then use only Column 1 for responses to Items 2b - 2k. Items 2b - 2k will apply only to the irrigation system types listed in Item 2a.

V2, V5, V6, V7, V8, V10: In Item 2a, list the code for the type of irrigation system used for most of the acres of the target crop in the selected field for the 2000 crop year. If more than one system is used on the same acres, code the one that was used to apply the most water. Items 2b - 2d will refer to the totals for all irrigation systems used for the target crop in the selected field for 2000.

NOTE: Don't list any system or irrigation technology that wasn't used on the target crop in this field, even if it was used on other fields or other crops on the farm operation.

Item 2a: Type of system

Refer the operator to the Irrigation System Types Codes in the Respondent Booklet and record the System Type Code for the irrigation system used to irrigate most of the acres of the target crop on the selected field during the 2000 growing season.

The Irrigation System Type Codes are:

Pressure Systems

Code 1 - Hand-move

Code 2 - Solid or Permanent Set
Code 3 - Side Roll or Wheel Line
Code 4 - Center Pivot or Linear Move With Sprinklers on Main Line
Code 5 - Center Pivot or Linear Move With Sprinklers below Main Line, But More than 2 Feet above Ground
Code 6 - Center Pivot or Linear Move With Sprinklers less than 2 Feet above Ground
Code 7 - Big Gun
Code 8 - Low-flow Irrigation (Drip, Trickle, or Micro Sprinkler)
Code 9 - Other Pressure System -- Specify Type

Gravity Systems

Code 10 - Siphon-tube System from Unlined Ditches
Code 11 - Siphon-tube System from Lined Ditches
Code 12 - Portal- or Ditch-gate System from Unlined Ditches
Code 13 - Portal- or Ditch-gate System from Lined Ditches
Code 14 - Poly-pipe System
Code 15 - Gated Pipe (Not Poly Pipe)
Code 16 - Improved Gated Pipe (Surge Flow or Cablegation, Not Poly Pipe)
Code 17 - Subirrigation
Code 18 - Open Discharge from Well or Pump
Code 19 - Other Gravity System -- Specify Type

Each of these irrigation systems is described in Exhibits 5.1 and 5.2 at the end of this section. The descriptions are designed to explain system characteristics and how the system applies the water to the field.

These systems are on-farm, field-level irrigation technologies and do not describe the water distribution systems of an irrigation district or company.

Exhibit 5.1 includes descriptions of end-tow sprinkler and carousel sprinkler-traveler systems. If either of these systems are used on the field, enter them as a side roll/wheel line system using a code “3".

Also provided are descriptions of several big-gun systems, including self-propelled big-gun system, reel-type hose pull and reel-type cable pull systems that use large gun-type sprinklers. Each of these systems should be entered as a big-gun system using a code “7".

Flood irrigation is a gravity based irrigation system where the water applied is allowed to flow across all or part of a field between levees, dikes, or borders. However, for water management and cost reasons, it is important to recognize how the water is applied to the field. Therefore, the flood irrigation system type can vary depending on how the water is applied to the field. A flood irrigation system can consist of any gravity system type, except system type 17 (and it is also unlikely for system type 16).

For example, if the field was flood irrigated (the water applied is allowed to flow across the field between levees, dikes, or borders), but the water was applied to the field using a siphon tube or portal/ditch-gate system, then record the flood irrigation system type as either a 10, 11, 12 or 13. Record a code 10 if the field was flood irrigated by applying water from an unlined ditch using a siphon tube system, or a code 11 if the siphon tube system applied water from a lined ditch. Record a code 12 if the field was flood irrigated by applying water from an unlined ditch using a portal/ditch-gate system, or a code 13 if the portal/ditch-gate system applied the water from a lined ditch. If water is applied to the field through a single discharge from a well or pump and allowed to flood all or part of the field (between levees, dikes, or borders), code the irrigation system as 18.

V2

Rice

Rice may be irrigated with either pressure or gravity systems, but gravity is the most common. Gravity irrigation of rice is unique when compared to other crops. Rice is flooded and standing water is retained over the entire field through the growing season. Almost all of the Gravity System options (10-19) are possible on rice. (Code 17 - Subirrigation is not possible.) The gravity system codes relate to the way water is controlled as it is released into the field.

Most fields are not naturally flat enough to allow an even water depth across the field, so fields are leveled, internal levees constructed in the field, or both to enable even water distribution. Each area in the field encircled by levees is termed a contour, level, or bay, depending on the region. Water control devices are placed in the levees to prevent water overtopping of the levees. These devices “levee gates or boxes” are used to both manage irrigation water to a specific depth and in draining excess water from the field.

In all these cases, the water is allowed to flood the field and remains on the soil until irrigation needs are met. Flood irrigation system types do not use furrows

to distribute water across the field. Once the water is applied to the field (or a field bay), gravity controls the flow of water across the entire field (or bay). Often, land-leveling is performed to ensure that gravity equally distributes water across the field (or bay).

Item 2b: Total quantity of water applied

Record the total quantity of water applied to the target commodity in the selected field during the entire 2000 crop year either (1) in inches per acre, or (2) total acre feet. **Include** water that was applied during preplant irrigations either to soften the soil for planting or to improve the soil profile.

V3: Record this separately for each Irrigation System Type recorded in Item 2a. Include any pre-plant water application.

V2, V5, V6, V7, V8, V10: Record the total inches per acre or total quantity for the field applied by all irrigation systems used for the target crop in the selected field for 2000. ***V2*:** Also, include water applied to a ratoon crop .

Item 2b(1) & 2b(2) Estimating water applied

These items are asked ***only*** if the operator cannot provide a response to Item 2b.

Item 2b(1) Total hours water applied

The operator should estimate the total hours that water was applied to the selected crop in the field during the 2000 growing season. In ***V3*** this should be obtained separately for each irrigation system. The total hours the system operated may range from one to greater than 1000 hours.

Irrigation may occur continuously for days, or even weeks. For example, if the irrigation occurs continuously (every day for 5 weeks), then the total number of hours this system irrigated the field was 840. This is computed as follows:

(5 weeks) * (7 days/week) * (24 hours/day) = 840 hours

Another example, if a system was used to irrigate a field three different times during the growing season - once continuously for six days, the second time for eight days (but only from 8 p.m. to 8 a.m. daily), and the third time continuously for six more days - then the total number of hours this system irrigated this field was 384. This is computed as follows:

First irrigation:	6 days (irrigation non-stop, day and night)	6 x 24 = 144 hours
Second irrigation:	8 days (irrigation from 8 p.m. to 8 a.m. daily)	8 x 12 = 96 hours
Third irrigation:	6 days (irrigation non-stop, day and night)	6 x 24 = 144 hours
		Total = 384 hours

Item 2b(2) Average gallons per minute

Record the operator's best estimate of the average gallons per minute that the irrigation system(s) applied water to the selected field during the hours of irrigation reported in Item 2b(1). Convert cubic feet per second (cfs) to gallons per minute (gpm) by multiplying by 450, therefore 1 cfs = 450 gpm. NOTE: This value may be the same as the value in Item 2j.

Item 2c: Percent surface water used

Water sources can involve surface water and/or ground water (water from wells). Sometimes the same acres are irrigated using more than one source of water. Record the operator's best estimate of the percent of all the water used to irrigate the selected field from surface water sources.

Sometimes a single irrigation system uses more than one source of water. In ***V3*** for each system type reported in Item 2a, record the operator's best estimate of the percent of the total water the system used to irrigate the selected field from surface water sources. Percents for each system can range from zero to 100 percent.

Surface water is water stored in natural ponds or lakes, flowing in streams and rivers, and water stored in man-made reservoirs. Surface water can originate on the farm or from off-farm sources. Water sources are different from water suppliers. Here, it does not matter who supplied the water to the farm.

Item 2d: Number of times field was irrigated

V3, V5, V6, V7, V8, V10

Sugarbeets, Corn, Soybeans, Wheat, Upland Cotton

The number of times a field is irrigated during the growing season will vary across farms depending upon the system, and other characteristics such as soil

type and season weather. The number of times a field is irrigated during the crop year can be useful in estimating both the total quantity of water applied and total costs of irrigation for the field.

Record the number of times the selected field was irrigated during the 2000 crop year. One “irrigation time” is an uninterrupted period the system was actively irrigating the field. Include all applications of water made to benefit the 2000 target crop for the selected field. Include any pre-plant water applications.

For each irrigation system reported in Item 2a in ***V3*** record the number of times each system was used to irrigate the selected field for the 2000 crop.

For example, if a system was actively irrigating a field first for 6 days, later for 8 more days, later still for 5 more days, and finally later for 4 more days, then this system irrigated this field 4 times during the growing season.

If the system operated continuously during the crop season, this would be counted as only 1 irrigation.

The number of times a field is irrigated can also be estimated by the number of times the irrigation system covers the entire field. For example, if a field is irrigated continuously until the entire field is irrigated (that is, it takes 2 days to cover the entire field), and then the irrigation system set still (not in operation) for a period of time, the number of times the field is irrigated during the crop year can be recorded as the number of times the irrigation system covered the field during the crop year.

Item 2d: Number of times system used to apply water

V2

Rice

Record the number of times this irrigation system was used to apply water to the selected field . Be sure to include pre-plant irrigations.

If the irrigation system operated continuously during the crop season (this is often the case for rice), enter code “1" for continuous irrigation.

Item 2e: Pump type

V2, V3

Rice, Sugarbeets

To apply water to a field, some irrigation systems may have to lift the water from a well and/or put the water under pressure to distribute it across the field. Pressurized systems must use a pump. For each system reported, identify and record the code for the most common pump type used to lift and/or distribute water across the field.

The Codes for Pump Types Are:

Code 1 - **Turbine**
Code 2 - **Submersible**
Code 3 - **Centrifugal**
Code 4 - **Booster**
Code 5 - **Siphon**
Code 99 - **No Pump**

If more than one pump is used with a single system, such as a booster pump, etc., record the pump type for the pump closest to the water source for the field.

Exclude pumps owned and operated by an irrigation company or district even if the respondent is part-owner of the irrigation company.

Sprinkler irrigation systems generally use **centrifugal**, deep well turbine, or **submersible** type pumps. Turbine and submersible pumps are generally used where it is necessary to lift the water more than 25 feet.

Turbine and **centrifugal** pumps differ in the design of the impellers used to move water through the pump. Impellers are devices internal to the pump used to create water force (or pressure) to lift and/or distribute the water across a field or block.

For an ordinary deep-well **turbine pump**, the impeller is suspended vertically on the end of a drive shaft (submerged below the water level) within a long discharge pipe, but the motor is above ground.

A **submersible pump** is a deep-well pump, usually turbine, with a direct-connect electric motor placed below the submerged impeller. This pump eliminates the need for a long drive shaft required for ordinary turbine pumps. Its principle advantage is that this pump type can be used in very deep wells or crooked wells where long drive shafts for ordinary turbine pumps are impractical. For the pump type, the motor is submerged.

A **booster pump** is generally a relatively small horsepower pump used to provide added lift or pressure when the pump at the water source does not provide adequate pressure for field or block water distribution.

A **siphon pump** is generally used to prime a large siphon tube that transfers water from a mainline water-supply to a ditch or canal providing water to the field or block.

If no pumps were used to draw or apply water to the field (for example water flows by gravity only) enter code “99" and go to Item 2g.

Item 2f: Average pumping rate

V2, V3

Rice, Sugarbeets

For each system reported, enter the average pumping rate in gallons per minute (GPM) for the pump type recorded for that system. Report the pumping rate(s) used during normal operation. NOTE: This may be the same value as entered in item 2b(2) above.

Item 2g: System operating pressure

V2, V3

Rice, Sugarbeets

If the system type recorded in Item 2a is NOT a Pressure System (codes 1 through 9), skip to Item 2h.

Only ask this item whenever a pressure irrigation system is used (Item 2a is code 1-9). Enter the average system operating pressure in pounds per square inch (PSI). Report the system operating pressure used during normal operation.

Item 2h: Pump motor type

V2, V3

Rice, Sugarbeets

Systems using a pump to deliver water to the field require a motor. Enter the code to identify the fuel or power type for the pump motor type entered in Item 2e.

If a tractor was used, enter the motor type of the tractor.

The codes for motor type are:

Code 1 - **Diesel**
Code 2 - **Gasoline**
Code 3 - **LP Gas**
Code 4 - **Natural Gas**
Code 5 - **Electricity**
Code 6 - **Solar Power**

Item 2i: Average pump motor size

V2, V3

Rice, Sugarbeets

Enter the average horsepower rating of the motor type recorded in Item 2h. For tractors enter the PTO horsepower.

Item 2j: Average flow rate

V2, V3

Rice, Sugarbeets

This item is asked only for the system(s) where the respondent indicates that **NO PUMP** was used (code 99 entered in Item 2e).

If no pump was used with a system, then the respondent should estimate the average flow rate in gallons per minute when the irrigation system applied water to the selected field. NOTE: This may be the same value as entered in item 2b(2) above.

Convert responses in cubic feet per second (cfs) to gallons per minute (gpm) by multiplying by 450, therefore, 1 cfs = 450 gpm.

Item 2k: Other acres irrigated using system(s)

V2, V3

Rice, Sugarbeets

Sometimes an irrigation system is moved during the irrigation season and used to irrigate more than one field or for other crops. For each system type reported in Item 2a, record the **other** acres on this operation irrigated with the irrigation system(s) used to irrigate the selected field during the 2000 irrigation season. Record the number of other acres irrigated to the nearest TENTH.

Exclude the acres for this field.

Item 3: Purchased water

V2, V3, V5, V6, V7, V8, V10

Rice, Sugarbeets, Corn, Soybeans, Wheat, Upland Cotton

If any water was purchased to irrigate the selected field, enter code "1" for YES and continue.

V5, V6, V7, V8, V10: If no water was purchased, go to Item 9.

V2: If no water was purchased, go to Item 4.

V3: If no water was purchased, go to Item 6.

Water is considered purchased if the operator and/or landlord paid a fee for water used on the selected field AND the water originates from an off-farm source. Do not consider water pumped from on-farm sources to be purchased water.

Water may be purchased from many sources, including:

- The U.S. Bureau of Reclamation,
- An irrigation district,

- Mutual, private, cooperative, or neighborhood ditch associations or canal companies, and
- Commercial or municipal water systems.

The purchase fee may be a yearly fee or charges for each application of irrigation water.

Water that comes from an irrigation district, water-supply ditch association, or canal company should be considered purchased water no matter where the off-farm water supplier got the water. These water suppliers generally provide water through canals which are served with water from lakes, reservoirs, or rivers and streams. All water supplied by these organizations should be listed as purchased water. Even if an irrigation district, water-supply ditch association, or canal company does not charge a water fee, but only charges the producer for the cost of water delivery or for the maintenance cost of water delivery facilities, **report the water as purchased water**.

Sometimes a farmer near an area served by an irrigation district is charged a fee by the irrigation district even if the farm doesn't get any water from that district. The fee may be charged because there is a value attached to the groundwater recharge which occurs due to the use of irrigation district water by other irrigators in the area. When the operator pays a fee of this sort, but doesn't irrigate using irrigation district water, do not record the field as being irrigated with purchased water.

Item 3a: Percent purchased water

V2, V3, V5, V6, V7, V8, V10

Rice, Sugarbeets, Corn, Soybeans, Wheat, Upland Cotton

If water was purchased (Item 3 = “1"), record the operator’s best estimate of the percent of all the water applied to the selected field during the 2000 growing season that was purchased from off-farm water sources. The percent may range from zero to 100.

Item 3b: Purchased water cost

V2, V3

Rice, Sugarbeets

Record either: (1) the per acre cost for purchased water; or (2) the total cost of ALL water purchased from off-farm water sources that was used to irrigate the **selected target commodity** in **the selected field** for the 2000 growing season. Purchased water costs include water fees and costs to deliver off-farm water to this field.

Include in the expenses associated with purchasing the off-farm water used on the selected field:

- fees associated with the water quantity;
- all fees not associated with water quantities, such as fees charged on a per acre basis to cover water delivery and maintenance costs incurred by the off-farm water supplier; and
- any purchased water costs paid for by the landlord.

Exclude any costs associated with pumping or distributing the water on the farm or the selected field.

Items 4 & 4a: Levee gates

V2

Rice

Item 4: Record the total number of levee gates (or boxes) used in the selected field during the 2000 growing season. Include levee gates on internal field levees and on the field edge used when draining water from the field.

Item 4a: A common irrigation method in rice involves water entering a field comprised of a series of areas encircled by levees, termed contours, levels, or bays. (We use the term “bays” for convenience, use whatever term is accepted locally.) The entire water supply enters the field through one bay. Levee gates on the first bay are set to the desired water depth so that when water fills the first bay, it flows into the second, and so on. This process of “cascading” water from one bay to another for irrigation is indicated by a “Yes” response to this item. (Do not confuse the drainage process when the goal is to remove as much water as possible with the irrigation process. The case of water cascading only after rain also is also excluded.)

Indicate “No” if other irrigation systems are used. One irrigation alternative would be a single bay field. Another alternative involves setting levee gates above the desired water depth and limiting the water inflow to the bay such that irrigation does not cause water to flow from one bay to another. This method

requires that each bay is connected to the water source by pipe or ditch. This method is known as “multiple or Side-inlet” system..

Item 5: Type of levee

V2

Rice

Record the appropriate code for the type of levees used in the selected rice field during the 2000 growing season. Straight levees code = “1". Contour levees code = “2". If the field has no internal levees, code = “3".

Item 6: Replacement cost for siphon tubes

V2, V3

Rice, Sugarbeets

Ask this item only if a siphon-tube gravity system was used to irrigate the selected field of the target crop during the 2000 growing season (either column of Item 2a is code 10 or 11).

Record the operator's best estimate of the total cost to replace all of the siphon tubes used on the selected field. This item provides data to calculate a cost for the irrigation system.

Item 7: Cost for poly pipe

V2, V3

Rice, Sugarbeets

Ask this item only if poly pipe was used to irrigate the selected field of the target crop during the 2000 growing season (either column of Item 2a is code 14).

Record the total expense for poly pipe used to irrigate the selected field. This item is used to calculate a cost for the irrigation system.

Item 8: Gated pipe system used

V2, V3

Rice, Sugarbeets

Ask Items 8a and 8b ONLY if a gated-pipe system was reported (either column of Item 2a is code 15 or 16).

Item 8a: Average diameter of gated pipe

Record the average diameter of the gated pipe used for irrigating the selected field during the 2000 growing season.

Item 8b: Total length of gated pipe for field

Record the total length (in feet) of all the gated pipe used to irrigate the selected field during the 2000 growing season.

Item 9: Water from wells

If water from wells (ground water) was used to irrigate the selected target commodity field for the 2000 crop, enter code "1" for YES and continue.

V2, V3 : If water from wells was not used to irrigate the selected field, go to Item 10.

V5, V6, V7, V8, V10: If water from wells was not used to irrigate the selected field, go to Item 11.

Item 9a: Number of wells

V2, V3

Rice, Sugarbeets

Record the number of wells used to irrigate the selected field during the 2000 growing season. The wells could have irrigated other fields, but they must have at least partly irrigated this field.

Item 9b: Average well casing diameter

V2, V3

Rice, Sugarbeets

Record the average diameter of the outer well casing of all wells that irrigated the selected field during 2000. The average diameter of the outer well casing will probably be between 12 and 36 inches; 20 inch casings are relatively

standard throughout much of the West. Do not record the average diameter of the well column pipes (the well pipes pumps are attached to).

Item 9c: Average pumping depth

V2, V3

Rice, Sugarbeets

Record the average pumping depth (in feet) of wells that irrigated the selected field during 2000.

Well pumping depths depend on the water table level and the amount of draw down on the water table during pumping. In other words, pumping depth is the depth to water at the start of the irrigation season, plus an average decline in the water level caused by pumping during the irrigation season.

Item 9d: Other acres irrigated from these wells

V2, V3

Rice, Sugarbeets

Often a well may be used to supply water to more than one field. Record the number of other acres (for fields other than the selected target commodity field) that were irrigated using water pumped from the well(s) that supplied water to the target field.

Item 9e: Fuel and power costs for pumping water

V2, V3

Rice, Sugarbeets

Record the total fuel and power expenses incurred to pump the irrigation water from wells used to apply water to the selected field during 2000.

Fuel and power pumping costs may include expenses for fuels, lubrication, and electricity. Include the landlord's share of total pumping costs and any pumping expenses incurred for preplant irrigation applications.

Item 10: Additional pipe used

V2, V3

Rice, Sugarbeets

This question finds out if any other pipes besides pipe that was part of the irrigation system itself was used to irrigate the selected field during 2000. Additional pipe includes mainline or lateral pipe but not the pipe that is in the system itself. If additional pipe was used on the selected field, enter code "1" for YES and continue. If no additional pipe was used, go to Item 11.

A mainline pipe connects the pump or water source and the field or the lateral pipes. Mainline pipes can be either portable or buried in the ground.

Lateral pipes are pipes that carry water from the mainline pipe to the discharge or distribution point in the field. There can be more than one lateral pipe, and they can be permanent or portable.

Item 10a: Most common type of additional pipe used

V2, V3

Rice, Sugarbeets

Enter the code for the most common type of mainline or lateral pipe used. Exclude pipe that is part of the irrigation system, such as gated pipe, sprinkler pipe, etc.

Item 10b: Average diameter of additional pipe used

V2, V3

Rice, Sugarbeets

Record the diameter in inches of the additional mainline or lateral pipe used. If there are different diameters of pipe used, record the average diameter in inches.

Item 10c: Feet of additional pipe used

V2, V3

Rice, Sugarbeets

Enter the total feet of mainline or lateral pipe used to carry water to the selected field during 2000. Exclude pipe that is part of the irrigation system, such as gated pipe, sprinkler pipe, etc.

Item 11: Field run-off

Refer the operator to the list of field fun-off options in the Respondent Booklet and record the code the operator indicates best describes what happens to the **majority** of the run-off from irrigation for the selected field.

Field run-off is the portion of the irrigation water applied to the field that does not soak into the soil where the crop is growing. This 'extra' water flows across a field and either collects to form a pool at the end of the field, or it flows off the field. The pool of extra water is not large enough or doesn't last long enough to prevent normal farming operations for the field.

This question is a multiple choice question. Be sure to read ALL of the items in the Run-Off Code List before accepting an answer from the respondent. The respondent may want to answer before hearing all the possible answers, and one of the later codes may be the best answer.

Do not ask "Was there any run-off from this field?"or "What happens to the run-off from this field?". These questions are not correct. Many operators will say there is no run-off when, in fact, one of the other codes is what really happens. The respondent will not know that these codes are acceptable answers if you don't read ALL of them before accepting an answer.

The codes describing field run-off are:

Code 1 - Retained at the End of the Field: This is when the pool of extra water is held at the end of the field because the field is bordered or there is a natural basin at the end of the field. The run-off is not re-used for irrigation.

Code 2 - Reused to Irrigate on the Farm: Extra irrigation water from the field collects in an on-farm lake, pond, or pit below the field, and is re-used to irrigate the same field or another field on the farm.

Code 3 - Collected in Evaporation Ponds on the Farm: The extra irrigation water collects in an on-farm pond or pit below the field and is not re-used for irrigation. Instead, it remains in the pond or pit until it evaporates. Evaporation ponds are sometimes used for disposal of poor quality drainage flows.

Code 4 - Drains from the Farm: Run-off drains off the field and away from the farm through man-made drainage ditches or natural water courses. Run-off drained from a farm may be recovered by another farm or it may re-enter the water supply downstream as return flow.

Code 5 - No Run-off: Irrigation water is applied to the field so that no extra water collects at the end of the field or drains from the field.

Exhibit 5.1: Types of PRESSURE Irrigation Systems

Hand-move Sprinkler System (Code 1)	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 Sprinkler Systems (Code 2)	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 once established for the irrigation season. Adapted to most crops, soil types, topography, field sizes and shapes.
Side-roll or Wheel-line Sprinkler Systems (Code 3)	A wheel-move, lateral-line system which moves as a unit in fixed increments (irrigation sets) across the field. The system is powered by a small gasoline engine that is manually operated. The system is stationary while irrigation is taking place. 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. Wheels are generally spaced 40 feet apart and are 5-7 foot in diameter, with the main system pipe serving as an axle in the middle of the wheel. 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 3)*	Wheel or skid, lateral-line system which is end-towed via tractor to new locations in the field. The system is stationary while irrigation is taking place. System is designed for reasonably flat or slightly rolling, rectangular or square fields with an alley through the center of the field. 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 3).*	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.

Center Pivot or Linear Move with Sprinklers on Main Line (Code 4)	Self-propelled, continuous-move sprinkler system that either travels in a circle (center pivot) or laterally (linear move) across a field. Sprinklers are located **directly on** the system's main water-supply pipe, which is supported by A-frame towers. Some circle systems have features that provide coverage of most of the corners on a square field. Some systems may be towed to adjacent fields to increase system use by irrigating a different crop with different timing of water needs. Water is delivered to a fixed center point for center-pivot systems and by hose or supply ditch for lateral move systems. Center-pivot systems have been developed for areas from 40 to 240 acres, but most systems irrigate 128-132 acres of a square 160 acre field. Lateral moves require a square or rectangular field of 40 to 240 acres. These systems may be adapted to most crops, soil types, and level to gently-rolling topography. Systems with sprinklers **directly** on the main water-supply line will tend to be **medium to higher pressure** (above 30 psi) and use impact sprinklers.
Center Pivot or Linear Move, with Sprinklers below the Main Line, but More than 2 Feet above the Ground (Code 5)	Self-propelled, continuous-move sprinkler system that either travels in a circle (center pivot) or laterally (linear move) across a field. Sprinklers or sprayers are located on drop-tubes or booms suspended **below** the system's main water-supply pipe, but **more than 2 feet above the ground**. This includes most standard drop-tube sprinkler systems. Some circle systems have features that provide coverage of most of the corners on a square field. Some systems may be towed to adjacent fields to increase system use by irrigating a different crop with different timing of water needs. Water is delivered to a fixed center point for center-pivot systems and by hose or supply ditch for lateral move systems. Center-pivot systems have been developed for areas from 40 to 240 acres, but most systems irrigate 128-132 acres of a square 160 acre field. Lateral moves require a square or rectangular field of 40 to 240 acres. These systems may be adapted to most crops, soil types, and level to gently-rolling topography. Systems with sprinklers **below** the main water-supply line will tend to be **lower pressure** (below 30 psi), with spray nozzles rather than impact sprinklers.

Center Pivot or Linear Move, with Sprinklers less than 2 Feet above the Ground (Code 6)	Self-propelled, continuous-move sprinkler system that either travels in a circle (center pivot) or laterally (linear move) across a field. Sprinklers or sprayers are located on drop-tubes suspended **below** the system's main water-supply pipe and are located less than 2 feet above the ground. This includes low pressure precision application systems (LEPA) and other below-the-crop-canopy systems. Some circle systems have features that provide coverage of most of the corners on a square field. Some systems may be towed to adjacent fields to increase system use by irrigating a different crop with different timing of water needs. Water is delivered to a fixed center point for center-pivot systems and by hose or supply ditch for lateral move. Center-pivot systems have been developed for areas from 40 to 240 acres, but most systems irrigate 128-132 acres of a square 160 acre field. Lateral moves require a square or rectangular field of 40 to 240 acres. These systems may be adapted to most crops, soil types, and level to gently-rolling topography. Systems with sprinklers **suspended to within 2 feet of the ground** tend to be **very low pressure** (below 15 psi) and use spray nozzles and bubblers. Some units may run water directly on the ground using a cloth-like extension attached to the drop tube.
Big Gun (Code 7)	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 across a field 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. Three specialty-type big-gun systems are defined below, including a 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 7).*	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 high pressure, greater than 60 psi.
Reel-type Hose Pull *INCLUDE as a big gun system (Code 7).*	Single, large gun-type sprinkler on a carriage. A flexible, but noncollapsible hose is attached to a large reel at one end of the field. The carriage and sprinkler is 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 high pressure, greater than 60 psi.

Reel-type Cable Pull *INCLUDE as a big gun system (Code 7).*	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 to operate on since the hose is pulled behind the unit. Systems are high pressure, greater than 60 psi.
Low-flow Irrigation System (Drip, Trickle, Micro Sprinkler) (Code 8)	Low-pressure systems 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, and alternatively, tubing may be installed below ground with emitters on risers above ground. While used primarily on trees, vines, and vegetable crops, these systems are only 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 wetted 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.

Exhibit 5.2: Types of GRAVITY-FLOW Irrigation Systems

Siphon-tube System with Unlined Ditches (Code 10)	System uses short curved tubes, usually aluminum or plastic, to siphon water onto a field from an **unlined** ditch across the head of the field. Siphon tubes are curved to fit over the ditch bank and most range from 1 to 3 inches in diameter and from 3 to 5 feet in length. Water, once on the field, may flow down furrows, between borders or dikes, or in corrugations. The unlined ditch is formed with mechanical operations using only the soil on the field. The ditch may be reformed each year or reused with maintenance.
Siphon-tube System with Lined Ditches (Code 11)	System uses short curved tubes, usually aluminum or plastic, to siphon water onto a field from a **lined** ditch across the head of the field. Siphon tubes are curved to fit over the ditch bank and most range from 1 to 3 inches in diameter and from 3 to 5 feet in length. Water, once on the field, may flow down furrows, between borders or dikes, or in corrugations. The ditch may be lined with concrete, plastic, clay, or other nonporous material. The ditch is permanent and is reused each year.
Portal- or Ditch-gate System with Unlined Ditches (Code 12)	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. Water, once on the field, may flow down furrows, between borders or dikes, or in corrugations. The unlined ditch is formed with mechanical operations using only the soil on the field. The ditch may be reformed each year or reused with maintenance.
Portal- or Ditch-gate System with Lined Ditches (Code 13)	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 a **lined** ditch across the head of the field. Portals in the ditch bank can be of any diameter and 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. Water, once on the field, may flow down furrows, between borders or dikes, or in corrugations. The ditch may be lined with concrete, plastic, clay, or other nonporous material. The ditch is permanent and is reused each year.
Poly Pipe System (Code 14)	A system using 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.

Gated Pipe (Not Poly) (Code 15)	A system using 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 for cultural operations or moved to new field locations through the season. The gates usually match row widths so water can flow directly into rows. Gated-pipe systems may also be used on flood or corrugation water-control systems. The pipe is reused for many years.
Improved Gated Pipe System (Surge Flow or Cablegation, Not Poly) (Code 16)	A system using 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 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 for cultural operations 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. It would defeat the purpose of the improved system. The pipe is reused for many years.
Sub-irrigation (Code 17)	Maintenance of a water table at a predetermined depth below the field surface by using ditches or sub-surface drains and water-control structures. Water is added or removed as needed to maintain the water level of the water table at a specific depth using the ditches or drains. 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. The irrigation system may also be used as a drainage system.
Open discharge from well or pump (Code 18)	Open discharge from well or pump occurs where there is only one point of discharge into the field. This system is often 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 meet, 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.

Section H - Drying and Storage

V2

Rice

What is Section H for? How is this information used?

Engineering relationships are used to estimate the operating and ownership costs of drying facilities. Drying systems use various fuels as a heat source and electricity to power the fans that force the air through the grain. These costs are added to other costs such as fuels and electricity, repairs, etc.

The costs of drying and storing the crop are significant variable costs that must be accounted for to accurately compute the cost of producing the 2000 crop.

Item 1: Drying method

Record whether rice from the selected field, including the landlord's share, was (or will be, if harvest is not complete):

Code 1 = **Custom Dried**
Code 2 = **Dried Other Than Custom Dried**
Code 3 = **Not Dried**

Include the landlord's share of the crop.

`If more than one of these choices apply for the rice harvested from the selected field, use the code for the choice that applies to the largest portion of the crop harvested from this field.

Custom drying may also be called commercial drying. If drying facilities on another operation were used to dry the rice from the selected field, record this as custom dried.

If custom dried, **continue with Item 2.**
If dried other than custom dried, **skip to Item 3.**
If not dried, **skip to Item 4**

Item 2: Custom drying cost

If the rice from this field was custom dried (Item 1 = “1"), record the amount paid by the operator in either cents per hundredweight (cwt) or total dollars for custom drying the rice from the selected field.

If drying facilities on another operation were used to dry the crop from the selected field, include any rent paid for using the drying facilities. Record the operator’s estimate of the value of the drying if no direct cash payment was made (for example, if the commodity was dried free-of-charge on another operation).

Exclude the landlord’s share of the cost of drying the crop.

Items 2a & 2b: Storage costs included?

If the cost reported in Item 2 included storage fees, enter code “1" for YES. The actual storage fees will be reported in Item 5.

If there was no cost for the custom drying of the rice crop, explain why in Item 2b.

Item 3: Dried other than custom

If the rice from the selected field was dried, but not custom dried (Item 1 = “2"), complete Items 3a and 3b.

Item 3a: Type of fuel used to dry crop

Record the main fuel type used to dry the crop from the selected field. Choices are:

Code 1: **Diesel**
Code 2: **Gasoline**
Code 3: **LP Gas**
Code 4: **Natural Gas**
Code 5: **Electricity**
Code 6: **Other**

If more than one fuel type was used to dry the crop from the selected field, enter the code for the type of fuel used to dry the largest portion of the crop.

Item 3b: Average moisture removed by drying

Ask the respondent to estimate the average percent of moisture removed from the rice from the selected field by drying. Enter this average percent of moisture removed to the nearest tenth. For example, if the rice was harvested at 14 percent average moisture, and then dried to 12.5 percent moisture, enter **"1.5"** in Item 3b (14.0 - 12.5 = 1.5).

Item 4: Crop Marketing and Storage

Items 4a through 4c provide information on marketing strategies followed by producers of the 2000 crop. Depending on the current price for rice at harvest, a producer may decide to sell the crop immediately at harvest, or to store the crop until a later date. The crop may be stored at a commercial elevator facility, or on farm if the producer has capacity to store grain on-farm. Commercial storage facilities usually charge a fee (often on a per bushel / per month basis) to store the grain.

The respondent can report either percents or total pounds for each of the items in 4a - 4c; however pounds are the preferred reporting unit. If the respondent reports in percents, the **sum of Items 4a through 4c must equal 100 percent**. If the respondent reports in total pounds, you can calculate total production from Section B, Items 24a and 24b (yield times acres equal production) to check that all the crop harvested is accounted for.

For instance, if the respondent reports 5,650 pounds per acre yield on 100.0 acres in Item B24a, the total production is 565,000 pounds (5,650 x 100.0 = 565,000) If the respondent also harvested a ratoon crop from this field, then you should add this production to to calculate total production from the field.

Item 5: Storage charge

If any of the rice harvested from the selected field was stored in off-farm storage, we need to obtain the average monthly storage charge per unit.

If Item 2a = 1, indicating that the storage charges were included in the cost of custom drying reported in Item 2, this Item 5 storage charge MUST be recorded.

Some producers may be unsure what the final storage cost per unit will be until the rice is removed from storage or sold at a later date. In these cases, ask the grower what charge the storage facility quoted him when he placed the rice into storage.

Section I - Landlord Costs

V2, V3

Rice, Sugarbeets

What is Section I for? How is the information used?

If the selected field was rented, the landlord may have paid some of the variable costs associated with producing the crop. Sharing costs is more common with share-rented land, but it can happen in cash or rent-free rental arrangements.

This section obtains variable expenses paid by landlords to produce the target crop. Landlord costs are added to the expenses provided by operators to estimate the total costs of producing the target crop in the selected field. It is very important to have a good estimate of landlord expenses when calculating the cost of producing the target crop. Counting only the operator's expenses will understate the total cost of producing a crop if part of the cost is paid by a landlord.

Item 1: Landlord share of expenses

Refer to Item 2 in Section B. If the selected field was rented for cash, a share of the crop, or used rent-free, ask the respondent which of the expenses listed the landlord(s) *did* pay for the 2000 target commodity crop. Check each item and enter the amount the landlord(s) paid in 1a-1x.

If the field has more than one landlord, record the total dollars or percent paid by all landlords.

If landlords did NOT pay any of these costs, enter a code "3" in Item 1 then skip to the conclusion section on the back page.

Before completing any of column 2 dollars or percents for items 1a-1x, check the column 1 box next to each item the landlord paid a share of. This will help you and the respondent ensure that the most common landlord contributions are considered.

Item 1a: Purchased seed cost

Record the landlord's share of the seed cost for the target commodity in the selected field, either in percent or in total dollars. ***V2 (Rice):*** Refer to Section B, Item 19 for the total cost of purchased rice seed, including the landlord's

share. ***V3 (Sugar beet):*** Refer to Section B, Item 20 for the total cost for purchased sugar beet seed, including the landlord's share.

Item 1b: Seed cleaning and treating

V2

Rice

Record the landlord's share for the cost for cleaning and treating the rice seed planted in the selected field. Refer to Section B, item 15 for the total cost including the landlord's share.

Item 1c: Custom fertilizer application cost

Record the landlord's share of the cost of custom fertilizer application services on the selected field for the 2000 crop of the target commodity. Exclude material costs; these should be recorded in Item 1e. Enter percent or total dollars. Refer to Section C, Item 5 for the total cost, including the landlord's share. Exclude lime and gypsum.

Item 1d: Fertilizer materials cost

Record the landlord's share of the cost of fertilizer materials (fertilizers, soil conditioners, and micronutrients) applied to this field for the 2000 crop. Exclude application costs; these should be recorded in Item 1d. Enter percent or total dollars. Refer to Section C, Item 4 for the total cost, including the landlord's share. Exclude lime and gypsum.

Item 1e: Custom chemical/pesticide application cost

Record the landlord's share of the cost of custom chemical/pesticide application services on the selected commodity field for the 2000 crop. Exclude material costs; these should be recorded in Item 1g. Record percent or total dollars. Refer to Section D, Item 3 for the total cost, including the landlord's share.

Item 1f: Chemical/pesticide materials cost

Record the landlord's share of the cost of chemical/pesticide materials applied to the selected commodity field for the 2000 crop. Exclude application costs; these should be recorded in Item 1f. Record percent or total dollars. Refer to Section D, Item 4 for the total cost, including the landlord's share.

Item 1g: Soil/plant test cost

Record the landlord's share of the costs of soil/plant tests for the selected field, either in percent or in total dollars. Refer to Section C, Item 14 for the total cost, including the landlord's share.

Item 1h: Scouting cost

Record the landlord's share of the cost of scouting services for the selected field, either in percent or in total dollars. Refer to Section E, Item 3 for the total cost, including the landlord's share.

Item 1i: Biological pest control cost

Record the landlord's share of the cost of biological pest controls for the selected field, either in percent or in total dollars. Refer to Section E, Item 24a for the total cost, including the landlord's share.

Item 1j: Non-chemical blackbird control cost

V2

Rice

Record the landlord's share of the cost of shotgun shells and other non-chemical controls for the selected rice field, either in percent or in total dollars. Refer to Section E, Item 27 for the total cost, including the landlord's share.

Item 1*k:* Custom land preparation cost

Record the landlord's share of the cost of custom land preparation for the target commodity in the selected field, either in percent or in total dollars. Refer to Section F, Item 5a to see if any per acre amounts were entered.

Item 1l: Custom cultivating cost

Record the landlord's share of the cost of custom cultivating for the target commodity in the selected field, either in percent or in total dollars. Refer to Section F, Item 5b to see if any per acre amounts were entered.

Item 1m: Custom planting cost

Record the landlord's share of the cost of custom planting for the target commodity in the selected field, either in percent or in total dollars. Refer to Section F, Item 5c to see if any per acre amounts were entered.

Item 1n: Custom harvesting cost

Record the landlord's share of the cost of custom harvesting of the target commodity in the selected field, either in percent or in total dollars. Refer to Section F, Items 5e to see if any per acre amounts were entered.

Item 1o: Custom hauling cost

Record the landlord's share of the cost of custom hauling of the target commodity from the selected field, either in percent or in total dollars. Refer to Section F, Item 5f or 5g to see if any per acre amounts were entered.

Item 1p: Custom drying cost

V2

Rice

Record the landlord's share of the cost of custom drying the target commodity, either in percent or in total dollars. Refer to Section H, Item 2 to see if any of the target crop was custom dried.

Item 1q: Custom mechanical thinning

V3

Sugarbeets

Record the landlord's share of the cost of custom mechanical thinning of sugarbeets in this field. Refer to Section F, item 5d to see if any costs including landlord's costs were reported.

Item 1r: Custom harvesting and hauling

V3

Sugarbeets

Record the landlord's share of the cost of custom harvesting and hauling of sugarbeets from this field. Refer to Section F, item 5g to see if any costs including landlord's costs were reported.

Item 1s: Other custom service cost

Record the landlord's share of the cost of any other custom or technical services not already reported. Refer to Section F, Item 5h to see if any other custom or technical services were provided on this field.

Irrigation and water management costs

In Items 1t & 1u, enter the landlord's share of irrigation costs incurred only for the selected field of the target commodity during the 2000 irrigation season. If the landlord owns and maintains the irrigation system and pays all costs, probe for the operator's best estimate of the landlord's costs for the selected field for each cost Item 1t & 1u.

V3 (Sugar beet): Refer to Section G, Item 1 to see if any of the target crop was irrigated. If not, skip to the Conclusion on the back page.

Item 1t: Purchased Irrigation water expense

Record the landlord's share of the total purchase cost of the irrigation water purchased to irrigate the selected field of the target commodity for the 2000 irrigation season. Enter the landlord's share in either percent or total dollars. (Purchased water is water purchased from an off-farm water source as defined for Section G, Item 3.) Refer to Section G, Item 3b to see if any water was purchased to irrigate this field.

Item 1u: Irrigation fuel expense

Record the landlord's share of total expenses for fuels, lubrication, and electricity used to irrigate the selected field of the target commodity for the 2000 irrigation season. Enter the landlord's share in either percent or total dollars. Since the operator's fuel and power expenses for irrigation are not asked directly in Section G, there is no specific item to refer to when asking for landlord share of this expense.

Section J - Operator and Operation Characteristics

V5, V6, V7, V8, V10

Corn, Soybeans, Wheat, Upland Cotton

What is Section J for? How is the information used?

Production practices may differ significantly between small and large farms. ERS will use data provided in this section to answer questions about production practices employed by different sizes of farms and by different operators. No other source of data is available to illustrate the relationship, if any, of operator and farm characteristics to the production practices they use.

These questions can only be answered if information about the operation (legal structure, economic size and type) and operator (major occupation, education level) can be tied to the data collected in the Production Practices Report.

This Section is **NOT included** in ***V2 (Rice) or V3 (Sugar beet).***

Item 1: Operation's LEGAL Status

We want to record the operation's legal status. This does not mean how decisions are made for the operation on a day-to-day basis. Therefore, the answer to this question may be different than the answer to the question on day-to-day decision-making in the screening section of the questionnaire.

Show the operator the Operation Status Code list in the Respondent Booklet and ask him/her to select the appropriate code.

Individual (Sole or family proprietorship): This type of operation exists when one person (operator) is responsible for making management decisions for the operation. Include partnerships which are NOT LEGALLY ESTABLISHED.

Legal Partnership: Two or more individuals are LEGALLY joined together to carry on the operation. Each partner contributes money, property, labor or skills and shares in profits or losses according to some percentage agreed upon by the partners. To be recognized as a partnership, the relationship of the partners must be LEGALLY established. Husband and wife partnerships should be classified as individual/family proprietorships unless they are legally established. Exclude joint operations which involve livestock only (with no land operated in partnership) and landlord-tenant arrangements.

Family-held Corporation: This is a legal form of incorporation in which more than 50% of the stock in the operation is owned by people related either by blood or by marriage. The operator of these operations may be paid a salary, but these operations usually report that day-to-day decisions are made by an individual or by partners.

A Non-family Corporation: This is a legal form of organization separate from its owners. It is created under the laws of individual states. For these operations, the operator is almost always considered a hired manager.

Other: If this operation is any other kind of organization not readily classified in the above-mentioned categories, enter code "5". Some examples are:

Estate -- Undivided property still in, or subject to, probate.

Trust -- The farm is operated by a person as trustee for someone else who is not of age, or may be in a hospital, institution, or is otherwise unable to carry on his/her own business. Estate or trust may be further defined as a property administered for the benefit of another individual or organization. Estate or trust may also be defined as a fund of money or property administered for the benefit of another individual or organization.

Cooperative -- this place is operated as a cooperative. It is defined as an incorporated or unincorporated enterprise or association created and farmed jointly by the members.

Item 2: Operator's major occupation in 2000

We consider major occupation to be the occupation or work at which an individual spent more than 50% or more work time in 2000.

Some farmers may call themselves retired because they are farming on a smaller scale than when they were younger. Other people who have retired from an off-farm job and now farm on a small scale may also call themselves retired.

Show the operator the list of occupations in the Respondent Booklet and ask him/her to provide the appropriate code.

Item 3: Operator's formal education

This question provides the data for a look at the operation's financial situation as it relates to the education of the operator.

Show the operator the list of education levels in the Respondent Booklet and enter the code representing the highest level of school completed by the operator. Vocational school, secretarial school, etc. should not be counted as formal education unless the credits can be transferred to a college or university. An associate degree should be recorded as code “3" for 'some college'.

Item 4: Year respondent began operating

Enter the 4-digit year that the respondent began making day-to-day decisions for **any** farm/ranch. For example, the respondent began farming the target operation with his brother in 1994. Prior to going into partnership with his brother he farmed individually for 10 years. You would enter “1984" as the year that the operator began making day-to-day decisions for any farm/ranch.

Item 5: Expected gross value of sales

Show the operator the list of value ranges in the Respondent Booklet and check the appropriate total gross value of sales code according to his/her answer. This should be the respondent's **estimate of what the gross value of sales for 2000 will be.**

In determining the code, be sure to include all sales of crop and livestock products raised on the total acres operated by the selected operation. For tenant farmers, include the value of production given to the landlord in lieu of cash rent.

Exclude money the target operator receives for sale of (or the value of) products received as payment for land rented out to others.

Crops sales include all 2000 and earlier years' production that has been (or will be) sold during 2000.

Livestock and poultry refer to all kinds of livestock and poultry sold and to be sold during the 2000. Sales of all types of horses are considered farm income. Prizes or winnings from horse racing or showing are not considered farm income.

Include:

1. All government program payments received in 2000.
2. In contract arrangements, the estimated value of product removed/delivered from the operation.
3. The value of crops grown and placed under CCC loan during 2000.
4. The value of equity or premium payments received from the transfer or final sale of crops under CCC loan to others.

Item 6: Economic type of operation

For this question, make sure the respondent refers to the list of Farm Type Codes in the Respondent Booklet. Ask the respondent to select the category which represents the largest portion of this operation's expected 2000 gross income.

Government payments should be distributed among the categories according to the type of program in which the operator participated.

When the respondent reports that sales for two of the categories are equal, ask which group is more important and is the primary production activity.

Operations primarily engaged in producing short-term woody crops should be counted as farms and classified in "Nursery, Greenhouse, and Floriculture" category. Short-term woody crops are softwood trees (hybrid poplar, cottonwoods and pines) reaching maturity in 10 years or less and typically are used for paper production.

A farm primarily engaged in raising dairy heifers for herd replacements is classified as a "Beef Cattle" operation because no milk or dairy products are being produced.

Section K - Total Cotton Acreage

V8 (Upland Cotton) - North Carolina ONLY

You must be sure that the respondent understands that the questions in this section pertain to the respondent's **entire cotton acres** and not just the selected cotton field.

Item 1: Years experience growing cotton

Enter the total number of years the respondent has grown cotton. If this is the first year that the respondent has grown cotton, enter code "1".

Item 2: Tillage system and years used

For each type of tillage system (conventional tillage; strip tillage; no tillage) record the total acres planted with this type of system and the number of years the operator has used the system.

Be sure that the operator understands that you are not asking how many years they have used the specified tillage on only the acreages reported. We want the total acres planted in 2000 using the tillage system and then the total number of years the operator has had experience in using the specified system.

For example: The operator planted a total of 450 acres of cotton in 2000. He used conventional tillage on 400 acres in 2000 and he has used this type of tillage for the last 10 years. He tried 50 acres of no till cotton this year for the first time. You would record conventional tillage acres of "400" and years used would be "10". No tillage acres should be reported as "50" and years used equal "1".

Items 3a, 3b, 3c: Use of ultra narrow rows (UNR)

If the respondent plants ultra narrow row cotton, continue with Items 3a, 3b and 3c, otherwise skip to Item 4.

Item 3a: Years experience

Record the total number of years the operator has grown UNR cotton.

Item 3b: Percent of total cotton acreage

Enter the percent of the operator's total cotton acres that are planted in UNR.

Item 3c: Special cleaning equipment used

Ask the respondent if his UNR cotton is ginned with special cleaning equipment If YES, enter code “1".

Item 4: GMO acres

Enter the total number of cotton acres planted in 2000 with a genetically modified (GMO) seed variety.

Item 5: Years experience growing GMO cotton

Enter the total number of years, including this year, that the operator has planted genetically modified cotton.

Back Cover - Conclusion

Item 1: Location of selected field

Selected commodity code

V10

Multi-crop

Enter the code for the selected commodity 1 in cell 0009, and the code for the selected commodity 2 in cell 0014.

Tell the respondent that you need to mark the location of the selected field(s) of the target commodity on a map. On *Version 10*, you will locate both the selected field of *target commodity 1* and *target commodity 2*.

Ask the respondent what county the selected field is located in, and record the county name in the space provided.

V2, V3, V5, V6, V7, V8 (except NC), V10

Rice, Sugarbeets, Corn, Soybeans, Wheat, Upland Cotton

A field description box has been added for your use in better describing the location of the field.

V8

Upland Cotton - ***North Carolina Only***

Field location boxes for your use in recording the Latitude and Longitude of the field. Both the Latitude and Longitude should be recorded to 1 decimal place. To obtain the latitude and longitude, enter the sample field 15 paces. Using the GPS unit, record the latitude and longitude.

If the latitude and longitude readings are NOT recorded, the cotton field MUST be mapped on a county map as described in Item 2 below. If the latitude/longitude is recorded, DO NOT mark the cotton field on the county map.

Item 2: Marking field locations on the map

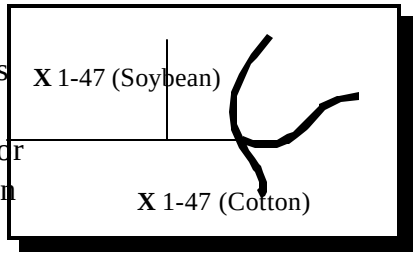
NOTE: If you do not have a map for the county the field is located in, you should contact the State Office or your Supervisor to obtain the correct map. Be sure to record enough information (such as legal description, township, range, section, etc..) from the respondent to allow you to locate the field on the correct map when you receive it.

Mark the location of the selected field of the target commodity with an "X" on the county maps provided by the Office. Verify with the respondent that you have located the field correctly. Be sure that the "X" you mark on the map is in the county named in Item 1.

Next to the "X", record "1-" followed by the sequence (sample) number that appears on the label on the Face Page of the questionnaire. The "1" indicates that this is an ARMS survey sample. This identification code is needed to link the "X" on the map with the data in the completed questionnaire.

For ***V10***, record the name of the selected commodity next to the "X".

Figure 35 Mapping Field Locations



In this example, an "X" on the map marks the location of each selected target commodity (soybean and cotton) field for Sample Number 47, a soybean and cotton Multi-crop Version 10 questionnaire.

NASS will use this "X" to determine the longitude and latitude in degrees, minutes and seconds for the selected target commodity field for each sampled operation. ERS will use this information to access the Natural Resources Conservation Service's (NRCS, formerly Soil Conservation Service) Soils V Database. This data base contains soil type, slope, leaching characteristics and other geologic information used for analysis.

Item 3: Re-contact in the spring 2001

V2, V3

Rice, Sugarbeets

Inform respondents that they will be re-contacted in February or March of 2001 to collect additional information to complete the profile of their operations for the Agricultural Resource Management Study. Explain that you will be

asking about entire year and year-end information at that time, and it will be easier to collect these figures when their records for 2000 are complete.

It is important that you leave the interview on a good note and that you put the Spring contact in as positive light as possible. After the first of the year, when records are complete and individual receipts and record book line items have been summarized, collecting the information will be easier and take less time. It would be difficult to answer the Spring questions right now, because records are incomplete.

It is important to retain the respondent's cooperation for the Spring interview, because very limited use of the respondent's Production Practices and Costs data can be made if data from the Spring interview is not available. Information would be lost to the ARMS, and this operation would not be represented in the full Agricultural Resource Management Study. More importantly, the hundreds of similar operations the selected farm represents would not be reflected in official USDA estimates.

Emphasize that you will call to make an appointment for a time convenient to the respondent for conducting the Spring interview.

Item 4: Survey Results or Other Agency Publications

After completing the interview, offer the results of the survey or other Agency or State Office publications to the respondent. A number of publications will result from the ARMS, and they will be published in a variety of sources. Many of these are explained in Chapter 1 of this Manual. In addition, there may be other releases from NASS or your State Office that responding farm operators may be interested in. We would like to serve the respondents better by providing survey results and other information that they will find useful and interesting.

Your Survey Statistician will explain which publications from Headquarters or from your State Office to offer to participants in the ARMS. The Survey Statistician will instruct you how to record requests for information from each respondent, if any Release order forms need to be filled out, or if any additional coding is required on the questionnaire.

If the respondent would like a free copy of the survey results, enter a code '1' in cell 0099.

Items 5a, 5b, 5c: Records Use

Do not ask these remaining questions of the Respondent. They are only for administrative purposes and analysis. You should fill them out after the interview is completed.

Analysts and other data users are interested in comparing reported data with the use of records. The use of records should indicate data are of a higher quality. Enter a code "1" to indicate the respondent referred to and used written records when reporting the indicated items.

Item 5a: Fertilizer Data

If farm records were used for completing the majority of the **fertilizer** data items in the questionnaire, enter code "1"=YES in cell 0011 For ***V10***, enter a "1" in cell 0011 if records were used for commodity 1, and in cell 0016 if records were used for commodity 2.

Item 5b: Pesticide Data

If farm records were used for completing the majority of the **pesticide** data items in the questionnaire, enter code "1" in cell 0012. For ***V10***, enter a "1" in cell 0012 if records were used for commodity 1, and cell 0017 if records were used for commodity 2.

Item 5c: Expense Data

V2, V3

Rice, Sugarbeets

Indicate whether farm/ranch records were used for the completing most of the **expense** items in the questionnaire. Enter "1" in cell 13 for YES.

Item 6: Supplements Used

Record the total number of each type of supplement used in completing this interview in the designated cell. These items are important to provide a means to check for misplaced or lost supplement sheets during the computer edit. Be sure all of the supplements are inside the questionnaire before mailing the questionnaire or turning it over to a supervisor.

Administrative Items

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 0101.

Code 1 = **Operator, Manager, or Partner**
Code 2 = **Operator's Spouse**
Code 3 = **Accountant or Bookkeeper**
Code 4 = **Someone Other than These People.**

Record the respondent's name and phone number.

Ending Time

Record the ending time of the interview in cell 0005. If more than one person was interviewed or it took more than one appointment to complete the interview, times should reflect the approximate total time for the questionnaire. Exclude the time you spend reviewing the questionnaire or verifying calculations by yourself after you have completed the interview. Be sure the ending time is after the beginning time entered on the face page. Use military time.

Date

Record the date the questionnaire was completed. Enter the date in MMDDYY format on the lines provided in cell 0007. For example, if the interview was completed on November 6, 2000, enter 11 06 00 in the date cell.

Enumerator Name

Sign the questionnaire and record your enumerator ID number in cell 0098.

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.

Many of the equipment items have a number at the end of their name. This number represents the standardized code that is to be used in identifying equipment types in survey questionnaires.

Plows

Disks

Cultivators

Harrows (Drags)

Bedder shapers

Packers

Miscellaneous tillage

Fertilizer applicators

Fertilizer applicators, tractor mounted

Fertilizer applicators, trailer mounted

Chemical applicators

Drills and seeders

Planters

Harvesting equipment

Mowers and balers

Land forming or shaping equipment

Hauling equipment

Other implements

Cotton equipment

Tobacco equipment

Peanut Equipment

Sugarbeet Equipment

Sprinkler Irrigation Systems

Gravity-flow Irrigation Systems

Plows

Chisel Plow (1)

A primary tillage machine either integral or trailing that consists of three or more ranks or bars upon which either rigid or spring trip standards are attached. The shanks are usually spaced 12 inches apart overall. A variety of ground engaging tools may be used ranging from narrow points or shovels to 18 inch wide sweeps. Chisel plows may be used to a maximum depth of 10 inches.

Coulter-plow (2)

A multi-purpose machine with one or two ranks of plow coulters, usually smooth or notched rim, followed by two or three ranks of chisel standards with a wide selection of ground engaging tools. The main purpose of the coulters is to cut through the crop residue in order to reduce plugging of the chisel standards. This is a primary tillage tool.

Deep Ripper (3)

Similar to v-ripper (code 8). For deep plowing or breaking.

Disk Plow (4)

A machine doing essentially the same work as a moldboard plow but which has from one to ten large disks set at an angle to the direction of travel. The disks are mounted on individual beams or shanks. It is used in hard ground and where a regular moldboard plow does not scour well.

Moldboard Plows (Regular, Two-way) (5 & 6)

A machine with one or more (up to 18) curved metal plates (bottoms or moldboards) that engage the soil to a depth of up to 12 inches. The curvature of the moldboard causes the soil or furrow slice to be completely inverted. This action pulverizes the soil and buries almost all of the crop residue or stubble. Moldboard plows may be made with one set of moldboards or with two sets. The two-way plow has two sets of moldboards, one left-handed and the other right. This allows the plow to be rotated so that all of the soil can be turned in the same direction and eliminate dead furrows. Moldboard plows are often used in irrigated areas to help maintain the level and slope of a field for furrow or bench irrigation.

Stubble-mulch Plow (Noble Blade, Sweep, Hoeme McKeroy Plow) (7)

Usually a tool bar or trailing machine with one or more standards that can be fitted with sweeps of various angles of penetration and several widths. A sweep does not turn the soil over, it slightly mixes soil and stubble.

Subsoil Plow, Subsoil Chisel, V-ripper (8)

A heavy tillage tool either toolbar mounted or trailing having from one to 13 heavy shanks often with a parabolic curve. These shank standards usually are fitted with replacement chisel points and penetrates the soil up to 22 inches. The standards can be fitted with various auxiliary tools such as knives or lister bottoms. This allows the machine to deep-rip the soil and form beds at the same time.

Disks

Disk-chisels (Mulch-tiller) (9)

A multi-purpose machine; a single disk followed by two or more ranks of chisel shanks.

Offset Disk, Light or Heavy Duty (10 & 11)

A simple offset disk is the equivalent of one side of a tandem. All disks in each rank throw the soil in the same direction. Offset disks may vary in size from five feet to 35 feet or larger. The larger offsets have several disk units in each rank to gain flexibility. Disk blades may be cone-shaped or spherical and have diameters as large as 30 inches for extra heavy duty conditions.

One-way (Disk-tiller) (12)

A machine used mainly in the plains and northwestern areas as a primary tillage tool. It consists of a series of spherical disk blades, 20-60 inches in diameter, set on a single solid shaft that throws the soil in one direction. Sizes range from ten to twenty feet with multiple hitches available. One-ways have been replaced to some extent by chisel plows in many areas.

Single Disk (13)

Two sets of disk blades that throw the soil out from the center when angled. Size may vary from five to 40 or more feet. Used primarily as a secondary tillage tool. Most single disks have been replaced by tandems, offset or chisel plows.

Tandem-disk (Regular, Plowing or Heavy Duty) (14 & 15)

Two gangs of disk blades configured in tandem; the front set throws the soil outward and the rear set throws it inward. The cut width may vary from 5 feet up to 35 or more feet. Spacing between blades may vary widely with 7, 9, and 11 inch spacing most common. The diameter of each blade may range from 16 to 24 inches. Each blade may be either cone-shaped or spherical. The cone-shaped blades are used in heavy soil conditions for primary tillage. They may be integral, 3 point hitch, trailing, double tandem or other configurations.

Paraplow (16)

An implement with narrow shafts with flaps at the bottom which create a nearly undisturbed surface layer while loosening and lifting a 20 inch subsurface furrow. It provides hardpan penetration like a moldboard plow, while maintaining surface residue similar to no till.

Cultivators

Field cultivator (regular digger, danish tined, swedish tined, s-tine cultivator, vibra-shank harrow, lilliston tiller) (21)

An Implement Similar to the Chisel Plow Except of Lighter Construction and with the Shanks Closer Together, about Six Inches Overall. The shanks are usually of a spring steel, vibra-shank type. Ground engaging tools may be points, shovels or sweeps. Size may range as wide as 70-80 feet. Used primarily as a secondary tillage machine.

Furrow-out Cultivator (22)

A row cultivator of the shovel variety where a fairly large shovel is placed to operate between the rows and open a furrow for irrigation. Thus, weeds are cultivated out and irrigation ditches are formed in one pass.

Rotary Hoe (23)

A series of curved spider wheels attached either to a solid shaft or in segments of two to four wheels for flexibility. Usually used to kill small weeds in summer fallow or row crops and sometimes as a wind erosion stop-gap. Rotary hoes are usually pulled at speeds of 6 mph and above and may be hitched to cover up to 50 feet or more.

Row Cultivator (Shank, Rolling, Lister, Disk) (24 & 25)

An implement with shanks arranged in such a manner that rows of crops can pass through without damage while the weeds are removed. The shanks or standards may be fitted with shovels, disks or spider-wheels set at an angle to the direction of travel. Size can vary from one to twenty-four rows. Most are rear tool-bar or front mounted on tractors.

Field Cultivator, Heavy Duty (Duckfoot Cultivator) (26)

Same as regular field cultivator except heavier construction and may have "duckfoot" shanks.

Marker (27)

An implement similar to a light row cultivator, that makes a shallow furrow at the designated row width for a planter to follow.

Fallow Master (28)

A sweep type implement with 20" shank spacing and 26" sweeps that vary in width, usually between 20' and 50'. The equipment is similar to a field cultivator (21) and heavy duty field cultivator (26), but these equipment have narrower shank spacing and sweep widths.

Harrows (Drags)

Heavy harrow (30)

Field conditioner, seed bed conditioner, soil conditioner, scratcher (31)

A Lightweight Wheeled Tillage Tool, Usually Two or Three Bars or Ranks of Spring Steel Teeth Spaced 12-18 Inches Apart. Tine-tooth attachment available 30-60 feet wide.

Finishing harrow (harrogator) (32)

Spiral Cutting Blade Reels Followed by Spike Teeth or Field Cultivator Shanks, (2 or More Ranks) Possibly Another Rank of Spiral Knives and a Smoothing Board of Wood or Steel.

Flex-tine tooth (coil line, multi-weeder) (33 & 34)

Usually 5.5 to 6 Foot Sections of Five Bars or Ranks with Spring Steel Teeth Usually 5/16 Inches in Diameter and about 10 Inches Long. Teeth are formed in a spring coil and bolted to the bar, or set in rubber and bolted to the bar. Usually 50 teeth per 6 foot section. At field speed, 3.5 - 5 mph, the tines vibrate in a circular motion to break clods, smooth seedbeds and kill weeds.

Rail, Pipe, Log, Plank, Etc. (35)

Make shift device used alone or with another implement to smooth soil or crunch clods.

Rod Weeder (36)

A steel, reverse rotating rod usually square, 7/8 or 1 inch in diameter, on shanks. Power for rod rotation is either ground driven or by hydraulics. Sections are normally 10 ft. wide and may range up to 80 ft. Used in summer fallow areas and on relatively rock-free ground.

Roller Harrow (37)

Two ranks of packer rollers (smooth "vee", toothed "vee", crow foot, sprocket, birdfoot, or serrated type) with two or more ranks of chisel- type teeth in between. Packer roller wheels turn independently of each other. Ten to 16 feet in size.

Spike Tooth Harrow (38)

Usually 5-6 foot sections of five bars or ranks with 7-8 steel spikes or teeth per bar. Angle of spikes is adjustable. Can be hitched up to 8 or 10 sections in one unit.

Spring Tooth Harrow (39)

Usually built in sections, 3-4 feet in width. Some wheeled models have a ten foot center section with extension wings up to a 57 feet. Teeth are spaced 12 inches on 3 bar models and 18 inches on 4 bar models. Spring steel teeth are about 1.75 inches wide with a single or double curve. The wheel-less, drag models have metal skids for transport and depth control.

Powered Spike Tooth Harrow (40)

A harrow with spike tine teeth in two rows that move back and forth. Powered by PTO.

Bedder shapers

Bedder-shaper (Crowder) (41)

A bedder with a forming device that flattens or shapes the bed in preparation for seeding. Shapers are sometimes used as single toolbar implements.

Bed-shaper, Bed Former (42)

Similar to bedder-shaper (coded 41)

Disk (Hipper) (43)

An implement usually 2-8 rows used to make beds for seeding using disk blades. Can also be used to break or bust the beds.

Disk (Row) (44)

Similar to disk (hipper) coded 43.

Float (45)

A device, usually homemade, used for minor rough leveling. Soil moving bars or blades may be made of wood or metal.

Lister (Middle Buster or Breaker) (46)

Same as bedder but lister (plow type) bottoms. Different types of bottoms available (hard land, general purpose, soft land and planter sweeps).

Rotovator-bedder (47)

Same as lister bedder except uses PTO powered knives to form beds.

Seed Bed Roller, Flat Roller (48)

Flat or concave rim wheel rollers. Packs soil in rows immediately before or after planting.

Subsoil-bedder, Subsoiler (Ripper-hipper, Tiller, No-till Disk Bedder) (49)

Any type bedder either attached to a subsoil shank or as a separate bedder attached behind a subsoiler shank.

Discovator (50)

A multi-tillage machine made up of disk blades, a drag, and a harrow.

Packers

Culti-packer (Pulverizer) (51)

An implement with a series of heavy crowfoot, inverted v-rim or serrated rim wheels running independently on a shaft. May be a single or tandem unit. Main uses of this implement are to firm the seed beds and reduce the size of clods and lumps of soil.

Plow Packer (52)

A packer designed to be pulled behind a moldboard plow with or without a drill. Packer unit may be spiral rod, crowfoot, inverted v, cogged or other.

Roller Packer (Smooth & Flat) (53)

Smooth roller or flat wheels on a shaft used to firm seed bed and crush clods.

Miscellaneous tillage

Landall, Do-all, Till-all, Mix-n-till (61)

Multi-tillage machine made of up to 2 to 4 ranks of shovels, disks, coulters, blades or basket rollers. Usually disk blades, followed by shovels, and then reel and spikes or basket rollers.

Mulch-treader, Picker-treader, Skew Treader (62)

Implement with tined wheels on a gang shaft angled like a section of a tandem or single disk. Used as a separate machine or an attachment behind a stubble mulch plow. Tined wheels resemble rotary hoe wheels.

Roto-tiller (Rotary Tiller) (63)

A series of bolo or slicer blades attached to a rotating shaft. Used as a primary or secondary tillage implement. Can be used in tandem with planting equipment as a minimum-till system. Mounted motor or PTO powered.

Roterra, Lely (64)

A machine with several sets of counter-rotating vertical tines that rotate with an overlapping action. It stirs the soil without turning it over. With attachments, tillage, planting, pesticide application and incorporation are possible in one trip.

Sand-fighter (65)

An implement used as an aid in controlling wind erosion. Essentially a shaft or bar with a frame and bearings to allow the shaft to rotate. Blades or teeth, about 10 inches long and 2-3 inches wide, are welded to the shaft. The teeth enter the soil as the machine is pulled forward, roughening the soil. Sizes range up to 24 rows.

Soil Finisher (Finishing Tool, Mulch Finisher, Tri-tiller, Task Master) (66)

A multi-tillage machine made up of disk blades, followed by field cultivator shanks, and ending with some type of harrow or drag.

Fertilizer applicators

Aerial, Fixed or Rotary Wing (71)

Airplanes or helicopters with fertilizer distribution attachments. Commonly used in rice production, but also used for other crops where field sizes and the surrounding area permits.

Attachment to Implement (72)

Usually drop dry-type attached to a drill or planter but may be liquid or gas type that is injected into the soil.

Manure Spreader (73)

Any type; apron with rear beater, flail or liquid spreader with pump spreader.

Self-propelled (74)

A self-powered implement; may spread dry or liquid fertilizer, usually dry.

Truck Spreader (75)

Any applicator mounted on a truck. These usually are dry broadcast-type spreaders.

Fertilizer applicators, tractor mounted

Anhydrous (76)

Supply tank with chisel shanks and injectors on tool bar. Not commonly used.

Dry (77)

(Includes lime/gypsum applicators) three point hitch mounted: single or dual spinners with supply tank. Pneumatic: air delivery system through hoses to soil surface or below surface with hollow hoe shanks. The supply and distribution system is mounted on a tool bar. Drill-type: drill type hopper with agitator and metering device to drop material on the surface of the soil.

Liquid (78)

Usually spray nozzles or injector units on a tool bar.

Fertilizer applicators, trailer mounted

Anhydrous (79)

Usually a 2 or 4 wheel supply trailer feeding a chisel plow with injector tubes on each shank. Can be high or low pressure type.

Dry (80)

(Includes lime/gypsum applicators) - distributes the material by revolving spinner, or a pneumatic system through tubes to soil surface or below; also the agitator metered bottom drop drill-type.

Liquid (81)

Various configurations of two or four wheel trailers. Most use a boom with spray nozzles to surface or foliage apply the material. PTO or mounted engine powered.

Chemical applicators

Aerial (Fixed or Rotary Wing) (91)

Airplane or helicopter with tanks and a spray boom to apply pesticides at very low altitudes.

Attachment to Implement (92)

Granular or liquid spray unit attached to a tillage, cultivating or seeding implement.

Large Self-propelled or Truck (93)

Large converted truck or specially built machine to spray liquid or apply dry chemicals.

Motorcycle or Atv Sprayer (94)

A small spray unit mounted on a 3-wheel motor vehicle. Spray with a boom, with hand held guns or wiper type. Mostly used for spot spraying.

Small Self-propelled Sprayer (Spra-coupe, Hi-cycle) (95)

Light weight self-propelled implement, (spra-coupe) used on field crops such as wheat or barley.

Small Truck (Pick-up with Slide-in Unit, Skid Mounted) (96)

Spraying mechanisms with boom, wiper, recirculating, micro-spray/dry spinner or tube delivery.

Tractor Mounted (97)

Supply tanks and spreading mechanism mounted on a tractor. Material may be spread by boom, recirculating sprayers, rope or wick wipers, row type nozzles or air blast. Facilitates spraying while cultivating.

Trailer Mounted (98)

Supply tanks and spreading mechanism mounted on a trailer pulled by tractor or other power vehicle. All types of spreading mechanisms.

Drills and seeders

Aerial Seeding (101)

Seeding by either fixed or rotary wing aircraft. Seeding often in rice areas and occasionally with other crops.

Broadcast Seeder (102)

Spinner type seeder, either tractor mounted (PTO or electric) or trailer mounted (wheel driven).

Drill-air Delivery (103)

Same as conventional drill except seed is taken from a supply box through a manifold and blown by air through tubes to the seeding points.

Grain Drill (Lister Disk) (104)

Uses lister bottoms, shovels, or hoes to prepare soil for seeds.

No-till, Minimum-till Drill, Zero-conventional (105)

Usually fluted or ripped coulters that open up narrow prepared soil areas for the single or double disk drill shoes to deposit the seed in otherwise untilled soil. Herbicide attachments are available. Modified chisel plows with coulters are also used.

Grain Drill (Plain) (106)

Seeder with seed box, metered seed feed through tubes to single or double disk openers. Tubes spaced 7", 9" or 10". May have fertilizer attachment.

Press Drill (Disk or Hoe) (107)

Drill with disks or lister bottoms with press wheels to firm soil around seed.

Planters

Bedder-shaper (111)

Plants upon a bed formed by disks or lister bottoms and shaped by a metal smoothing form into a flat bed. Used mostly in the south for cotton, peanuts and sorghums.

Lister-bedder Planter (112)

Planter mechanism either plate type or plateless, air or otherwise actuated. Seed is deposited in furrows made by lister bottoms either hard land or soft land type (may be equipped with fertilizer, insecticide, and/or herbicide attachments).

No-till, Minimum-till (113)

Fluted, rippled, or smooth coulters and/or subsoil shanks used to disturb the untilled soil in a narrow band for the planter units to deposit seeds. Usually used in conjunction with fertilizers, herbicides and insecticides.

Conventional, Row Crop Planter, All Crop Planter, (114)

Plate or plateless metering devices that drop seed through a boot or shank in a seed furrow or bed opened by a shoe or disk. Seed is covered by a press wheel. Planters may be trail type - wheel carried or tool bar mounted. Widths range from two to twenty-four rows.

Air Delivery (115)

Same as conventional planter except seed is taken from a supply box through a manifold and blown by air through tubes to the seeding points.

Planter, Ridge till (116)

Same as no-till planter except with sweeps or disk blades for cutting the top of preformed ridges and depositing the residue between the rows.

Harvesting equipment

Combine, All Types (121 - 125 & 128 - 132)

Self-propelled or PTO implement for harvesting standing crops or gather crops from windrows or swaths. It separates the crop from the straw, stalks, cobs and husks, cleans and elevates it into a holding tank for immediate or eventual delivery into a truck, wagon or grain cart. Self-propelled units may have 2 wheels, 4 wheels or track drives and can be set up for rice, barley, peanuts, beans, all small grains, and soybeans. They may have rigid or flexible cutter bars, bat or pick-up reels or windrow pickups, and may be fitted as hillside, sidehill or level land machines. Special barley and other row crop heads are available.

Windrower-swather (PTO & Self-propelled) (126, 127)

A machine, either self-propelled or PTO, that cuts the standing hay or ripened grain with a reciprocating sickle aided by a revolving reel of four or more bats or sails. Cut material is deposited on a platform, either draper or auger type. The auger or drapers move the cut material either to the end or the center of the platform where it is discharged onto the ground in a "windrow" or "swath". The swather may have metal and/or rubber rollers for the hay to pass through. This "conditions" or "crimps" the hay to allow more rapid and uniform curing.

Corn Picker (133)

A corn harvesting machine, usually PTO powered, that removes the ears from the corn stalk.

Hand harvest (134)

Picked by hand, no machines.

Mowers and balers

Amish Harvest (141)

Non-motorized device for harvesting hay.

Bale Wagon (PTO & Self-propelled) (142, 143)

A wide range of wagons or trailers from the simple, wide flat bed used to haul bales to a sophisticated, self-propelled (or PTO) unit that collects and stacks bales. This stacking ability allows the baler to be unloaded by power to form a compact stack of bales. Some units also can pick up stacked bales for transport.

Bale Loader (144)

A device, either ground or engine driven, that picks up the bales from the ground and deposits the bales onto the truck or trailer as it moves down the windrow of bales. Largely used for small rectangular bales but models for the large round bales are available.

Balers (PTO & Self-propelled) (145-148)

Balers pick the hay or straw up from a windrow and compact it into either round or square bales which may be small (40 - 125 pounds) or large (1000 to 2000 pounds). Balers may be motor mounted, PTO or self-propelled.

Rotary Mower-cutter, Chopper, Bush Hog (149)

A machine used largely to cut weeds and roadsides but may be used to harvest a crop for hay or to shred crop residue. Sizes range from 4 to 20 or more feet of cut when hitched in multiple units. Available in integral, semi-mounted and pull-type. Mostly PTO powered. Cuts by means of a rapidly rotating blade either rigid or flexible.

Mower Conditioner PTO (150)

Consists of a cutterbar, a reel, a pair of full width conditioning rolls, and a deflector. Width ranges from 7 to 12 feet.

Mower Conditioner, Self-propelled (151)

Self-propelled machine, similar to mower conditioner (code 150).

Disk Mower (152)

A mower with a number of cutting blades on rotating disks mounted on a bar. The disks are driven from the bottom by a series of flat gears.

Drum Mower (152)

A series of rotary drums or cylinders with blades attached. The drums are driven by an enclosed gear or chain train from the top. PTO powered.

Flail Mower Shredder (Rotary Chopper) (153)

A machine that mows, cuts or shreds crops by means of steel blades or knives on a horizontal rotating shaft or drum. The high speed of the drum (about 1850-2000 rpm) cause the hinged knives to cut or shred the crop. Can be used to harvest hay or to shred crop residue. Ranges in size from 5 to 15 feet or more.

Sickle Mower (154)

A machine with a reciprocating sickle running in a cutter bar with guards and ledger plates. Mowers may be 3 point mounted, semi-mounted, belly mounted or trail type. Usual sizes are 7 to 9 foot sickle or cutter bars but some heavy cutters are only 5 foot.

Dump-rake (155)

A series of large "c" shaped teeth attached a bar or frame. This frame can be raised or lowered alternately to pick up the hay and "dump" it into windrows. Either ground or PTO powered. Sizes range from 8 to 32 or more feet.

Rake Side Delivery (156)

A rake with a four or five bar reel and set at an angle to the direction of travel. The reel rotates, either PTO or ground driven, in the opposite direction of the carrier or tractor wheels. This motion along with the angle sweeps the crop into a windrow on the left or the right. Raking swath is 7 to 9 feet.

Wheel-rake (157)

A series of overlapping wheels, four to five feet in diameter with spring teeth on the rim of the wheels. The wheels are mounted on a bar or frame at 10 to 60 degree angles to the direction of travel. The wheels are turned by contact with the crop and the ground. The 5 wheel rake covers about 16 3/4 feet and the 7 wheel about 20 feet.

Stacker Mover (158)

A forklift-like device for moving hay stacks.

Stacker Automatic (159)

A device for compacting hay.

Front End Loader (160)

Small bulldozer with scoop or bucket in front.

Round Bale Mover (161)

A prong-like attachment to a tractor or other equipment used to move round hay bales. The tractor normally backs the prong into the bale, lifts the bale off of the ground using hydraulic or PTO assist, and moves the bale.

Land forming or shaping equipment

Backhoe (171)

Large shovel or scoop operated with a mechanical arm. Often used for ditch digging.

Disk Border Maker (172)

Set of two single disks or two sets of 3 or more disks used to make borders for irrigation. Can be reversed to tear down borders. Usually mounted on a tool bar.

Ditch Closer (173)

A machine usually mounted on a 3-point hitch or on wheels pulled behind a tractor that pulls dirt together to fill in an irrigation or drainage ditch.

Ditcher (Vee Rotary) (174)

A machine either with a vee shaped blade or a rotary auger or fan that is used to cut field irrigation or drainage ditches. Either 3-point or trail mounted.

Levee Plow Disk (175)

A machine used to throw up levees or ridges between rice fields. Most machines have two sets of disks, each with one to three disk blades that throw the soil up into a levee. Most disks are tool-bar mounted. Disk sets can be reversed to tear down the levees.

Quarter Drain Machine (176)

A machine mounted on a tractor that is used to clean out the quarter drains in the field. This operation is performed several times a year to keep open the drains leaving the field.

Rear Mounted Blade (177)

A curved blade, 5 to 8 feet long and 15 to 24 inches deep, attached to the 3-point hitch of a tractor. Most can be angled sideways and up and down from ground level either manually or hydraulically. Used for ditching, back filling, scraping and rough leveling.

Corrugator (178)

A device that produces vee shaped indentions in the soil to aid in the distribution of irrigation water. The units may be mounted on a row cultivator or on a tool-bar.

Land Plane Leveler (180)

A machine used primarily to level land for irrigation or to improve drainage. This machine usually has two or more sets of wheels on a long wheel-base supporting one or more bowls, blades or baskets that are intended to carry soil from high points to low areas in a field.

Laser Planer (181)

Similar to land plane leveler (coded 180) which uses a laser beam for precise leveling.

Hauling equipment

General Purpose Wagon or Cart (194)

Wagon with or without sides used for many purposes such as hauling grain, sugarbeets, vegetables, and fruit, among other commodities.

Hay Wagon (195)

Flat-bed wagon used to haul hay.

Gravity Wagon (208)

Wagon with sloping sides that direct grain to an opening at the bottom.

Grain Cart with Auger (209)

Cart with sloping sides that direct grain to an auger at the bottom. Often used to collect grain from a harvester in the field and load the grain in a truck.

Other implements

Burn Buggy (191)

Homemade device used to burn after-harvest residue in rice production.

Chaff/straw Saver (192)

Attachment pulled behind a combine that bunches or stacks chaff and/or straw as it comes from the combine. The small stacks are left in the field for later retrieval.

Electric-discharge Weed Killer (193)

A machine that produces an electric charge which uses the weed plant to complete an electrical circuit to the ground. Current causes plant cells to rupture, killing the plant. Weeds must be taller than the plants for the method to be feasible. Utilizes a 50 kw generator powered by a 1000 rpm - PTO on a minimum 120 hp tractor.

Off-field Thresher (196)

Stationary threshing machine.

Rock Picker (197)

Heavy duty machine with pick-up teeth or heavy duty rotating reels that deposits rocks and stones from "1" diameter to 500 pound boulders into a tank or bucket for removal from a field. Some rock pickers are equipped with elevators that deposit the rocks directly into a truck or trailer.

Rock Windrower or Rock Rake (198)

A heavy side-delivery or wheel-type rake that moves stones into windrows in order to speed up the process of rock picking.

Rodent (Gopher) Killer (199)

Machine with a sub-soil shank that allows poisoned bait to be injected into soil at the same depth as gopher burrows or runways. Fields are usually covered in a criss-cross pattern.

Roller Groover (200)

Pull-type device that forms ditches in the soil. Used in preparing rice acreage for seeding.

Rubber-wheeled Weed Puller (201)

A series of paired rubber-tired wheels set touching one another and rotating in opposite directions. As the machine moves forward at a level above the crop but below the weed tops, the weeds are caught by the spinning wheels and are pulled out

.

Shredder Flail (202)

Same as flail mower. See 153.

Shredder Rotary (203)

Same as a rotary mower. See 149.

Silage Harvester (204)

Similar to forage harvester for chopping fodder.

Stalk Shredder, Cutter (205)

A rotobeater with hard metal rods or cutting blades attached to a revolving horizontal shaft.

Swath Roller (206)

Packing attachment about 8 ft. wide; hitches back to swather.

Tractor or Truck - No Attachments (207)

Tractor - a self propelled vehicle with a gasoline or diesel engine used to supply power to other machines in one of four ways (1) pulling at the drawbar; (2) rotary power from the power-take-off; (3) hydraulic power; and (4) electric power (direct current from a generator).

Truck - a sturdy, motorized vehicle primarily used for hauling.

Cotton equipment

Chopper, Stalk Cutter (211)

A machine with a ground driver reel with cutting blades, either angled or spiral, used to chop or cut cotton or other heavy stalks. Also does minor soil preparation.

Module Builder (212)

A four sided form having an openable rear door. It has a traversing, mechanical compactor and compressor for placing cotton into high density stacks.

Gleaner (213)

A cotton harvesting machine, usually ground driven or PTO, pulled by a tractor that gleans or picks up loose cotton left after picking or stripping or perhaps before harvest began.

Picker, Mounted, Sp (214, 215)

A 2 or 4 row implement usually tractor mounted or self-propelled for picking mature cotton from bolls through an intricate arrangement of spindles and doffers. It deposits the cotton by means of an air stream into a holding basket. When full, the basket is emptied into a trailer or cart for delivery to a gin or module builder. Several trips may be made over a ripening field.

Rood Machine (216)

Cotton harvester which retrieves cotton from the ground through such means as air suction.

Stripper, Mounted, Pull Type, Sp (217 - 219)

Made as self-propelled, PTO, pulled, or tractor mounted machines that pull or strip all of the bolls from the plant at one time over. Stripping is accomplished by rotating brushed and rubber flaps. Strippers may be 2 - 6 rows or a platform type in some instances.

Trailer (220)

Used for transporting seed cotton from the picker or stripper to the gin.

Tobacco equipment

Mechanical Harvester (Combine), Multi-pass (251)

A self-propelled or tractor drawn machine that is used more than 1 trip through a field and mechanically removes 4 to 6 leaves per plant per trip across the field.

Mechanical Harvester (Combine), Last-over (252)

An automatic harvester that is designed to mechanically remove the remaining leaves in a last pass through the field.

Mechanical Harvester (Combine), Once-over (253)

An automatic harvester that is designed to mechanically remove all the leaves from the stalk in one pass through the field. This machine is sometimes referred to as a stripper.

Primer, Field Box Filling (254)

Any of several different types of self-propelled or tractor drawn machines that allow workers to sit and prime tobacco. Workers in the field place tobacco leaves in big boxes used for curing.

Primer, Field Racking (255)

Any of several different types of self-propelled or tractor drawn machines that allow workers to sit and prime tobacco. Workers in the field place tobacco leaves in bulk racks used for curing.

Primer, Field Looping on Sticks (256)

Any of several types of self-propelled or tractor drawn machines that allow workers to sit and prime tobacco. Field workers take small bunches of tobacco and place the butt ends at both sides of tobacco sticks and then wrap twine around the bunches of tobacco until the sticks are filled.

Primer, Other (257)

Any of several different types of self-propelled or tractor drawn machines that allow workers to sit down and prime tobacco. Workers in the field or at the barns place tobacco for curing in other than machines 254, 255 and 256 above.

Trailer, Harvest (258)

A tractor or truck drawn trailer used to carry tobacco from the field to the barn.

Transplanter, Regular (259)

A power drawn transplanting machine is operated by a driver and carries 2, 4 or 8 persons on "setters". The persons on setters alternate in placing or guiding the plants into the mechanism which spaces them at the proper intervals in the row. The machine opens the furrow, dumps a measured quantity of water, sets the plant and draws the soil about the roots of the plants.

Transplant Digger, Mechanical (260)

A power drawn machine pulled across the plantbed that will dig transplants, shake off loose soil from their roots and stack them neatly in a box so that they can be fed into mechanical transplanters.

Tying Machine (261)

A machine that loops tobacco with an automatic tying or sewing machine. The tobacco leaves and sticks are placed on a moving conveyor belt which passes them under a sewing head. The leaves are attached to the stick by stitches at the butt end.

Topper, 2 Row (265)

A machine which removes the blossoms and sometimes the top leaves of the burley tobacco plant from two rows in one pass.

Topper, 4 Row (266)

A machine which removes the blossoms and sometimes the top leaves of the burley tobacco plant from four rows in one pass.

Mechanical Harvester (PTO), Multi-pass (267)

Mechanical harvester (PTO), last-over (268)

Mechanical Harvester (PTO), Once-over (269)

Transplanter, carousel (270)

Peanut Equipment

Combine, PTO (281)

A Peanut Harvesting Machine That Picks up the Windrow of Peanuts Left by the Digger-shaker and Separates the Peanuts from the Vines. The peanuts go into a holding tank. Only PTO models are available. Peanut combines are used only on peanuts.

Digger-shaker (282)

A machine, usually 2 or 4 row, that lifts the peanuts, vine and all, by means of long angled knives, from the soil. The soil is shaken from the vines with reel or chain type shakers and vines are deposited in a windrow.

Shaker-inverter (283)

Same as a digger-shaker except vines in windrow are inverted so the peanuts lay on the vines.

Reshaker-conditioner (284)

A machine used to fluff-up the windrows to enhance drying or conditioning.

Vine Cutter (285)

A device for cutting peanut vines from roots.

Wagon (286)

A wagon for hauling peanuts; can be used for drying peanuts.

Sugarbeet Equipment

Beater (231)

An implement used to remove the beet leaves before harvesting. Some models also chop the beet leaves for quicker decomposition. This implement is not used to save tops, however, a scalper, which uses knives or rotating disc to remove the crown core and bud from the top of the beet, may or may not be attached to the beater.

Harvester (regular or direct) (233)

An implement that digs and lifts beets from the ground, directly loading them into a cart of trailer in the field.

Harvester (tank) (234)

An implement that digs and lifts beets from the ground, directly loading them into a large storage tank attached to the machine. When full, the tank is emptied onto carts or trailers.

Harvester (other) (235)

Any other implement that digs and lifts beets from the ground excluding a regular, direct, or tank harvester.

Thinner (mechanical, electronic) (236)

An implement that use flexible toothed or knife weeders that are electronically activated to thin beets. This is done after the beets have grown to a stand - after the plants have developed from 8 to 10 leaves.

Thinner (mechanical, random) (237)

An implement that cultivates and skips measured distances to thin beets. This is done after the beets have grown to a stand - after the plants have developed from 8 to 10 leaves.

Planter (238)

An implement that uses seed plate metering devices (mechanical or air activated) to drop beet seed through a boot or shank into a seed bed opened by a shoe or disc.

Topper (topsaver) (239)

An implement that uses knives or rotating disc to remove tops, crown, core, and bud from the top of the beet. This implement is used to save tops and may not include a windrower attached, where the tops are windrowed for pick-up later or loaded by conveyer belt into a truck.

Sprinkler Irrigation Systems

Hand-move Sprinkler System (1)

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 Sprinkler Systems (2)

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. Requires no labor to move the system to a new location once established for the irrigation season. Adapted to most crops, soil types, topography, field sizes and shapes.

Permanent Sprinkler System - *Use solid set sprinkler system (2)*

Buried pipe system with only the risers and sprinklers above ground. This system has the same characteristics as the solid-set sprinkler system, except that the labor requirements are lower.

Side-roll or Wheel-line Sprinkler Systems (3)

A wheel-move, lateral-line system which moves as a unit in fixed increments (irrigation sets) across the field. The system is powered by a small gasoline engine that is manually operated. The system is stationary while irrigation is taking place. 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. Wheels are generally spaced 40 feet apart and are 5-7 foot in diameter, with the main system pipe serving as an axle in the middle of the wheel. 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 - *Use side-roll system (3)*

Wheel or skid, lateral-line system which is end-towed via tractor to new locations in the field. The system is stationary while irrigation is taking place. System is designed for reasonably flat or slightly rolling, rectangular or square fields with an alley through the center of the field. Designed for hay and pasture irrigation, the system may be used on some row crops and orchards.

Carousel Sprinkler-traveler System - *Use side-roll system (3)*

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.

Center Pivot or Linear Move with Sprinklers on Main Line (4)

Self-propelled, continuous-move sprinkler system that either travels in a circle (center pivot) or laterally (linear move) across a field. Sprinklers are located **directly on** the system's main water-supply pipe, which is supported by A-frame towers. Some circle systems have features that provide coverage of most of the corners on a square field. Some systems may be towed to adjacent fields to increase system use by irrigating a different crop with different timing of water needs. Water is delivered to a fixed center point for center-pivot systems and by hose or supply ditch for lateral move systems. Center-pivot systems have been developed for areas from 40 to 240 acres, but most systems irrigate 128-132 acres of a square 160 acre field. Lateral moves require a square or rectangular field of 40 to 240 acres. These systems may be adapted to most crops, soil types, and level to gently-rolling topography. Systems with sprinklers **directly** on the main water-supply line will tend to be **medium to higher pressure** (above 30 psi) and use impact sprinklers.

Center Pivot or Linear Move, with Sprinklers below the Main Line, but More than 2 Feet above the Ground (5)

Self-propelled, continuous-move sprinkler system that either travels in a circle (center pivot) or laterally (linear move) across a field. Sprinklers or sprayers are located on drop-tubes or booms suspended **below** the system's main water-supply pipe, but **more than 2 feet above the ground**. This includes most standard drop-tube sprinkler systems. Some circle systems have features that provide coverage of most of the corners on a square field. Some systems may be towed to adjacent fields to increase system use by irrigating a different crop with different timing of water needs. Water is delivered to a fixed center point for center-pivot systems and by hose or supply ditch for lateral move systems. Center-pivot systems have been developed for areas from 40 to 240 acres, but most systems irrigate 128-132 acres of a square 160 acre field. Lateral moves require a square or rectangular field of 40 to 240 acres. These systems may be adapted to most crops, soil types, and level to gently-rolling topography. Systems with sprinklers **below** the main water-supply line will tend to be **lower pressure** (below 30 psi), with spray nozzles rather than impact sprinklers.

Center Pivot or Linear Move, with Sprinklers less than 2 Feet above the Ground (6)

Self-propelled, continuous-move sprinkler system that either travels in a circle (center pivot) or laterally (linear move) across a field. Sprinklers or sprayers are located on drop-tubes suspended **below** the system's main water-supply pipe and are located less than 2 feet above the ground. This includes low pressure precision application systems (LEPA) and other below-the-crop-canopy systems. Some circle systems have features that provide coverage of most of the corners on a square field. Some systems may be towed to adjacent fields to increase system use by irrigating a different crop with different timing of water needs. Water is delivered to a fixed center point for center-pivot systems and by hose or supply ditch for lateral move. Center-pivot systems have been developed for areas from 40 to 240 acres, but most systems irrigate 128-132 acres of a square 160 acre field. Lateral moves require a square or rectangular field of 40 to 240 acres. These systems may be adapted to most crops, soil types, and level to gently-rolling topography. Systems with sprinklers **suspended to within 2 feet of the ground** tend to be **very low pressure** (below 15 psi) and use spray nozzles and bubblers. Some units may run water directly on the ground using a cloth-like extension attached to the drop tube.

Big Gun (7)

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 across a field 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. Three specialty-type big-gun systems are defined below, including a self-propelled gun traveler system, a reel-type hose pull system, and a reel-type cable pull system.

Self-propelled Gun Traveler - *Use big gun system (7)*

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 high pressure, greater than 60 psi.

Reel-type Hose Pull - *Use big gun system (7)*

Single, large gun-type sprinkler on a carriage. A flexible, but noncollapsible hose is attached to a large reel at one end of the field. The carriage and sprinkler is 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 high pressure, greater than 60 psi.

Reel-type Cable Pull - *Use big gun system (7)*

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 to operate on since the hose is pulled behind the unit. Systems are high pressure, greater than 60 psi.

Low-flow Irrigation System (Drip, Trickle, Micro Sprinkler) (8)

Low-pressure systems 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, and alternatively, tubing may be installed below ground with emitters on risers above ground. While used primarily on trees, vines, and vegetable crops, these systems are only 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 wetted 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.

Gravity-flow Irrigation Systems

Siphon-tube from Unlined Ditches (10)

System uses short curved tubes, usually aluminum or plastic, to siphon water onto a field from an unlined ditch across the head of the field. Siphon tubes are curved to fit over the ditch bank and most range from 1 to 3 inches in diameter and from 3 to 5 feet in length. Water, once on the field, may flow down furrows, between borders or dikes, or in corrugations. The unlined ditch is formed with mechanical operations using only the soil on the field. The ditch may be reformed each year or reused with maintenance.

Siphon-tube System from Lined Ditches (11)

System uses short curved tubes, usually aluminum or plastic, to siphon water onto a field from a lined ditch across the head of the field. Siphon tubes are curved to fit over the ditch bank and most range from 1 to 3 inches in diameter and from 3 to 5 feet in length. Water, once on the field, may flow down furrows, between borders or dikes, or in corrugations. The ditch may be lined with concrete, plastic, clay, or other nonporous material. The ditch is permanent and is reused each year.

Portal- or Ditch-gate System from Unlined Ditches (12)

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. Water, once on the field, may flow down furrows, between borders or dikes, or in corrugations. The unlined ditch is formed with mechanical operations using only the soil on the field. The ditch may be reformed each year or reused with maintenance.

Portal- or Ditch-gate System from Lined Ditches (13)

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 a lined ditch across the head of the field. Portals in the ditch bank can be of any diameter and 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. Water, once on the field, may flow down furrows, between borders or dikes, or in corrugations. The ditch may be lined with concrete, plastic, clay, or other nonporous material. The ditch is permanent and is reused each year.

Poly Pipe System (14)

A system using 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.

Gated Pipe (Not Poly) (15)

A system using 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 for cultural operations or moved to new field locations through the season. The gates usually match row widths so water can flow directly into rows. Gated-pipe systems may also be used on flood or corrugation water-control systems. The pipe is reused for many years.

Improved Gated Pipe System (Surge Flow or Cablegation, Not Poly) (16)

A system using 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 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 for cultural operations 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. It would defeat the purpose of the improved system. The pipe is reused for many years.

Sub-irrigation (17)

Maintenance of a water table at a predetermined depth below the field surface by using ditches or sub-surface drains and water-control structures. Water is added or removed as needed to maintain the water level of the water table at a specific depth using the ditches or drains. 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. The irrigation system may also be used as a drainage system.

Open Discharge from Well or Pump System (18)

Open discharge from well of pump occurs when there is only one point of discharge into the field. This system is often 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 drained, allowed to infiltrate, or evaporates. Land forming is often required with this system. As a gravity irrigation system it can be used to irrigate a single contour/bay field or discharge water into the topmost multiple contour/levee/bay field. Do not use this system when discharging water into each bay of a multiple bay field.

Contour-levee - *Use the code for the type of system used to apply the water*

Completely flooded areas bounded by small contour levees and cross levees. Application rate is considerably larger than intake rate. Water remains on soil until irrigation needs are met with the excess drained away. Used for crops tolerant of flooding up to 12 hours such as rice, cotton, corn, soybeans, small grains, and grasses. Land forming is required and adequate surface drainage is essential. Irrigation water must be of good to excellent quality.

Corrugation - *Use the code for the type of system used to apply the water*

Partial surface flooding method. Water is applied in small evenly spaced channels. Initial streams are greater than soil intake rate. Must be cut back when water reaches lower unit to prevent runoff or having a tail water recovery system. Best suited to close growing, non-cultivated crops such as legumes, grasses, and small grains.

Graded-border - *Use the code for the type of system used to apply the water*

Type of controlled surface flooding. Field is divided into strips by parallel dikes. Strips should have little cross-slope. Best suited to soils with moderately low to moderately high intake rates. Used to irrigate legumes, grasses, small grains, orchards and vineyards.

Level-border (Basin) - *Use the code for the type of system used to apply the water*

Rapid application of water to level or nearly level area enclosed by dikes to retain water at uniform depth until it infiltrates the soil. Best suited to soils with moderate to slow intake rate and a moderate to high available water holding capacity. Can irrigate a number of crops without changing the basic layout or rate of application. Accurate land leveling is required. No irrigation water is lost by runoff.

Level-furrow - *Use the code for the type of system used to apply the water*

uses small channels without grade to irrigate crops planted in or between the furrows. A large stream of water is required and water remains at a uniform depth throughout the furrow until it infiltrates the soil. Best suited to soils having moderate to slow infiltration rate and moderate to high available moisture holding capacity. Best suited to row crops, but can be used for grass crops.

Graded-furrow

Application of water in small channels having continuous slope in direction of water movement to irrigate row crops. Best suited to sites where furrow grade does not exceed 1%. Fields must be well graded and tail water facilities should be installed. Not designed for light irrigation. Water is applied to furrows by gated pipe or from ditches by siphon tubes. Use the code for the type of system used to apply the water.

Contour-furrow

Similar to graded furrow, but furrows are laid on the contour to reduce slope. Can be used on all soils except light sandy soils and soils that crack. Use the code for the type of system used to apply the water.

Contour-ditch

Form of controlled surface flooding. Water is distributed from ditches running along the contour. Water is discharged through openings in ditch bank, by siphon tubes or a uniformly graded lower lip of ditch. Water flows in unconfined sheet down slope from one contour ditch to the next and collected in next ditch for reuse. Suited to noncultivated crops such as legumes, grasses, and small grains. Use the code for the type of system used to apply the water.