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1998 Agricultural Resource Management Survey (ARMS)

Phase II - Production Practices
Interviewers Manual

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 by version are listed in the [Exhibit 1](#) at the end of this overview.

Questions are numbered the same on all versions, and their instructions are the same. Particular questions do not appear in every version or they are not asked for every target commodity. For these questions, there are two notations 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 ***V2, V7, V10*** appears, this indicates that the item applies only to *Versions 2, 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, 6, 8, 9, and 10:

V5, V6, V8, V9, V10

Corn, Soybeans, Upland Cotton, Potatoes

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 you.

Finally, Chapter 5 is organized so that you may remove sections of questionnaire versions not being enumerated in your state.

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For example: Section H only appears in *V2: Wheat Production Practices and Costs*. If your state is not using this version, you can remove Section H from this manual.

Exhibit 1: Questionnaire Sections by Version

<u>Version</u>	<u>Section</u>	<u>Section Title</u>
all	A	Field Selection
all	B	Field Characteristics
all	C	Fertilizer and Nutrient Applications
all	D	Pesticide Applications
all	E	Pest Management Practices
2, 3, 5, 6, 7, 8, 10, 11	F	Field Operations, Labor and Custom Services
all	G	Irrigation
2	H	Drying
2	I	Landlord Costs

Section A - Field Selection

What is Section A for anyway?

Field level samples supply the specific details needed for the economic analysis of the Production Practices and Costs Reports and the Production Practices Reports for field crops. For the field samples to be representative of all fields of the target commodity of interest (corn, soybeans, wheat, upland cotton, potatoes, sorghum), each field must be randomly selected from all of the operation's fields of that crop. Simple random sampling procedures are used for field selection.

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

Item 1 Total acreage of target commodity

Note: For All Wheat (Version 2) and Winter Wheat (Versions 7 and 10), all fields **planted for any purpose are eligible for selection**. Prior to 1998, only harvested fields were eligible. This change makes procedures for winter wheat and other crops the same.

Enter the total number of acres of the target commodity that this operation planted for the 1998 crop year. For V2: *Wheat Production Practices and Costs*, enter the total acres of all wheat, regardless of type (winter, spring, or durum) planted for all purposes for the 1998 crop year. This includes winter wheat planted during the fall and winter of 1997.

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 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 for some reason the operator had to replant some of the acres (poor seed

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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 original target crop.

For instance, a field of winter wheat plowed down and replanted to spring wheat would be eligible for both the Winter Wheat Production Practices Report and the Spring Wheat Production Practices Report. However, the acres are only counted once in the Wheat Production Practices and Costs Report.

Likewise, acreage in a winter wheat / soybean double cropped field for the 1998 crop year is eligible to be counted as both Winter Wheat and Soybeans.

If no acres of the target commodity are reported in Item 1, review the information on the Phase I Information Form inserted in the questionnaire. Make explicit notes about the reason why the current report of zero acres is different from the information reported on the Phase I Information Form. Then go to Item 4 of the Conclusion, and conclude the interview. Even though no target commodity acres are reported, this operator may be re-contacted in the spring for the financial information to be collected in Phase III.

There are many good, logical reasons why the Item 1 acreage may be different from the pre-screened acreage. The information on the Phase I Information Form is useful for determining likely reasons for any differences. For example, the respondent to the Phase I Screening Survey may have been a different person from the respondent you are interviewing, or the acreage reported in Phase I may have represented intentions and not crops that had already been planted. Don't assume that something is wrong. It may not be wrong, just different. You may tell the operator your notes from the Screening Survey conducted in May and June 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.

Item 1a Winter Wheat planted for all purposes

V2

Wheat Production Practices and Costs

Data from the All Wheat PPCR (Version 2) will be combined with data from Versions 7 and 10 for specific types of wheat (Winter, Durum, and Other Spring) to set estimates of fertilizer and chemical use by type of wheat. In order to combine the data, the acreage and number of fields by type are needed.

Ask the respondent how many of the Item 1 all wheat acres were winter wheat. Enter the acreage of winter wheat planted for all purposes during the fall and winter of 1997 for the 1998 crop year. Record the acreage to the nearest tenth of an acre. Include cover crops.

Then, ask the respondent how many fields were planted to winter wheat.

Item 1a(1) Winter Wheat planted with intention of harvesting for grain

V2

Wheat Production Practices and Costs

Prior to 1998, only winter wheat fields planted with the intention of harvesting for grain were eligible for Phase II. Starting this year, all winter wheat fields are eligible. Due to this change, we need to obtain the number of acres and fields planted with the intention of harvesting for grain to analyze the impact of this change.

Ask the respondent how many of the Item 1a winter wheat acres and fields were planted with the intention of harvesting for grain. Point out to the respondent that we want the acreage he intended to harvest for grain at the time he planted it. Enter the acreage to the nearest tenth of an acre. Include cover crops. Then, ask the respondent how many of the winter wheat fields were planted with the intention of harvesting for grain.

Item 1b Durum Wheat planted for all purposes

V2

Wheat Production Practices and Costs

Ask the respondent how many of the Item 1 all wheat acres were durum wheat. Record the acreage to the nearest tenth of an acre. Include cover crops.

Then, ask the respondent how many fields were planted to durum wheat.

Item 1c Durum Wheat planted for all purposes

V2

Wheat Production Practices and Costs

Ask the respondent how many of the Item 1 all wheat acres were spring wheat (other than durum). Record the acreage to the nearest tenth of an acre. Include cover crops.

Then, ask the respondent how many fields were planted to spring wheat (other than durum).

Enumerator Action: Verify sum of acreage

V2

Wheat Production Practices and Costs

After obtaining the breakdown of the item 1 all wheat acreage by type, sum the acreage recorded in items 1a + 1b + 1c and verify that all of the acreage recorded in item 1 are accounted for. Make corrections to Items 1, 1a, 1b, or 1c as necessary.

Item 2 Land tenure

V2

Wheat Production Practices and Costs

Complete Items 2a - 2d by recording the number of acres of the target commodity the operation had in each category: owned by the operation, rented for cash, share rented, or used rent-free. Acres should be recorded in tenths (for example: 45.3). The total number of target commodity acres must equal those recorded in Item 1.

Item 2a Acres planted on owned acres

V2

Wheat Production Practices and Costs

Record the number of acres of the target commodity planted on land the operation owned.

Items 2b-2d Land rented

V2

Wheat Production Practices and Costs

Record the total acres of the target commodity planted on rented acres, by type of rental arrangement.

INCLUDE:

- 1) all land for which the operator paid cash rent on a per acre basis (Item 2b).
- 2) all land for which the operator paid the landlord a share of the crop (either standing or harvested). The respondent may need to add all the share rented units together to get a total share rented figure (Item 2c). 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 specifies the rental fee is to be a share of the crop grown.

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- 3) all land belonging to others (private individuals, federal, state, railroad, etc.) which the operator used rent free (Item 2d). 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 Number of Fields

Item 3 asks for the number of fields planted to the target commodity on the operation for the 1998 crop.

Version 2: Wheat Production Practices and Costs Report: Include all fields planted to wheat for the 1998 crop, regardless of type (winter, durum, other spring).

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 go to Item 5.

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.

NOTE: If the operator had only 1 field, skip to Item 5.

Enumerator Action: Verify sum of fields

V2

Wheat Production Practices and Costs

After obtaining the total fields planted to all wheat in Item 3, sum the number of fields recorded in items 1a + 1b + 1c and verify that all of fields are accounted for. Make corrections to Items 3, 1a, 1b, or 1c as necessary.

Item 4 Identification of Fields

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 these fields on the lines provided in the questionnaire.

The fields do not have to be listed in any particular order as long as they are the (up to 18) closest fields to the operator's permanent residence. Do not skip any lines when completing this listing.

Operators can list these 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 number, name, or other description, use the Field Selection Supplement to draw off (up to 18 of) the operation's fields closest to the operator's permanent residence. The Field Selection Supplement is printed in Versions 2-9. For Version 10, you will need to use a separate supplement.

The supplement may be used if the respondent cannot adequately describe the target commodity fields without drawing them. Prior experience has shown the supplement to be very beneficial in these cases. However, experience has also shown supplement use to be necessary only in a few cases each survey.

Item 5 Random Number Selection

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

The State Office staff will place a Random Number Label (see Example [3](#)) in the designated box on the Field Selection page in each questionnaire. Read across the FLD (field) line to match the number of fields you listed in Item 4. On the SEL (selected) line below is the number of the randomly selected field for this operation.

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.

Item 6 Informing Respondent of Field Selection

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

The respondent must be able to focus on that field, and provide you with information for only that field.

Field Selection on Version 10: Multi-crop

When you've completed field selection for *Commodity 1* identified on the Random Number label on page 3 in Section A, proceed with field selection for *Commodity 2* identified on the Random Number label on the page 4. 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 had no fields of *target commodity 1* AND had no fields of *target commodity 2*, go to Item 2 of the Conclusion and conclude the interview.

Using the Field Selection Supplement

The reason we use the Field Selection Supplement 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. Past experience has shown that this supplement is used very few times during the survey.

Field Mapping for Random Selection

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.

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.

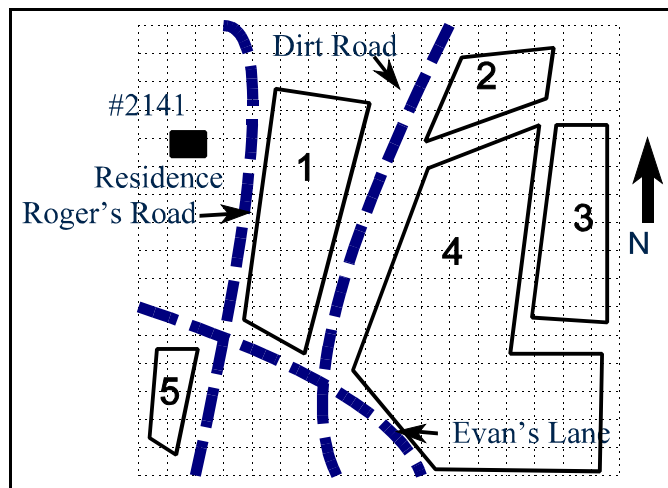
Some operators have copies of maps or aerial photos from their local county office of USDA's Farm Service Agency (FSA). The operator's fields are drawn off on these maps or aerial photos and identified with letters and numbers. These maps may also be helpful in the field selection process for this survey. 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. Be sure the operator can identify the selected field when you've completed field selection.

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.

Example 1: Mapping Fields on the Field Selection Supplement



Example 2: 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 [Example 1](#).

- 1) For Item 3, enter "5".
- 2) Turn to the Field Selection Supplement grid in the questionnaire. You may also 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.

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- 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.

Example 3: Random Number Label

ST:	xx	SOYBEANS								
FLD:	1	2	3	4	5	6	7	8	9	
SEL:	1	2	2	4	3	5	7	6	2	
FLD:	10	11	12	13	14	15	16	17	18	
SEL:	5	6	10	9	10	14	11	8	16	

- 6) Circle the pair of numbers on the label associated with the number 5. For this example, the corn field listed on line 3 of Item 4 is selected as the random field.
- 7) Record the randomly selected field number, number 3, in Item 5.
- 8) Circle field 3 in the Item 4 listing and on the grid (or map).
- 9) 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 #3 "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, "What fertilizers were applied to these 45 acres on Smitty's for the 1998 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 avoid 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. Cost items are handled differently depending on whether the crop is grown on owned or rented land. If rented land is used, you must have the cost of that rent.

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, that seed cost is needed. In non-survey years, knowing the cover crop allows ERS to adjust cover crop seed costs using NASS' annual seed prices.

Seeding rate and costs of purchased seed are 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.

Producers often ask why both actual yields and expected yields are asked. Cost and return accounts published by ERS use actual yields reported by farm operators. However, policy makers often ask about the "typical" situation. It may be that crop conditions were unusual during the survey year and the operators' responses reflected an unusual situation. With "expected" yields, ERS can see how conditions would have changed if operators had harvested what they thought they would harvest.

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. Fertilizer and manure data are needed to address water quality issues. USDA is responsible for publishing estimates of the amount of fertilizer used in crop production.

Item 1 Field acres

Enter the number of acres planted in the selected commodity field. Round to nearest tenth (1/10) of an acre.

Item 2 Tenure arrangement

This item, along with Items 3 and 4 (V2), are used to determine the cost of land for crop production. In addition, tillage practices on owned fields may differ from those on rented fields.

Determine if the selected field was owned by the operation, or if it was rented for cash or for a share of the crop produced from the selected field, or if it was used rent free.

Item 2a Acres in field owned

Record the number of acres of the target commodity planted in the selected field that were owned by the operation.

Items 2b-2d Acres in field rented

Record the number of acres of the target commodity planted on rented acres in the selected field, by type of rental arrangement.

INCLUDE:

- 1) acres in the field for which the operator paid cash rent on a per acre basis (Item 2b).
- 2) acres in the field for which the operator paid the landlord a share of the crop (either standing or harvested), (Item 2c). 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 specifies the rental fee is 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 (Item 2d). 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

Wheat Production Practices and Costs

If any part of the selected field is cash rented (recorded in Item 2b), 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.

Item 4 Landlord's share of the crop

V2

Wheat Production Practices and Costs

If any part of the selected field is share rented (recorded in Item 2c), 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 first rented

Items 5 and 5a are new for 1998. These questions will be asked if any acres in the field are rented. 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 28, provide information needed for this analysis.

Record the year this operator began renting land inside the field. If more than one lease is involved in the field, enter the year of the first lease arrangement. If 1998 was the first year the field was rented, enter '1998'.

Item 5a Is rental arrangement long-term

Analysts are interested in the relationship between the expected length of the rental arrangement and the operation's application of long-term capital land improvements to rented land. This item will help answer the question of whether or not operators who do not intend to remain in rental arrangements for an extended time 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 renting this field through the 2003 crop year (5 years from now).

Item 6 Type of wheat planted

V2

Wheat Production Practices and Costs

Enter the code indicating the type of wheat planted in the selected field. If a winter wheat field was plowed down and replanted to spring wheat, note this on the questionnaire and enter code 3 for spring wheat. Winter wheat fields overseeded with spring wheat to thicken the wheat or improve areas of poor growth should be coded as winter wheat (code 1).

Item 7 Harvest intentions for wheat planted

V2, V7, V10

Wheat

Changes to the procedures for selecting fields of winter wheat require that we ask the respondent for his intentions for the wheat when he planted it. This item will allow analysts to study differences in costs, chemical applications, and production practices between fields originally planted with the intention of harvesting grain and fields planted only for grazing or hay.

It is important to emphasize that this question applies to the operator's original intentions when he planted the field to wheat. If the field was planted with the intention of harvesting grain, but grazed off over the winter, you would still code this as code 1 (for grain).

Item 8 Expected yield

V2

Wheat Production Practices and Costs

The reason we ask this item is that 1998 yields may not have been normal, and data from this survey will be used as the basis for estimating production costs for several years. Asking the operator about the yield he expected should provide a good measure of "normal" yields.

Most operators budget for the crop season based on an expected yield per acre for each crop they grow. If you have to probe to obtain the yield, it may help to ask the operator what yield he budgeted for in 1998.

Record the yield per acre the operator expects for the wheat crop on the selected field during a normal or typical growing season. Record expected yield in bushels per acre. If the respondent reports in units other than bushels, record the response and reported units in the margin.

Item 9 Expected market price at planting

V2

Wheat Production Practices and Costs

The purpose of this question is to determine how producers make their decisions about planting and what crops to plant. When the producer decided to plant wheat, costs of producing the crop were likely considered. The producer probably also had an expectation about the price that would likely be received when the crop was sold. If the budget for expenses exceeded the expected return per acre, the producer would probably not have planted wheat.

Record the price the producer was expecting for the crop at planting time. Enter the expected price in dollars and cents per **bushel** (for example, 3.35). If the response is in units other than bushels, record the response and reported units in the margin.

Some producers are reluctant to report the budget price they used when planning to plant the 1998 crop. Emphasize that this item refers to the price they expected when they made the decision to **plant** the crop, and not the price they actually received. In some cases, you may encounter a

producer who plants wheat with no intention of harvesting the crop for grain. For instance, some wheat growers plant wheat only for use as winter grazing, and never expect to harvest a crop for grain. In these cases, an expected budget price may be unavailable. Be sure to document these situations with a note on the questionnaire.

Item 10 Was a no-till system used?

V5, V6, V7, V8, V10, V11

Corn, Soybeans, Wheat, Upland Cotton, Sorghum

In a no-till system, no tillage type implements (those that disturb the soil surface) cross the field before the planter. This would exclude implements such as shredders and rock pickers that do not disturb the soil. No-till practices affect the amount of crop residue left on the field at planting, and also affect the amount and type of pesticides applied.

Ask if a no-till system was used to prepare and plant the selected field. If YES, enter code 1 and ask Item 10a. If NO, go to Item 11.

Item 10a Consecutive years no-till system used

V5, V6, V7, V8, V10, V11

Corn, Soybeans, Wheat, Upland Cotton, Sorghum

If no-till was used, then determine the number of **consecutive** years that no-till has been used on the selected field. The key word is consecutive. This is regardless of previous crop type.

For example, the target commodity is soybeans and a corn/soybean rotation is used over the years. If the operator no-tills only soybeans each time, this would only be **one** consecutive year for the target commodity of soybeans. The number "1" would be entered in Item 10a.

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Item 11 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 8, 1998, will be entered as 05 08 98.

Item 12 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.

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**
- 5 = **Barrels** (only used for potatoes)
- 25 = **Kernels / Seeds**

For example: A seeding rate of 1 bushels per acre is recorded as:

	UNITS PER ACRE	UNIT CODE 1=POUNDS 2=CWT. 4=BUSHEL 5=BARRELS 25=KERNELS/SEEDS
12. What was the seeding rate per acre the first time this field was seeded?	1 . <u>0</u>	4

Item 12a Type of planting system

V5, V6, V8, V10, V11

Corn, Soybeans, Upland Cotton, Sorghum

For the selected field, determine what type of planting system 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 12b Row width

V6, V8, V10, V11

Corn, Soybeans, Upland Cotton, Sorghum

Record the row width in whole inches. If the primary planting method (Item 12a) was “broadcast”, then skip this item.

Item 13 Acres reseeded

V2

Wheat Production Practices and Costs

Record the total number of acres of the selected field that were reseeded to wheat (regardless of type). 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 14 Seed source

V2, V6, V7, V8, V9, V10, V11

Soybeans, Wheat, Upland Cotton, Potatoes, Sorghum

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

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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 1998 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).

If all of the seed was purchased (code 1), skip to Item 17.

Item 15 Amount of home grown or traded seed

V2, V7, V10

Wheat

If any of the seed used was grown on this operation or traded, 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 bushels is the preferred response.

Item 16 Cost for cleaning and treating seed

V2

Wheat Production Practices and Costs

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 bushel. 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.

Item 17 Pest resistant seed varieties

V5, V6, V8, V9, V10

Corn, Soybeans, Upland Cotton, Potatoes

Item 17 is only asked if any of the seed used was purchased (Item 14 is coded '1' or '3').

Determine the type of seed variety used on the selected field. 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. Determine if one of the TYPES of varieties listed was used for the 1998 crop.

If the same crop was planted in the field for the 1997 crop, find out the type of variety planted for 1997.

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, cotton, and potatoes, 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.

Item 18 Reason for use of herbicide resistant seed

V2, V5, V6, V8, V9, V10

Corn, Soybeans, Upland Cotton, Potatoes

Item 18 is only asked if the seed planted WAS NOT a pest resistant variety (Item 17 is code 1, 2, 3, 4, or 5)

Pest 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 cost of the variety is offset by reduced herbicide costs because a lower cost herbicide can be used), environmental reasons

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(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 '5' in the answer cell and write a note to describe the producer's reason. 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.

Item 19 Reason for choice of wheat seed variety

V2

Wheat Production Practices and Costs

Point out the reason list in the respondent booklet, and ask the respondent for his primary reason for selecting the variety of wheat seed used in the selected field for the 1998 crop. If wheat was planted in this field for the 1997 crop, ask for his primary reason for selecting the seed variety used for the 1997 crop.

Item 20 Seed cost

V2

Wheat Production Practices and Costs

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.

Exclude any seed technology fee; this will be reported in Item 20a.

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.

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	DOLLARS AND CENTS PER UNIT	UNIT CODE 1=POUNDS 2=CWT 4=BUSHEL 5=BARREL 22=ACRE 23=50 POUND BAG
20. What was the total cost (including both your and the landlord's share) of purchased seed for this field? <i>[Exclude technology fee if Bt or resistant variety used.]</i>	1 1.90	4

Item 20a Technology fee for resistant seed

Companies developing new seed varieties may charge an additional “technology fee” in order to defray the costs of research and development. Record the cost per unit and unit code of the any technology fee paid to purchase the seed. Include costs paid by the landlord.

Item 20b Landlord share of technology fee

Record the cost per unit and unit code, if any, paid by the landlord for the seed technology fee.

Item 21 Harvest completed

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 22 Acres harvested and yield

Item 22 obtains the disposition of acres of the crop planted in the selected field and yields.

Grain/bean/lint/potato production

Determine acres in the selected field harvested for:

grain (V5/V10: corn; V2/V7/V10: wheat; V11: sorghum),

beans (V6/V10: soybeans),

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lint (V8/V10: cotton), or

potatoes (V9: potatoes, including both table and processing),

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.

Yield per acre

If the selected field has been harvested, record the average yield per acre for the purpose indicated.

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. Record the yield per acre to the nearest tenth of a unit. For crops other than cotton, record the appropriate unit code for the reported yield. For upland cotton, yield must be reported in pounds per acre.

Silage production

V2, V5, V7, V10, V11

Corn, Wheat, Sorghum

Determine acres in the selected field harvested for silage. 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 silage. Record acres to the nearest TENTH of an acre.

Yield per acre

If the selected field has been harvested, record average yield per acre for silage.

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. Record silage yield per acre to the nearest tenth of a ton per acre.

Seed production

V2, V5, V7, V9, V10, V11

Corn, Wheat, Potatoes, Sorghum

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, record average yield per acre for seed.

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. Record the yield per acre to the nearest tenth of an unit. Record the appropriate unit code for the reported yield.

Acres abandoned

Determine acres in the selected field that were abandoned before harvest. Record abandoned acres to the nearest tenth of an acre.

Acres used for other purpose

Determine acres in the selected field that were some other purpose other than (grain/beans/lint/potatoes), silage, seed, or abandoned. This includes acreage harvested for hay. Record abandoned acres to the nearest tenth of an acre.

Item 23 Reason for not harvesting wheat for grain

V2

Wheat Production Practices and Costs

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

Item 24 Acres of wheat straw harvested

V2

Wheat Production Practices and Costs

Data are needed for wheat straw production because wheat straw contributes to the economic costs and returns for wheat producers. Record the acres from which wheat straw was harvested to the nearest tenth of an acre. Exclude wheat hay. If no wheat straw was harvested, skip to Item 25.

Item 24a Tons of wheat straw harvested

Record the total tons of wheat straw harvested.

If the respondent does not know the total tons, ask for the number of bales harvested and average weight per bale. Record the number of bales and average weight per bale in the margin. Multiply the number and average weight, convert the result into tons, and record the total tons in Item 24a.

Item 24b Landlord share of wheat straw

Record the landlord's share of the wheat straw harvested in either percent or tons. Tons is the preferred reporting unit.

Item 24c Cost of twine/wire used to bale straw

Record the total dollar cost of baling wire or twine used to bale the straw from this field. Include the cost of wire or twine purchased in previous years.

If the respondent does not know the price of twine/wire used to bale the straw (for instance, if the straw was custom baled for a flat fee), then indicate this with a note in the margin and record "DK" next to Item 24c.

Item 24d Price per ton

If no straw from this field was sold, enter a dash in the box and write a note in the margin.

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If straw was sold from this field, record the price per ton in total dollars received for the wheat straw sold from this field. If the total is not known, ask for the price per bale and total bales sold from this field.

Multiply these in the margin and convert the amount to dollars per ton. Record the dollars per ton in Item 24d.

Item 25 Livestock grazing

V2

Wheat Production Practices and Costs

Livestock grazing is an important source of income for wheat growers. For some growers, this provides a larger source of income from the wheat enterprise than the income from selling the grain.

If the field was not grazed, enter code 4 for “livestock did not graze” and skip to Item 26. If more than one type of livestock grazed the field, record a note in the margin and enter the code representing the type of livestock that had the largest number of head grazing the field.

Item 25a Number of head grazed

Record the number of head of the livestock coded in Item 25 that grazed the 1998 wheat field. Include all livestock, regardless of ownership.

Item 25b Days field grazed

Record the number of days the field was grazed by the type of livestock coded in Item 25.

Item 25c Dollars received for grazing

Ask if any of the livestock that grazed the field were owned by someone other than the operator. If the operator grazed livestock owned by someone else on this field, record the total dollar amount received for grazing livestock owned by others on this field.

The operator may need to report the number of head grazed for others and the fee per head, or the number of AUMs and fee per AUM received. In these cases, you will need to record this information in the margin and calculate the total dollars received.

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Include the landlord's share of grazing income from this field.

Item 26 Previously planted crops

Item 26 obtains the crop planted in the selected field for the previous 3 crop years.

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 1995.

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 perennial crop is growing on the field during a particular time period, but it was not planted during that period, then code 318 (for fallow, idle/diverted) 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 1995). 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 occurred. 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.

Previous crops planted in field (Column 2)

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.

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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.

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. Use code 318 if **no** crop was planted during that period, if the selected field was fallow, idle, or diverted, or if a crop planted during the previous period was growing.

On *Version 10*: MULTI-CROP, skip Item 26a when WINTER WHEAT is the target commodity for the selected field.

Crop planted spring/summer 1997

Record the code for the crop planted on the selected field in the spring/summer of 1997. Use code 318 if no crop was planted during that period or if the selected field was fallow, idle, or diverted, or if a previously planted crop was already growing.

Crop planted fall 1996

Record the code for the crop planted on the selected field in the fall of 1996. If a crop was planted, it would likely be a cover crop or a winter crop. Use code 318 if no crop was planted during that period or if the selected field was fallow, idle, or diverted, or if a previously planted crop was already growing.

Crop planted spring/summer 1996

Record the code for the crop planted on the selected field in the spring/summer of 1996. Use code 318 if no crop was planted during that period or if the selected field was fallow, idle, or diverted, or if a previously planted crop was already growing.

Crop planted fall 1995

Record the code for the crop planted on the selected field in the fall of 1995. If a crop was planted, it would likely be a cover crop or a winter crop. Use code 318 if no crop was planted during that period or if the selected field was fallow, idle, or diverted, or if a previously planted crop was already growing.

Crop planted spring/summer 1995

Record the code for the crop planted on the selected field in the spring/summer of 1995. Use code 318 if no crop was planted during that period or if the selected field was fallow, idle, or diverted.

If a perennial crop, such as alfalfa, clover, or other grasses, was growing on the selected field in this time period, 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 spring/summer of 1998. The only exception is when the target commodity is WINTER WHEAT, which would have been planted in FALL of 1997 (and Item 26a is left blank).

Example 4: Continuous crop example

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

Items 26a, 26c, and 26e receive code 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.

26. 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 1997?	Name of crop	none
		Code	318
	Was this crop irrigated?	Yes=1	—
b.	SPRING/SUMMER of 1997?	Name of crop	soybeans
		Code	26
	Was this crop irrigated?	Yes=1	—
c.	FALL of 1996?	Name of crop	none
		Code	318
	Was this crop irrigated?	Yes=1	—
d.	SPRING/SUMMER of 1996?	Name of crop	soybeans
		Code	26
	Was this crop irrigated?	Yes=1	—
e.	FALL of 1995?	Name of crop	none
		Code	318
	Was this crop irrigated?	Yes=1	—
f.	SPRING/SUMMER of 1995?	Name of crop	soybeans
		Code	26
	Was this crop irrigated?	Yes=1	—

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Example 5: Double crop soybeans / wheat example

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

26. 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 1997?	Name of crop	
		Code	
	Was this crop irrigated?	Yes=1	
b.	SPRING/SUMMER of 1997?	Name of crop	soybeans
		Code	26
	Was this crop irrigated?	Yes=1	---
c.	FALL of 1996?	Name of crop	w. wheat
		Code	165
	Was this crop irrigated?	Yes=1	---
d.	SPRING/SUMMER of 1996?	Name of crop	soybeans
		Code	26
	Was this crop irrigated?	Yes=1	---
e.	FALL of 1995?	Name of crop	w. wheat
		Code	165
	Was this crop irrigated?	Yes=1	---
f.	SPRING/SUMMER of 1995?	Name of crop	soybeans
		Code	26
	Was this crop irrigated?	Yes=1	---

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Example 6: Double crop soybeans/wheat example

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

26. 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 1997?	Name of crop	w. wheat
		Code	165
	Was this crop irrigated?	Yes=1	---
b.	SPRING/SUMMER of 1997?	Name of crop	soybeans
		Code	26
	Was this crop irrigated?	Yes=1	---
c.	FALL of 1996?	Name of crop	w. wheat
		Code	165
	Was this crop irrigated?	Yes=1	---
d.	SPRING/SUMMER of 1996?	Name of crop	soybeans
		Code	26
	Was this crop irrigated?	Yes=1	---
e.	FALL of 1995?	Name of crop	w. wheat
		Code	165
	Was this crop irrigated?	Yes=1	---
f.	SPRING/SUMMER of 1995?	Name of crop	soybeans
		Code	26
	Was this crop irrigated?	Yes=1	---

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Example 7: Perennial (hay) crop example

Alfalfa crop grown from before spring 1995, target crop planted in spring of 1998.

26. 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 1997?	Name of crop	alf growing
	Code	318
Was this crop irrigated?	Yes=1	---
b. SPRING/SUMMER of 1997?	Name of crop	alf growing
	Code	318
Was this crop irrigated?	Yes=1	---
c. FALL of 1996?	Name of crop	alf growing
	Code	318
Was this crop irrigated?	Yes=1	---
d. SPRING/SUMMER of 1996?	Name of crop	alf growing
	Code	318
Was this crop irrigated?	Yes=1	---
e. FALL of 1995?	Name of crop	alf growing
	Code	318
Was this crop irrigated?	Yes=1	---
f. SPRING/SUMMER of 1995?	Name of crop	alf. hay
	Code	1
Was this crop irrigated?	Yes=1	---

Item 27 Crop residue removal

Check to see if the most recent crop was a small grain. The most recent crop would be the first item in Item 26a-f that is not code 318 for FALLOW/IDLE/DIVERTED.

Small grains include barley, oats, wheat, rye, canola, etc. If the most recent crop WAS NOT a small grain, then skip Item 27.

If the most recent crop was small grain, then determine if the crop residue (normally after harvest) was removed from the field. Methods of removal could include baling, burning, and removing loose straw. Code 1 for YES if residue was removed.

Item 28 Land-use practices

New for 1998: You will be asking crop producers for additional information about long-term land-use practices this year. Specifically, 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, and what part of the cost was paid directly by the respondent.

Determine whether the land use practices in Items 28a-g 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 28e described below would be code 1= YES.

Each of the individual Items 28a, 28b, 28c, 28d, 28e, 28f, and 28g 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.

In Item 28a, determine if the operator uses terraces in the selected field. Terraces are raised level areas of a field supported on one or more sides by a wall or bank of turf.

If yes, ask when (what year) the terraces were first established, and what percent of the cost of the terraces was paid directly by the operator.

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In Item 28b, determine if the operator uses temporary or permanent levees. Levees are used in conjunction with flood irrigation systems to control the water level throughout the field. Levees are walls or banks of soil spaced across the field that identify points of equal elevation. Gates are placed in levees to control the water flow from one levee tier to the next. Levees may be permanent structures of the field (typically around the outside), or rebuilt each year during field preparation and leveled at harvest. Levees are most often used for irrigating rice, but are also commonly used with crops grown in rotation with rice.

If yes, ask when (what year) the levees were first established, and what percent of the cost of the terraces was paid directly by the operator.

In Item 28c, determine if the operator uses grassed waterways in the selected field. 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 channels that are used as outlets for terraces and for disposing of runoff from diversion channels, stabilization structures, contoured rows, and natural depressions.

If yes, ask when (what year) the grass levees were first established, and what percent of the cost of the terraces was paid directly by the operator.

In Item 28d, determine if the operator uses contour farming in the selected field. Contour farming is when producers perform tillage operations and plant crop rows across the slope of the land. Furrows, crop rows, and wheel tracks across the slope help retain water so that it can seep into the soil, instead of running off, taking loose topsoil with it.

In Item 28e, determine if the operator uses strip cropping in the selected field. 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.

In Item 28f, determine if the operator uses underground outlets such as tile drainage in the selected field. Underground outlets such as tile drainage control water runoff by carrying water through underground pipe to areas where it can run away without disturbing the soil.

In Item 28g, determine if the operator uses other drainage channels or diversions in the selected field. Other drainage channels or diversions include any other types of structures used to control or dispose of surface

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water runoff. Their purpose is to prevent or reduce soil erosion. Include water furrows.

Item 29 NCRS classification of Highly Erodible Land

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.

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. Enter code 1.

Item 30 Wetland

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.

If the NRCS has notified the operator that the selected field contains a wetland. Enter code 1.

Items 31-32 NRCS and FSA assistance

These items are new for 1998. NRCS needs objective data on the relationship between farm level production characteristics and USDA assistance. NRCS will use ARMS data to correlate conservation applications by producers with USDA assistance and services. Data will provide answers to questions such as:

- What is the relationship between conservation practices installed, farm size and program assistance?
- What is the relationship between input use, practices, and program assistance?
- What is the relationship between crops produced, practices, and program assistance?

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NRCS provides 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 NRCS provides assistance for include:

Access Road	Heavy Use Area Protection
Animal Trails and Walkways	Hedgerow Planting
Bedding	Herbaceous Wind Barriers
Brush Management	Hillside Ditch
Channel Vegetation	Irrigation Canal or Lateral
Chiseling and Subsoiling	Irrigation Field Ditch
Clearing and Snagging	Irrigation Land Leveling
Commercial Fishponds	Irrigation Pit or Regulating Reservoir Pit
Composting Facility	Regulating Reservoir
Contour Buffer Strips	Irrigation Storage Reservoir
Conservation Cover	Irrigation Systems
Conservation Crop Rotation	Irrigation Water Management
Contour Farming	Land Clearing
Contour Orchard and Other Fruit Area	Land Reclamation
Controlled Drainage	Land Reconstruction
Cover and Green Manure Crop	Land Smoothing
Critical Area Planting	Manure Transfer
Cross Wind Ridges	Mine Shaft and Audit Closing
Cross Wind Stripcropping	Mole Drain
Cross Wind Trap Strips	Mulching
Dam (diversion, floodwater, multi-purpose)	Nutrient Management
Dike	Obstruction Removal
Diversion	Open Channel
Fence	Pasture and Hayland Planting
Field Border	Pest Management
Filter Strip	Pipeline
Firebreak	Pond
Fish Raceway or Tank	Pond Sealing or Lining
Fish Stream Improvement	Precision Land Forming
Fishpond Management	Prescribed Burning
Floodwater Diversion	Prescribed Grazing
Floodway	Pumped Well drain
Forage Harvest Management	Pumping Plant for Water Control
Forest Harvest Trails and Landings	Range Planting
Forest Site Preparation	Recreation Area Improvement
Forest Stand Improvement	Recreation Trail and Walkway
Grade Stabilization Structure	Regulating Water in Drainage Systems
Grassed Waterway	Residue Management
Grazing Land Mechanical Treatment	Riparian Forest Buffer

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Rock Barrier	Tree/Shrub Pruning
Roof Runoff Management	Trough or Tank
Row Arrangement	Underground Outlet
Runoff Management System	Use Exclusion
Sediment Basin	Vertical Drain
Soil Salinity Management	Waste Management System
Spoil Spreading	Waste Storage Facility
Spring Development	Waste Treatment Lagoon
Streambank and Shoreline Protection	Waste Utilization
Stream Channel Stabilization	Water Harvesting Catchment
Stripcropping	Water and Sediment Control Basin
Structure for Water Control	Waterspreading
Subsurface Drain	Water Table Control
Surface Drainage	Well Decommissioning
Surface Roughening	Wetland Development or Restoration
Terrace	Wildlife Wetland Habitat Management
Toxic Salt Reduction	Windbreak/Shelterbelt Establishment
Tree/Shrub Establishment	Windbreak/Shelterbelt Renovation

Item 31 NRCS assistance provided for conservation

Enter a code 1 if the operator received assistance from NRCS in the last year for planning or installation of conservation practices or systems in the selected field.

Item 32 FSA cost sharing assistance for conservation

Enter a code 1 if the operator received cost-sharing assistance from FSA in the last year for installation of conservation practices or systems in the selected field.

Section C - Fertilizer and Nutrient Applications

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

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.

ERS uses data on costs to estimate fertilizer expense for the year of the survey. For non-survey years, actual materials 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 survey year.

The purpose of this section is to identify fertilizers used to produce the 1998 crop on the selected commodity field, and to obtain the cost of all fertilizers applied to the selected field for the 1998 crop, even if the materials were purchased before 1998.

Use of Supplements

If more lines are needed than the number available in the table, use a FERTILIZER SUPPLEMENT. 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 already appears in the questionnaire. Use as many supplements as you need.

Item 1 Fertilizer table

Determine if chemical fertilizers (nitrogen, phosphate, and/or potash) were applied to the selected field.

Include:

- all chemical fertilizer materials applied specifically for the 1998 crop.
- fertilizer applied in the fall of 1997.
- fertilizers applied during the summer of 1997 (if the selected field was fallow in 1997).
- custom applied fertilizers.

Exclude:

- micro-nutrients, such as iron, zinc, and boron.

If any fertilizers were applied, complete the Fertilizer Table.

V2 : If no fertilizers were applied to the selected field, then go to Item 3. You still need to ask for the cost of micronutrients and soil conditioners.

V5, V6, V7, V8, V9, V10, V11: If no fertilizers were applied to the selected field, go to Item 5.

Commodity Code (Column 1)

V10

Multicrop

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

When the fertilizer applications are completely enumerated for the selected *[commodity 1]* field, proceed to list the 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 of each fertilizer material, nitrogen (N), phosphate (P_2O_5), and potash (K_2O), applied to the selected field for the target commodity. Use of 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, 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. 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 most recent 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.

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When fertilizer materials are bulk blended for application (for example, 10-10-10 combined with 18-46-0), each product is recorded on a separate line in the fertilizer table, even though this 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 and K). 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 can also be 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.

No fertilizer reported by analysis will have an N-P-K total 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 percentages add up to more than 85 percent.

For each fertilizer application to the selected field 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.

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This would be a major error, because the correct analysis of this fertilizer is 7-17-38, calculated by:

$$N \quad 150 \div 400 \times .18 = .068 \text{ (or 7\%)}$$

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

$$P \quad 150 \div 400 \times .46 = .173 \text{ (or 17\%)}$$

because 46 percent of the 150 pounds was available Phosphorus.

$$K \quad 250 \div 400 \times .60 = .375 \text{ (or 38\%)}$$

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

Actual Plant Nutrients

Another way farmers commonly 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 or K, this is usually a clue that they are reporting pounds of actual nutrients. A unit of Nitrogen will amount to more than a pound of actual material applied, because part of it 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. ($100 \div .82 = 122$) 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 how much was actually applied.

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 2](#) at the end of this section and a table in the Respondent Booklet contain some of the more common fertilizers with their usual analysis.

Anhydrous ammonia is the strongest nitrogen fertilizer available. It must be kept (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 can 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.

With many of the other fertilizers listed in the [Exhibit 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, this column should be left blank.

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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.

$$\text{Total Pounds} \div \text{Acres} = \text{Rate per Acre}$$

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.

If the same fertilizer was applied at two separate times, record each application on a separate 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 defined as follows:

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

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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 - 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

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north half of the field was treated. These applications are reported just like any other applications.

If treatments were made with any fertilizer product to just certain spots in the selected field, calculate the quantity applied per acre by dividing the total quantity of product applied by the number of acres treated. Record this figure in Column 3 and in Column 7 enter the number of acres that actually received these spot treatments. Do not enter the total acres in the field. For example, if the operator estimates that only 6.5 acres in a 40-acre field were treated with a particular application of fertilizer, then enter 6.5 in Column 7. Spot treatments of fertilizers are rare.

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 N-P-K 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.

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Example 8: Entering Fertilizer Analysis Data

The example below illustrates how you would code the fertilizer products mentioned above.

diammonium phosphate applied to 50.0 acres before seeding

anhydrous ammonia injected before seeding

nitrogen solution

60 pounds n, 35 pounds p, 40 pounds k per acre

LINE	2 → → MATERIALS USED <i>[Enter percentage analysis or actual pounds of plant nutrients applied per acre.]</i>			3 What quantity was applied per acre? <i>[Leave this column blank if actual nutrients were reported.]</i>	4 <i>[Enter material unit code.]</i> 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? ACRES
	N Nitrogen	P ₂ O ₅ Phosphat e	K ₂ O Pofash					
01								
01								
01								
01								
01								

Item 2 Custom fertilizer application cost

V2

Wheat Production Practices and Costs

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 3 and skip Item 2. Enter dollars and cents per acre or total dollars for the field.

Item 3 Total fertilizer materials cost

V2

Wheat Production Practices and Costs

Record the TOTAL COST of MATERIALS for all fertilizer, soil conditioners, micronutrients, etc., applied to the selected field for the 1998 crop of the commodity. Include materials applied to this field last year if it was fallow in 1997. 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.

Item 4 Nitrogen inhibitor applied

V2, V5, V7, V8, V9, V10, V11

Corn, Wheat, Upland Cotton, Potatoes, Sorghum

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 5 Soil and plant tissue test

Many farmers have their soil or plants tested to determine soil nutrient needs or nutrient availability to the plant. The tests may be done in 1998 or in the Fall of 1997 for preparing for the 1998 crop on the field.

Operators using soil or plant tissue tests may follow different fertilizer application schedules, and apply different fertilizer types and amounts than those who use some other method for determining the fertilizer nutrients needed by their crops.

Item 5a Soil test

If a soil test was done on the selected commodity field in 1997 or 1998 for the 1998 crop on the field, enter code 1 for YES.

Item 5b 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 1997 corn crop) to determine the needs for this year's crop (the 1998 corn crop).

Item 5c Cost of soil/plant tests

V2

Wheat Production Practices and Costs

Record the total cost in dollars of the soil or plant tissue tests performed on the selected field for the 1998 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 1997 for the 1998 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

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fertilizer dealer or custom applicator does the test. If the fee was included in the cost of the materials or custom application, leave the cell blank and record a note to explain.

Item 6 Nitrogen test

V2, V5, V7, V8, V9, V10, V11

Corn, Wheat, Upland Cotton, Potatoes, Sorghum

If a SOIL test for nitrogen was done on the selected commodity field, enter code 1 for YES and ask Item 6a. If no nitrogen soil test was done, go to Item 7.

Item 6a Nitrogen test recommendation

V2, V5, V7, V8, V9, V10, V11

Corn, Wheat, Upland Cotton, Potatoes, Sorghum

If the amount of nitrogen applied to the selected field was more than the amount recommended, enter code 1. If the amount of nitrogen applied was less than the amount recommended, enter code 2. If the amount applied was exactly the amount recommended, enter code 3.

If the test resulted in a recommendation that nitrogen be applied, but none was applied, enter code 2 for 'less than the amount recommended.' If the test recommendation was that no nitrogen be applied, and none was applied, enter code 3 for 'exactly the amount recommended'.

Item 7 Lime

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

Item 7a 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 7b 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 $300 \div 2000 = .15$ tons. Enter .15 in Item 7b.

Item 7c Landlord share of lime cost

V2

Wheat Production Practices and Costs

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

Item 8 Manure application

Determine if livestock or poultry manure was applied to the selected field.

Exclude commercially prepared manure. 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, et al.). 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.) 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 that the field was grazed.

Item 8a 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 8b Amount applied

Record the amount of manure applied to the selected field. Enter either total tons to the nearest hundredth (example: 10.85) **or** total gallons. Figures cannot be entered in both cells. That is, 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 figures can be converted in the State Office to determine the total amount of manure applied to the field.

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. Then the amount of manure produced and spread on the field can be estimated by the Office using this information.

Item 8c 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. 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.

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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 8d Livestock type

Different types of 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, or 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 - **Other Type of Livestock**

Item 8e Source of manure

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

Item 9 Sulfur

V9

Potatoes

If sulfur (S) was applied as a specific chemical application to the selected potato field for the 1998 crop, enter code 1 for YES and ask Item 9a. If no sulfur was applied, go to Item 10.

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 2](#) at the end of this section.

Item 9a Sulfur application rate

V9

Potatoes

If sulfur was applied to the selected potato field (Item 9 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.

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).

The quantity of sulfur can be estimated from the analysis shown in the [Exhibit 2](#). For example, ammonium sulfate contains 24 pounds of sulfur per hundred pounds of material, ammonium thiosulfate contains 26 pounds of sulfur per hundred pound 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 9a. Be sure to record in notes all the necessary information for the State Office to make calculations.

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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 10 Micro-nutrients

V9

Potatoes

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

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).

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Exhibit 2: Common Fertilizers and Their Percent Analysis

<u>Name</u>	<u>Percentage Active Ingredients</u>			
	<u>N</u>	<u>P₂O₅</u>	<u>K₂O</u>	<u>S</u>
Anhydrous ammonia	82	--	--	--
Aqua ammonia	20	--	--	--
Ammonium nitrate	33	--	--	--
Ammonium sulfate	20	--	--	--
Nitrogen solutions (28 percent)	28	--	--	--
Sodium nitrate	16	--	--	--
Urea	45	--	--	--
Urea ammonium nitrate	32	--	--	--
Super phosphate (22 % & under)	--	19	--	--
Super phosphate (over 22 %)	--	45	--	--
Triple Super Phosphate	--	46	--	--
Ammonium phosphate	16	27	--	--
Diammonium phosphate	18	46	--	--
Monammonium phosphate	11	48	--	--
Potassium chloride	--	--	60	--
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	--
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	--	--	49	18
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. On *Version 2*, the costs of the materials are collected. 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 chemical information on expenses and usage is important.

Include all chemicals applied for the 1998 crop on the selected field. On *Version 2*, account for the cost of all chemicals and pesticides applied during 1997 and/or 1998 for the 1998 crop on this field, even if they were purchased before 1998.

Use of Supplements

The Pesticide Applications table contains a column for entering the number of applications of a specified pesticide. This column 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.

Item 1 Pesticide applications

Determine if any pesticides were applied to the selected commodity field for the 1998 crop. Include herbicides, insecticides, fungicides, or other chemicals. **Exclude** fertilizer and seed treatments.

Herbicide materials may be applied before weeds emerge or after weeds have emerged. Herbicides are sometimes used to “burn down” or kill weeds prior to planting in no-till systems. 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 effect the growth and development of the plant, such as pod-and-stem blight, anthracnose, brown spot, etc.

If any pesticides were applied, check YES and 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

Multicrop

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

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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 in the table. It also makes it easier to identify a product and its code when the same product is reported more than once.

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 in the fall of 1997. 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, defoliant, growth regulators, and desiccants.

“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.

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.

“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.

Use of the 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.

Both you and the respondent should use a Respondent Booklet. These booklets contain product code listings. 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.

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The Respondent Booklet also lists the type or class of each product: Herbicide (H), Insecticide (I), Fungicide (F) 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 H 4314
Gramoxone Extra O 9037.

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 (1037) when you really should have recorded the code for Dyfonate II 10-G (1038), 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.

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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.

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. Be sure the liquid or dry designation listed by the product code selected from the Respondent Booklet agrees 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): Wettable 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.

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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 Wettable 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 Items 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

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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 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.

Example 9: Coding a tank mix pesticide application.

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.

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

L I N E	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	6 or 7		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 This year, was the problem of this pest— 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.]	
					How much was applied per acre per application?	What was the total amount applied per application in this field?								
NOTES														
Far-go granular 10%	01	4211	D	---	1	12.00		1	6	5.0	1	171	3	2
Barvel (4L)	02	4136	L	2	4	.	1	14	1	5.0	1	174	1	2
Express DF	03	4205	D	2	4	.13		15	1	5.0	1	173	2	2

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. Because of the record keeping requirements for restricted use chemicals, most operators will have records of chemical applications for each field. Be sure to encourage the respondent to use these records if they are available.

Application rate (Columns 6 & 7)

Column 6 or Column 7 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, 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

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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,
- 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.

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

Liquid Products

1 Gallon = 4 Quarts

1 Quart = 2 Pints

1 Pint = 16 Fluid Ounces

Dry Products

1 Pound = 16 Dry Ounces

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, Wettable 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.

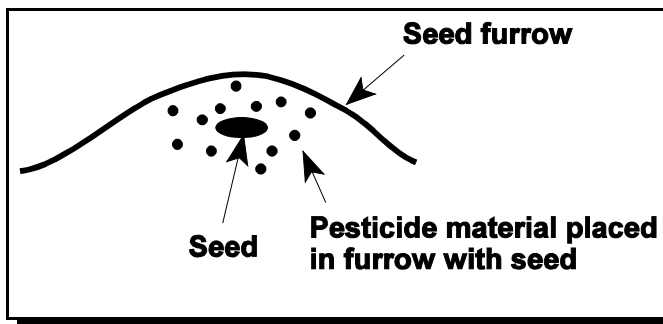
Code 2 - Broadcast, Ground with Incorporation: Pesticide material (herbicide, insecticide, fungicide, or other) is applied to the entire surface area by land application equipment. Application usually occurs before planting, and a planned mixing of the pesticide into the upper soil surface is completed 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.

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.

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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.

Special Instructions for Recording Spot Treatments

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. For spot applications, acres are usually very difficult to define. Usually spot treatments involve workers walking 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 were treated, and none of those areas may be near each other.

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Spot treatments are most common on cotton, soybeans, and potatoes, especially for herbicide applications to kill large weeds which may interfere with the crop growth or harvesting. If treatments were made only to certain spots or selected plants in the selected field (hence the term spot treatment) , record in Column 7 the total quantity of product applied, and in Column 10 enter the total number of acres **in the field** in which spot treatments were made.

If rates per acre are reported for spot applications, probe to determine the actual total quantity of product applied. For these applications, rate per acre multiplied by the total acres over which the spot treatments were made **does not equal** the total quantity applied. In fact, the result of such a calculation is greater than the actual total quantity applied. This is because not all of the acres in the field were treated in spot applications.

Do not record a rate per acre in Column 6 for spot treatments. Enter only the total amount applied (Column 7) for spot treatments.

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.**

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'll get serious errors when we summarize active ingredients applied per acre.

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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)

Ask the operator to identify the primary target pest for which the product in Column 2 was applied. 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 1998 crop year for the target pest recorded in Column 12.

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Consider a reported target of aphids; this question asks if the aphid problem was worse than normal in 1998, 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.**

Pesticide material cost

V2

Wheat Production Practices and Costs

Refer to the instructions for Item 4 below. **This Dashed Column: Optional Item 4, should only be used if the operator is unable to report the cost per acre for all chemical and pesticide materials in Item 4.**

If it becomes necessary to use this column, then ask the respondent for the cost per unit paid for each chemical applied to the specific field. Frequently operators who are unable to report the dollar per acre or total cost of chemicals do know the cost per unit they paid for each product they applied to the field. Or they have records or receipts that tell the product cost of these chemicals. Do not assume the unit of cost is equal to the unit of application, column 8.

Enumerators sometimes use this information to calculate the cost per acre, multiplying it times the number of applications in Column 11 and the application rate per acre reported in Column 6. Recording this information in this column saves enumerators from doing this calculation, because the computer can calculate the figure using the information recorded in the table. However, this column should only be used as a last resort, because operators may have a more accurate figure available that includes

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materials not captured in the Pesticide Table (such as surfactants and wetting agents).

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. Finally, record whether the product was liquid or dry when it was purchased.

The EPA Product Registration number 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.

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.

Example: A good, complete entry for Unlisted Products in the notes portion of the section is as follows:

line 22 Insecticide Danitol 2.4EC EPA# 39398-17 Liquid

Item 3 Pesticide custom costs

V2

Wheat Production Practices and Costs

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 1998 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

Wheat Production Practices and Costs

Record the TOTAL MATERIALS cost for all insecticides, herbicides, fungicides, surfactants, wetting agents, defoliant and growth regulators applied to the selected field for the 1998 crop. Include landlord costs.

Include materials applied to this field if it was fallow during 1997. Include materials applied to this field before planting. If custom applied, include the cost of materials ONLY, unless materials and application costs cannot

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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 will provide data about pest management practices that growers use on their crops, either as alternatives to pesticides or practices which improve the effectiveness of pesticides. This information provides researchers with better information to analyze the effectiveness and performance of alternative pesticide treatment strategies as well as their potential impacts on the environment and public health.

Several years ago, USDA, along with the U.S. Environmental Protection Agency and the Food and Drug Administration, 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 or 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 potentially reduce pesticide usage. These issues relate to and address food

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safety, water quality, and pesticide regulation. Data from these questions will provide vital information 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 they 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. But in this section, when the word PESTS is used, it refers to ALL three kinds, WEEDS, INSECTS, AND DISEASES. If you don't define that for all operators, they may only answer the questions for one kind of pest.

Item 2 Pest scouting

Was field scouted (Columns 1 & 2)

Determine if the selected field was scouted for weeds or 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 (weeds, insects, diseases) for which the field was scouted, enter code 1 = YES in Column 2, and ask Column 3 for weeds and insects. If no scouting was done, go to Item 6.

Who scouted most (Column 3)

Ask the respondent who did the majority of the scouting in the field for weeds and/or 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.

Column 3 is not completed for scouting done for diseases.

If a contractor provided the scouting services for the field, enter code 4 for CROP CONSULTANT OR COMMERCIAL SCOUT.

Item 3 Scouting Cost

V2

Wheat Production Practices and Costs

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

Wheat Production Practices and Costs

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

Wheat Production Practices and Costs

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 Pest records

If the field was not scouted for pests (Column 2 of Item 2 is NO for weeds, insects, and diseases), then skip Item 5 and go to Item 6.

In Item 5, we only want organized or formal records, not just notes jotted down on scraps of paper. It doesn't matter by who kept the records -- it can be the operator or someone else.

If this field was scouted for pests (Column 2 of Item 2 contains a positive entry), determine if some type of formal or organized written, electronic, or mapped records were kept for this field of specific pest activity, infestation levels or numbers of each type of pest listed.

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Example 10: Written 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:

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 7-10 must be asked. Check back to responses recorded in Column 2 of Item 1 of Section D. All herbicide products have a code number in the series 4000-4999.

If no HERBICIDES were used, then go to Item 11.

Item 7 Were Pre-emergence Herbicides Applied?

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 8. If no, go to Item 9.

Item 8 Reasons for applying pre-emergence herbicides

Items 8a-d obtain the reason or reasons the operator 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 = YES 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 pre-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 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 8c, determine if recommendations from a chemical dealer were considered in the operator's decision to apply pre-emergence herbicides.

In Item 8d, 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 9 Were post-emergence herbicides applied?

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 11.

Item 10 Reasons for applying post-emergence herbicides

Items 10a-d obtain the reason or reasons the operator 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 = YES for each reason the operator used.

It is also possible for the operator to say NO to all Items 10a-d. If this happens, it will be apparent that the operator based decisions on some reason besides those named in Items 10a-d, because these are all NO.

In Item 10a, 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 10b, 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 10c, determine if recommendations from a chemical dealer were considered in the operator's decision to apply post-emergence herbicides.

In Item 10d, determine if recommendations from an independent crop consultant were considered in the operator's decision to apply post-emergence herbicides. Do not include recommendations or consultation with a farm supply or chemical dealer. Include only services for which the operator paid.

Item 11 Enumerator Action: Were Insecticides Used?

If any INSECTICIDES were recorded in the Pesticide Table in Section D, then Item 13 must be asked. Check back to responses recorded in Column 2 of Item 1 of Section D. All INSECTICIDE products have a code number in the series 1000-1999.

V2, V7, V10 Wheat: If no insecticides were used, go to Item 14.

V5, V6, V8, V9, V10, V11 Corn, Soybeans, Upland Cotton, Potatoes, Sorghum: If no insecticides were used, go to Item 13.

Item 12 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 = YES for each reason the operator used.

It is also possible for the operator to say NO to all Items 12a-f. If this happens, it will be apparent that the operator based the decision to apply insecticides on some reason besides those named in Items 12a-f, because these are all NO.

In Item 12a, 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 12b, 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 12c, enter code 1 = YES if the operator decided to apply insecticides because this was standard practice or because there was a history of insect problems on this field.

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In Item 12d, 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.

In Item 12e, enter code 1 = YES if the operator's own determination of the infestation level was a reason for the decision to apply insecticides to the selected field.

Item 13 Row cultivation

V5, V6, V8, V9, V10, V11

Corn, Soybean, Upland Cotton, Potatoes, Sorghum

Determine whether this field was row cultivated for weed control during the growing season. If YES, enter code 1.

Items 14 - 15 Pest control procedures

Items 14 and 15 ask if the operator used a variety of procedures and practices 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.

Reason for pest control procedures

V2, V7, V10

Wheat

If the operator used a procedure or practice for the purpose of controlling pests, ask this question to determine if the main reason for the operator's use of the particular procedure was to control WEEDS (enter code 1), INSECTS (enter code 2), or BOTH weeds and insects (enter code 3).

Item 14 Questions asked for all crops

Item 14a Planting or harvest date adjusted

Find out if the planting or harvest date was adjusted on this field for the purpose of controlling pests. For wheat, if the operator used this practice to control pests, find out if it was done to control weeds (code 1), insects (code 2), or both weeds and insects (code 3).

Item 14b Pesticides alternated

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. For wheat, if the operator used this practice to control pests, find out if it was done to control weeds (code 1), insects (code 2), or both weeds and insects (code 3).

Item 14c Biological soil analysis to detect pests

Soil samples may be analyzed for the presence of insects, diseases, nematodes or other soil pests. Determine if the operator had such a biological soil analysis done for the selected field.

Item 14d Beneficial insects considered in pesticide selection

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.

Item 14e Purchase & release of 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.

Item 15 Questions asked only for wheat

Item 15a Crops rotated to control pests

V2, V7, V10

Wheat

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 in fact a reason the operator employed the practice. If the control of pests was a reason crops were rotated, then enter a code 1. If the operator used this practice to control pests, find out if it was done to control weeds (code 1), insects (code 2), or both weeds and insects (code 3).

Item 15b Pest resistant seed variety used

V2, V7, V10

Wheat

Find out if the operator used a pest resistant seed variety specifically to control or reduce pests. Enter code 1 if YES.

Item 15c Seed treatments used to control disease

V2, V7, V10

Wheat

Find out if the operator used seed treatments for disease control on this field. If seed treatments on purchased seed included treatment for disease control, then enter code 1=YES.

Item 15d Row spacing & plant density adjusted

V2, V7, V10

Wheat

Find out if row spacing (width) or plant density (planting rate in seeds per acre) was adjusted in this field for the purpose of controlling pests. If the operator used this practice to control pests, find out if it was done to control weeds (code 1), insects (code 2), or both weeds and insects (code 3).

Item 15e Tilling, mowing, burning or chopping

V2, V7, V10

Wheat

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 the operator used this practice to control pests, find out if it was done to control weeds (code 1), insects (code 2), or both weeds and insects (code 3).

Item 15f Water Management

V2, V7, V10

Wheat

Find out if water management practices were used to control pests in this field. Water management practices include irrigation scheduling, drainage control, and other such water management practices. If the operator used this practice to control pests, find out if it was done to control weeds (code 1), insects (code 2), or both weeds and insects (code 3).

Item 15g Grazing date

V2, V7, V10

Wheat

Find out if the grazing dates were adjusted in the selected wheat field for the purpose of controlling pests.

Item 15h Cleaning of equipment to prevent spread of pests

V2, V7, V10

Wheat

Find out if cleaning the harvesting and/or tillage equipment was used to reduce the spread of pests to or from the selected field. If the operator used this practice to control pests, find out if it was done to control weeds (code 1), insects (code 2), or both weeds and insects (code 3).

Item 16 Biological pest control costs

V2

Wheat Production Practices & Costs

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.

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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 1998 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.

Item 17 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 1998 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 1998.

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.

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Code 4 - 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 18 Pest identification and management training

V2, V7, V10

Wheat

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, 1997. Do not include seminars put on by chemical dealers.

Item 19 Certified applicator

Determine if operator has completed necessary training to receive certification for applying "Restricted Use" pesticides.

Section F - Field Operations, Labor, and Custom Services

V2, V5, V6, V7, V8, V10, V11

Corn, Soybeans, Wheat, Upland Cotton, Sorghum

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

The content of Section F in the various questionnaire versions differs between costs versions and non-costs versions. These differences are indicated throughout this section.

Information Obtained in All Versions

Machinery information is used to identify tillage systems and residue levels. This allows examination of the impact of the conservation compliance provisions of the 1996-96 Farm Bill on tillage systems, cropping practices, and crop residue levels.

Information Obtained in Production Practices and Costs Versions

V2

Wheat Production Practices and Costs

In Section F, the operator is asked to list all tractors and harvesters used on the selected field and then **all** machinery operations performed on that field to raise the commodity of interest, including custom operations and fertilizer and pesticide applications.

Use the checklist at the top of the field operations table to insure the proper operations are recorded.

The **costs** of custom operations (other than those already collected in earlier sections) are also collected in this section. In addition, labor hours for work other than operating machinery are obtained.

The machines listed in the Field Operations Table are also used in conjunction with tractors and harvesters listed in the Item 1 to determine costs of various field operations. Agricultural engineers have studied the relationships between machinery size and type of field operation to

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determine the costs of field work. Cost of production budget items estimated using data from items 1 and 2 include fuel, repairs, taxes, and insurance.

In addition, engineering formulas are used to compute the amount of physical capital (machines and equipment) "used up" while performing field operations on each of the commodities of interest. By itemizing tractors and equipment, the amount of capital invested in machinery is estimated using prices of equipment and machines. These estimates are used in cost of production budgets to assign annual costs for "capital replacement" and "other non-land capital." Operators do not pay this cost each year, but when they purchase machinery, they amortize the cost over the life of the machine. ERS estimates a capital replacement and other non-land capital cost based on the total value of the machinery.

Costs for custom and technical services used on the selected field are also collected in this section. These items are used to estimate the costs of the operator hiring out certain farming operations. Usually the custom provider supplies all the equipment and labor for performing the custom practice. A good example is hiring someone to harvest the crop, a common operation with small grains in the Great Plains. In cost of production budgets, the cost of custom operations is listed as a single cost. Since custom operations are enumerated along with other field operations in the Field Operations Table, costs need to be obtained for those operations.

Information Obtained in Production Practices Versions

V5, V6, V7, V10, V11

Corn, Soybean, Wheat, Sorghum

Fewer operations are collected on these versions. Section F obtains all the tillage and land forming operations performed on the selected field up to and including planting the target commodity, including custom operations, but excluding fertilizer and pesticide applications.

Use the checklist at the top of the field operations table to insure the proper operations are recorded.

V8, V10

Upland cotton

Limited tillage data are collected for upland cotton in *Versions 8 and 10*.

Item 1 Tractor and Harvester Table

V2

Wheat Production Practices and Costs

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.

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List all tractors used on the selected field for the 1998 crop, not just those actually used in 1998. Be sure to use the 1998 crop year, not calendar year, because some of the fieldwork for the crop may have been done in the fall of 1997.

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)

Tractors only

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**
- Code 6 - **Other**

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**

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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.

General Instructions for Field Operations and Equipment

V2, V5, V6, V7, V10, V11

Corn, Soybeans, Wheat, Sorghum

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 use different versions as you move from one interview 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.

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Exhibit 3: Field Operation Table Details

Instruction	Version	
	V5, V6, V7, V10, V11 Corn, Soybean, Wheat, Sorghum Production Practices	V2 Wheat 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 maintain 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 (<i>V10</i> only), 2-5, 9-11	2-11

To summarize:

Version 2 obtains 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.

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Versions 5, 6, 7, 10, and 11 obtain tillage and land forming operations (operations that disturb the soil) 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 1998 crop year, but abandoned and plowed under before the target crop was planted, begin with the operation of plowing down the abandoned crop.

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, V5, V6, V7, V10, V11

Corn, Soybeans, Wheat, Sorghum

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 1997, record operations starting with the fall of 1996.
- If a crop was grown in 1997, begin with the first operation after the 1997 crop was harvested.
- If the field was double cropped in 1998, and the target crop was the second crop, begin with the first operation after the first crop was harvested in 1998.
- If a crop was planted for 1998, 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 maintained, 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, V11

Corn, Soybeans, Wheat, Sorghum

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Only operations that disturb the soil are listed. 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 1997, list operations starting with the fall of 1996.

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

Wheat Production Practices and Costs

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

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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. If this field was fallow (idle, diverted) during 1997, list operations starting with the fall of 1996.

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.

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

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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, V5, V6, V7, V10, V11

Corn, Soybeans, Wheat, Sorghum

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

Multicrop

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, V5, V6, V7, V10, V11

Corn, Soybeans, Wheat, Sorghum

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 stalk shredder) 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 11: Recording operation sequence numbers

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2 S E Q U E N C E N O.	3 What operation or equipment was used?	4 <i>[Record</i> <i>machine</i> <i>code</i> <i>from</i> <i>Respondent</i> <i>Booklet.]</i> CODE
1	stalk shredder	205
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 12: Correcting operation sequence numbers

2 S E Q U E N C E No.	3 What operation or equipment was used?	4 [Record machine code from Respondent Booklet.] CODE
1	stalk shredder	205
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, V5, V6, V7, V10, V11

Corn, Soybeans, Wheat, Sorghum

Record either the operation or the equipment the operator reported, such as a plow, disk, harrow, planter, etc. In V2, 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, V10, and V11, the last entry will always be the planting operation. For V2,

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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, V5, V6, V7, V10, V11

Corn, Soybeans, Wheat, Sorghum

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.

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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, V5, V6, V7, V10, V11

Corn, Soybeans, Wheat, Sorghum

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, 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.

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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 7, Column 6, LABOR (in Version 2). 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 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

Wheat Production Practices and Costs

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

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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

Wheat Production Practices and Costs

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

Wheat Production Practices and Costs

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.

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, V5, V6, V7, V10, V11

Corn, Soybeans, Wheat, Sorghum

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

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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, V5, V6, V7, V10, V11

Corn, Soybeans, Wheat, Sorghum

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:

$$\text{Acres Per Hour} = (\text{Acres Covered}) \div (\text{Hours to Complete Operation}).$$

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.

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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:

$$\text{Acres Per Hour} = (\text{Machine Width in Feet}) \times (\text{Speed in MPH}) \div 10.$$

Leave this column blank for the second and subsequent equipment lines involved in tandem operations.

Month and year of operation (Column 11)

V2, V5, V6, V7, V10, V11

Corn, Soybeans, Wheat, Sorghum

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 two digit MM format for recording the month number and two-digit year. For example, operations completed in April 1998 is recorded as 0 4 9 8.

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 V2 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.

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Record the same SEQUENCE NUMBER as the operation entered on the previous line in Column 2.

V2: 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, VII: 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.

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Example 13: Field Operations, tandem and custom (V2)

The following example illustrates how tandem operations would be recorded in the FIELD OPERATIONS TABLE on V2. In this example, you should note that:

- operation 1 occurred in 1996 because the field was fallow in 1997.
- 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 are accounted for in operations 7 and 9, and
- hours (not acres) are entered in column 9 for the hauling operations (operations 11 and 12) and acres per hour column 10 is left blank.

2 S E Q U E N C E 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.]					11 In what month was this operation done? MMYY
				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	
1	stubble mulch	7	1	16	1	1	165.6	18.0	8 96
2	stubble-mulch	7	1	16	1	1	165.6	18.0	4 97
3	chisel	1	1	16	1	1	165.6	20.0	5 97
3	stubble mulch	7							
3	cond. harrow	31							
4	subsoiler	8	6						6 97
4	stubble mulch	7							
4	cond. harrow	31							
5	heavy cult.	26	1	12	1	1	165.6	15.0	7 97
6	heavy cult.	26	1	12	1	1	165.6	15.0	8 97
7	heavy cult.	26	1	12	1	1	165.6	12.0	9 97
7	fert. attach.	72							
8	press drill	107	1	20	1	1	165.6	10.5	9 97
9	airplane spray	91	6						3 98
10	combine	121	1	20	1	99	165.6	10.0	6 98
11	truck	301	3	150	5	99	18.0		6 98
12	grain wagon	194	3	200	5	88	18.0		6 98

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Example 14: 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:

- 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 S E Q U E N C E 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? MMYY
				9 How many acres were covered? 1/ ACRES	10 What were the acres covered per hour? ACRES PER HOUR	
1	<i>stubble mulch</i>	7	1	165.6	18.0	8 96
2	<i>stubble-mulch</i>	7	1	165.6	18.0	4 97
3	<i>chisel</i>	1	1	165.6	20.0	5 97
3	<i>stubble mulch</i>	7				
3	<i>cond. harrow</i>	31				
4	<i>subsoiler</i>	8	6			6 97
4	<i>stubble mulch</i>	7				
4	<i>cond. harrow</i>	31				
5	<i>heavy cult.</i>	26	1	165.6	15.0	7 97
6	<i>heavy cult.</i>	26	1	165.6	15.0	8 97
7	<i>heavy cult.</i>	26	1	165.6	12.0	9 97
8	<i>press drill</i>	107	1	165.6	10.5	9 97

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Example 15: Field operations, target crop abandoned

The following example illustrates coding operations for a Winter Wheat field that is planted, and then abandoned when winter wheat is the target crop. This example only applies to Version 2, since Versions 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 S E Q U E N C E N O. 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.]					11 In what month was this operation done? MMYY
				6 What was the size or swath of the [machine] used? CODE	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	
1	stubble mulch	7	1	16	1	1	165.6	18.0	8 96
2	stubble-mulch	7	1	16	1	1	165.6	18.0	4 97
3	chisel	1	1	16	1	1	165.6	20.0	5 97
3	stubble mulch	7							
3	cond. harrow	31							
4	subsoiler	8	6						6 97
4	stubble mulch	7							
4	cond. harrow	31							
5	heavy cult.	26	1	12	1	1	165.6	15.0	7 97
6	heavy cult.	26	1	12	1	1	165.6	15.0	8 97
7	heavy cult.	26	1	12	1	1	165.6	12.0	9 97
7	fert. attach.	72							
8	press drill	107	1	20	1	1	165.6	10.5	9 97
9	single disk	13	1	16	1	1	165.6	16.0	11 97
10	press drill	107	1	20	1	1	165.6	10.5	11 97
11	airplane spray	91	6						3 98

Field abandoned in March.

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Example 16: 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.]					11 In what month was this operation done? MMYY
				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	
1	stubble mulch	7	1	16	1	1	165.6	18.0	8 96
2	stubble mulch	7	1	16	1	1	165.6	18.0	4 97
3	chisel	1	1	16	1	1	165.6	20.0	5 97
3	stubble mulch	7							
3	cond. harrow	31							
4	subsoiler	8	6						6 97
4	stubble mulch	7							
4	cond. harrow	31							
5	heavy cult.	26	1	12	1	1	165.6	15.0	7 97
6	heavy cult.	26	1	12	1	1	165.6	15.0	8 97
7	heavy cult.	26	1	12	1	1	165.6	12.0	9 97
7	fert. attach.	72							
8	press drill	107	1	20	1	1	165.6	10.5	9 97
9	single disk	13	1	16	1	1	165.6	16.0	11 97
10	press drill	107	1	20	1	1	165.6	10.5	11 97
11	airplane spray	91	6						3 98
12	combine	121	1	20	1	99	165.6	10.0	6 98
13	truck	301	3	150	5	99	18.0		6 98
14	grain wagon	194	3	200	5	88	18.0		6 98

Field replanted in November.

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Example 17: Field operations, previous (non-target) crop abandoned

The following example illustrates coding operations for a Winter Wheat field that is planted, and then abandoned when **spring wheat** is the target crop. In this example, you should note that:

- the operation of plowing down the winter wheat becomes the first operation of planting the spring wheat.

2 S E Q U E N C E 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.]					11 In what month was this operation done? MMYY
				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	
1	subsoiler	8	3	12	1	1	165.6	9.6	3 98
2	subsoiler	8	3	12	1	1	165.6	9.6	3 98
3	heavy cult.	26	1	12	1	1	165.6	12.0	3 98
4	press drill	107	1	20	1	1	165.6	10.5	3 98
5	airplane spray	91	6						4 98
6	combine	121	1	20	1	99	165.6	10.0	9 98
7	truck	301	3	150	5	88	18.0		9 98
8	grain wagon	194	3	200	5	88	18.0		9 98

First operation was to plow down abandoned winter wheat.

The point of this example is to illustrate that you will record operations beginning with the first operation crossing the field after:

- the previous crop was harvested, or
- the operation of plowing under an abandoned crop.

Item 3 Labor used on the field

V2

Wheat Production Practices and Costs

This item collects data on labor used on the selected field for activities other than operating machines. *Acres covered* and *acres per hour* from the Field Operations Table will be used to calculate the labor hours spent operating machines for each field operation. This data will be combined with labor hours collected in Item 3 to provide an estimate of the total labor hours used to produce the target commodity on the selected field. These calculations save us from having to ask for ALL the labor hours separately.

In addition, wage rates are collected for ALL the paid workers that worked on the field, including for workers who only operated machinery, so that labor costs can be calculated as well.

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. Hours of non-machinery labor will be blank for workers who only operated machinery.

Workers (Column 1)

V2

Wheat Production Practices and Costs

First, ask the operator to identify and list all the workers that worked on the selected field. Include workers who only operated machinery. 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 1998. 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.

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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 1998 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 1997 (and earlier if the field was left fallow during 1997) to prepare for the 1998 crop.

Exclude contract or custom labor.

Number of workers (Column 2)

V2

Wheat Production Practices and Costs

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.

Non-machinery hours worked (Column 3)

V2

Wheat Production Practices and Costs

For each worker or group of workers listed in Column 1, record the total hours worked on this wheat field in ALL activities other than operating machines (reported in Item 2). This includes, but is not limited to:

- scouting,
- irrigation,
- hauling with trucks,
- drying,
- time spent moving machinery and equipment to and from the field,
- time spent loading materials into equipment,
- 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 3 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**.

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, 4, 5 and 6 should still be completed, with a dash entered in Column 3 and a note to explain the worker(s) only operated machinery.

If multiple workers are recorded in Column 2, enter the total hours worked by all the employees in Column 3. 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 3.

Paid or unpaid worker (Column 4)

V2

Wheat Production Practices and Costs

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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 5 and 6.

For UNPAID workers (code 2), skip to the next worker line.

Type of paid worker (Column 5)

V2

Wheat Production Practices and Costs

If Column 4 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 6)

V2

Wheat Production Practices and Costs

For PAID workers only (Column 4 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.

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If multiple workers are recorded in Column 2, the wage rate entered in Column 6 should be the same for all workers. Enter the average wage per hour paid to each worker in Column 6. 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 6.

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 $1500 \div 200 = \$7.50$ per hour, and enter "7.50" in Column 6.

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.

Item 4 Percent of unpaid work done by those under 16

V2

Wheat Production Practices and Costs

Considering the total hours worked by unpaid workers on this field (Column 1 workers with Code 2 (UNPAID) in Column 4 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 them with a different wage rate.

Item 5 Custom and technical services

V2

Wheat Production Practices and Costs

Custom operations and/or technical services performed on the field in 1997 for the 1998 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 Custom or technical service (Column 1)

V2

Wheat Production Practices and Costs

Several custom or technical services are listed. 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 Columns 2 and 3 for each item marked.

Item 5 Cost per acre for the custom/technical service (Column 2)

V2

Wheat Production Practices and Costs

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 1998 cotton crop. If YES, enter code 1 and ask Item 6a. If NO, go to Item 10.

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 MMY format (for example, April 1998 would be recorded as 0 4 9 8).

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. Only 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.

Item 8 Yield monitor

V2, V5, V6, V7, V8, V10, V11

Corn, Soybeans, Wheat, Upland Cotton, Sorghum

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 a combine to measure the yield at regular intervals as the combine moves through the field. These yield measurements can be tied to specific locations in the field through a global positioning system (GPS), which uses information from satellites pinpoint field locations. Then a map of the yields across the field can be drawn 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

V2, V5, V6, V7, V8, V10, V11

Corn, Soybeans, Wheat, Upland Cotton, Sorghum

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.

A yield map is a map prepared from information collected by a yield monitor. It shows how yield vary for small areas within a field. A yield map can be used to make to help the operator decide about practices used within the field, such as changes in fertilizer or pesticide applications.

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 process, the long term benefits are reducing chemical applications and costs, and improving yields. This process helps minimize the expense and use of crop chemicals by applying only what is needed, where it is needed.

Item 10 Use of variable rate technology

If the field has been grid sampled or mapped, ask if variable rate technology was used to seed the field, apply fertilizers, or chemicals.

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. Economists use engineering relationships to estimate irrigation costs.

There can be more than one type of irrigation system used on a particular crop field. To save space and interview time on the Production Practices and Costs V2, information is only collected for the two most common systems used on the selected field. The costs derived from the irrigation data are reported in cost-of-production budgets in several places. For example, the cost of purchased irrigation water obtained in this section is reported under a budget line item called "Purchased Irrigation Water." Operation costs of the irrigation systems listed in other parts of the section are reported under budget line items for fuel, repairs, capital replacement, etc., just like machinery costs.

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

The respondent should only report the number of acres of the selected crop in the field that were irrigated for the 1998 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 from the selected field which could have been irrigated (facilities were available) but which was not irrigated for the 1998 crop.
- land for 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 1998 crop year.

V2: You will record information for up to two systems used on the target crop for the 1998 crop year. If only one system was used on this field, then use only Column 1 for responses to Items 2b - 2l. Items 2a - 2l will apply only to the irrigation system types listed in Item 2a.

V5, V6, V7, V8, V9, V10, V11: 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 1998. Items 2b - 2e will refer to the totals for all irrigation systems used for the target crop in the selected field for 1998.

NOTE: Don't list any system or irrigation technology that wasn't used on soybeans or cotton for this field, even if it was used on other fields or other crops on the farm operation.

Item 2a Type of system(s)

Record the System Type Code(s) the irrigation system used to irrigate most of the acres of the target crop on the selected field of during the 1998 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 Cabledation, Not Poly Pipe)
- Code 17 - Subirrigation
- Code 18 - Flood
- Code 19 - Other Gravity System -- Specify Type

Each of these irrigation systems is described in [Exhibits 4](#) and [5](#) 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.

Additional system descriptions are provided in [Exhibit 4](#) for an end-tow sprinkler and carousel sprinkler-traveler system. If either of these systems are used on the field, enter them as a side roll/wheel line system using a code 3.

Additional system descriptions are also provided in [Exhibit 4](#) for big-gun systems, including descriptions for a self-propelled big-gun system, and descriptions for both 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.

Item 2b Total inches of water applied per acre

Record the total number of inches of water applied per acre to the target commodity in the selected field during the entire 1998 crop year.

V2, record this separately for each Irrigation System Type recorded in Item 2a. Include any preplant water application.

V5, V6, V7, V8, V9, V10, V11: Record the total inches applied by all irrigation systems used for the target crop in the selected field for 1998.

Item 2c & 2c(1) Estimating water applied

These items are asked only if the operator cannot provide a response to Item 2b.

Item 2c Total hours water applied

The operator should estimate the total hours that water was applied to the selected crop in the field during the 1998 growing season. In *V2*, this should be obtained separately for each irrigation system. The total hours the system operated may range from one to greater than 1000 hours.

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For 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 2c(1) Average gallons per minute

V5, V6, V7, V8, V9, V10, V11

Corn, Soybeans, Wheat, Upland Cotton, Potatoes, Sorghum

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 2c.

Item 2d 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.

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.

Sometimes a single irrigation system uses more than one source of water. In V2, 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

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selected field from surface water sources. Percents for each system can range from zero to 100 percent.

Item 2e Number of times field was irrigated

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.

Record the number of times the selected field was irrigated during the 1998 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 1998 crop-year production for the selected field. Include any pre-plant water applications.

For each irrigation system reported in Item 2a in V2, record the number of times each system was used to irrigate the selected field for the 1998 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 different times during the growing season.

If the system operated continuously during the crop season, this would be counted as 1 irrigation.

Item 2f Pump type

V2

Wheat Production Practices and Costs

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.

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The Codes for Pump Type 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.

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 2k.

Item 2g Average pumping rate

V2

Wheat Production Practices and Costs

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.

Item 2h System operating pressure

V2

Wheat Production Practices and Costs

If the system type recorded in Item 2a is NOT a Pressure System (codes 1 through 9), skip to Item 2i.

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 2i Pump motor type

V2

Wheat Production Practices and Costs

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 2f.

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 2j Average pump motor size

V2

Wheat Production Practices and Costs

Enter the average horsepower rating of the motor type recorded in Item 2i. For tractors enter the PTO horsepower.

Item 2k Average flow rate

V2

Wheat Production Practices and Costs

This item is asked only for the system(s) where the respondent indicates that **NO PUMP** was used (code 99 entered in Item 2f).

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.

Item 2l Other acres irrigated using system(s)

V2

Wheat Production Practices and Costs

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 1998 irrigation season. Record the number of other acres irrigated to the nearest TENTH.

Exclude the acres for this field.

Item 3 Purchased water

If any water was purchased to irrigate the selected field, enter code 1 for YES and continue.

V2 : If no water was purchased, go to Item 4.

V5, V6, V7, V8, V9, V10, V11: If no water was purchased, go to Item 7.

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

Record the operator's best estimate of the percent of all the water applied to the selected field during the 1998 growing season that was purchased from off-farm water sources. The percent may range from zero to 100.

Item 3b Purchased water cost

V2

Wheat Production Practices and Costs

Record only the total cost of the water purchased from off-farm water sources that was used to irrigate the **selected target commodity in the selected field** for the 1998 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 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.

Item 4 Replacement cost for siphon tubes

V2

Wheat Production Practices and Costs

Ask this item only if a siphon-tube gravity system was used to irrigate the selected field of the target crop during the 1998 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 5 Cost for poly pipe

V2

Wheat Production Practices and Costs

Ask this item only if poly pipe was used to irrigate the selected field of the target crop during the 1998 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 6 Gated pipe system used

V2

Wheat Production Practices and Costs

Ask Items 6a and 6b ONLY if a gated-pipe system was reported (either column of Item 2a is code 15 or 16).

Item 6a Average diameter of gated pipe

Record the average diameter of the gated pipe used for irrigating the selected field during the 1998 growing season.

Item 6b 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 1998 growing season.

Item 7 Water from wells

If water from wells (ground water) was used to irrigate the selected target commodity field for the 1998 crop, enter code 1 for YES and continue.

V2 : If water from wells was not used to irrigate the selected field, go to Item 8.

V5, V6, V7, V8, V9, V10, V11: If water from wells was not used to irrigate the selected field, go to the Conclusion.

Item 7a Number of wells

V2

Wheat Production Practices and Costs

Record the number of wells used to irrigate the selected field during the 1998 growing season. The wells could have irrigated other fields, but they must have at least partly irrigated this field.

Item 7b Average well casing diameter

V2

Wheat Production Practices and Costs

Record the average diameter of the outer well casing of all wells that irrigated the selected field during 1998. 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 7c Average pumping depth

V2

Wheat Production Practices and Costs

Record the average pumping depth (in feet) of wells that irrigated the selected field during 1998.

Well pumping depths depend on the water table level and the amount of drawdown 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 7d Other acres irrigated from these wells

V2

Wheat Production Practices and Costs

Record ALL OTHER crop acres (including other acres of the commodity of interest) and pasture land irrigated on this operation using the same wells used to irrigate this field. Exclude the acres of the selected field.

Item 7e Fuel and power costs for pumping water

V5, V6, V7, V8, V9, V10, V11

Corn, Soybeans, Wheat, Upland Cotton, Potatoes, Sorghum

Record the total fuel and power expenses incurred to pump the irrigation water from wells used to apply water to the selected field during 1998.

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 8 Additional pipe used

V2

Wheat Production Practices and Costs

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 1998. 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 9.

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 8a Most common type of additional pipe used

V2

Wheat Production Practices and Costs

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 8b Average diameter of additional pipe used

V2

Wheat Production Practices and Costs

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.

Item 8c Feet of additional pipe used

V2

Wheat Production Practices and Costs

Enter the total feet of mainline or lateral pipe used to carry water to the selected field during 1998. Exclude pipe that is part of the irrigation system, such as gated pipe, sprinkler pipe, etc.

Item 9 Field run-off

V2

Wheat Production Practices and Costs

Record the code best describing what happens to 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 in the part of the field where the crop is growing. It flows across a field and collects to form a pool of extra water at the end of the field, or it flows off the field. The pool of extra water is generally not large enough or doesn't last long enough to prevent normal farming operations for the field;

This question is like 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 - **Re-used 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 is collected in an on-farm pond or pit below the field, but 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 - **Drained 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 4: 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 <i>INCLUDE as a side-roll system (Code 3)</i>	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 <i>INCLUDE as a side-roll system (Code 3).</i>	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.

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**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.

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<p>Center Pivot or Linear Move, with Sprinklers less than 2 Feet above the Ground</p> <p>(Code 6)</p>	<p>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.</p>
<p>Big Gun</p> <p>(Code 7)</p>	<p>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.</p>
<p>Self-propelled Gun Traveler</p> <p><i>INCLUDE as a big gun system (Code 7).</i></p>	<p>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.</p>
<p>Reel-type Hose Pull</p> <p><i>INCLUDE as a big gun system (Code 7).</i></p>	<p>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.</p>

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Reel-type Cable Pull <i>INCLUDE as a big gun system (Code 7).</i>	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: 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.

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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 Cabling, 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.
Flood (Code 18)	Flood irrigation is any system that completely submerses the soil at a desired depth. These systems most often use levees or dikes to maintain an even water depth throughout the field. The water remains on the soil until irrigation needs are met, at which time the water is either drained from the field or allowed to infiltrate the soil. This system is typically adapted to crops that can tolerate flooding for up to 12 hours, such as rice, cotton, corn, soybeans, small grains, and grasses. Land forming is most often required with this system.

Section H - Drying and Storage

V2

Wheat Production Practices and Costs

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 1998 crop.

Item 1 Drying method

Record whether wheat 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 wheat 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 wheat 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 wheat from this field was custom dried (Item 1 = Code 1), record the amount paid by the operator in either cents per bushel or total dollars for custom drying the wheat 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.

Item 3 Dried other than custom

If the wheat from the selected field were dried, but not custom dried (Item 1 = Code 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 wheat from the selected field by drying. For example, if the beans were harvested at 14 percent average moisture, and then dried to 12 percent moisture, enter **2** in Item 3b ($14 - 12 = 2$).

Item 4 Crop Marketing and Storage

Items 4a through 4c provide information on marketing strategies followed by producers of the 1998 crop. Depending on the current price for wheat 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 bushels for each of the items in 4a - 4c; however bushels are the preferred reporting units. If the respondent reports in percents, the sum of Items 4a through 4c must equal 100 percent. If the respondent reports in total bushels, you can calculate total production from Section B, Items 22a and 22c (yield times acres equal production) to check that all the crop harvested is accounted for.

For instance, if the respondent reports 35.0 bushels per acre yield on 100.0 acres in Item B22a, the total production is 3,500 bushels ($35.0 \times 100.0 = 3,500$) If the respondent also harvested part of the field for seed, then you should add the seed production to the grain production to calculate total production from the field.

Item 5 Storage charge

If any of the wheat harvested from the selected field was stored in off-farm storage, we need to obtain the average monthly storage charge per unit.

Some producers may be unsure what the final storage cost per unit will be until the grain 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 grain into storage.

Section I - Landlord Costs

V2

Wheat Production Practices and Costs

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 Items 2b-2d in Section B. If any acres in the field were rented for cash, a share of the crop, or used rent-free, ask the respondent if the landlord(s) paid any of the listed variable production costs for the 1998 wheat crop. Enter a code 1 if yes, and completed Items 1a-1s. The landlord's contribution to the cost of some production items, such as lime, were obtained in earlier sections. These items complete the enumeration of the remaining production costs paid in part by landlords.

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 and skip to the conclusion section on the back page.

Before completing any of column 2 dollars or percents for items 1a-1s, check the column 1 box next to each item the landlord paid a share of. This will help you and the respondent ensure all landlord contributions are accounted for.

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. Refer to Section B, Item 20 for the total cost, including the landlord's share.

Item 1b Custom fertilizer application cost

Record the landlord's share of the cost of custom fertilizer application services on the selected field for the 1998 crop of the target commodity. Exclude material costs; these should be recorded in Item 1c. Enter percent or total dollars. Refer to Section C, Item 2 for the total cost, including the landlord's share.

Item 1c 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 1998 crop. Exclude application costs; these should be recorded in Item 1b. Enter percent or total dollars. Refer to Section C, Item 3 for the total cost, including the landlord's share.

Item 1d 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 1998 crop. Exclude material costs; these should be recorded in Item 1e. Record percent or total dollars. Refer to Section D, Item 3 for the total cost, including the landlord's share.

Item 1e Chemical/pesticide materials cost

Record the landlord's share of the cost of chemical/pesticide materials applied to the selected commodity field for the 1998 crop. Exclude application costs; these should be recorded in Item 1d. Record percent or total dollars. Refer to Section D, Item 4 for the total cost, including the landlord's share.

Item 1f 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 5c for the total cost, including the landlord's share.

Item 1g 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 1h 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 16 for the total cost, including the landlord's share.

Item 1i Other custom technical service cost

Record the landlord's share of the cost of other custom technical services (not accounted for in Items 1f, 1g, or 1h) used on the selected field, either in percent or in total dollars. Exclude custom field operations and services accounted for in Items 1j-1p. Refer to Section F, Item 5g to see if there was any total cost for these services.

Item 1j 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 1k 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 1l 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 1m 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 5d and 5f to see if any per acre amounts were entered.

Item 1n 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 5e to see if any per acre amounts were entered.

Item 1o Custom drying cost

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 1p 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 5g to see if any other custom or technical services were provided on this field.

Irrigation and water management costs

In Items 1q - 1s, enter the landlord's share of irrigation costs incurred only for the selected field of the target commodity during the 1998 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 1q - 1s. 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 1q 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 1998 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.

Item 1r Irrigation repair expense

Record the landlord's share of total expenses for repairs made to the irrigation equipment used to irrigate the selected field of the target commodity for the 1998 irrigation season. Enter the landlord's share in either percent or total dollars.

Item 1s 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 1998 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.

Back Cover - Conclusion

Item 1 Location of selected field

Selected commodity code

V10

Multicrop

Enter the code for the selected commodity 1 in cell 0105, and the code for the selected commodity 2 in cell 0109. Valid codes are:

- 191= **Corn**
- 26= **Soybeans**
- 201= **Upland Cotton**
- 165= **Winter Wheat**
- 163= **Durum Wheat**
- 164= (Other) **Spring Wheat**
- 20= **Potatoes**

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 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.

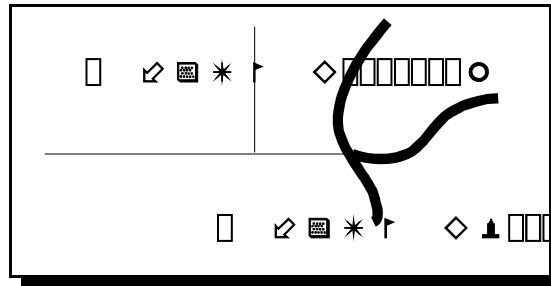
Item 2 Marking field locations on the map

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".

An example of plotting the location of two selected fields for a *Version 10* appears below. In this example, X 1-47, the “X” on the map marks the location for each selected target commodity (soybean and cotton) field for Sample Number 47 of the ARMS.



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 that is needed for analysis.

Item 3 Re-contact in the spring 1999

V2

Wheat Production Practices and Costs

Inform respondents that they will be re-contacted in February or March of 1999 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 1998 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

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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.

Item 5 Records Use

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 0107. For **V10**, enter a "1" in cell 0107 if records were used for commodity 1, and in cell 0111 if records were used for commodity 2.

Item 5b Chemical/Pesticide Data

If farm records were used for completing the majority of the **chemical and pesticide** data items in the questionnaire, enter code 1=YES in cell 0108. For **V10**, enter a "1" in cell 0108 if records were used for commodity 1, and cell 0112 if records were used for commodity 2.

Item 5c Expense Records

V2

Wheat Production Practices and Costs

Indicate whether farm/ranch records were used for the completing most of the **expense** items in the questionnaire. Enter "1" in cell 0106 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 101. Respondent codes are:

- Code 1 = **Operator, Manager, or Partner**
- Code 2 = **Operator's Spouse**
- Code 3 = **Accountant or Bookkeeper**
- Code 4 = **Someone Other than These People.**

If the respondent was an accountant, bookkeeper or someone other than the codes listed, record the respondent's name and phone number.

Ending Time

Record the ending time of the interview. 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.

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Date

Record the date the questionnaire was completed. Enter the date in MMDDYY format on the lines provided in the date cell. For example, if the interview was completed on November 6, 1998, enter 11 06 98 in the date cell.

Enumerator Name

Sign the questionnaire and record your enumerator ID number in code box 0098.